REMEDIATION ACTION PLAN FOR KNOWN SOIL CONTAMINATION INTERMODAL LOGISTICS CENTRE @ ENFIELD

Prepared for:

SYDNEY PORTS
FIRST PORT, FUTURE PORT

Sydney Ports Corporation
Level 8, 207 Kent Street
SYDNEY NSW 2000

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23 June 2009

Sydney Ports Corporation
Level 8, 207 Kent Street
SYDNEY NSW 2000

Attention: Mr Bruce Royds

Dear Bruce

RE: Remediation Action Plan for Known Soil Contamination
Intermodal Logistics Centre @ Enfield

Coffey Environments is pleased to provide the FINAL Remediation Action Plan for the Intermodal Logistics Centre at Enfield, for review and comment by SPC and the Site Auditor (Mr Graeme Nyland).

Please refer to the "Important Information About Your Coffey Environmental Report" at the end of the document.

Please do not hesitate to contact the undersigned should you have any questions.

For and on behalf of Coffey Environments Pty Ltd

Nalin De Silva
Senior Environmental Engineer

cc Mr Graeme Nyland - Environ

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ABBREVIATIONS

ACM	Asbestos Containing Materials
AEC	Areas of Environmental Concern
AHD	Australian Height Datum
ANZECC	Australian and New Zealand Environment and Conservation Council
ASSMP	Acid Sulfate Soil Management Plan
AST	Aboveground Storage Tank
C6-C36	Hydrocarbon chainlength fraction
CEMP	Construction Environmental Management Plan
BGL	below ground level
Bgs	below ground surface
BTEX	Benzene, Toluene, Ethylbenzene and Xylenes
CEMP	Construction Environmental Management Plan
COC	Chain of Custody
COPC	Contaminant(s) of Potential Concern
DECC	Department of Environment and Climate Change
DLWC	Department of Land and Water Conservation (NSW)
DoP	Department of Planning
DQO	Data Quality Objective
ESA	Environmental Site Assessment
ID	Identification
H2SO4	Sulfuric Acid
ha	Hectares
HCl	Hydrochloric Acid

HNO3	Nitric Acid
HRA	Health Risk Assessment
LOR	Limit of Reporting
µg/L	micrograms per litre
mg/kg	milligrams per kilogram
mg/L	milligrams per litre
MW	Monitoring Well
NATA	National Association of Testing Authorities
NEPC	National Environmental Protection Council
NEPM	National Environment Protection Measure
NSW EPA	Environment Protection Authority of New South Wales
OCP	Organochlorine Pesticide
OPP	Organophosphorous Pesticide
PAH	Polycyclic Aromatic Hydrocarbon
PASS	Potential Acid Sulfate Soils
PCB	Polychlorinated Biphenyl
PID	Photoionisation Detector
PMP	Project Management Plan
PPE	Personal Protective Equipment
Ppm	parts per million
ppmv	parts per million by volume
PQL	Practical Quantitation Limit
QA	Quality Assurance

QC	Quality Control
RAC	Remediation Acceptance Criteria
RAP	Remediation Action Plan
RIC	Rail Infrastructure Corporation
RBL	Risk-based level
RL	Reduced Level
RPD	Relative Percent Difference
SAQP	Sampling, Analytical and Quality Plan
SB	Soil Bore
SEMP	Site Environmental Management Plan
SEPP	State Environmental Planning Policy
SMP	Site Management Plan
SOP	Standard Operating Procedures
SPC	Sydney Port Corporation
SRA	State Rail Authority
SWL	Static Water Level
TCLP	Toxicity characteristic leachate procedure
TPH	Total Petroleum Hydrocarbon
UST	Underground Storage Tank
VENM	Virgin Excavated Natural Material
VHC	Volatile Halogenated Compounds
VOC	Volatile Organic Compound
WRS	Wagon Repair Shed

EXECUTIVE SUMMARY

Coffey Environments Pty Ltd (Coffey) was commissioned by Sydney Ports Corporation (SPC) to provide remediation and validation consulting services, including preparation of a Remediation Action Plan (RAP) for the redevelopment of the former Enfield Marshalling Yards located at Strathfield South for the Intermodal Logistics Centre (ILC) at Enfield (the Site).

It is understood that SPC has received development planning consent from the NSW Department of Planning, to redevelop the Site. This approval was granted on 5th September 2007 (Application Number 05_0147). It is understood that Site is approximately 60 hectares in area.

Historically, the Site has been used by the State Rail Authority (SRA) for marshalling of rail cars and locomotives, as well as sidings for rail and goods, for a period of seventy seven (77) years (Egis, 2002). Coffey conducted a walkover of the site in October 2008 and noted that structures present on the site included work sheds and facilities for the maintenance and servicing of diesel locomotives, administration and amenities buildings, as well as structures which have been heritage listed (including a wagon repair shed, a Yardmaster's Office, an Administration Building, a water tank, pedestrian footbridge and a carriage turn-table).

The objective of this RAP is to describe a remediation strategy and validation plan to render the site suitable for commercial/industrial land use by addressing:

- known contamination on the Site; and
- potential contamination in areas not previously assessed, specifically beneath building footprints.

While assessment and validation of groundwater is an objective of the remediation works, details of assessment groundwater has not been included in this RAP. Groundwater will be addressed separately through the remediation works.

Coffey has undertaken targeted sampling in known areas of contamination to assist with assessing both the horizontal and vertical extent of known contamination on the Site.

Areas of significant TPH surface soil staining as well as free product in selected soil profiles have also been observed. Soil contamination detected through laboratory analysis of samples collected from the Site appears to be predominantly total petroleum hydrocarbon (TPH) C_{10}-C_{36} based, which is understood to be a result of historical use of diesel fuels, oils and greases on the Site.

Other minor known contamination on the Site appears to include limited locations of heavy metal (arsenic, copper and zinc) soil contamination and limited locations of asbestos soil contamination.

A human health based risk assessment was undertaken for the site in order to establish risk based levels (RBLs) for total petroleum hydrocarbon (TPH) C_{10}-C_{36} soil contamination, based on ongoing commercial/industrial land use. Based on available data, exposure assumptions and constraints of the exposure assessment model, it was considered that petroleum hydrocarbon concentrations in excess of the established RBLs in soil at certain locations at the site as presented in this report, may pose an unacceptable health risk to:

- on-site security workers undertaking security patrols where direct contact with surficial soil impact is a complete exposure pathway; and
- on-site maintenance workers within a 1m deep sub-surface maintenance trench where vapours generated within the sub-surface emitted from a granular fill into a sub-surface structure.

However, based on available data, exposure assumptions and constraints of the exposure assessment model, the established RBLs for TPH C_{10}-C_{14} were greater than the theoretical C_{sat}[1] concentration and therefore the contaminant of potential concern is considered unlikely to pose an unacceptable health risk to:

- on-site commercial workers within the a concrete slab-on-ground commercial premises where vapours emitted from sandy clay and/or granular fill within the sub-surface migrate into a slab-on-ground structure;
- on-site security workers undertaking security patrols where vapours emitted from sandy clay and/or granular fill within the sub-surface migrate into the atmosphere; and
- on-site maintenance workers within a 1m deep sub-surface maintenance trench where vapours generated within the sub-surface emitted from a sandy clay fill into a sub-surface structure.

Furthermore, as direct contact RBLs established for maintenance workers were greater than the measured TPH concentrations at the site, known TPH impact at the site is unlikely to pose an unacceptable health risk to this receptor population via direct contact exposure.

For the purposes of this RAP, the following criteria have been adopted as Remediation Acceptance Criteria (RAC). These criteria are based on the RBLs derived in the human health risk assessment (for TPH C_{10}-C_{36} fractions) and published guidelines (for the remaining contaminants).

Contaminant	Human Health Based Criteria (mg/kg)
Arsenic	**500**
Cadmium	**100**
Chromium	**500**
Copper	**5000**
Lead	**1500**
Mercury	**75**
Nickel	**3000**
Zinc	**35000**

[1] C_{sat} has been defined as contaminant concentration at which the absorptive limits of the soil particles, the solubility limits of the soil pore water and the saturation of soil pore air have been reached.

Contaminant	Human Health Based Criteria (mg/kg)
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**
Ethylbenzene	**3.1**
Xylene	**14**
Aldrin + Dieldrin	**50**
Chlordane	**250**
DDT + DDD + DDE	**1000**
Heptachlor	**50**
Total Phenol	**42500**
Polychlorinated Biphenyls (PCB)	**50**
Asbestos	**0.001% w/w asbestos for fibrous asbestos and asbestos fines.** **0.05% w/w asbestos for ACM**

It is noted that these criteria are targets and that in some situations, due to soil volumes, cost, logistics and other reasons, alternative risk based methodologies may need to be applied to assess the need for further remediation.

The remediation strategy proposed for the Site includes a combination of approaches, depending on the nature and extent of the contamination. These approaches include:

- excavation and off-site disposal of disposal of material in excess of the adopted Remediation Acceptance Criteria (RAC);
- ex-situ containment onsite of material in excess of the adopted RAC; and
- In-situ containment of material in excess of the adopted RAC;

Based on the historical data available for the Site, Coffey recommends that:

- the Site soils are subjected to the remediation strategy proposed in this RAP;
- the Site soils are validated in general accordance with this RAP;
- additional contamination that is identified during Site validation works, undergoes risk assessment or remediation;
- further groundwater assessment works are undertaken to address two of the Site Auditor's concerns, including the presence of total petroleum hydrocarbon (TPH) in groundwater (and potential migration off site) and the presence of copper in groundwater; and
- develop a long term Site Environmental Management Plan (SEMP) to manage the retained contamination in the form of capped area and containment cells. The SEMP will address TPH and asbestos impacted soil and document the required management of TPH, asbestos and management of access to community and ecological areas. The SEMP will also address the requirements of on-going groundwater monitoring.

1 INTRODUCTION

1.1 Background

It is understood that Sydney Ports Corporation (SPC) has received development planning consent from the Minister of Planning, to develop the former Enfield Marshalling Yards site located at Strathfield South for the Intermodal Logistics Centre (ILC) at Enfield (the Site). This approval was granted on 5th September 2007 (Application Number 05_0147). We understand that the site is about 60 hectares in area and the development will involve:

- An intermodal terminal area of approximately 12 hectares together with two rail sidings (of approximately 920 metres long), container maintenance activity shed, and wash down facility where a total of 300,000 TEU movements per annum of port related container throughput (as measured at the rail / IMT interface) can be moved into and out of the ILC site;
- Two empty container storage areas with a combined size of approximately eight (8) hectares. One empty container storage area will be located to the north of the intermodal terminal area (approximately 4.7 hectares in area) and the other empty container storage area will be located to the south of the intermodal terminal area (approximately 3.8 hectares in area);
- Six (6) warehouse and distribution areas collectively covering an area of approximately 15 hectares, with an approved floor area of 70,000 square metres, where containers could be unpacked and packed on site and goods distributed;
- Light industrial and commercial areas, collectively covering an area of approximately 4 hectares with an approved floor area of 40,000 square metres;
- Two (2) road access points. The key entry point is proposed at Wentworth Street to the west of the LIC site which will be accessed by a bridge over the New Enfield Marshalling Yards which connects Wentworth Street to the ILC site. This will link via the internal road system at the ILC to the secondary access point at Cosgrove Road on the eastern side of the ILC site;
- The construction of a railway through line to extend along the western side of the ILC site adjacent to the intermodal terminal area;
- On-site traffic management and queuing within the leased areas; and
- Community and ecological areas of approximately six (6) hectares for ecological enhancement and community opportunities. The area would also serve as a buffer between operations at the ILC and residences located to the south of the ILC site.

1.2 Objectives

The objective of this RAP is to describe a remediation strategy and validation plan to render the site suitable for commercial/industrial land use by addressing:

- known contamination on the Site; and
- potential contamination in areas not previously assessed, specifically beneath building footprints.

While assessment and validation of groundwater is an objective of the remediation works, details of assessment of groundwater has not been included in this RAP. Groundwater will be addressed separately through the remediation works.

1.3 Scope of Works

The scope of works undertaken in preparing this RAP was as follows:

- Prepare a summary of the Site identification, history and condition as well as the surrounding environment;
- Prepare a summary of previous contamination assessments carried out on the Site;
- Establish remediation goals;
- Establish risk based levels (RBLs) for assessment criteria for selected primary contaminants of concern;
- Carry out delineation sampling and laboratory analysis of known contamination on the Site;
- Assess likely remediation options;
- Select the preferred remediation option/s;
- Provide details of the remediation option/s;
- Outline procedures and activities that are required for the implementation of the preferred remediation option;
- Outline procedures and activities that are required for validating the remediation;
- Outline requirements for a site management plan and an occupational health and safety plan to be implemented during the remediation;
- Outline requirements for a contingency plan to be prepared for the remediation;
- Outline the regulatory compliance requirements for the remedial works;
- Provide details of contacts for the period of remediation works; and
- Outline the requirements for periodic reporting during the remediation works.

2 SITE DESCRIPTION

2.1 Site Identification

The site is located in the Enfield Marshalling Yards and is bounded by the Hume Highway to the north, Roberts Road and Wentworth Road to the west, Punchbowl Road to the south and Cosgrove Road to the east (the Site). Refer to Figure 1 for a site locality plan. It is understood that the site covers a total area of approximately sixty (60) hectares (ha).

The Site comprises Lot 2 in DP1006861,Lot 14 in DP 1007302 and Lot 101 in DP 1001498 (excluding the two leased areas Toll and Wheel Lathe). The Site has been zoned Special Uses 5b (Railways) according to the Strathfield Planning Scheme, with the entire area around the site zoned Industrial 4 (Egis 2001). The site is generally divided into two portions, consisting of a diesel-electric train maintenance area (referred to as the DELEC area) and areas outside of the DELEC area. The majority of the infrastructure on the Site is located within the DELEC area, while other buildings (including a wagon repair shed, Yardmaster's Office and Administration Building, all currently disused) are located outside the DELEC area but within the boundary of the Site.

It is noted that the Tarpaulin Factory is not a part of the Site for the purposes of this project.

For the purposes of remediation works, the Site has been divided into five (5) separable portions (SP). The scope of this RAP is limited to SP2, SP3, SP4 and SP5. The remediation and validation of SP1 is being carried out under a separate RAP (refer to Coffey Environments, 2009).

2.2 Site History

2.2.1 Overview

The Site was used by the State Rail Authority (SRA) for marshalling of rail cars and locomotives, as well as sidings for rail and goods, for a period of seventy seven (77) years (Egis 2002). Coffey Environments staff conducted a walkover of the site in October 2008 and noted that structures present on the site included work sheds and facilities for the maintenance and servicing of diesel locomotives, administration and amenities buildings, as well as structures which have been subject to heritage investigation and some of structures have been assessed as having heritage value (including a wagon repair shed, a Yardmaster's Office, an Administration Building, a water tank, pedestrian footbridge and a carriage turn-table). Locations of major buildings and structures which were present on the Site in October 2008 are presented in Figure 3. The historical use of the Site based on previous consultant's report is presented below.

Pre 1916

- Site used for agricultural purposes;

1916-1990

- Site largely developed as marshalling yard by mid 1920s. Development likely to have included levelling of site to allow laying of railway tracks;
- Wagon repair shed operated for the life of the yard. Activities conducted in shed included stripping and general maintenance of axle boxes, relining of brakes and internal carriage repairs; and

- Railway tracks and sidings occupied up to 75% of site. No history of locomotive maintenance or refuelling outside DELEC area during this time. Most of the track work outside the DELEC area removed in the late 1980s.

1990-1999

- During early 1990s, a large stockpile ("Mt Enfield") – originally situated on adjacent Freight Rail Yard – relocated and sorted into 5 stockpiles on site. Mt Enfield contained reworked shale and sandstone, plus building rubble, ash, slag, ballast and general debris.

Previous environmental consultant and auditor reports on the Site suggest few facilities within and outside the DELEC area have been removed and there have been few major changes in processes over the life of the Site. These reports suggest that known potential sources of contamination on the Site have included an old load box, former above-ground storage tanks (ASTs) in an unsealed area, as well as a formerly unsealed refuelling area). A significant unknown potential source of contamination appears to be the presence of waste dumps generated at unspecified locations over time (Environ 2002).

Numerous assessments of soil and groundwater contamination have been conducted on the site and a large number of these assessment reports have been audited by Dames and Moore Pty Ltd and Environ. Table 1 below includes a list of relevant audit reports as well as a list of the assessment reports that were subject to audit.

Table 1: Documents reviewed in Site Audit Reports

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

Site Audit Report	Documents Reviewed
Dames & Moore (1999) Summary Site Audit Report Enfield Marshalling Yard. Dames & Moore Pty Ltd. Document Reference: 30306-006-070 (Continued)	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 Centre, Cosgrove Road, Enfield. Groundwater Technology Australia Pty Ltd

Site Audit Report	Documents Reviewed
Site Audit Report Delec Depot, Enfield, for Sydney Ports Corporation (Environ 2002) Ref: 31-0022 (Continued)	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 (1999) Enfield Marshalling Yards Part A and Part B Contamination Assessments (March and August). CH2MHill Australia Pty Ltd
	SKM (2001) Phase 1 Environmental Audit Report. Sinclair Knight Merz Pty Ltd

In addition, Coffey Environments also reviewed the following documents which were not included in the abovementioned site audit reports:

- Douglas Partners (1993) Report on Site Investigation Enfield Intermodal Terminal. Douglas Partners Pty Ltd, Document Reference: Project 19109
- GHD (2003) Asbestos Validation – Rail Infrastructure Corporation (RIC) Site, Enfield. GHD Environmental Pty Ltd, Document Reference: 2112009/R002.

Based on Coffey's review of these reports, contamination at the site generally appears to be present as:

- Heavy fraction (C_{10}-C_{36}) total petroleum hydrocarbon (TPH) contamination predominantly in shallow and limited deeper soils across the DELEC area, as well as in selected areas within the wagon repair shed;
- With respect to background levels, elevated concentrations of primarily arsenic, copper and zinc were found in isolated locations within the DELEC area, although there was only one exceedence of the NEPC (1999) commercial/industrial assessment criteria adopted for the Site (copper from one sampling location near the locomotive workshop);
- Asbestos fibres were detected at isolated locations within the DELEC area; and
- Elevated concentrations of copper, manganese and zinc relative to background levels were detected in groundwater samples taken from wells across the site. Of these, only manganese exceeded the criteria adopted within the assessment reports. The auditor, however, considered the manganese as attributable to natural occurrences owing to the site once being a swamp (Environ 2002).

2.2.2 Areas and Contaminants of Concern

The Dames & Moore (1999) and Environ (2002) summary audit reports on portions of the Site outside of the DELEC area and within the DELEC area, respectively, identified the following areas of environmental concern (AECs) and contaminants of potential concern (COPCs):

Table 2: Outside DELEC area, based on Dames & Moore (1999, p. 6)

Areas of Site	Potential Source of Contamination	Contaminants of Potential Concern
Wagon Repair Shed	Light maintenance of wagons and carriages, including axle box maintenance / stripping, fixing / fitting / re-lining asbestos brake shoes, and replacing air hoses etc	Metals, asbestos, TPH, benzene, toluene, ethyl benzene and xylenes (BTEX)
Yardmaster's Office / Administration Building	Possible use of pesticides under floor slab	Metals and Organochlorine Pesticides (OCPs)
Drainage channels/low lying areas	Fill deposits	Metals, polycyclic aromatic hydrocarbons (PAH), phenolics

Areas of Site	Potential Source of Contamination	Contaminants of Potential Concern
Eastern Boundary	No known activities	Metals
Stockpiles	Contents of stockpiles not documented	Metals, TPH / BTEX, PAH, phenolics
Groundwater*	Leaching of contaminants or migration from upgradient*	TPH and metals*

*From Environ (2002 p. 6)

Table 3: Within DELEC Area, based on Environ (2002, p. 6)

Areas of Site	Potential Source of Contamination	Contaminants of Potential Concern
Track areas, especially load box and refuelling areas, fuel and lubricant storage etc.	Spills and leaks	TPH, especially long chain oils and diesel
Filled area (most of area)	Filling with ash and other unknown materials	Likely PAHs, heavy metals and other contaminants typically associated with fill material in industrial areas
Diesel AST area	Abrasive blasting	Zinc, copper, lead, mercury
Car park and diesel AST area, based on previous results	Steam boiler wastes	Chromium
Steam spray shed and electrical workshop, mixed liquor waste tank areas	Cleaning with solvents	Volatile Halogenated Compounds (VHC)
Around old fibro buildings, potentially anywhere on site	Deterioration of building materials, abrasion of asbestos brake linings, disposal of linings	Asbestos
Near turn-table	Possible former market garden	OCPs
Groundwater	Leaching of contaminants or migration from upgradient	TPH and heavy metals

2.2.3 Patterns of Contamination – Outside DELEC

Based on information contained in the Site Audit Report by Dames & Moore (1999), patterns of contamination on the site in areas outside the DELEC area appear to be:

2.2.3.1 Wagon Repair Shed

Elevated concentrations of arsenic, copper, lead, zinc, TPH (C_{10}-C_{36}) and PAHs were detected. The highest TPH and lead concentrations were distributed within and around the shed without any noticeable pattern, indicating that they were sourced from activities prior to sealing of the shed floor.

Asbestos was also detected in a four (4) of the samples assessed, although it is unclear whether these detections were in the form of fibres, bundles and/or fragments.

2.2.3.2 Yardmaster's Office/Administration Building

Of the samples taken from this area and reviewed by Dames and Moore (1999), one sample showed detection of OCPs (mainly endrin) and some elevated concentrations of metals. All results were, however, well below the adopted assessment criteria in the reviewed reports.

2.2.3.3 Drainage Lines

The auditor noted that only shallow samples from less than 1m below ground level (BGL) were taken from drainage-lines, while it is understood that fill material used in these areas may be up to 6.5m in depth. None of the soil samples from the drainage lines contained elevated concentrations of metals, although the status of contamination in soil along drainage lines at depths greater than 1m BGL is currently unknown.

2.2.3.4 Eastern Boundary

Samples from the eastern boundary of the site were analysed for selected metals, mercury, OCPs, organophosphorus pesticides (OPPs), TPH, phenols and PAH. There were detections of elevated concentrations of metals, especially lead (up to 208 mg/kg) and zinc (up to 382 mg/kg) and elevated TPH C_{10}-C_{36} (up to 339 mg/kg), although these concentrations were below the adopted assessment criteria in the reviewed reports. Dames and Moore (1999) considered that the results clearly indicated contamination above background concentrations and that the sampling density was insufficient for reliable detection of hotspots.

2.2.3.5 Marshalling Yards

While there were no concentrations detected above the adopted assessment criteria in the reviewed reports, there were elevated concentrations of arsenic, copper, lead and zinc detected at a number of locations throughout the marshalling yard;. An elevated concentration of cadmium was detected at one location. Asbestos was detected in several samples from this area.

The audit report concluded that as a result of the low sampling density in this large area, there is a possibility of undetected contamination of unacceptable dimension and that validation of exposed areas should be conducted after site development.

2.2.3.6 Groundwater

Elevated concentrations of copper and zinc were detected above the assessment criteria adopted in the reviewed reports, in the majority of the monitoring wells at the Site.

There were low concentrations of TPH (C_{10}-C_{28} fractions: CH2MHill 1999) detected in several, but not all, of the monitoring wells on the Site. Based on the low concentrations of TPH detected and the distribution of wells containing TPH, the auditor suggested that TPH contamination in the monitoring wells was not related to site activities.

2.2.4 Patterns of Contamination – DELEC Area

Based on information contained in the Site Audit Report by Environ (2002), patterns of contamination on the site inside the DELEC area appear to be:

2.2.4.1 TPHs

Detections of total TPH C_{10}-C_{36} greater than the adopted site assessment criteria of 1,000 mg/kg were recorded in a number of locations, mainly near the railway tracks, the turn-table and underground stormwater drain location. Significant concentrations were generally recorded in the upper 1m of soils, although the audited reports did not include an analysis of the depth profile of hydrocarbon contamination. It was noted, however, that in more than half of the sampling locations, staining and odour did not extend to the fine-grained soil beneath the ballast. Field observations suggested that most of the staining was between the tracks, particularly near switching locations.

Hydrocarbon contamination was detected in deeper soils at selected locations on the Site. One test-pit down gradient of the mixed liquid waste tank area contained TPH (C15-C36) concentrations of up to 5600 mg/kg at depths of 2m bgl. TPH contamination was not, however, detected in the shallower samples from this area.

Surface staining was noted around the load box. A borehole located to the south between the load box and the turntable in a stained area had a TPH (C_{10}-C_{36}) concentration of 1300 mg/kg in a sample from 2m bgl, indicating the potential for some vertical migration of contamination. At a second borehole between the turntable and the Staff Amenities Building, TPH C_{10}-C_{36} was detected at 3400 mg/kg at a depth of 3m bgl, near the base of fill, with no detections on a shallow sample. These results suggest either migration from an up gradient source (such as the load box or trackway area) or burial of contaminants.

Previous assessments indicated the presence of a solid waste tip to the south east of the Wheel Set Storage building. A test pit excavated near this area showed traces of waste, including wire, tiles, plastic and tarry asphalt, with a TPH (C_{10}-C_{36}) concentration of 5600 mg/kg at a depth of 2m bgl.

2.2.4.2 Metals, PAHs, OCPs and Asbestos

Ash was noted in the fill material and PAHs were detected at approximately 40 sampling locations across the DELEC area. At some of the locations, samples from two depths were analysed. The highest PAH concentration detected was 28 mg/kg, which was well below the adopted site assessment criteria of 100 mg/kg. It was considered that sufficient samples containing ash were analysed to allow confidence that the fill did not contain PAHs at concentrations that would pose a human health risk to industrial land use.

Arsenic, chromium (assumed to be Cr III), copper, lead, nickel and zinc were detected at most sampling locations. While some of the detected metals, especially copper, lead and zinc, usually associated with each other, were elevated with respect to assumed background concentrations, all results were less than the adopted site assessment criteria except for copper in one (1) location. Elevated copper concentrations were detected in a borehole near the locomotive workshop.

2.2.4.3 Diesel AST area

Zinc was detected at a concentration of 58700 mg/kg in a previous site assessment, in the area that is now concrete sealed within the new bunded AST area. The concentrations of copper, lead, zinc and mercury detected in the surrounding area were not significantly elevated, indicating that high concentrations are probably localised within the existing bunded area.

2.2.4.4 Asbestos

Asbestos detections were noted in previously prepared reports. The auditor considered that there is a possibility for other areas of asbestos contamination to exist within the DELEC area.

2.2.4.5 Market Gardens

Aerial photograph reviews in previously prepared reports indicated that there could have been market gardens near the existing turn-table location. Samples from this area were analysed for OCPs and OPPs. No indications of contaminants associated with market gardens were found. As contaminants would be expected to be near the former ground surface, and this area now has several metres of fill on it, the risk of significant pesticide contamination was considered low by the auditor.

2.2.4.6 Groundwater

It was the auditor's opinion that low concentrations of barium, manganese and nickel detected in the groundwater were attributable to natural occurrences.

Copper, detected in a monitoring well located at an assumed (by the auditor) down gradient location of the locomotive workshop, was considered by the auditor as potentially due to leaching from overlying soils.

Zinc was detected in the groundwater and may be due to onsite sources. Based on the distribution of the wells in which zinc was detected, however, the auditor considered it difficult to distinguish between onsite and offsite sources based on the available data.

2.2.5 Further Contamination Information

2.2.5.1 Additional Reports

The following documents were not reviewed in the abovementioned auditor's reports, however they provided the following additional information on contamination at the site:

- Douglas Partners (1993) Report on Site Investigation Enfield Intermodal Terminal. Douglas Partners Pty Ltd. Document Reference: Project 19109

A site investigation was conducted comprising 16 boreholes, 25 test pits and 6 excavation trenches aimed at providing contamination and geotechnical information to facilitate development of a site remediation and management plan. Environmental samples were analysed for metals, TPH, PAH, OCPs and polychlorinated biphenyls (PCB);

The investigation identified a complex combination of subsurface conditions, comprising minor surficial filling, major filling/spoil/rubbish, major filling/reclamation material, alluvial sediments, residual soils/clays, very low strength rock and medium strength rock;

Groundwater was recorded at depths of between 0.7m and 7.6m BGL;

Asbestos containing materials (ACM) were identified by visual inspection in the southern solid waste area. The ACM were generally considered to be in a stable condition;

Hydrocarbons were detected in one soil and two water samples. These results were, however, within the guidelines adopted for the study and indicated that hydrocarbons were not leaving the site via the groundwater system;

Out of 272 individual results for detected metals, thirteen soil samples showed concentrations of copper (6 samples), lead (1 sample) or zinc (6 samples) in excess of the assessment criteria adopted at the time. All results for soil analyses were from samples of fill and were considered to be isolated occurrences not warranting further remediation;

One water sample indicated the presence of chromium at a level above that specified in the Clean Waters Act (1970). Chromium was not identified in the adjacent bores or down gradient and, although not considered significant, further investigation could comprise repeat sampling and testing or the installation of additional test bores and standpipes (monitoring wells);

PAH, OCP and PCB were not detected on site.

- GHD (2003) Asbestos Validation – Rail Infrastructure Corporation (RIC) Site, Enfield. GHD Environmental Pty Ltd. Document Reference 2112009/R002

The report was commissioned by Sydney Ports Corporation to undertake validation sampling of near surface soils of unsealed areas of the RIC site for asbestos fibres;

A visual inspection of the site was conducted and 13 near surface (0-0.1m) soil samples were collected from across the site from the unsealed areas (approximately 0.5 ha) on a systematic grid basis;

Visual inspections and laboratory analyses of samples found no evidence of fibrous cement sheeting or other potentially asbestos bearing fragments across the site.

2.2.5.2 Groundwater Contamination

It is understood that:

- soil contamination on the Site is predominantly located in shallow soils;
- the proposed site redevelopment includes covering the majority of the Site with concrete and/or asphalt paving (limiting potential infiltration of surface water and subsequent contaminant migration from shallow soils to deeper soils where groundwater may be present);
- perched groundwater on the Site does not have a significant hydraulic gradient and has a low potential for movement; and

- the Site fill and natural materials are of low permeability.

Based on these understandings and current Site conditions, Coffey considers that there is a low potential for significant groundwater contamination to be present on the Site. However, it appears that there are gaps in the historical groundwater data for the Site and these gaps should be addressed via additional groundwater assessment works.

This requirement for additional groundwater assessment works was also raised by the Site Auditor in his Site Audit Statement No. GN34.

2.3 Site Condition and Surrounding Environment

Coffey's environmental scientists conducted a brief walkover of the site in October 2008. The Site is a relatively flat parcel of land with access from the east off Cosgrove Road. The site was being used as a Locomotive Maintenance Centre and there were a significant number of railway tracks present over much of the site. Activities being undertaken at the site, particularly within the DELEC area, included locomotive servicing (repairs and maintenance), refuelling and training. Ancillary facilities used to service these operations included bulk fuel storage and effluent treatment plants. Areas of the site outside the DELEC area were generally either disused or used infrequently, which has resulted in most areas outside the DELEC becoming overgrown. Fly-tipping has also occured in areas of the Site outside the DELEC, due to the relative inactivity and lack of surveillance on those areas of the Site.

The site is surrounded primarily by commercial and industrial landuses, although there are residential areas to the north east and south west of the Site.

SPC has advised that a potential Green and Golden Bell Frog habitat is situated on either side of Cox's Creek canal (west of the rail line) in the southern portion of the site and that another potential habitat is present around the drainage line (east of the rail line) that crosses Cosgrove Road (approximately west of Cleveland Street). A Frog Protection Plan (to assist with protection of frogs that may use the site during construction) and a Frog Management Plan (to assist with management of the proposed habitat area to be created at the southern part of the Site) have been developed. Both plans have been included in SPC's Construction Environmental Management Plan Framework (Rev 8). SPC has advised that these plans have been addressed in the Construction Environmental Management Plan prepared by the Remediation Contractor for the site (which was approved by the NSW Department of Planning on 18 December 2008).

The nearest surface water body is the Upper Cooks River, the nearest tributary of which is located approximately 1300m north-east of the site. Two stormwater drains, which pass under Cosgrove Rd, flow from the site and into the tributary. The northern most drain is located approximately adjacent to the fuel unloading area at the Site, The other drain is located approximately 250m to the south of the DELEC maintenance workshop.

2.4 Geology and Hydrogeology

Detailed descriptions of the geology and hydrogeology of the Site are presented in reports by Egis (2001 & 2002) and have been reproduced below.

The Site is located in a topographical depression, sitting approximately 20m AHD across the majority of the Site. The highest point of the Site is located in the north, near the intersection of the Hume Highway and Roberts Road (32m AHD). The lowest point of the Site was noted around the southeast area in the vicinity of the Punchbowl Stormwater Channel, where a 12m AHD contour is found where the channel

intersects Cosgrove Road (Egis, 2002). In general, the Site slopes downward in a south-easterly direction, towards the Cosgrove Road / Punchbowl Road intersection.

The Site is covered by fill comprising imported clay and ash. The ash was reported to have originated from steam locomotives, which were stored on the Site prior to the development of the Locomotive Maintenance Centre. The fill extends to depths typically ranging from 2m – 4m, particularly on the eastern portion of the property. The fill material is underlain by 0.2m – 6.0m of natural clay, which is underlain by moderately weathered shale. At several locations near the locomotive maintenance shed in the centre of the property, a single layer of ash fill was found to exist, while the northern and southern areas of the site are characterised by two layers of ash separated by clay fill material. The Locomotive Maintenance Centre has been shown on plans as being excavated to the base of the fill material, which possibly explains why only a single layer of ash is present in this area, if the upper ash layer was excavated during construction of the Centre.

The direction of the natural groundwater flow was found in the previous assessments to be in a generally easterly direction. However, as indicated during previous investigations, the flow direction exhibits a degree of variability with directions ranging between SE and NE.

Perched groundwater has been found to exist in the fill material above the natural clay materials. Previous assessments have reported that the perched water on the Site does not have a significant hydraulic gradient and has a low potential for movement. Previous assessments have also concluded that the perched groundwater is thought to have little flow or migration and would generally follow the fill and natural clay boundary.

Observations and measurements made during these past assessments indicated that the fill material is of low permeability. It was noted that monitoring wells screened in the ash took considerable time to recharge during development). The measured levels of the perched water were highly variable and there was no indication, under the dry weather conditions at the time that these bodies of perched water were either hydraulically connected or drained through conduits on the Site. In particular, there was no correlation found between the perched groundwater levels and the former drainage channels which traverse the subsurface of the site.

However, the possibility exists, particularly during wet weather periods, for some of the perched water bodies to become hydraulically connected when infiltration causes the perched water(s) to “spill” or “overflow” into other perched waters and / or infiltrate into the underlying bodies of ash fill. In those areas of the Site where the ash fill is deepest, notably below the old load box and the wheel lathe, the groundwater in the natural clays may be contiguous with groundwater found in the deep fill.

2.5 Acid Sulfate Soils

The acid sulfate soil characteristics for the site have been assessed in Egis (2002). This report noted that the majority of the Site is mapped as Planning Class 5 land, according to the Strathfield City Council Local Environment Plan (2000). In Class 5 lands, soil planning and management provisions for acid sulfate soils are required for any works within 500m of adjacent Class 2, 3 or 4 land, which are likely to lower the watertable below 1m AHD on adjacent Class 2, 3 or 4 land.

Egis (2002) also considered the following as applicable for the south-eastern end of the site:

- Approximately 1 ha of the southern area is mapped as Class 4 land, corresponding to the low-lying tributary extending from the Cooks River;

- Potential acid sulfate soils (PASS) may exist in this area;
- If excavations in the south-eastern end of the site (the area of the site mapped as Class 4 land) are likely to extend to depths 2m BGL, management plans would be required to outline:
    - mitigation strategies to minimise impacts from the disturbance of PASS, any excavated soils and any acid leachate produced;
    - a proposed monitoring program for soils and surface and subsurface water quality; and
    - contingency procedures to be implemented in the case of unprecedented events or the failure of management systems including a Remedial Action and Restoration Action Plan.

According to the Department of Land and Water Conservation (DLWC) 1:25000 scale Acid Sulfate Soil Risk Map (Botany Bay, 1:25000 scale, 2nd Edition, Map No. 913OS3), the south-east corner of the site lies within an area designated as having a low risk of acid sulfate soils. For these areas, land management is generally not required for acid sulfate soils, although highly localised occurrences of acid sulfate soils may be encountered from 1m BGL (DLWC 1997).

Where remediation activities require excavation below 2m BGL, or to an extent which may result in the lowering of the water table below 1m AHD, such work may be required to be done in accordance with an acid sulfate soil management plan (ASSMP). The ASSMP may be developed either for specific works and/or specific portions of the Site at which the work is to be conducted. Furthermore, it should be recognized that an ASSMP will be required to manage any acid sulfate soils encountered on the Site, irrespective of depth or position.

Works associated with the construction phase may involve excavations which extend significantly past 2m BGL and/or the watertable (e.g. excavations for basements, piers, footings). These works, therefore, will likely require acid sulfate management plans to be developed either for specific works and/or specific portions of the site at which such works are conducted. As the construction phase is beyond the scope of this RAP, it is understood that acid sulfate management plans associated with the construction phase, if required, would be included as part of the Construction Environmental Management Plan developed by the relevant construction contractor.

3 CONTAMINATION ASSESSMENT

3.1 Previous Assessments

The results of previous assessments have been reviewed and are generally discussed in Section 2.2 of this RAP.

3.2 Known Contamination Delineation Assessment

3.2.1 Background

Delineation sampling at locations of known contamination was undertaken by Coffey in January 2009. The soil contamination issues at the Site that were to be addressed as part of these delineation works included:-

- Total Petroleum Hydrocarbon (TPH) C_{10}-C_{36}
- Arsenic, Copper and Zinc
- Asbestos

The potential sources of known TPH C_{10}-C_{36} contamination on the Site were understood to be leaks and spills from historical activities on the Site, including fuel storage and maintenance activities.

The potential source of known arsenic contamination on the Site (limited to a location in the south of the Site) was understood to be uncontrolled fill.

The potential source of known copper contamination on the Site (limited to a location to the south west of the Locomotive Maintenance Shed (Building 1) was understood to be from servicing and maintenance activities.

The potential source of known zinc contamination on the Site (in the vicinity of the diesel AST area) was understood to be from abrasive blasting of the zinc based tank coatings on former ASTs at this location.

The potential source of the known asbestos contamination on the Site was understood to be the use of asbestos containing materials in building structures (e.g. fibre cement wall sheeting and roofing). The use of brake shoes containing asbestos on trains on the Site also cannot be precluded.

This delineation sampling was undertaken in order to provide additional information for the development of this RAP for the Site. It is expected that the data obtained from this project will assist in:

- assessing the horizontal and vertical extent of known contamination and estimating subsequent remediation areas, by collecting samples beneath known contamination depths and at step out locations around the known contamination;
- providing an improved understanding of the leachable nature of metals at specific locations; and
- providing an improved understanding of the nature of the contamination and the likely remediation strategy required to address each contaminant, by undertaking laboratory analysis on samples collected.

3.2.2 Objective

The objective of this contamination delineation assessment was to;

- Assess the extent of known contamination located at in the DELEC and Wagon Repair Shed laterally and vertically;
- Assess the potential presence of asbestos in an area suspected to be an asbestos brake shoe burial ground located in the south east of the site.
- Assessing the leachable nature of metals at targeted locations (based on known locations of elevated concentrations of metals in soils).

3.2.3 Scope

The scope of work carried out was generally in accordance with Coffey (2009) Sampling, Analytical and Quality Plan, Delineation of Known Contamination (ref: ILC – CO – D&R – ENVIRHOD00634AA-R001). The scope included:

- Excavation of boreholes and test pits at locations of known contamination and at step out locations around these boreholes and test pits;
- Collection of primary and step out soil samples from previously reported depths of known contamination as well as 0.2m and 0.5m below ground level.
- Grid-based intrusive sampling in an area referred to as an asbestos brake shoe burial ground (located at the southern end of the Site);
- Excavation logging on new boreholes/test pits;
- Targeted laboratory analysis; and
- Data assessment and reporting.

3.2.4 Fieldwork

Fieldwork was undertaken between 14 and 21 January 2009, by Coffey's environmental scientists.

3.2.4.1 Sampling Points

The locations that underwent sampling were selected based on the aforementioned Sampling, Analytical and Quality Plan (SAQP).

A targeted sampling approach was applied to each location (with the exception of the asbestos brake shoe burial area), based on an understanding of previously identified locations of known contamination, for the purposes of further assessment and delineation of that contamination.

A uniform sampling approach was applied to the asbestos brake shoe burial area. Based on drawings provided by SPC, it was estimated that the potential burial area was approximately 4,000m^2 in size. NSW EPA (1995) requires a minimum of eleven (11) sampling locations for a site of this size. Coffey planned twelve (12) locations to facilitate a uniform grid sampling pattern.

A summary of sampling locations is provided in the table below.

Sampling Point	Location
DELEC	
BD8	Adjacent Locomotive Fuelling Point (Building 14)
BD20	North of Old Load Box (Building 16)
BD25	Track area north of Locomotive Maintenance Shed (Building 1)
BD35	Adjacent A/C Workshop and Plumbers (Building 20)
BD38	Adjacent Yard Staff Amenities (Building 24)
BD50	Main Fuel Storage Area (Building 10)
BD51	Main Fuel Storage Area (Building 10)
BH11	Adjacent Yard Staff Amenities
BH12	Adjacent Mixed Liquid Waste Tank Area (Building 26)
BH19	Adjacent Dangerous Goods Storage Compound (Building 21)
BH21	Track area adjacent Locomotive Maintenance Shed (Building 1)
BH34	Adjacent Old Load Box (Building 16)
BH36	Track areas north Staff Amenities Building (Building 4)
BH42	Track area west of Fuellers Amenities (Building 15)
BH45	Track area between Load Box (Building 7) and Turntable (Building 5)
SS6	Track area near Mixed Liquid Waste Tank (Building 26)
TP7	Area east of Smart Ash Burner (Building 25)
TP9	Area west of Smart Ash Burner (Building 25)
GENERAL	
BH30	South end of site

Sampling Point	Location
Wagon Repair Shed	
BH13	Footprint of Wagon Repair Shed
WRS2	Curtilage of Wagon Repair Shed
WRS9	Curtilage of Wagon Repair Shed
WRS12	Curtilage of Wagon Repair Shed
WRS32	Footprint of Wagon Repair Shed
Asbestos Brake Shoe Burial Ground	
ABS1 – ABS11	Asbestos Brake Shoe Burial Ground

The locations of each sampling point (excluding the Asbestos Brake Shoe Burial Ground) were estimated based on a combination of

- drawings in previous contamination assessment reports supplied by SPC
- observations made in the field of previous intrusive work (e.g. evidence of previous concrete coring.

Once each location had been established, the northing and easting was recorded using a hand held GPS.

The boundaries of the Asbestos Brake Shoe Burial Ground were estimated based on a drawing supplied by SPC (ref: SEDP081B) and features observed in the field. The northings and eastings of the four (4) corners of the area were recorded using a hand held GPS (refer Figure 4C).

The following sampling locations were originally identified in the SAQP for delineation but were not sampled:

Location Not Sampled	Reason
BH31 (DELEC adjacent Building 17)	Sampling point is located in Separable Portion 1, which is outside the scope of this RAP. Separable Portion 1 is addressed in another RAP.
BD18 (DELEC north of Building 16)	Sampling point is located in Separable Portion 1, which is outside the scope of this RAP. Separable Portion 1 is addressed in another RAP.

Location Not Sampled	Reason
BD31 (DELEC east of Building 29)	Sampling point is located in the immediate vicinity of two underground storage tanks (UST) discovered as unexpected finds. SPC indicated they would like these USTs assessed as a separate task during excavation/removal or an in-situ abandonment. The contamination at this location could be addressed at the same time.
TP10 (DELEC south east of Building 33)	Sampling point is located in a separate leasehold area, which is outside the scope of this RAP
ABS12 (Asbestos Brake Shoe Burial Area)	The burial area on SPC drawing SEDP081B indicates the area traverses the southern rail line. Advice received from Mr Bruce Royds of SPC indicated that it was highly unlikely that brake shoes would have been buried beneath the southern rail line and to limit the area of assessment to the western side of the rail track. This reduced the assessment area to approximately 2,900m2. The sampling design was reduced to eleven (11) sampling points which exceeds the minimum requirement of nine (9) as nominated in NSW EPA (1995) for an area of this size.

The locations of all the sampling points are represented graphically in Figure 4A, Figure 4B and Figure 4C.

3.2.4.2 DELEC, Wagon Repair Shed & General Sampling

An underground service clearance was carried out at each sampling location using a professional service locating contractor. Depending on field accessibility and soil conditions, the test pits/boreholes were drilled/excavated either using a hydraulic backhoe, Geoprobe push tube drilling rig or hand auger. Where concrete/bitumen was present at the sampling location, coring was undertaken by a professional concrete coring contractor beforehand.

The depth of boreholes and test pits varied from 0.5m to 3.5m below ground level. Observations made indicated that the geology at the sampling locations was generally consistent with the geology reported in Section 2.4 above. It is noted that groundwater was not encountered in the boreholes or test pits. Logs were prepared for each of the primary sampling locations, noting soil types encountered and visual/olfactory evidence of potential contamination. These logs are included in Appendix D.

3.2.4.3 Asbestos Brake Shoe Burial Ground Sampling

An underground service clearance was carried out at each sampling location using a professional service locating contractor. Soils were drilled using a Geoprobe push tube drilling rig.

All eleven (11) boreholes (ABS1 – ABS11) reached their target depth of 2.0m below ground level. Natural material was encountered at all boreholes except ABS2 and ABS7 (where target depth was reached before natural material was observed). The general geology of the soil in this area consisted of a layer of fill (0-2m bgl) overlying natural clays (0.5–2m bgl). It is noted that groundwater was not encountered in the boreholes or test pits.

Logs were prepared for each of the primary sampling locations, noting soil types encountered and visual/olfactory evidence of potential contamination. It was noted that groundwater was not encountered in the boreholes or test pits. These logs are included in Appendix D.

3.2.4.4 Sampling and Analysis Methodology

The sampling methodology was based on the SAQP and Coffey's Standard Operating Procedures (SOPs), which are generally based on standard industry practices.

In the DELEC and Wagon Repair Shed areas, soil samples were collected at each of the primary sampling locations and at nominal 5m step out distances, as per the SAQP. Samples were collected at the following depths:

- previously reported contamination depth
- 0.2m and 0.5m below the previously reported contamination depth;

In the asbestos brake shoe area, samples were collected at each location from the surface and at depths of approximately 0.5m down to 2.0m bgl (if material suspected to contain asbestos fibres was observed, then sampling was targeted at that depth).

The hand augers and push tube used during the drilling were decontaminated between sampling locations using potable water and phosphate-free detergent. A clean pair of disposable nitrile gloves was used when handling each sample.

All samples (with the exception of those prepared for asbestos analysis) were placed into laboratory-supplied 250mL glass jars and placed in an ice-filled esky. Asbestos samples were placed into separate zip lock bag for asbestos analysis.

Samples for photo ionisation detector (PID) screening were not collected, as the targeted contaminants of concern did not include volatile organic compounds.

Intra-laboratory and inter-laboratory duplicate samples were also collected at a frequency of 1:10 and 1:20 respectively.

All primary and intra-laboratory soil samples were dispatched under chain of custody (COC) protocols to SGS Laboratories, which is NATA accredited for the test methods requested.

Inter-laboratory duplicate soil samples were dispatched under chain of custody protocols to MGT Laboratories, which is NATA accredited for the test methods requested.

Initial analysis was requested on samples collected from:

- 0.2m below the known contamination depth at each of the primary boreholes;
- the contamination depth at each of the step out locations; and
- 0.2m below the contamination depth at the step out locations.

If the samples returned laboratory results above the adopted assessment criteria, the samples at those locations collected at 0.5m below the contamination depth were also submitted for analysis.

Samples with the highest detected concentrations of metals at each applicable location were also submitted for toxicity characteristic leachate procedure (TCLP) analysis.

3.2.5 Analytical Testing Program

A summary of the analytical testing program carried out is provided in the table below.

Sampling Location	Analytes	Number of Samples Analysed
DELEC Area		
BD20	TPH C_{10}-C_{36}	9
BD25	TPH C_{10}-C_{36}	9
BD35	TPH C_{10}-C_{36}	10
BD38	TPH C_{10}-C_{36}	11
BD50	TPH C_{10}-C_{36}	10
BD51	Zinc	9
BD51	Zinc TCLP	1
BD51	TPH C_{10}-C_{36}	10
BD8	TPH C_{10}-C_{36}	9
BH11	TPH C_{10}-C_{36}	10
BH12	TPH C_{10}-C_{36}	11
BH19	Asbestos	9
BH21	Copper	9
BH21	Copper TCLP	1
BH34	TPH C_{10}-C_{36}	9
BH36	TPH C_{10}-C_{36}	9

Sampling Location	Analytes	Number of Samples Analysed
DELEC Area (Continued)		
BH42	TPH C_{10}-C_{36}	9
BH45	TPH C_{10}-C_{36}	9
SS6	TPH C_{10}-C_{36}	9
TP7	TPH C_{10}-C_{36}	9
TP9	TPH C_{10}-C_{36}	8
Wagon Repair Shed		
BH13	Copper	9
BH13	Copper TCLP	1
WRS2	TPH C_{10}-C_{36}	9
WRS2	Asbestos	9
WRS9	Asbestos	12
WRS12	Asbestos	11
WRS32	Asbestos	9
Community Area & Asbestos Brake Shoe Burial Ground		
BH30A14	Arsenic	9
BH30A14	Arsenic TCLP	1
Asbestos Brake Shoe Area	Asbestos	44

3.2.6 Lab Results

Soil sample analytical results are tabulated in Table LR1 (chemical analysis), LR2 (TCLP analysis) and LR3 (asbestos analysis). The laboratory analytical certificates and COCs are presented in Appendix B.

The results were assessed against the criteria proposed in Section 4.3 of this RAP.

3.2.6.1 DELEC, Wagon Repair Shed & General Results

Detected concentrations of metals (As, Cu, and Zn) in the soil samples analysed ranged from;

- Arsenic - 8 to 77mg/kg
- Copper - 13 to 1,300mg/kg
- Zinc - 33 to 4,300mg/kg

Leachability of metals:

- Arsenic at BD30 0.2/E5 was <0.05 mg/L;
- Copper at BH13 0.0-0.1 was 0.05mg/L;
- Copper at BH21 0.4 was 0.12mg/L; and
- Zinc at BD51 0.5/N5 was 34mg/L.

Detected concentrations of TPH C_{10}-C_{36} in the soil samples analysed ranged from:

- TPH C_{10}-C_{36} – 53mg/kg to 18,300mg/kg

Chrysotile asbestos fibre bundles were detected in ten (10) soil samples. All of these samples were located in the Wagon Repair Shed area.

3.2.6.2 Asbestos Brake Shoe Burial Ground Results

- Chrysotile asbestos fibre bundles were detected in one (1) soil sample. This sample was collected from near the surface and the fibres were found in plaster fragments.

3.2.7 QA/QC

The QA/QC data assessment based on field and laboratory considerations is presented in Appendix C. Analytical results of field duplicate samples are presented in Table LR4.

The QA/QC assessment revealed that:

- Data Completeness – the data was generally considered to be adequately complete for the objective of the project, except for samples BD35 1.0, BH11 0.7/N5, BD50 1.0/E5, BH12 0.7 and BH12 0.7/W5 which were analysed outside the laboratory recommended holding time. These samples returned detected concentrations below the assessment criteria which should be treated with some caution as analysis outside the holding time may results in a lower detected concentration. The possibility that these soils are impacted with the contaminant of concern cannot be dismissed
- Data Comparability – the data is adequately comparable for the purposes of this assessment;
- Data Representativeness – the data is adequately representative for the purposes of this assessment;
- Data Precision and Accuracy – the precision and accuracy of some of the TPH C_{10}-C_{36} data appears to have been affected by the heterogeneity of contamination within the soils analysed, as there were some were some exceedances of the Relative Percentage Difference (RPDs) control limits. The RPD data is presented in Table LR4.

- For samples, BD 8 0.5/ W5, BD25 0.5/E6 BD50 0.7/N5, and BH42 0.5/W3 and their corresponding duplicates, the RPD exceedences are not considered to adversely affect the suitability of the data because the detected concentrations in the primary and duplicate samples were both below or both above the adopted criteria. This can be attributed to heterogeneous nature of fill soils.
- For samples BD25 0.5/E6, BD50 0.7/N5, and BH42 0.5/W3, the results should be treated with caution as detected concentrations in the corresponding duplicates were above or marginally below the adopted criteria, while the calculated RPD exceeded the control limits.
- For the duplicate value (dup of BH42 0.5/W3) which is higher than the adopted assessment criteria, the primary sample detected concentration should be replaced with the duplicate sample detected concentration.

Trip spikes and blanks were not used for these works because the targeted contaminants of concern did not include volatiles.

Rinsate blanks were not collected where disposable sampling equipment was used or where samples were collected from the centre soils in the backhoe bucket (where soil was not likely to have contacted the bucket). Rinsate blanks were collected where re-usable sampling equipment was used (i.e. push tube drilling rig). Analytical results of the rinsate blank indicated that decontamination procedures were generally adequate. However, it was noted that rinsate blank QCC collected on 20 January 2009 returned a detectable concentration of zinc of 0.007mg/L. The detected concentration of zinc in the lab blank for this sample was below the practical quantitation limit (PQL). Given that the detected concentration was relatively low and that the three (3) other rinsate blanks returned concentrations of analytes below the laboratory's limit of reporting, it is considered that the zinc was already present in the rinsate water and therefore unlikely to have affected the detected concentrations of zinc in the associated soil samples.

3.2.8 Discussion

3.2.8.1 DELEC, Wagon Repair Shed and General Areas

The field observations and laboratory results indicate that the contamination at each of the known contamination locations has generally been delineated both horizontally and vertically, with some exceptions.

Below is a summary table of the delineated horizontal and vertical extent of contamination at each of the locations assessed. The delineation is based on a combination of data provided in historical reports as well as field observations and laboratory results established during this project. The laboratory results have been compared to the Remediation Acceptance Criteria (RAC) established in Section 4.3.1.1 of this RAP.

Location	Contaminant of Concern	Historical Data, Field Observations & Laboratory Results
DELEC		
BD8	TPH C_{10}-C_{36}	Soils at location BD8 appear to be below the RAC.
BD20	TPH C_{10}-C_{36}	Soils at location BD20 appear to be impacted above the RAC at a depth of 0.5m bgl but not beyond a depth of 0.7m bgl.
BD25	TPH C_{10}-C_{36}	Soils at location BD25 appear to be below the RAC.
BD31	TPH C_{10}-C_{36}	Soils at location BD31 appear to be below the RAC.
BD35	TPH C_{10}-C_{36}	Soils at location BD35 appear to be below the RAC. The sample at 1.0m bgl returned results below assessment criteria, however, this should be treated with caution as analysis was undertaken outside holding time.
BD38	TPH C_{10}-C_{36}	Soils at location BD38 appear to be impacted above the RAC to a minimum depth of 1.5m. Product was observed throughout the soil profile.
BD50	TPH C_{10}-C_{36}	Soils at location BD50 appear to be below the RAC.
BD51	TPH C_{10}-C_{36} Zinc	Soils at location BD51 appear to be below the RAC (for TPH C_{10}-C_{36}) Soils at location BD51 appear to be impacted above the RAC (with zinc) at a depth of 0.5m bgl but not beyond 0.7m bgl. TCLP analysis indicates a zinc leachability concentration in these soils of 34mg/L.

Location	Contaminant of Concern	Historical Data, Field Observations & Laboratory Results
DELEC (Continued)		
BH12	TPH C_{10}-C_{36}	Soils at location BH12 appear to be below the RAC.
BH19	Asbestos TPH	Soils at location BH19 appear to be impacted above the RAC at a depth of 0.2m bgl but not deeper than 0.3m bgl and not beyond a 5m radius. Surface staining is also present in this area.
BH21	Copper	Soils at location BH21 appear to be impacted above the RAC at a depth of 0.2m bgl but not deeper than 0.4m bgl and not beyond a 5m radius. TCLP analysis indicates a copper leachability concentration in these soils of 0.12mg/L.
BH34	TPH C_{10}-C_{36}	Soils at location BH34 appear to be impacted above the RAC to a depth of up to 1.5m in a radius of 5m. Free oily product was observed in shallow soils and at depth.
BH36	TPH C_{10}-C_{36}	Soils at location BH34 appear to be below the RAC.
BH42	TPH C_{10}-C_{36}	Soils at location BH42 appear to be below the RAC.
BH45	TPH C_{10}-C_{36}	Soils at location BH45 appear to be below the RAC. However, soils to the north of BH45 appear to be above the RAC. Impact appears to be limited to surface staining.
SS6	TPH C_{10}-C_{36}	Soils at location SS6 appear to be above the RAC. Impact appears to be limited to surface staining.
TP7	TPH C_{10}-C_{36}	Soils at location TP7 appear to be below the RAC.

Location	Contaminant of Concern	Historical Data, Field Observations & Laboratory Results
DELEC (continued)		
BH13	Copper	Soils at location BH13 appear to be above the RAC. TCLP analysis indicates a copper leachability concentration in these soils of 0.05mg/L.
WRS2	Asbestos TPH C_{10}-C_{36}	Soils at location WRS2 appear to be above the RAC at a depth of 0.1m bgl but not deeper than 0.2m bgl and not beyond a 5m radius. It is noted that asbestos was detected in the Wagon Repair Shed in the form of fibre bundles.
WRS9	Asbestos	Soils at location WRS9 appear to be above the RAC at a depth of 0.3m bgl beyond a 5m radius but not deeper than 0.5m bgl. It is noted that asbestos was detected in soils in the form of fibre bundles.
WRS12	Asbestos	Soils at location WRS12 appear to be above the RAC at a depth of 0.3m bgl beyond a 5m radius but not deeper than 0.5m bgl. It is noted that asbestos was detected in soils in the form of fibre bundles.
WRS32	Asbestos	Soils at location WR32 appear to be above the RAC at a depth of 0.1m bgl beyond a 5m radius but not deeper than 0.2m bgl. It is noted that asbestos was detected in soils in the form of fibre bundles.
General		
BH30	Arsenic	Soils at location BH30 appear to be below the RAC. TCLP analysis indicates the arsenic leachability concentration in these soils is below the laboratory limit or reporting (<0.05mg/L).

Location	Contaminant of Concern	Historical Data, Field Observations & Laboratory Results
Asbestos Brake Shoe Area		
ABS10	Asbestos	Soils at location ABS10 reported asbestos in a plaster fragment (fibro). No observations were made of potential brake shoe material being present at this location. It is noted that asbestos was detected in soils in the form of fibre bundles in plaster fragments. The potential for this asbestos to be present as the result of fly tipping cannot be precluded. Given that asbestos was reported in only 1 sample out of 44 samples analysed, and given that the asbestos was detected in a fragment of fibro, remediation of the soils in the asbestos brake shoe area is deemed not necessary.

In addition to the data above, the following historical data (from previous site contamination assessments) was considered to indicate the nature and extent of soil contamination.

Location	Contaminant	Historical Data, Field Observations & Laboratory Results
DELEC		
BD1	TPH C_{10}-C_{36}	Soils at location BD1 appear to be above the RAC. It is noted that visual impact was observed on the surface soils.
BD15	TPH C_{10}-C_{36}	Soils at location BD15 appear to be below the RAC.
BD21	TPH C_{10}-C_{36}	Soils at location BD21 appear to be below the RAC.
BH2	Arsenic	Soils at location BH2 appear to be above the RAC. It is noted that leachability of the arsenic is unknown at this stage.
BH6	TPH C_{10}-C_{36}	Soils at location BH6 appear to be below the RAC.
Location A	TPH C_{10}-C_{36}	Soils at Location A appear to be above the RAC. It is noted that visual impact was observed on the surface soils.
SS2	TPH C_{10}-C_{36}	Soils at SS2 appear to be above the RAC. It is noted that visual impact was observed on the surface soils.

Location	Contaminant	Historical Data, Field Observations & Laboratory Results
DELEC (continued)		
Building 14	TPH	Soils in the vicinity of this building appear to be above the RAC. It is noted that visual impact (TPH staining) has been observed here. Data on the TPH fractions is not available.
Track Areas	TPH	Soils in the immediate vicinity of DELC track areas appear to be above the RAC. It is noted that visual impact (TPH staining) was observed on ballast and surface soils. These areas should be re-assessed after ballast demolition/removal activities are complete to confirm potential extent of remedial requirements. Data on the TPH fractions is not available.
Wagon Repair Shed		
BH13	TPH C_{10}-C_{36}	Soils at location BH13 appear to be below the RAC.
WRS3	TPH C_{10}-C_{36}	Soils at location WRS3 appear to be below the RAC.
WRS7	TPH C_{10}-C_{36}	Soils at location WRS7 appear to be below the RAC.
WRS14	TPH C_{10}-C_{36}	Soils at location WRS14 appear to be below the RAC.
WRS19	TPH C_{10}-C_{36}	Soils at location WRS19 appear to be below the RAC.
WRS21	TPH C_{10}-C_{36}	Soils at location WRS21 appear to be below the RAC.
WRS22	TPH C_{10}-C_{36}	Soils at location WRS22 appear to be below the RAC.
WRS24	TPH C_{10}-C_{36}	Soils at location WRS24 appear to be below the RAC.
WRS30	Asbestos	Soils at location WRS30 appear to be above the RAC It is noted that asbestos was detected in soils in the form of fibre bundles.
WRS32	TPH C_{10}-C_{36}	Soils at location WRS32 appear to be below the RAC.

Location	Contaminant	Historical Data, Field Observations & Laboratory Results
General – Community, Ecological & Landscape Area (Southern End of Site – ref: SEDP082F App B)		
BH30	Arsenic Copper Zinc	Suggest that soils at location BH30 are not impacted above the RAC.

3.2.9 Conclusions

Based on the historical data, field observations and sample laboratory results, Coffey has made the following conclusions:

- TPH contamination exceeding the RAC in the DELEC area is generally limited to shallow surface soils (<1m bgl);
    - Soils at sampling locations BD1, BD20, BD38, BH11, BH9, BH34, SS2, SS6, Location A, WRS2, soils north of BH45, soils in the vicinity of Building 14 and soils within the immediate vicinity of track areas in the DELEC exceed the RAC.
- Metal contamination exceeding the RAC is generally limited to shallow surface soils (<0.5m bgl);
    - Soils impacted by zinc at sampling location BD51, copper at sampling location BH21, arsenic at BH2 and, copper at sampling location BH13 (Wagon Repair Shed) exceed the RAC.
- Asbestos contamination appears to be limited to surficial and shallow soils (<0.4m bgl);
    - Soils at sampling location BH19 in the DELEC, and within the Wagon Repair Shed footprint/curtilage soil have been impacted by asbestos and exceed the RAC.
- The arsenic contamination delineated at sampling location BH30 is considered suitable to remain insitu as it does not exceed the RAC.
- Asbestos contamination was detected in only one sample (at a depth of less than 0.5m below ground level) out of 44 samples tested in the Asbestos Brake Shoe Burial Area The nature of the asbestos detection (fibres in a plaster fragments) and observations made during drilling in this area indicates that buried asbestos brake shoes do not appear to be present in this area. The nature and location of the detected asbestos suggests that the presence of asbestos in this area could be the result of historical fly tipping on the Site. As such, remediation works in this area is deemed not necessary.

3.3 Health Based Risk Assessment

Coffey was commissioned by Sydney Ports Corporation (SPC) to conduct an on-site health risk assessment (HRA) to develop site-specific risk-based levels (RBLs) for petroleum hydrocarbon impacted soil for the proposed Site.

This risk assessment was reported in Coffey Environments (2009) On-Site Health Risk Assessment Risk Based Level Development, Intermodal Logistics Centre Enfield, New South Wales 2136 (ref: ILC – CO – D&R – ENVIRHOD00634AA-R005, dated 10 March 2009)

3.3.1 Objective of the HRA

The objective of the HRA was to develop human health risk-based levels (RBLs) for potential future on-site receptors associated with potential exposures to petroleum hydrocarbon contaminated soil, and to qualitatively assess the potential human exposures with asbestos and metal impacts in soil to potential future on-site receptors based on the proposed future general non-sensitive commercial land uses of the site.

It was noted that the HRA did not include assessment of health risks to on-site users under more sensitive future land uses (e.g. residential land use, childcare facility, etc.), off-site land uses, basement structures or contaminants which may be present but not in excess of the nominated assessment criteria adopted for the site.

3.3.2 Derived Conservative Site-specific Risk-based Levels (mg/kg)

The report noted that in the event TPH fractions are not speciated upon analysis, as a conservative measure, it is recommended that the species (i.e. aromatic or aliphatic) for the respective TPH fraction which provides the lowest RBL should be adopted. The most conservative RBLs for the respective TPH fractions are presented in the table below.

COPC	Vapour Inhalation	Vapour Inhalation	Direct Contact	Vapour Inhalation	Direct Contact
	Concrete Slab-on-ground Commercial Premises	Open-space Commercial		1m Deep Sub-surface Maintenance Trench	
TPH C_{10}-C_{14}	> C_{sat}	> C_{sat}	18,642	0.261 – 9.05 (1)	87,538
TPH C_{15}-C_{28}	N/A	N/A	13,953	N/A	65,608
TPH C_{29}-C_{36}	N/A	N/A	13,953	N/A	65,608

>C_{sat} The calculated RBL is greater than the calculated saturated concentration of the chemical in soil based on soil type at the site (C_{sat}).

N/A Not applicable – not considered as a Contaminant of Potential Concern for the exposure scenario.

1 Refer to the source report for depth range and soil-type.

C_{sat} was defined as the COPC concentration at which the absorptive limits of the soil particles, the solubility limits of the soil pore water and the saturation of soil pore air have been reached. C_{sat} is therefore applicable to vapour intrusion pathways where the calculated acceptable concentration exceeds the theoretical concentration indicating the likely presence of free product in soil.

A qualitative assessment of residual asbestos and metal impact at the site was also undertaken. Given that the impact was assessed as surficial or near surface (<1m below ground surface (mbgs)), and that metal impacts had been reported in excess of the relevant health investigation levels nominated in NEPC (1999), this contamination may pose an unacceptable health risk to future users of the site in the event a complete exposure pathway is established via direct contact pathways and/or inhalation of airborne dust.

3.3.3 General Commentary

The adoption of exposure mitigation measures at the site such as off-site disposal of impacted soil, on-site containment, and/or on-going management of the impact under an approved and implemented site management plan (SMP) will mitigate potential future exposures by receptor populations to asbestos, metals and petroleum hydrocarbons. In the event risk management options are to be considered at the site (including an SMP), the report recommended that a suitably qualified Environmental Risk Assessor should be consulted to ensure the human health protection objectives of the proposed measure can be met.

4 REMEDIAL ACTION PLAN

4.1 Remediation Goal

The remediation goal for the Site is to remediate areas containing unacceptable levels of contamination to acceptable levels commensurate with the proposed land use (commercial / industrial).

Remediation of the groundwater is deemed not required at this stage. A groundwater monitoring program to assess elevated TPH and metals concentrations, as well as the risk of offsite migration, has been proposed.

4.2 Key Stakeholders

The following stakeholders are expected to be directly involved in the remediation project:-

Role	Organisation
Site Owner	Sydney Ports Corporation
Client Project Manager	Sydney Ports Corporation
Demolition & Remediation Project Manager	Coffey Projects Pty Ltd
Environmental Consultant	Coffey Environments Pty Ltd
Remediation Contractor	Enviropacific Services Pty Ltd
Site Auditor	Environ
Planning Authority	NSW Department of Planning

4.3 Remediation Acceptance Criteria

4.3.1 Human Health Criteria

It is understood that the proposed land use for the majority of the Site is commercial/industrial. Subsequently, the Column F values in NEPC (1999) have been adopted as Remediation Acceptance Criteria (RAC).

As NEPC (1999) does not include values for BTEX, the relatively conservative values for BTEX in DEC (2006) have been adopted as RAC.

As the NEPC (1999) and NSW CLM Act do not include values for asbestos, the WA guideline (WA DEC, 2009) values for asbestos has been adopted as RAC.

It is acknowledged that human health risk based site specific criteria have been developed for TPH fractions C_{10}-C_{14}, C_{15}-C_{28} and C_{29}-C_{36} (refer Coffey Environments (2009)). These risk based criteria were reviewed and accepted by the Site Auditor at the time of preparing this RAP. These criteria suggest that risk of human health impact is relatively low, resulting from:

- dermal contact with soils containing these fractions of TPH on Site; and
- vapour inhalation of the C_{10}-C_{14} fraction in areas to be overlain with slabs and open space areas.

Based on the results of human health risk assessment work carried out previously (refer Section 3.3 of this RAP) and the understanding that redevelopment of the Site (particularly where TPH contamination has been identified) is proposed to be covered with concrete slabs as part of the ILC @ Enfield design, Coffey considers that the conservative site specific risk based levels noted in Section 3.3.2 of this RAP as suitable and conservative quantitative RAC for protection of human health for the Site.

Based on the report summarised in Section 3.3 of this RAP, the risk of human health impact as a result of vapour inhalation to the C_{10}-C_{14} fraction in service/maintenance trenches appears to be more significant at the Site. SPC has previously advised that, as the site owner, they are willing to manage C_{10}-C_{14} contamination (in service/maintenance trenches) through a long term Site Environmental Management Plan (SEMP). Subsequently, it is proposed that soils will not be remediated to the conservative site specific risk based levels established for vapour inhalation in a 1m deep sub-surface maintenance trench.

While the TPH C_6-C_9 fraction has not previously been considered to be a contaminant of concern with respect to remediation works, criteria have been proposed in the RAC in the event that this fraction becomes a contaminant of concern. This criterion has been based on the threshold concentrations for sensitive land use in NSW EPA (1994) Contaminated Sites: Guidelines for Assessing Service Station Sites.

In addition to quantified RAC for TPH and following liaison with Mr Graeme Nyland, Coffey also considers that the RAC for TPH also needs to address the issue of aesthetics. Subsequently, those soils heavily impacted by TPH (i.e. visible free product or surface staining) should also be remediated.

4.3.1.1 Remediation Acceptance Criteria Table

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**

Contaminant	Human Health Based Criteria (mg/kg)
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**
Ethylbenzene	**3.1**
Xylene	**14**
Aldrin + Dieldrin	**50**
Chlordane	**250**
DDT + DDD + DDE	**1000**
Heptachlor	**50**
Total Phenol	**42500**
Polychlorinated Biphenyls (PCB)	**50**
Asbestos	**0.001% w/w asbestos for fibrous asbestos and asbestos fines.** **0.05% w/w asbestos for ACM**

It is noted that these criteria are targets and that in some situations, due to soil volumes, cost, logistics and other reasons, alternative risk based methodologies may need to be applied to assess the need for further remediation.

4.3.2 Ecological Criteria

Coffey notes that documentation provided by SPC suggests the establishment of a community and ecological area and an eastern boundary marginal habitat area on the Site. It is understood that the community and ecological area is located at the southern end of the Site (in the vicinity of the Tarpaulin Factory area) and the marginal habitat area is located on the eastern boundary of the Site, opposite the intersection of Cosgrove Road and Cleveland Street (refer to Appendix E). It is understood that both of these areas are within the boundary of the Site which is proposed for commercial/industrial land use.

SPC has advised that the community and ecological area would be divided into eight sub-areas with proposed activities (refer Appendix F) to include:

- Heritage Precinct – Pedestrian Bridge
    - This area will have controlled public access from Punchbowl Road along a secured pathway which ends at the stairs to the Pedestrian Bridge. Visitors will be able to walk up the stairs, along the bridge then down the opposing stairs onto another secured pathway which leads back to Punchbowl Road. Visitors will be restricted to the secured pathway and will be unable to gain access to the ground level heritage artefacts.
- Heritage Precinct – Tarpaulin Factory
    - This area is not within the boundaries of the Separable Portions that are the subject of this RAP and therefore not considered relevant to the establishment of RAC.
- South Access Track
    - Currently proposed to run north from Punchbowl Road, the west adjacent the frog habitat area, ending at gates which provide access to the marshalling yards on an adjacent property. This track will allow:
        - authorised escorted access for visitors to view the frog habitat area. Visitors will be restricted to walking along the access track, to a small designated viewing area;
        - authorised unescorted access for authorised SPC contractors/employees for maintenance purposes; and
        - authorised unescorted access for rail organisations to drive vehicles along the access track across SPC's Site to the marshalling yard on an adjacent property, from Punchbowl Road.
- Frog Habitats & Curtilage
    - This area will be subject to authorised unescorted access only for authorised SPC contractors/employees for maintenance purposes.
- Qenos Pipeline and Fenced Compound
    - This area will be subject to authorised unescorted access only for authorised SPC contractors/employees for maintenance purposes.
- Industrial Landscaped Areas, Floodplain and Frog Corridor
    - This area will be subject to authorised unescorted access only for authorised SPC contractors/employees for maintenance purposes.

- Detention Basin
    - This area will be subject to authorised unescorted access only for authorised SPC contractors/employees for maintenance purposes.
- IMT South Rail Corridor
    - This area will be subject to authorised unescorted access only for authorised SPC contractors/employees for maintenance purposes.

SPC has advised that the eastern boundary marginal habitat area will be subject to authorised unescorted access for authorised SPC contractors/employees for maintenance purposes.

Coffey has reviewed these activities proposed to occur within this commercial/industrial Site, in conjunction with the current zoning of the Site (Special uses – 5b (Railways)). Coffey considers these activities:

- fall within the range of commercial/industrial land use for the purpose of land contamination management; and
- do not cause the land use of these portions of the Site be classified as parks or recreational open space within the intent of NEPC (1999).

As land use for the entire site remains commercial / industrial, the decision making process in Appendix I of NSW DEC (2006) does not require assessment of soil phytotoxicity and therefore, RAC to address potential phytotoxic impacts are not considered necessary.

4.4 Approach & Extent of Remediation Required

The proposed remediation approach is currently generally based on targeting known horizontal and vertical extents of contamination (with the exception of visually observed areas or surface TPH staining). This approach has been proposed as historical data suggests a discontinuity between lay down mechanisms of contamination on the Site. It is considered likely that once demolition works on the Site (including removal of buildings, rail tracks and ballast) are complete and an assessment of exposed soils beneath this infrastructure is carried out (both visually and collection of soil samples – refer Section 6.2 and 6.3 of this RAP), the additional data collected may allow for a remediation (if required) of “areas of contamination” approach rather than a hotspot approach.

Based on the known data available for the Site, it is considered the following sections provide the minimum extent of remediation required for the Site. It is noted that further remediation may be required during additional assessment works and/or validation works on the Site. The depth and radius of contamination may also be refined during excavation works as sub-surface soils are exposed.

4.4.1 SP2

4.4.1.1 Total Petroleum Hydrocarbon (implied presence of asbestos)

- WRS2 soils to a minimum depth of 0.3m below ground level and in a radius of 2.5m;
- Track area soils to horizontal and vertical extent of visually observable TPH stained surface soils;

4.4.1.2 Metals (implied presence of asbestos)

- BH2 (arsenic) soils to a depth of 0.3m below ground level in a radius of 5m;
- BH13 (Wagon Repair Shed) soils to be excavated as part of the asbestos remediation works proposed below.

4.4.1.3 Asbestos

- Soils to a minimum depth of 0.4m below ground level within the entire building footprint of the Wagon Repair Shed building and the curtilage soils as shown in Figure 5d.

4.4.1.4 General

- Fly tipped materials as observed in the field;

4.4.2 SP3

4.4.2.1 Total Petroleum Hydrocarbon

- Track area soils to horizontal and vertical extent of visually observable TPH stained surface soils;

4.4.2.2 General

- Fly tipped materials as observed in the field;

4.4.3 SP4

4.4.3.1 Total Petroleum Hydrocarbon

- BD1 soils to horizontal and vertical extent of visually observable TPH stained surface soils;
- BD20 soils to a depth of 0.7m below ground level and in a radius of 5m;
- BH11 soils to horizontal and vertical extent of visually observable TPH stained surface soils;
- Location A soils to horizontal and vertical extent of visually observable TPH stained surface soils;
- SS2 soils to horizontal and vertical extent of visually observable TPH stained surface soils;
- SS6 soils to horizontal and vertical extent of visually observable TPH stained surface soils;
- Building 14 soils to horizontal and vertical extent of visually observable TPH stained surface soils;
- Building 18 soils to horizontal and vertical extent of visually observable TPH stained surface soils;
- Track area soils to horizontal and vertical extent of visually observable TPH stained surface soils;
- BH34 soils to horizontal and vertical extent of visually observable TPH stained soils;

- Fuel impacted soils excavated from the two underground storage tank excavations[2], located to the south of SP1;
- Oil impregnated concrete[3] removed from Building 1 and Building 14.

4.4.3.2 Metals

- BD51 soils (zinc) to a depth of 0.7m below ground level in a radius of 5m;
- BH21 soils (copper) to a depth of 0.4m below ground level an in a radius of 5m;

4.4.3.3 Asbestos

- BH19 soils to a depth of 0.3m below ground level in a radius of 5m and to horizontal and vertical extent of visually observable TPH stained surface soils;

4.4.3.4 General

- Fly tipped materials as observed in the field;

4.4.4 SP5

4.4.4.1 Total Petroleum Hydrocarbon

- Horizontal and vertical extent of visually observable TPH stained surface soils;

4.4.4.2 General

- Fly tipped materials as observed in the field.

[2] During the remediation works conducted in SP1, two underground storage tanks were observed in an area to the south of SP1. These tanks were subsequently excavated and removed off site. The stockpile of impacted material has not been assessed at this stage.

[3] The TPH impact in this concrete was assessed to be leachable, and is likely to classify as Restricted Solid Waste. Remediation options for this concrete are currently being assessed. When available, the proposed remediation strategy, along with the available analytical results, will be submitted to the auditor for approval.

4.5 Remediation Option Assessment

4.5.1 Potential Options and Assessment

Remediation of soils on the Site are required under the Department of Urban Affairs and Planning's State Environment Protection Policy (SEPP) 55 to address soil contamination on the Site and minimise potential risk to human health and the environment. Based on the contamination assessment in Section 3 and extent of remediation required in Section 4.4 in this RAP, five (5) remediation options have been established as being potentially suitable for implementation at the Site. These are as follows:

No.	Option	Assessment
1.	Leave the contamination undisturbed.	Applying this option is likely to compromise earthworks and construction works required for the proposed redevelopment on the Site. This option is not considered to be suitable due to the proposed excavation and filling activities required for the proposed construction works.
2.	Excavation and off-site disposal of material in excess of the adopted Remediation Acceptance Criteria (RAC).	Contaminated material would may be removed and disposed of following classification in accordance with NSW EPA (2008) Waste Classification Guidelines. The advantages of utilising this option include the potential for minimising ongoing management of the land, as well as minimising restrictions on future land use following remediation and validation. The disadvantages of utilising this option include significant costs of associated with waste transport and disposal and the potential for medium to large areas of the Site to be disturbed.
3.	Ex-situ containment onsite of material in excess of the adopted Remediation Acceptance Criteria (RAC).	As part of the excavation works for demolition and construction on the Site, contaminated materials may could buried at depth on Site in purpose built containment cells. The advantage of utilising this option is reduced waste transport and disposal costs. The disadvantages of utilising this option include the dedication of land for containment of contaminated soil (and the associated design, approval and construction costs for the containment cells) and potentially restricted land use in its vicinity. Ongoing management and maintenance of containment cells would be required. A human health risk assessment for contaminated soils to remain on the Site and endorsement from the Site Auditor would be required for the containment cell design. A notification would be recorded on the Environmental Planning and Assessment Act Section 149 Planning Certificate for the Site (which

No.	Option	Assessment
		may affect future value and use of the Site).
4.	In-situ containment of material in excess of the adopted Remediation Acceptance Criteria (RAC).	Pursuing this option would involve the capping of delineated areas (where contamination exceeds the adopted site assessment criteria) with a suitable capping system and potentially the construction of a cut-off wall around the contamination to minimise risk of future groundwater contamination (where applicable). An area of contamination could be capped with suitable capping materials (concrete, bitumen etc.) where the status of groundwater contamination and risk of further groundwater contamination are adequately assessed, and where it can be demonstrated that the groundwater is not likely to be significantly impacted by the retained contamination. This option could be completed in-situ, without or with minimal disturbance to the impacted soils. Delineation sampling would be required to identify and confirm the outer perimeter of each contamination location. Depending on the nature of the contaminant, vapour management systems may also be required to address inhalation risks to human health. A Site Environmental Management Plan (SEMP) may be required to assess the risk of exposure of site users to the retained contamination. A groundwater risk assessment and/or a groundwater monitoring program[4] may be required to assess and monitor the potential impact to the groundwater. . The advantage of utilising this option is reduced waste transport and disposal costs. The disadvantages of utilising this option include the dedication of land for containment of contaminated soil (and the associated design, approval and construction costs for the capping system) and potentially restricted land use in its vicinity. Ongoing management and maintenance of capping system would be required.

[4] The groundwater monitoring program will include two (2) monitoring events during remediation works, two (2) quarterly monitoring events after the remediation works followed by two (2) half-yearly monitoring events. The results of the 6 rounds of monitoring over approximately 2 years will be used to assess if further monitoring is required. It is noted that the post construction monitoring period d is dependent on the timing of the construction of the concrete slabs which will act as the cap. Should the construction of the slab not be completed by December 2009 as planned, the monitoring period will be extended such that at least four monitoring will be undertaken following the completion of the slab.

No.	Option	Assessment
		Endorsement from the Site Auditor would be required for the capping system design. A notification would be recorded on the Environmental Planning and Assessment Act Section 149 Planning Certificate for the Site (which may adversely affect future value and use of the Site).
5.	Excavation and on-site treatment of TPH impacted material in excess of the adopted Remediation Acceptance Criteria (RAC).	This option would involve excavation of TPH impacted soil and treatment using bioremediation techniques (landfarming). The advantage of using this option is minimisation of waste transport and disposal costs and potential creation of re-usable fill material (on the site). The disadvantages of using this option are the time taken to bioremediate soils (particularly recalcitrant heavy end hydrocarbons) and the potential risk that bioremediation is not successful resulting in contingent waste transport and disposal costs. Available space onsite and prevailing weather conditions are also considered constraints to the success of a landfarming strategy.

4.6 Proposed Remediation Option & Rationale

The remediation options referred to in Section 4.5 were assessed in conjunction with SPC's proposed re-development objectives for the Site.

Factors considered in this assessment included:-

- Minimising remediation requirements by adopting long term site management plans (SMPs) where possible/appropriate;
- Minimising potential off-site disposal to reduce remediation costs and the need for importing fill material to make good on remedial excavations;
- Minimising potential constraints on future earthworks programs for the Site; and
- Maximising potential re-use of remediated soil as general fill on the Site.

SPC has recently indicated that the majority of the SP4 area will be filled with approximately 0.2m of suitably validated (for contamination) fill material, followed by approximately 0.5m of impermeable pavement such as concrete or bitumen. This will essentially act as an impermeable cap. Following liaison with SPC regarding the remediation options and associated factors for consideration (including review of these options in conjunction with their proposed re-development objectives), Coffey proposes the following remediation options:

4.6.1 SP2

Where free oil impacted material or contamination that is likely to be readily leachable is observed, this soil should be excavated and disposed of offsite. Asbestos, metals and TPH impacted soils (which do not contain free oil and are unlikely to be readily leachable) in this area could be remediated by either:

- Land farming (applicable only for TPH impacted soils);
- burying in appropriately designed containment cells; or by
- moving and placing the impacted soils to SP4 area, to be capped and contained (see below).

4.6.2 SP3

Where free oil impacted material or contamination that is likely to be readily leachable is observed, this soil should be excavated and disposed of offsite. Asbestos, metals and TPH impacted soils (which do not contain free oil and are unlikely to be readily leachable) in this area could be remediated by either:

- Land farming (applicable only for TPH impacted soils);
- burying in appropriately designed containment cells; or by
- moving and placing the impacted soils to SP4 area, to be capped and contained (see below).

4.6.3 SP4

Where free oil impacted material contamination that is likely to be readily leachable is observed, this soil should be excavated and disposed of offsite.

Asbestos, metals and TPH impacted soils (which do not contain free oil) in this area is proposed to be remediated by in-situ containment (capping). Coffey understands that SPC intends to fill the majority of SP4[5] with approximately 0.2m of fill (suitably validated for contamination, and also suitable from other design requirements), followed by approximately 0.5m of impermeable paving such as concrete or bitumen or a mix of both[6].

Contamination identified in areas outside of the proposed capping area would require to be remediated by either:

- Land farming (applicable only for TPH impacted soils);
- burying in appropriately designed containment cells; or
- excavation and offsite disposal; or

[5] The validated fill material is to be placed in this area to minimise potential for the mobilisation of asbestos fibres into the air during remediation works in the DELEC area. The area to be filled has not yet been defined. When available, this information will be submitted to the Site Auditor for review and comment.

[6] The impermeable concrete and/or bitumen paving is to be constructed as part of the future development of the site for container storage and heavy traffic.

- moving and placing the impacted soils to SP4 area that is proposed to be capped.

The oil impregnated concrete from Building 1 and Building 14 should be disposed off site as Restricted Solid Waste. However, due to the cost of offsite disposal of this concrete, SPC has indicated that they wish to retain this concrete on site. Coffey is currently assessing containment options for this material[7].

During the remediation works conducted in SP1, two underground storage tanks were identified in an area to the south of SP1. These tanks were subsequently excavated and removed off site. The backfill sands in the two excavations were observed to be impacted, and were excavated and stockpiled on site. Additional soil, also observed to be impacted, was also scraped/excavated (approximately 20com from the base and the walls) and stockpiled with the impacted backfill sands. The excavation base and the walls were assessed, and samples were collected for analysis. The analytical results indicated that widespread contamination exceeding the RAC is unlikely to be present in the walls and the base of the excavations. The results of this work will be reported separately for the Site Auditor to review.

The stockpile of impacted material has not been assessed at this stage. It is anticipated that this soil, and other fuel impacted soils identified, will be land farmed to remediate the observed fuel impact.

4.6.4 SP5

Where free oil impacted material or contamination that is likely to be readily leachable is observed, this soil should be excavated and disposed of offsite. Asbestos, metals and TPH (which do not contain free oil and are unlikely to be readily leachable) impacted soils in this area could be remediated by either:

- Land farming (applicable only for TPH impacted soils);
- burying in appropriately designed containment cells; or by
- moving and placing the impacted soils to SP4 area, to be capped and contained.

4.7 Impacted Soil Containment Cell Strategy

In the event that impacted soils are to be retained on site (where contaminants are demonstrated to not pose a significant risk of groundwater contamination), containment cells will satisfy the following minimum requirements:-

- Assess the likely volumes of material requiring containment;
- Confirm the preferred location and minimum geotechnical requirements of the containment cell with both SPC and the ILC @ Enfield earthworks designer (consideration should be given to carrying out soil contamination assessment works in the area proposed for a containment cell, prior to cell construction commencing, so that an appropriate strategy can be developed to manage cell construction spoil).

[7] The TPH impact in this concrete was assessed to be leachable, and is likely to classify as Restricted Solid Waste. Remediation options for this concrete are currently being assessed. When available, the proposed remediation strategy, along with the available analytical results, will be submitted to the auditor for approval.

At the stage, one of the containment cells are proposed to be located above the northern storm water culvert, which crosses the site about 280 metres north of the northern end of the Wagon Repair Shed. We understand that the culvert is located at a depth of approximately 7m below ground level, and thus the containment cell is expected to be well above the level of water flow in the culvert.

This cell is designed to contain asbestos impacted concrete and the asbestos and TPH impacted soils that were excavated from the SP1 area, and some of the asbestos impacted soils excavated from the Wagon Repair Shed. It is envisaged that the construction of this containment cell will require conducting the following works:

- Excavate an approximately 70m x 30m x 2.2m deep pit where the containment is to occur, undertake compaction at the base of the pit and survey the excavation (including design levels to AHD);
- Place the asbestos and TPH impacted soil at the bottom of the containment cell to a thickness of 200mm and compact the soil layer;
- Place the asbestos impacted concrete in layers with maximum layer thickness of 400mm and compact the concrete layers;
- Once the containment cell is full, place a permeable marker layer (geofabric or similar) across the entire surface of the contaminated material. Survey the coordinates and levels of the extent of the marker layer ;
- Place soil containing a mix of ash and ballast (deemed not contaminated) on the compacted concrete to bring to design levels.
- The SEMP will document the final condition of the containment cell and provide required long term management; and

Residual soils from the excavation of the containment cell shall be assessed from a contamination perspective, prior to consideration being given to their re-use onsite. The validation requirements for these soils are nominated in Section 6.6 of this RAP.

In the event that elevated concentrations of other contaminants are present in soils (including but not limited to petroleum hydrocarbons or metals), then additional containment design requirements would be required. This would need to be addressed on a case-by-case basis and additional design requirements issued as an addendum to this RAP.

If additional containment cells are required to manage the identified contaminated soil, details of the proposal (including the material to be contained, and the location and design of the containment cell) will be submitted to the Site Auditor for review and approval.

4.8 In-Situ Capping Strategy

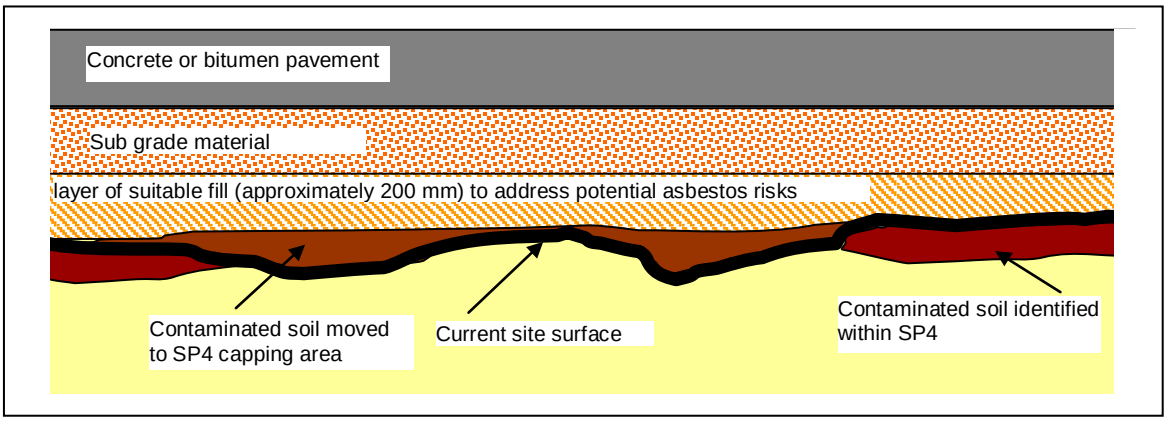
SPC have indicated that the majority of SP4 area will be filled with approximately 0.2m of suitable fill[8] (including clean fill and sub-grade material such as road base or aggregate or sand), followed by approximately 0.5m of impermeable paving such as bitumen, or concrete or a mix of both[9].

Provided that:

- the groundwater is assessed and demonstrated not likely to be significantly impacted by the retained contamination, with allowance to provide on-going regular monitoring of the groundwater quality[10]; and
- the cap is maintained and managed to ensure that the cap integrity is upheld, and measures are taken to protect the site users and construction workers who breach the cap, from exposure to the contamination retained below the cap;
- Required management will be addressed and documented in SEMP;

Coffey considers this capping strategy (across majority of SP4) will be suitable for the remediation of contamination within that portion of SP4 of the site. Additionally, the capping system in SP4 could be used to remediate contamination identified in areas outside of the area proposed to be capped, provided that the area can accept impacted soils from a design elevation perspective.

A concept sketch of the proposed capping strategy is shown below.



[8] The validated fill material is to be placed in this area to minimise potential for the mobilisation of asbestos fibres into the air during remediation works in the DELEC area. The area to be filled has not yet been defined. When available, this information will be submitted to the Site Auditor for review and comment.

[9] The concrete and/or bitumen paving is to be constructed as part of the future development of the site for container storage and heavy traffic.

[10] The groundwater monitoring program will include two (2) rounds of monitoring events during remediation works, two (2) quarterly monitoring events after the remediation works followed by two (2) half-yearly monitoring events. The results of the 6 rounds of monitoring over approximately 2 years will be used to assess if further monitoring is required.

It is understood that the underground services for the proposed development works across the SP4 capped area is likely to be at depths between 1m and 2m below the final surface level. It is likely that some of the underground service corridors will be located in areas that have been identified as being contaminated. Despite the proposed capping strategy for the majority of SP4 area, it is prudent (from a health and safety perspective) to remediate and validate these proposed underground service corridors prior to their construction.

Once the locations and the depths of the proposed underground service corridors have been finalised, the contamination status of those corridors should be assessed with a combination of existing information and new data (if required). If contamination exceeding the remediation assessment criteria is present in the underground service corridors, these will be remediated by excavating and placing within other areas of SP4 that is proposed to be capped. The resultant excavations will be validated in accordance with requirements in Section 6.1.

Note that a site management plan will be required to address the vapour inhalation risk to the workers constructing and maintaining the underground service corridors.

4.9 Landfarming Strategy

Soils impacted by fuel or light hydrocarbon and designated for remediation using land farming techniques shall be managed in the following way.

4.9.1 Establishment

A soil landfarming area/s shall be established on the Site. This area shall be

- located away from drainage lines, gutters or stormwater pits;
- paved or covered with high density polyethylene (HDPE) sheeting; and
- surrounded with silt barriers (e.g. sediment fencing or hay bales).

4.9.2 Treatment

The Remediation Contractor will transport soil material designated for land farming treatment to the established area. Movements of this soil shall be tracked by the Remediation Contractor.

Large lumps (greater than a nominal 100mm diameter) in the soil shall be broken down using physical methods (e.g. churning using hydraulic excavation equipment) or chemical methods (e.g. addition of lime to the soil), to assist with increasing the surface area of the impacted soil.

Land farming stockpiles will be constructed, involving spreading of the soil into thin stockpiles no greater than 1m thick. Each stockpile shall be identified and tracked by the Remediation Contractor on a stockpile register.

The stockpiles will be kept aerated to assist with breakdown of the TPH contamination. Aeration will be achieved via periodic turning of the soil using hydraulic excavation equipment.

Validation sampling of the stockpiles will be performed on an ongoing basis to assess the progress of the land farming treatment.

Depending on the results of the validation sampling, it may be necessary to apply additives to the stockpile to stimulate biological activity (which may improve TPH breakdown rates). The type of additives should be discussed with Coffey and SPC (and SPC's earthworks designer) prior to application, to assess the potential for impact on re-use of the soil onsite. Validation for re-use must be consistent with the requirements of Section 6.6 of this RAP.

Should large quantity of TPH impacted soil (say greater than 1000 m^3) is to be landfarmed, then there may a need to design the landfarm area such that potentially contaminated runoff during wet weather is captured and not allowed to impact the site soil, surface water and groundwater.

4.10 Remediation Contingency Plan

In the event that contaminated material that is suitable for onsite containment in an "unsealed" cell cannot be placed in that cell (due to limited available space in the cell for example), then consideration should be given to off-site disposal of the material. Prior to this option being implemented, the material will need to be classified generally in accordance with Section 4.10 of this RAP. If for any reason, oil impregnated concrete cannot be contained onsite, then the concrete should be disposed off site. The material will require to be classified in accordance with DECC (2008).

In the event that capping is not a suitable remediation option for the SP4 area (due to potential to impact groundwater, or potential to cause prohibitive costs to the construction works, or contamination characteristics not being suitable for capping etc), consideration should be given to offsite disposal.

Should groundwater impact be identified following the in situ capping of contamination, then the potential for groundwater contamination to migrate offsite and its associated risks needs to be assessed, and measures may be required to limit the impacted groundwater migrating off site.

4.11 Waste Classification

This section describes the methodologies to be used in order to classify waste soils from remediation activities prior to transport offsite for disposal.

4.11.1 Waste Classification Criteria

- The waste material shall be assessed against NSW DECC (2008) Waste Classification Guidelines.

4.11.2 Waste Soil Sampling and Laboratory Analysis Regime

The material shall be assessed by a suitably qualified environmental consultant prior to removal and disposal offsite. This assessment shall include:

- a visual survey of the surface of the stockpile; and
- collection and laboratory analysis of spatially representative samples of the soil material.

The material proposed for disposal shall be given a stockpile identifier in accordance with the Remediation Contractor's stockpile tracking system, as nominated in the Construction Environmental Management Plan (CEMP).

Soil samples will generally be collected at a frequency of one (1) sample per 25m^3 of soil proposed for offsite disposal, with a minimum of four (4) samples. However, this sampling frequency may be

increased or decreased, depending on the volume of the stockpile and the homogeneity of the stockpiled material.

The soil samples shall be submitted to a NATA accredited laboratory for the following minimum analysis:

Contaminant	Quantity of Samples
Metals (As, Cd, Cr, Pb, Hg, Ni,)	**100%**
Polycyclic Aromatic Hydrocarbons (PAH)	**50%**
Total Petroleum Hydrocarbon C_6-C_{36}	**100%**
Asbestos	**50%**

It is noted that this sampling and analysis regime is a minimum requirement only. The range of contaminants and/or the quantity of samples requiring analysis may need to be increased, depending on the environmental consultant's understanding of historical source site usage and the visual assessment of the material.

4.11.3 Waste Classification Quality Assurance & Quality Control

Quality assurance and quality control of both the fieldwork activities and the laboratory analysis shall be in accordance with Section 7 of this RAP.

4.11.4 Waste Classification Reporting

Once the material has been assessed against NSW DECC (2008), the environmental consultant will prepare a brief letter report nominating the classification of the waste.

4.11.5 Waste Tracking

The source, volume, classification and destination of the waste soil material will be tracked by the remediation contractor, as per the stockpile tracking system nominated in the CEMP. The contractor will ensure that a materials tracking register is maintained along with consignment dockets confirming receipt of the material at the disposal facility.

5 SITE MANAGEMENT

The Remediation Contractor will be responsible for managing the Site during the remediation works, to the extent of its contractual arrangements with SPC.

5.1 Construction Environmental Management Plan

The Remediation Contractor has prepared a Construction Environmental Management Plan (CEMP) to address issues including:

- Stormwater management;
- Soil management;
- Stockpile management;
- Noise control;
- Dust control;
- Odour control; and
- Waste management.

5.2 Occupational Health and Safety Plan

The Remediation Contractor will ensure that a project specific occupational health and safety plan has been prepared. This RAP does not relieve the Remediation Contractor of their responsibility for the health and safety of their employees, sub-contractors and visitors to the Site, nor their responsibility for preventing contamination of areas outside remediation work areas.

Specific safe work method procedure details for the remediation of contamination on the Site will be the responsibility of the Remediation Contractor and will depend upon the equipment used and the overall sequence of removal.

The Environmental Consultant will prepare a project specific occupational health and safety plan to address health and safety risks associated with the activities they will be carrying out on the Site during remediation works.

5.3 Remediation Schedule

Remediation is scheduled to commence in June 2009 and is due to complete in August 2009.

5.4 Hours of Operation

The hours of operation during the remediation works for the Site shall be nominated in the CEMP to be prepared by the Remediation Contractor. It is noted that approval conditions from the Department of Planning have limited site operation hours to 0700hrs – 1800hrs Monday to Friday and 0800hrs – 1300hrs on Saturday. No work on the Site is permitted on Sundays.

5.5 Incident Response

The procedures for responding to environmental incidents during the remediation work on the Site shall be nominated in the CEMP prepared by the Remediation Contractor.

5.6 Licences and Approvals

The licences and approvals required for the remediation works on the Site will be nominated in the CEMP prepared by the Remediation Contractor.

5.7 Contact Personnel

The contact personnel for the Site during the remediation works for the Site shall be nominated in the CEMP prepared by the Remediation Contractor.

5.8 Community Consultation Plan

SPC have prepared a Community Consultation Plan – Site Preparation and Pre-Construction for the Intermodal Logistics Centre at Enfield (ref: ILC – CC – 001). It is understood that this Community Consultation Plan will be used during the proposed remediation works.

5.9 Progress Reporting

The scope, frequency and style of reporting have been addressed in the Project Management Plan (PMP) prepared by Coffey Projects for the demolition and remediation activities on the Site.

6 VALIDATION AND CHARACTERISATION PLAN

The intent of the validation plan for remediation works is to collect and assess suitable data in order to demonstrate that the Site remediation goals have been successfully met. The intent of the characterisation plan is to collect and assess suitable data to characterise the area where the contaminants would be contained in-situ and capped with suitable capping materials.

6.1 Hotspot Excavations

Upon completion of excavation works at locations of contamination hotspots, a visual assessment of the excavation will be undertaken by Coffey and validation samples will be collected and submitted for analysis by a NATA accredited laboratory.

6.1.1 Sampling Regime

The following validation sampling regime will be implemented at the completion of hot spot remediation works:

- One (1) sample at the remediation depth (base) of each excavation;
- Four (4) targeted samples in the walls of each excavation.

Samples shall be collected from the base (remediated surface) of the excavation and in the walls of the excavation at the contamination depth in order to assess whether the horizontal and vertical extents of detected contamination have been remediated.

To address representativeness of the validation works, additional samples in the base and walls of each excavation may need to be taken, depending on the vertical and horizontal and vertical extent of the final excavation and visual/olfactory observations made of the soils. This will be assessed on a case by case basis by Coffey.

6.1.2 Analysis Regime

The samples collected shall be analysed for the contaminant of concern at each remediation location. Dependent on the laboratory results, further analysis to assist with assessing the potential to contaminate groundwater and extent of identified contamination may be required.

6.1.3 Validation of Wagon Repair Shed Remediation Works

The remediation works will include excavation to a minimum depth of 0.4m below ground level within the entire building footprint of the Wagon Repair Shed building and the cartilage soils as shown in Figure 5d.

The resultant excavation will be validated prior to backfilling as follows:

- The excavation will be visually assessed for the presence of asbestos containing materials;
- Samples will be collected along the walls of the excavation at a rate of 1 sample per 10 linear metres;
- Twenty samples will be collected from the base of the excavation (the NSW EPA 1995 guidelines require a minimum of 9 samples for an area of 3000m^2);

- All samples will be analysed for asbestos. In addition, as requested by the Site Auditor, field duplicates at the rate of 1 per 10 samples, or a minimum of 5 samples, will be submitted to analysis to a secondary laboratory.

Visual assessment followed by validation sample collection will be undertaken on a 10m x 10m grid along the walls and base of the excavations.

The samples collected shall be analysed for asbestos.

6.2 Demolished Rail Track Areas – DELEC

6.2.1 Sampling Regime

- Field assessment along track areas for evidence of contamination such as free oil, staining, discolouration, odours and asbestos containing materials;
- Preparation of observation/photographic logs of representative and selected locations along the track areas;
- Collection of 70 surface soil samples from locations approximately evenly distributed across the track areas. The proposed sampling density is based on significant potential for contamination associated with observed locomotive/carriage storage and maintenance activities in this area, but with an understanding that the distribution of contamination is likely to be relatively uniform across the track areas, and that additional samples will be collected where evidence of contamination is observed;
- Where evidence of contamination (elevated PID readings, odour, staining, free oil etc) is observed along the track areas, collection of additional surface soil samples.
- Soil samples are to be logged, including descriptions of soil types, visual and olfactory observations and PID assessments.

6.2.2 Analysis Regime

- Total Petroleum Hydrocarbon (TPH) C_{10}-C_{36}
- Asbestos

Dependent on the laboratory results, further sampling and analysis to assist with assessing the potential to contaminate groundwater and extent of identified contamination may be required.

6.3 Demolished Building Footprints – DELEC, Administration Building & Yardmasters Office

6.3.1.1 Sampling

- Field assessment for evidence of contamination such as free oil, staining, discolouration, odours and asbestos containing materials;
- Preparation of observation/photographic logs of each of the building footprints;
- Field screening of soils from the building footprints, using a PID.
- Where evidence of contamination (elevated PID readings, odour, staining, free oil etc) is observed in the building footprints, collect surface soil samples from the entire building footprint as per the table below.

- Prepare soil sampling field notes.

Building Number and Name	Number of Samples To Be Collected if evidence of contamination is observed (excluding duplicates)
Building 01 - Locomotive Maintenance Shed	24
Building 02 - Administration Building	Excluded
Building 03 - Canteen	2
Building 04 - Amenities Building	2
Building 05 - Rail Turn Table	2
Building 06 - Distribution Shed	2
Building 06A - Store Shed	2
Building 07 - Load Box	2
Building 08 - Effluent Treatment Plant	4
Building 09 - Training Centre	2
Building 10 - Fuel Tank & Bund	6
Building 11 - Fuel Shed	2
Building 12 - Maintenance Shed	2
Building 13 - Sand Plant	2
Building 14 - Refuelling Shed	5
Building 15 - Fuelers Amenities Shed	1
Building 15B - Fuelers Amenities Shed	1
Building 16 - Old Load Box	2
Building 17 - Wash Bays	2
Building 18A - Brick Building	2

Building Number and Name	Number of Samples To Be Collected if evidence of contamination is observed (excluding duplicates)
Building 18B - Brick Building	2
Building 18C - Brick Building	1
Building 19 - Substation	2
Building 20, 21 - Workshop and Shed	3
Building 22 - Crew Shed	3
Building 23 - Gas Bottle Storage	1
Building 24 - Amenities Building	2
Building 25 - Tank Storage Area	2
Building 25A - Brick Building	1
Building 26 - Concrete Pad	2
Building 27 - Separate Leasehold	Excluded
Building 28 - Three Buildings Plus Demountable	Excluded
Building 29 - Separate Leasehold	Excluded
Building 30 - Concrete Fuel Bund	2
Building 31 - Administration Building	Excluded
Building 32 - Bike Sheds	2
Building 33 - Wheel Set Storage	Excluded
Building 35 - Oily Water Separator	Excluded
Building 36 - Old Train Station	Excluded
SP2 - Administration Building	2
SP2 - Yardmasters Office	1

Building Number and Name	Number of Samples To Be Collected if evidence of contamination is observed (excluding duplicates)
SP2 - Wagon Repair Shed	Excluded
SP2 - Pedestrian Footbridge	2

6.3.1.2 Analysis

- Metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn) – 100% of samples collected
- Polycyclic Aromatic Hydrocarbons (PAH) – 50% of samples collected
- Total Petroleum Hydrocarbon (TPH) C_{10}-C_{36} – 100% of samples collected
- Asbestos – 100% of samples collected
- Organochlorine Pesticides (OCP) – 30% of samples collected
- Volatile Organic Compounds (VOC) – 30% of samples collected
- Polychlorinated Biphenyl (PCB) – 30% of samples collected

Dependent on the laboratory results, further sampling and analysis to assist with assessing the potential to contaminate groundwater and extent of identified contamination may be required.

6.4 Heritage Item – Pedestrian Footbridge

6.4.1 Sampling

- Four (4) surface soil samples
- Soil samples are to be logged, including descriptions of soil types, visual and olfactory observations.

6.4.2 Analysis

- Metals (Pb and Zn) – 100% of samples collected

Dependent on the laboratory results, further sampling and analysis to assist with assessing leachate risk and extent of identified contamination may be required.

6.5 Ballast Stockpiles

Ballast stockpile/s will be given a stockpile identifier in accordance with the Remediation Contractor's stockpile tracking system, as nominated in their CEMP.

The material will be assessed by Coffey. This assessment will include:

- a visual survey of the surface of the stockpile (particularly of the ballast material); and

- If fines are present within the ballast material, then collection and laboratory analysis of spatially representative samples of the material (it is noted that because of the potential particle size of the ballast material, samples may have to be limited to the sand and fines fractions (silt and clay) present within the ballast matrix).

Should sampling be required, samples will be collected at a frequency of one (1) sample per 100m^3 with a minimum of four (4) samples per stockpile. However, this sampling frequency may be increased or decreased, depending on the volume of the stockpile and the homogeneity of the stockpiled material.

The samples will be analysed for TPH (C_{10}-C_{36}) and asbestos as a minimum (additional contaminants may require assessment, based on the findings of the aforementioned visual survey). The samples shall be collected in a spatially representative pattern and beneath the surface of the stockpile (at a depth of at least 0.2m).

The visual assessment (and laboratory results where applicable) will be compared to the adopted RAC and an assessment made by Coffey as to the suitability (from a contamination perspective) of the ballast material to be contained onsite or removed from site. Should the laboratory results for ballast material satisfy the RAC and the ballast material not include significant staining, then the ballast material may be suitable for re-use on the Site. However, should the ballast be significantly stained, then the ballast will need to be cleaned prior to it being considered suitable for re-use on the Site. Consideration will be given to the 95% UCL of the laboratory results for each chemical contaminant when making this assessment.

The site auditor will be notified prior to reuse of any ballast.

6.6 Reuse of Onsite Fill Material

This section describes the methodologies to be used in order to validate onsite fill material prior to it being re-used elsewhere on the Site during remediation works.

6.6.1 Onsite Fill Material Validation Criteria

The fill material shall comply with the adopted RAC as nominated in this RAP.

6.6.2 Onsite Fill Material Sampling and Laboratory Analysis Regime

The material shall be assessed by a suitably qualified environmental consultant prior to importation. This assessment shall include:

- a visual survey; and
- collection and laboratory analysis of spatially representative soil samples of the fill material.

Samples shall be collected at a frequency of one (1) sample per 100m^3 of soil proposed to be re-used on Site, with a minimum of four (4) samples. However, this sampling frequency may be increased or decreased, depending on the volume of the stockpile and the homogeneity of the stockpiled material.

The material proposed for reuse shall be given a stockpile identifier in accordance with the Remediation Contractor's stockpile tracking system, as nominated in the CEMP.

The soil samples collected shall be submitted to a NATA accredited laboratory for the following minimum analysis:

Contaminant	Quantity of Samples
Metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn)	**50%**
Polycyclic Aromatic Hydrocarbons (PAH)	**50%**
Total Petroleum Hydrocarbon C_6-C_{36}	**100%**
Asbestos	**100%**

It is noted that this regime is a minimum requirement only. The range of contaminants and/or the quantity of samples requiring analysis may need to be revised, depending on the Environmental Consultant's understanding of the source of the material and the visual survey of the material.

6.6.3 Onsite Fill Material Quality Assurance & Quality Control

Quality assurance and quality control of both the fieldwork activities and the laboratory analysis shall be in accordance with Section 7 of this RAP.

6.6.4 Onsite Fill Material Approval

Once the potential reuse fill has been assessed, the Environmental Consultant will prepare a brief letter report that will include a recommendation as to whether the material complies with the reuse fill assessment criteria and is therefore suitable (from a contamination perspective) for reuse on the Site.

This report shall include a comparison of survey and laboratory results against the re-use fill criteria nominated in Section 6.6.1 above.

It is noted that other non-contamination related criteria may also need to be met (e.g. engineering or geotechnical requirements). However, assessments of this kind are not within the scope of the RAP.

6.6.5 Onsite Fill Material Tracking

The source, volume, approval status and destination of the beneficial re-use fill material shall be tracked by the Remediation Contractor, as per the stockpile tracking system nominated in the CEMP.

6.7 Imported Fill Material

This section describes the methodologies to be used in order to validate offsite fill material prior to it being imported to the Site during remediation works.

6.7.1 Imported Fill Assessment Criteria

The fill material shall comply with the following validation criteria:

- the definition of Virgin Excavated Natural Material (VENM) as defined in NSW DECC (2008) Waste Classification Guidelines;

- sample analysis results generally below laboratory limits of reporting (LOR) for organic contaminants;
- sample analysis results within expected metal concentration background ranges (as nominated in Table 5-A of NEPC (1999); and
- the adopted RAC (as nominated in this RAP).

6.7.2 Imported Fill Sampling and Laboratory Analysis Regime

The material shall be assessed by a suitably qualified environmental consultant prior to importation. This assessment shall include:

- a visual survey of the source site and the proposed fill material (if exposed); and
- collection and laboratory analysis of spatially representative soil samples of the fill material.

The proposed material for importation shall be given a stockpile identifier in accordance with the Remediation Contractor's stockpile tracking system, as nominated in the CEMP.

The soil samples shall be submitted to a NATA accredited laboratory for the following minimum analysis:

Contaminant	Quantity of Samples
Metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn)	**100%**
Polycyclic Aromatic Hydrocarbons (PAH)	**100%**
Total Petroleum Hydrocarbon C_6-C_{36}	**100%**
Benzene, toluene, ethyl benzene, xylene (BTEX)	**100%**

It is noted that this regime is a minimum requirement only. The range of contaminants and/or the quantity of samples requiring analysis may need to be revised, depending on the environmental consultant's understanding of historical source site usage and the visual assessment of the material.

6.7.3 Imported Fill Quality Assurance & Quality Control

Quality assurance and quality control of both the fieldwork activities and the laboratory analysis shall be in accordance with Section 7 of this RAP.

6.7.4 Imported Fill Approval

Once the fill has been assessed, the environmental consultant shall prepare a brief letter report that shall include a recommendation as to whether the material complies with the fill assessment criteria and is therefore suitable (from a contamination perspective) for importation to the Site.

This report shall include a comparison of survey and laboratory results against the imported fill criteria nominated in Section 6.7.1 above.

Should the fill assessment be carried out by a consultant other than Coffey, then the fill assessment report shall be submitted to Coffey for review and comment, prior to the commencement of importation. The review and comment process may also require a site visit by Coffey in order to confirm site conditions.

It is noted that other non-contamination related criteria may also need to be met (e.g. engineering or geotechnical requirements). However, assessments of this kind are not within the scope of the RAP.

6.7.5 Imported Fill Tracking

The source, volume, approval status and destination of the imported VENM material will be tracked by the Contractor, as per the stockpile tracking system nominated in the CEMP.

6.8 Validation of Cap Thickness

The validation of the thickness of the proposed 200mm cap of suitable fill material will be undertaken during the remediation works. Validation of the cap thickness would likely involve a survey of surface levels before and after capping, or drilling through the cap on a grid basis to assess the thickness of the cap at point locations.

It is understood that the 500mm impermeable pavement (i.e. concrete, bitumen etc) will be installed during construction works.

7 QUALITY ASSURANCE AND QUALITY CONTROL

7.1 Sampling and Analytical Quality Plan

Data Quality Objectives (DQOs) for validation activities have been developed generally in accordance with the seven step process outlined in NSW DEC (2006).

7.1.1 Step 1 – State the Problem

7.1.1.1 Objective

To assess whether the remediation goals have been achieved.

7.1.1.2 Problem Statement

The known soil contamination issues at the Site that are to be addressed in this project are:-

- TPH C_{10}-C_{36}
- Arsenic, Copper and Zinc
- Asbestos

The potential sources of known TPH C_{10}-C_{36} contamination on the Site are leaks and spills from historical activities on the Site, including fuel storage and maintenance activities.

The potential source of known arsenic contamination on the Site (limited to a location in the south of the Site) is uncontrolled fill. It is noted that historical sampling in this area returned an arsenic concentration (327mg/kg) that was below the adopted site assessment criteria for commercial/industrial land use (500mg/kg), however, the concentration exceeded the ecological investigation level (EIL) assessment criteria (20mg/kg).

The potential source of known copper contamination on the Site (limited to a location to the south west of the Locomotive Maintenance Shed (Building 1) is servicing and maintenance activities.

The potential source of known zinc contamination on the Site (in the vicinity of the diesel AST area) is abrasive blasting of the zinc based tank coatings on former ASTs at this location.

The potential source of the known asbestos contamination on the Site is the use of asbestos containing materials in building structures (e.g. fibre cement wall sheeting and roofing).

It is noted that other areas of potential contamination (i.e. beneath structures to be demolished) are proposed to be assessed after demolition has been completed by others and remedial works are underway.

7.1.1.3 Reasoning

This project is being undertaken in order to gather information to assist with validation of site soils for the Site.

7.1.1.4 Project Team

The likely team members and their responsibilities for this project are presented in the table below:

Name	Title	Responsibilities
Sam Gunasekera	Principal Coffey Environments	Project Director Technical Reviewer
Rob Pulvirenti	Project Manager Coffey Projects	Project Management
Nalin De Silva	Senior Environmental Engineer Coffey Environments	Project Planning Data Assessment & Reporting Consultant's Representative
I-Hui Waung	Environmental Scientist Coffey Environments	Field Data Collection Data Validation
Julian Howard	Environmental Scientist Coffey Environments	Data Validation Data Assessment & Reporting
Nick Cowman	Environmental Scientist Coffey Environments	Field Data Collection Data Validation
Zia Husain	Environmental Scientist Coffey Environments	Field Data Collection Data Validation
Matt Vanderheyden	Environmental Scientist Coffey Environments	Field Data Collection Data Validation
Bruce Royds	Project Manager Sydney Ports Corporation	Client Representative
Cameron Newling	Project Manager Enviropacific Services	Remediation contracting
Nat Stevens	Site Manager Enviropacific Services	Remediation contracting
Graeme Nyland	Site Auditor Environ	Audit of remediation and validation activities

7.1.1.5 Regulatory Authorities

The regulatory authority relevant to this project is NSW Department of Planning (DoP). Whilst neither the Site nor the works subject to this plan are regulated by the Department of Environment & Climate Change (DECC), the works under this plan will be carried out in general accordance with the relevant documents prepared and endorsed by the DECC.

The following list includes State legislative requirements that may be relevant to the remediation activities:

- Contaminated Land Management Act 1997 (DECC) (Contaminated Land Management Amendment Act 2008 commences 1 July 2009. New regulation currently being drafted);
- Environmental Planning and Assessment Act 1979 (Department of Planning);
- Protection of the Environment Operations Act 1997 (DECC);
- Protection of the Environment Operations (Waste) Regulation 2005;
- Waste Classification Guideline 2008;
- Waste Avoidance and Resource Recovery Act 2001 (DECC); and
- OHS Act 2000 and OHS Regs 2001 (WorkCover).

7.1.2 Step 2 – Identify the Decision

The decisions that are required to be made in this project include:

- Is the data suitable for assessing whether the site is suitable for the proposed land use; and
- Is the site suitable for the proposed land use?

7.1.3 Step 3 – Identify Inputs to the Decision

The primary inputs to assessing the above include:

- The results of the previous assessments carried out on the site including site history information, field observations and laboratory analytical results;
- Validation data collected by Coffey Environments including field observations and laboratory analytical results;
- Remediation Acceptance Criteria as stated in Section 3.3; and
- Applicable NSW DECC guidelines.

7.1.4 Step 4 – Define the Study Boundaries

7.1.4.1 Horizontal Boundaries

The horizontal boundaries for the project are generally defined by the boundaries of Separable Portion 2, Separable Portion 3, Separable Portion 4 and Separable Portion 5 as represented in Figure 2.

7.1.4.2 Vertical Boundaries

The vertical boundaries of the project are defined as being from existing ground level to the base of the impacted fill material on the Site, as nominated in previous site contamination assessment activities. Should data become available that suggests contamination may be present at depths beyond the vertical boundaries of the project, then further assessment (and revision of this SAQP) may be required. Depending on the outcome of this further assessment (including the nature/extent of the contamination) additional excavation works or other soil management strategies may be required,

7.1.5 Step 5 – Develop a Decision Rule

The decision rule for the project will be as follows:

- If the results of the analytical data quality control / quality assurance (QA/QC) assessment (also referred to as a data useability assessment) are acceptable within the adopted control limits, then the data will be deemed suitable for the purposes of the project. In this regard data will be assessed against completeness, comparability, representativeness, precision and accuracy.

7.1.6 Step 6 – Specify Acceptable Limits on Decision Errors

There are two types of decision errors:

- Sampling errors which occur when the samples collected are not representative of the conditions of the project area;
- Measurement errors which occur during sample collection, handling, preparation and analysis;

These errors may lead the decision maker to make the following errors:

- Deciding that the Site is suitable for the proposed use when it is actually not;
- Deciding that the Site is not suitable for the proposed use when it actually is;

The limits for assessment are nominated in Section 7.3.2 of this RAP.

7.1.7 Step 7 – Optimise the Design for Obtaining Data

Based on the previous Steps 1 – 6 of this SAQP, the optimal design for obtaining the required data is considered to be as per Section 6 of this RAP.

7.2 Fieldwork QA/QC

7.2.1 Preparation

Sampling equipment required for fieldwork should include the following:

- Notebook/indelible marker pens;
- Stainless steel sampling trowel;
- Three decontamination buckets;
- Deionised or distilled water and Decon 90 detergent;
- Laboratory prepared sample containers

- Zip lock bags
- Eskies and ice;
- Disposable latex gloves
- Personal protective equipment (PPE)

7.2.2 Soil Sampling Procedure

Samples will be collected using a decontaminated stainless steel trowel, stainless steel hand auger or scooped directly (grab sample) into the laboratory prepared container or zip lock plastic bag, using a fresh pair of latex gloves. The soil sample shall be lightly packed into the container with headspace minimised to avoid the loss of volatiles. The containers and/or bags will be labelled with a project number, sample location, sample depth (where applicable) and date sample was collected.

Soil samples will be analysed on a discrete basis. Composite sampling and analysis methods will not be utilised.

7.2.3 Decontamination Procedures

Non-disposable sampling equipment coming into in contact with soils shall be decontaminated before and between sampling events to minimise the possibility of cross contamination between samples and minimise the risk of impacting sample integrity. The decontamination process will include the following procedure:

- Removal of soil from the equipment with a clean plastic brush in potable water;
- Washing the equipment in a solution of Decon 90 (or similar) detergent and potable water; and
- Rinsing the equipment in potable water.

7.2.4 Storage and Transport Procedures

Soil samples shall be placed into laboratory prepared jars (which have Teflon lined lids) or zip lock bags (depending on the proposed analysis requirements). The sample containers will then be placed directly into an ice packed insulated esky for transportation to the NATA accredited analytical laboratory with the Chain of Custody form recording the following information:

- Project reference;
- Date of sampling;
- Sample identifications;
- Matrix and container details
- Preservation methods
- Name of sampler;
- Required analysis;
- Turnaround times required; and
- Signatures of sender and receiving laboratory.

A copy of the Chain of Custody will be kept in the project file. Samples will be transported to the laboratory with sufficient time to perform analysis within the specified holding period.

7.2.5 Intra-laboratory Duplicates

Intra-laboratory field duplicates will be collected on an average frequency of one sample per ten samples collected (10%). The analytical results of the two spilt samples will be compared to assess the precision of the sampling protocol and to provide an indication of variation in the sample source.

7.2.6 Inter-Laboratory Duplicates

Inter-laboratory field duplicates will be collected on an average frequency of one sample per twenty samples collected (5%). The analytical results of the two split samples will be compared to assess the precision of the sampling protocol, provide an indication of variation in the sample source and to assess the accuracy of the primary laboratory.

7.2.7 Rinsate Blanks

Rinsate blanks will be prepared in the field using empty bottles and the distilled water/potable water used for the cleaning of sampling equipment. These blanks will be a check on field decontamination procedures and sample device cleanliness. A rinsate blank will be collected and analysed for each day of field work carried out, where non-disposable sampling equipment has been used. Where the same decontamination procedures are being used regularly for similar sampling equipment (and previous rinsate blank analysis has returned acceptable results), it will be appropriate to use rinsate blanks on a “spot check” frequency rather than for each day of field work carried out, where non-disposable sampling equipment has been used.

7.2.8 Trip Blanks

Trip blanks are samples of organic free soil prepared by the laboratory and are a check on sample contamination originating from sample transport, shipping and Site conditions. The blank will remain with the sample containers during sampling and during the return trip to the lab. At no time during these procedures will the blanks be opened. Upon return to the lab the blank will be analysed, if needed, as any other field sample. A trip blank will be used and analysed for a batch of samples released to the laboratory, where the contaminants being assessed are volatile in nature (e.g. BTEX or TPH C_6-C_9). Where the same sampling and transport procedures are being used regularly for samples proposed for volatile analysis (and previous trip blank analysis has returned acceptable results), it will be appropriate to use trip blanks on a “spot check” frequency rather than for every batch.

7.2.9 Trip Spikes

Trip spikes are samples of soil containing a pre-determined concentration of a volatile organic contaminant (typically BTEX) and are a check on sample preservation during sample collection and transport. The spike will remain in the sample container during the sampling activity and during transport to the laboratory. At no time during these procedures will the trip spike be opened. Upon return to the laboratory, the trip spike will be analysed, if needed, as any other field sample. A trip spike will be used and analysed for each batch of samples released to the laboratory, where the contaminants being analysed are of a volatile nature (e.g. BTEX or TPH C_6-C_9). Where the same sampling and transport procedures are being used regularly for samples proposed for volatile analysis

(and previous trip spike analysis has returned acceptable results), it will be appropriate to use trip spikes on a "spot check" frequency rather than for every batch.

7.3 Laboratory QA/QC

7.3.1 Laboratory Selection

The primary laboratory proposed for this project is SGS Laboratories Pty Ltd, which is NATA-accredited for the analyses to be undertaken.

Laboratory Quality Control would include the following:

- The laboratory analysis of samples will be undertaken by a NATA accredited environmental testing laboratory;
- The NATA accredited environmental testing laboratory will implement a quality control plan conforming to the National Environmental Protection (Assessment of Site Contamination) Measure 1999 (NEPM) Schedule B(3) Guidelines for Analysis of Potentially Contaminated Soils;
- The laboratory will include reagent blanks, spike samples, duplicate spikes, matrix spikes, and surrogates spikes and duplicates to assess the laboratory quality control.

7.3.2 Assessment

The laboratory quality control data shall be assessed as follows:

- Checking that the reporting limits and procedures are satisfactory;
- Checking that the samples are analysed within holding times;
- Checking that laboratory blanks / reagent blanks are less than the laboratory reporting limits;
- Checking the reproducibility of samples by calculating the Relative Percentage Differences (RPDs) between primary and duplicate laboratory samples using a control limit of 30%; and
- Checking that spikes, surrogate spikes, matrix spikes and duplicate matrix spike recoveries are within acceptable control limits.

Data Quality Indicators that will be adopted for duplicate, spike and blank samples are as shown in the following table:

Type of Quality Control Sample	**Control Limit**
Duplicate Samples	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 10-140% for SVOC and speciated phenols
Blanks	Analytes not detected.

8 VALIDATION REPORTING

8.1 Interim Validation Reporting

At the completion of remediation and validation works in each Separable Portion, an interim validation report will be prepared by the Environmental Consultant.

Each interim validation report will include:

- Site Identification
- Remediation Activities Undertaken
- Validation Sampling Results
- Interim Recommendations

8.2 Final Validation Reporting

At the completion of remediation and validation works in all the separable portions, a validation report will be prepared in general accordance with NSW EPA (1997), DUAP (1998) and other relevant guidance documentation.

The validation report will include:

- Executive Summary
- Scope of Work
- Site Identification
- Summary of Site History
- Summary of Site Condition and Surrounding Environment
- Summary of Geology and Hydrogeology
- Remediation Activities Undertaken
- Validation Sampling and Analysis Plan (including Methodology)
- Field QA / QC
- Laboratory QA / QC
- QA / QC Data Evaluation
- Basis for Validation Criteria
- Validation Sampling Results
- Site Characterisation
- Ongoing Site Monitoring Requirements
- Conclusions and Recommendations

9 RECOMMENDATIONS

Based on the historical data available for the Site, Coffey recommends that:

- the Site soils are subjected to the remediation strategy proposed in this RAP;
- the Site soils are validated in general accordance with this RAP;
- additional contamination that is identified during Site validation works, undergoes risk assessment or remediation;
- further groundwater assessment works are undertaken to address two of the conditions included in the Site Auditor's Site Audit Statement, including the presence of total petroleum hydrocarbon (TPH) in groundwater (and potential migration off site) and the presence of copper in groundwater. The additional groundwater assessment will also likely provide information to assess the suitability of the proposed cap and contain strategy for the majority of SP4 area; and develop a Site Environmental Management Plan (SEMP) to manage the retained contamination in the form of capped area and containment cells. The SEMP will address TPH and asbestos impacted soil and document the required management of TPH, asbestos, and management of access to community and ecological areas. The SEMP will also address the requirements of on-going groundwater monitoring.

10 REFERENCES

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Tables

Remediation Action Plan
for Known Soil Contamination
Intermodal Logistics Centre @ Enfield

coffey environments

Ref: ILC - CO - D&R - ENVIRHOD00634AA

Table LR1 Laboratory Results
Known Contamination Delineation Assessment
ILC @ Enfield

Chemical Name	Units	PQL	NEPM 1999 HIL F	Site Specific Risk Based Criteria *	Sample ID	BD 8 0.5/ E5	BD 8 0.5/ S5	BD 8 0.5/ W5	BD 8 0.5/N5	BD 8 0.7	BD 8 0.7/ E5	BD 8 0.7/ S5	BD 8 0.7/ W5	BD 8 0.7/N5	BD20 0.5/E5	BD20 0.5/N5	BD20 0.5/S5	BD20 0.5/W5
					Sample Depth	0.5	0.5	0.5	0.5	0.7	0.7	0.7	0.7	0.7	0.5	0.5	0.5	0.5
					Sample Date	19/01/2009	19/01/2009	19/01/2009	19/01/2009	19/01/2009	19/01/2009	19/01/2009	19/01/2009	19/01/2009	14/01/2009	14/01/2009	14/01/2009	14/01/2009
					Sample Analytical Code	66857-62	66857-65	66857-68	66857A-59	66857A-57	66857-63	66857-66	66857-69	66857A-60	66756-R-7	66756-R-4	66756-R-10	66756-R-13
Arsenic	mg/kg	3	**500**		-	-	-	-	-	-	-	-	-	-	-	-	-
Copper	mg/kg	0.5	**5,000**		-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc	mg/kg	0.5	**35,000**		-	-	-	-	-	-	-	-	-	-	-	-	-
TPH C10 - C14 Fraction	mg/kg	20		**18,642**	330	41	<20	520	<20	82	<20	<20	<20	350	5600	<20	<20
TPH C15 - C28 Fraction	mg/kg	50		**13,953**	790	320	<50	1500	93	230	<50	<50	<50	700	8700	<50	<50
TPH C29-C36 Fraction	mg/kg	50		**13,953**	<50	<50	<50	76	<50	<50	<50	<50	<50	270	210	<50	<50

* Coffey Environments (2009) On-Site Health Risk Assessment, Risk Based Level Development, Intermodal Logistics Centre Enfield, New South Wales, 2136 (ref: ILC - CO - D&R - ENVIRHOD00634AA-R005

Ref: ILC - CO - D&R - ENVIRHOD00634AA

Table LR1 Laboratory Results
Known Contamination Delineation Assessment
ILC @ Enfield

Chemical Name	Units	PQL	NEPM 1999 HIL F	Site Specific Risk Based Criteria *	Sample ID	BD20 0.7	BD20 0.7/E5	BD20 0.7/N5	BD20 0.7/S5	BD20 0.7/W5	BD25 0.5/E6	BD25 0.5/N5	BD25 0.5/S5	BD25 0.5/W5	BD25 0.7	BD25 0.7/E6	BD25 0.7/N5	BD25 0.7/S5
					Sample Depth	0.7	0.7	0.7	0.7	0.7	0.5	0.5	0.5	0.5	0.7	0.7	0.7	0.7
					Sample Date	14/01/2009	14/01/2009	14/01/2009	14/01/2009	14/01/2009	20/01/2009	20/01/2009	20/01/2009	20/01/2009	20/01/2009	20/01/2009	20/01/2009	20/01/2009
					Sample Analytical Code	66756-R-2	66756-R-8	66756-R-5	66756-R-11	66756-R-14	66890-52	66890-49	66890-55	66890-58	66890-47	66890-53	66890-50	66890-56
Arsenic	mg/kg	3	**500**			-	-	-	-	-	-	-	-	-	-	-	-	-
Copper	mg/kg	0.5	**5,000**			-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc	mg/kg	0.5	**35,000**			-	-	-	-	-	-	-	-	-	-	-	-	-
TPH C10 - C14 Fraction	mg/kg	20		**18,642**		<20	<20	<20	<20	<20	36	<20	<20	2900	<20	<20	<20	<20
TPH C15 - C28 Fraction	mg/kg	50		**13,953**		<50	<50	<50	<50	<50	140	60	100	7800	<50	<50	<50	<50
TPH C29-C36 Fraction	mg/kg	50		**13,953**		<50	<50	<50	<50	<50	52	52	100	980	<50	<50	<50	<50

* Coffey Environments (2009) On-Site Health Risk Assessment, Risk Based Level Development, Intermodal Logistics Centre Enfield, New South Wales, 2136 (ref: ILC - CO - D&R - ENVIRHOD00634AA-R005

Ref: ILC - CO - D&R - ENVIRHOD00634AA

Table LR1 Laboratory Results
Known Contamination Delineation Assessment
ILC @ Enfield

Chemical Name	Units	PQL	NEPM 1999 HIL F	Site Specific Risk Based Criteria *	BD25 0.7/W5	BD35 1.0	BD35 0.5/E5	BD35 0.5/N5	BD35 0.5/S5	BD35 0.5/W5	BD35 0.7	BD35 0.7/E5	BD35 0.7/N5	BD35 0.7/S5	BD35 0.7/W5	BD38 0.5/E5	BD38 0.5/N5
Sample ID					BD25 0.7/W5	BD35 1.0	BD35 0.5/E5	BD35 0.5/N5	BD35 0.5/S5	BD35 0.5/W5	BD35 0.7	BD35 0.7/E5	BD35 0.7/N5	BD35 0.7/S5	BD35 0.7/W5	BD38 0.5/E5	BD38 0.5/N5
Sample Depth					0.7	1	0.5	0.5	0.5	0.5	0.7	0.7	0.7	0.7	0.7	0.5	0.5
Sample Date					20/01/2009	14/01/2009	14/01/2009	14/01/2009	14/01/2009	14/01/2009	14/01/2009	14/01/2009	14/01/2009	14/01/2009	14/01/2009	15/01/2009	15/01/2009
Sample Analytical Code					66890-59	66756B-46	66756-R-50	66756-R-47	66756-R-53	66756-R-56	66756-R-45	66756-R-51	66756-R-48	66756-R-54	66756-R-57	66771-39	66771-35
Arsenic	mg/kg	3	**500**		-	-	-	-	-	-	-	-	-	-	-	-	-
Copper	mg/kg	0.5	**5,000**		-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc	mg/kg	0.5	**35,000**		-	-	-	-	-	-	-	-	-	-	-	-	-
TPH C10 - C14 Fraction	mg/kg	20		**18,642**	<20	<20	<20	1900	<20	<20	300	<20	<20	<20	<20	1700	300
TPH C15 - C28 Fraction	mg/kg	50		**13,953**	<50	<50	<50	4200	<50	<50	1600	<50	<50	<50	<50	5600	1800
TPH C29-C36 Fraction	mg/kg	50		**13,953**	<50	<50	<50	3000	<50	<50	3900	<50	<50	<50	<50	11000	3100

* Coffey Environments (2009) On-Site Health Risk Assessment, Risk Based Level Development, Intermodal Logistics Centre Enfield, New South Wales, 2136 (ref: ILC - CO - D&R - ENVIRHOD00634AA-R005

Ref: ILC - CO - D&R - ENVIRHOD00634AA

Table LR1 Laboratory Results
Known Contamination Delineation Assessment
ILC @ Enfield

Chemical Name	Units	PQL	NEPM 1999 HIL F	Site Specific Risk Based Criteria *													
Sample ID					BD38 0.5/S5	BD38 1.0/E5	BD38 1.0/N5	BD38 1.0/S5	BD38 1.2	BD38 1.2/E5	BD38 1.2/N5	BD38 1.2/S5	BD38 1.5/E5	BD50 0.5/E5	BD50 0.5/N5	BD50 0.5/S5	BD50 0.5/W6
Sample Depth					0.5	1	1	1	1.2	1.2	1.2	1.2	1.5	0.5	0.5	0.5	0.5
Sample Date					15/01/2009	15/01/2009	15/01/2009	15/01/2009	15/01/2009	15/01/2009	15/01/2009	15/01/2009	15/01/2009	20/01/2009	20/01/2009	20/01/2009	20/01/2009
Sample Analytical Code					66771-43	66771-40	66771-36	66771-44	66771-33	66771-41	66771-37	66771-45	66771A-42	66890-4	66890-1	66890-7	66890-10
Arsenic	mg/kg	3	**500**		-	-	-	-	-	-	-	-	-	-	-	-	-
Copper	mg/kg	0.5	**5,000**		-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc	mg/kg	0.5	**35,000**		-	-	-	-	-	-	-	-	-	-	-	-	-
TPH C10 - C14 Fraction	mg/kg	20		**18,642**	170	450	240	290	<20	480	<20	<20	720	290	3400	500	3400
TPH C15 - C28 Fraction	mg/kg	50		**13,953**	590	1400	1700	1800	<50	1900	73	93	2600	1200	10000	1400	5700
TPH C29-C36 Fraction	mg/kg	50		**13,953**	1200	3100	2900	4400	75	3400	160	120	4500	54	<500	<50	<50

* Coffey Environments (2009) On-Site Health Risk Assessment, Risk Based Level Development, Intermodal Logistics Centre Enfield, New South Wales, 2136 (ref: ILC - CO - D&R - ENVIRHOD00634AA-R005

Ref: ILC - CO - D&R - ENVIRHOD00634AA

Table LR1 Laboratory Results
Known Contamination Delineation Assessment
ILC @ Enfield

Chemical Name	Units	PQL	NEPM 1999 HIL F	Site Specific Risk Based Criteria *													
Sample ID					BD50 0.7	BD50 0.7/E5	BD50 0.7/N5	BD50 0.7/S5	BD50 0.7/W6	BD50 1.0/E5	BD51 0.5/E5	BD51 0.5/E5	BD51 0.5/N5	BD51 0.5/N5	BD51 0.5/S5	BD51 0.5/S5	BD51 0.5/W5
Sample Depth					0.7	0.7	0.7	0.7	0.7	1	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Sample Date					20/01/2009	20/01/2009	20/01/2009	20/01/2009	20/01/2009	20/01/2009	20/01/2009	20/01/2009	20/01/2009	20/01/2009	20/01/2009	20/01/2009	20/01/2009
Sample Analytical Code					66890-14	66890-5	66890-2	66890-8	66890-11	66890B-6	66890-22	66890A-22	66890-19	66890A-19	66890-25	66890A-25	66890-28
Arsenic	mg/kg	3	**500**		-	-	-	-	-	-	-	-	-	-	-	-	-
Copper	mg/kg	0.5	**5,000**		-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc	mg/kg	0.5	**35,000**		-	-	-	-	-	-	-	77	-	4300	-	110	-
TPH C10 - C14 Fraction	mg/kg	20		**18,642**	47	850	83	160	<20	<20	3500	-	540	-	<20	-	330
TPH C15 - C28 Fraction	mg/kg	50		**13,953**	54	3000	150	<50	<50	75	5200	-	2700	-	<50	-	6300
TPH C29-C36 Fraction	mg/kg	50		**13,953**	<50	<50	<50	<50	<50	<50	65	-	320	-	<50	-	4300

* Coffey Environments (2009) On-Site Health Risk Assessment, Risk Based Level Development, Intermodal Logistics Centre Enfield, New South Wales, 2136 (ref: ILC - CO - D&R - ENVIRHOD00634AA-R005

Ref: ILC - CO - D&R - ENVIRHOD00634AA

Table LR1 Laboratory Results
Known Contamination Delineation Assessment
ILC @ Enfield

Chemical Name	Units	PQL	NEPM 1999 HIL F	Site Specific Risk Based Criteria *	Sample ID	BD51 0.5/W5	BD51 0.7	BD51 0.7	BD51 0.7/E5	BD51 0.7/E5	BD51 0.7/N5	BD51 0.7/N5	BD51 0.7/S5	BD51 0.7/S5	BD51 0.7/W5	BD51 0.7/W5	BD51 1.0/N5	BH 13 0.2-0.3
					Sample Depth	0.5	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	1	0.2-0.3
					Sample Date	20/01/2009	20/01/2009	20/01/2009	20/01/2009	20/01/2009	20/01/2009	20/01/2009	20/01/2009	20/01/2009	20/01/2009	20/01/2009	23/01/2009	19/01/2009
					Sample Analytical Code	66890A-28	66890-17	66890A-17	66890-23	66890A-23	66890-20	66890A-20	66890-26	66890A-26	66890-29	66890A-29	66890B-21	66857-92
Arsenic	mg/kg	3	**500**		-	-	-	-	-	-	-	-	-	-	-	-	-
Copper	mg/kg	0.5	**5,000**		-	-	-	-	-	-	-	-	-	-	-	-	170
Zinc	mg/kg	0.5	**35,000**		210	-	36	-	33	-	130	-	35	-	63	-	-
TPH C10 - C14 Fraction	mg/kg	20		**18,642**	-	42	-	<20	-	360	-	<20	-	<20	-	78	-
TPH C15 - C28 Fraction	mg/kg	50		**13,953**	-	72	-	<50	-	880	-	<50	-	<50	-	130	-
TPH C29-C36 Fraction	mg/kg	50		**13,953**	-	<50	-	<50	-	150	-	<50	-	<50	-	<50	-

* Coffey Environments (2009) On-Site Health Risk Assessment, Risk Based Level Development, Intermodal Logistics Centre Enfield, New South Wales, 2136 (ref: ILC - CO - D&R - ENVIRHOD00634AA-R005

Ref: ILC - CO - D&R - ENVIRHOD00634AA

Table LR1 Laboratory Results
Known Contamination Delineation Assessment
ILC @ Enfield

Chemical Name	Units	PQL	NEPM 1999 HIL F	Site Specific Risk Based Criteria *	Sample ID	BH 13 0.2-0.3/ E5	BH 13 0.2-0.3/ N5	BH 13 0.2-0.3/ S5	BH 13 0.2-0.3/ W5	BH 13 0-0.1/ E5	BH 13 0-0.1/ N5	BH 13 0-0.1/ S5	BH 13 0-0.1/ W5	BH11 0.2/E5	BH11 0.2/N5	BH11 0.2/S5	BH11 0.2/W5	BH11 0.4
					Sample Depth	0.2-0.3	0.2-0.3	0.2-0.3	0.2-0.3	0 - 0.1	0 - 0.1	0 - 0.1	0 - 0.1	0.2	0.2	0.2	0.2	0.4
					Sample Date	19/01/2009	19/01/2009	19/01/2009	19/01/2009	19/01/2009	19/01/2009	19/01/2009	19/01/2009	15/01/2009	15/01/2009	15/01/2009	15/01/2009	15/01/2009
					Sample Analytical Code	66857-98	66857-95	66857-101	66857-104	66857-97	66857-94	66857-100	66857-103	66771-7	66771-4	66771-10	66771-13	66771-2
Arsenic	mg/kg	3	**500**			-	-	-	-	-	-	-	-	-	-	-	-	-
Copper	mg/kg	0.5	**5,000**			13	67	22	150	220	350	170	150	-	-	-	-	-
Zinc	mg/kg	0.5	**35,000**			-	-	-	-	-	-	-	-	-	-	-	-	-
TPH C10 - C14 Fraction	mg/kg	20		**18,642**		-	-	-	-	-	-	-	-	<20	2500	<20	<20	<20
TPH C15 - C28 Fraction	mg/kg	50		**13,953**		-	-	-	-	-	-	-	-	<50	5900	76	380	<50
TPH C29-C36 Fraction	mg/kg	50		**13,953**		-	-	-	-	-	-	-	-	<50	380	<50	80	<50

* Coffey Environments (2009) On-Site Health Risk Assessment, Risk Based Level Development, Intermodal Logistics Centre Enfield, New South Wales, 2136 (ref: ILC - CO - D&R - ENVIRHOD00634AA-R005

Ref: ILC - CO - D&R - ENVIRHOD00634AA

Table LR1 Laboratory Results
Known Contamination Delineation Assessment
ILC @ Enfield

Chemical Name	Units	PQL	NEPM 1999 HIL F	Site Specific Risk Based Criteria *	BH11 0.4/E5	BH11 0.4/N5	BH11 0.4/S5	BH11 0.4/W5	BH11 0.7/N5	BH12 0.7	BH12 0.2/E5	BH12 0.2/N5	BH12 0.2/S5	BH12 0.2/W5	BH12 0.4	BH12 0.4/E5	BH12 0.4/N5
Sample ID					BH11 0.4/E5	BH11 0.4/N5	BH11 0.4/S5	BH11 0.4/W5	BH11 0.7/N5	BH12 0.7	BH12 0.2/E5	BH12 0.2/N5	BH12 0.2/S5	BH12 0.2/W5	BH12 0.4	BH12 0.4/E5	BH12 0.4/N5
Sample Depth					0.4	0.4	0.4	0.4	0.7	0.7	0.2	0.2	0.2	0.2	0.4	0.4	0.4
Sample Date					15/01/2009	15/01/2009	15/01/2009	15/01/2009	15/01/2009	20/01/2009	20/01/2009	20/01/2009	20/01/2009	20/01/2009	20/01/2009	20/01/2009	20/01/2009
Sample Analytical Code					66771-8	66771-5	66771-11	66771-14	66771A-6	66890B-33	66890-37	66890-34	66890-43	66890-40	66890-32	66890-38	66890-35
Arsenic	mg/kg	3	**500**		-	-	-	-	-	-	-	-	-	-	-	-	-
Copper	mg/kg	0.5	**5,000**		-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc	mg/kg	0.5	**35,000**		-	-	-	-	-	-	-	-	-	-	-	-	-
TPH C10 - C14 Fraction	mg/kg	20		**18,642**	<20	3000	<20	<20	170	860	900	<20	<200	880	150	130	<20
TPH C15 - C28 Fraction	mg/kg	50		**13,953**	<50	4400	110	<50	480	2100	2200	68	2700	5600	810	260	<50
TPH C29-C36 Fraction	mg/kg	50		**13,953**	<50	100	<50	<50	<50	55	1000	<50	3100	9300	250	<50	<50

* Coffey Environments (2009) On-Site Health Risk Assessment, Risk Based Level Development, Intermodal Logistics Centre Enfield, New South Wales, 2136 (ref: ILC - CO - D&R - ENVIRHOD00634AA-R005

Ref: ILC - CO - D&R - ENVIRHOD00634AA

Table LR1 Laboratory Results
Known Contamination Delineation Assessment
ILC @ Enfield

Chemical Name	Units	PQL	NEPM 1999 HIL F	Site Specific Risk Based Criteria *	BH12 0.4/S5	BH12 0.4/W5	BH12 0.7/W5	BH21 0.2/E5	BH21 0.2/N5	BH21 0.2/S5	BH21 0.2/W5	BH21 0.4	BH21 0.4/E5	BH21 0.4/N5	BH21 0.4/S5	BH21 0.4/W5	BH30 0.0-0.1/E5
Sample ID					BH12 0.4/S5	BH12 0.4/W5	BH12 0.7/W5	BH21 0.2/E5	BH21 0.2/N5	BH21 0.2/S5	BH21 0.2/W5	BH21 0.4	BH21 0.4/E5	BH21 0.4/N5	BH21 0.4/S5	BH21 0.4/W5	BH30 0.0-0.1/E5
Sample Depth					0.4	0.4	0.7	0.2	0.2	0.2	0.2	0.4	0.4	0.4	0.4	0.4	0-0.1
Sample Date					20/01/2009	20/01/2009	20/01/2009	14/01/2009	14/01/2009	14/01/2009	14/01/2009	14/01/2009	14/01/2009	14/01/2009	14/01/2009	14/01/2009	14/01/2009
Sample Analytical Code					66890-44	66890-41	66890B-42	66756-R-36	66756-R-34	66756-R-39	66756-R-42	66756-R-32	66756-R-37	66756-R-35	66756-R-40	66756-R-43	66756-R-80
Arsenic	mg/kg	3	**500**		-	-	-	-	-	-	-	-	-	-	-	-	55
Copper	mg/kg	0.5	**5,000**		-	-	-	360	680	260	220	1300	420	160	740	43	-
Zinc	mg/kg	0.5	**35,000**		-	-	-	-	-	-	-	-	-	-	-	-	-
TPH C10 - C14 Fraction	mg/kg	20		**18,642**	<20	1400	27	-	-	-	-	-	-	-	-	-	-
TPH C15 - C28 Fraction	mg/kg	50		**13,953**	<50	5900	130	-	-	-	-	-	-	-	-	-	-
TPH C29-C36 Fraction	mg/kg	50		**13,953**	<50	11000	290	-	-	-	-	-	-	-	-	-	-

* Coffey Environments (2009) On-Site Health Risk Assessment, Risk Based Level Development, Intermodal Logistics Centre Enfield, New South Wales, 2136 (ref: ILC - CO - D&R - ENVIRHOD00634AA-R005

Ref: ILC - CO - D&R - ENVIRHOD00634AA

Table LR1 Laboratory Results
Known Contamination Delineation Assessment
ILC @ Enfield

Chemical Name	Units	PQL	NEPM 1999 HIL F	Site Specific Risk Based Criteria *	Sample ID	BH30 0.0-0.1/N4	BH30 0.0-0.1/S5	BH30 0.0-0.1/W4	BH30 0.2	BH30 0.2/E5	BH30 0.2/N4	BH30 0.2/S5	BH30 0.2/W4	BH34 1.0/E5	BH34 1.0/N5	BH34 1.0/S5	BH34 1.0/W5	BH34 1.2
					Sample Depth	0-0.1	0-0.1	0-0.1	0.2	0.2	0.2	0.2	0.2	1	1	1	1	1.2
					Sample Date	14/01/2009	14/01/2009	14/01/2009	14/01/2009	14/01/2009	14/01/2009	14/01/2009	14/01/2009	14/01/2009	14/01/2009	14/01/2009	14/01/2009	14/01/2009
					Sample Analytical Code	66756-R-77	66756-R-83	66756-R-86	66756-R-75	66756-R-81	66756-R-78	66756-R-84	66756-R-87	66756-R-22	66756-R-19	66756-R-25	66756-R-28	66756-R-17
Arsenic	mg/kg	3	**500**			19	8	29	63	77	25	44	48	-	-	-	-	-
Copper	mg/kg	0.5	**5,000**			-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc	mg/kg	0.5	**35,000**			-	-	-	-	-	-	-	-	-	-	-	-	-
TPH C10 - C14 Fraction	mg/kg	20		**18,642**		-	-	-	-	-	-	-	-	<20	<20	<20	<20	<20
TPH C15 - C28 Fraction	mg/kg	50		**13,953**		-	-	-	-	-	-	-	-	<50	<50	<50	<50	<50
TPH C29-C36 Fraction	mg/kg	50		**13,953**		-	-	-	-	-	-	-	-	<50	<50	<50	<50	<50

* Coffey Environments (2009) On-Site Health Risk Assessment, Risk Based Level Development, Intermodal Logistics Centre Enfield, New South Wales, 2136 (ref: ILC - CO - D&R - ENVIRHOD00634AA-R005

Ref: ILC - CO - D&R - ENVIRHOD00634AA

Table LR1 Laboratory Results
Known Contamination Delineation Assessment
ILC @ Enfield

Chemical Name	Units	PQL	NEPM 1999 HIL F	Site Specific Risk Based Criteria *	Sample ID	BH34 1.2/E5	BH34 1.2/N5	BH34 1.2/S5	BH34 1.2/W5	BH36 3.0/ E5	BH36 3.0/ N5	BH36 3.0/ S5	BH36 3.0/ W5	BH36 3.2	BH36 3.2/ E5	BH36 3.2/ N5	BH36 3.2/ S5	BH36 3.2/ W5
					Sample Depth	1.2	1.2	1.2	1.2	3	3	3	3	3.2	3.2	3.2	3.2	3.2
					Sample Date	14/01/2009	14/01/2009	14/01/2009	14/01/2009	16/01/2009	16/01/2009	16/01/2009	16/01/2009	16/01/2009	16/01/2009	16/01/2009	16/01/2009	16/01/2009
					Sample Analytical Code	66756-R-23	66756-R-20	66756-R-26	66756-R-29	66838-52	66838-49	66838-55	66838-58	66838-47	66838-53	66838-50	66838-56	66838-59
Arsenic	mg/kg	3	**500**		-	-	-	-	-	-	-	-	-	-	-	-	-
Copper	mg/kg	0.5	**5,000**		-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc	mg/kg	0.5	**35,000**		-	-	-	-	-	-	-	-	-	-	-	-	-
TPH C10 - C14 Fraction	mg/kg	20		**18,642**	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
TPH C15 - C28 Fraction	mg/kg	50		**13,953**	<50	<50	<50	<50	<50	<50	<50	210	<50	<50	<50	<50	<50
TPH C29-C36 Fraction	mg/kg	50		**13,953**	<50	<50	<50	<50	<50	<50	<50	100	<50	<50	<50	<50	<50

* Coffey Environments (2009) On-Site Health Risk Assessment, Risk Based Level Development, Intermodal Logistics Centre Enfield, New South Wales, 2136 (ref: ILC - CO - D&R - ENVIRHOD00634AA-R005

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Table LR1 Laboratory Results
Known Contamination Delineation Assessment
ILC @ Enfield

Chemical Name	Units	PQL	NEPM 1999 HIL F	Site Specific Risk Based Criteria *	Sample ID	BH42 0.1/N3	BH42 0.5/E5	BH42 0.5/N3	BH42 0.5/S4	BH42 0.5/W3	BH42 0.7	BH42 0.7/E5	BH42 0.7/S4	BH42 0.7/W3	BH45 2.2	BH45 2.0/E5	BH45 2.0/N5	BH45 2.0/S5
					Sample Depth	0.1	0.5	0.5	0.5	0.5	0.7	0.7	0.7	0.7	2.2	2	2	2
					Sample Date	21/01/2009	21/01/2009	21/01/2009	21/01/2009	21/01/2009	21/01/2009	21/01/2009	21/01/2009	21/01/2009	21/01/2009	21/01/2009	21/01/2009	21/01/2009
					Sample Analytical Code	66889-20	66889-22	66889-19	66889-25	66889-28	66889-17	66889-23	66889-26	66889-29	66889-2	66889-7	66889-4	66889-10
Arsenic	mg/kg	3	**500**			-	-	-	-	-	-	-	-	-	-	-	-	-
Copper	mg/kg	0.5	**5,000**			-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc	mg/kg	0.5	**35,000**			-	-	-	-	-	-	-	-	-	-	-	-	-
TPH C10 - C14 Fraction	mg/kg	20		**18,642**		<20	<20	<20	580	<20	<20	<20	<20	<20	<20	<20	74	<20
TPH C15 - C28 Fraction	mg/kg	50		**13,953**		<50	<50	<50	2700	<50	<50	<50	<50	<50	110	<50	450	<50
TPH C29-C36 Fraction	mg/kg	50		**13,953**		<50	<50	<50	3000	<50	<50	<50	<50	<50	100	<50	580	<50

* Coffey Environments (2009) On-Site Health Risk Assessment, Risk Based Level Development, Intermodal Logistics Centre Enfield, New South Wales, 2136 (ref: ILC - CO - D&R - ENVIRHOD00634AA-R005

Ref: ILC - CO - D&R - ENVIRHOD00634AA

Table LR1 Laboratory Results
Known Contamination Delineation Assessment
ILC @ Enfield

Chemical Name	Units	PQL	NEPM 1999 HIL F	Site Specific Risk Based Criteria *	Sample ID	BH45 2.0/W5	BH45 2.2/E5	BH45 2.2/N5	BH45 2.2/S5	BH45 2.2/W5	SS6 0.0/ E5	SS6 0.0/ N5	SS6 0.0/ S5	SS6 0.0/ W5	SS6 0.2	SS6 0.2/ E5	SS6 0.2/ N5	SS6 0.2/ S5
					Sample Depth	2	2.2	2.2	2.2	2.2	0	0	0	0	0.2	0.2	0.2	0.2
					Sample Date	21/01/2009	21/01/2009	21/01/2009	21/01/2009	21/01/2009	16/01/2009	16/01/2009	16/01/2009	16/01/2009	16/01/2009	16/01/2009	16/01/2009	16/01/2009
					Sample Analytical Code	66889-13	66889-8	66889-5	66889-11	66889-14	66838-7	66838-4	66838-10	66838-13	66838-2	66838-8	66838-5	66838-11
Arsenic	mg/kg	3	**500**			-	-	-	-	-	-	-	-	-	-	-	-	-
Copper	mg/kg	0.5	**5,000**			-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc	mg/kg	0.5	**35,000**			-	-	-	-	-	-	-	-	-	-	-	-	-
TPH C10 - C14 Fraction	mg/kg	20		**18,642**		42	<20	<20	85	<20	<20	<20	170	<20	<20	<20	<20	<20
TPH C15 - C28 Fraction	mg/kg	50		**13,953**		390	<50	53	220	<50	90	280	1300	250	180	<50	85	180
TPH C29-C36 Fraction	mg/kg	50		**13,953**		410	<50	<50	100	<50	180	600	460	670	320	<50	140	180

* Coffey Environments (2009) On-Site Health Risk Assessment, Risk Based Level Development, Intermodal Logistics Centre Enfield, New South Wales, 2136 (ref: ILC - CO - D&R - ENVIRHOD00634AA-R005

Ref: ILC - CO - D&R - ENVIRHOD00634AA

Table LR2 TCLP Results
TCLP Analytical Results
ILC @ Enfield

			Field ID	BH30 0.2/E5	BD51 0.5/N5	BH13 0.0-0.1	BH21 0.4
			Sample Depth	0.2	0.5	0 - 0.1	0.4
			Sample Date	14/01/2009	20/01/2009	19/01/2009	14/01/2009
Chemical Group	**Chemical Name**	**Units**	**EQL**				
Inorganics	pH	pH	0	5.5	4.9	4.92	5.14
Metals	Arsenic	mg/L	0.05	<0.05	-	-	-
	Copper	mg/L	0.01	-	-	0.05	0.12
	Zinc	mg/L	0.01	-	34	-	-

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Table LR3 Asbestos ONLY Results
ILC @ Enfield

			Field ID	BH19 0.3	BH19 0-0.2/N5	BH19 0.3/N5	BH190-0.2/E5	BH19 0.3/E5	BH19 0-0.2/S5	BH19 0.3/S5	BH19 0-0.2/W5	BH19 0.3/W5	WRS2 0.0-0.1/N5	WRS2 0.0-0.1/W5	WRS2 0.3-0.4/N5
			Sample Depth	0.3	0-0.2	0.3	0-0.2	0.3	0-0.2	0.3	0-0.2	0.3	0 - 0.1	0 - 0.1	0.3-0.4
			Sample Date	16/01/2009	16/01/2009	16/01/2009	16/01/2009	16/01/2009	16/01/2009	16/01/2009	16/01/2009	16/01/2009	15/01/2009	15/01/2009	15/01/2009
Chemical Group	**Chemical Name**	**Units**	**EQL**												
Asbestos	Asbestos	-	D	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

D = Detect
ND = Non Detect

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Table LR3 Asbestos ONLY Results
ILC @ Enfield

			Field ID	WRS2 0.3-0.4/W5	WRS2 0.3-0.4	WRS 2 0.1-0.2/ S5	WRS 2 0.1-0.2/E5	WRS 2 0.3-0.4/ E5	WRS 2 0.3-0.4/ S5	WRS9 0.3	WRS9 0-0.1/N5	WRS9 0.3/N5	WRS9 0-0.1/E5	WRS9 0.3/E5	WRS9 0-0.1/S5
			Sample Depth	0.3-0.4	0.3-0.4	0.1-0.2	0.1-0.2	0.3-0.4	0.3-0.4	0.3	0.0-0.1	0.3	0-0.1	0.3	0-0.1
			Sample Date	15/01/2009	15/01/2009	19/01/2009	19/01/2009	19/01/2009	19/01/2009	16/01/2009	16/01/2009	16/01/2009	16/01/2009	16/01/2009	16/01/2009
Chemical Group	**Chemical Name**	**Units**	**EQL**												
Asbestos	Asbestos	-	D	ND	ND	ND	ND	ND	ND	**D**	ND	**D**	ND	ND	**D**

D = Detect
ND = Non Detect

Ref: ILC - CO - D&R - ENVIRHOD00634AA

Table LR3 Asbestos ONLY Results
ILC @ Enfield

			Field ID	WRS9 0.3/S5	WRS9 0-0.1/W5	WRS9 0.3/W5	WRS9 0.5	WRS9 0.5/N5	WRS9 0.5/W5	WRS12 0.3	WRS12 0.1/N5	WRS12 0.3-N5	WRS12 0.1/E5	WRS12 0.3/E5	WRS12 0.1/S5
			Sample Depth	0.3	0-0.1	0.3	0.5	0.5	0.5	0.3	0.1	0.3	0.1	0.3	0.1
			Sample Date	16/01/2009	16/01/2009	16/01/2009	16/01/2009	16/01/2009	16/01/2009	16/01/2009	16/01/2009	16/01/2009	16/01/2009	16/01/2009	16/01/2009
Chemical Group	**Chemical Name**	**Units**	**EQL**												
Asbestos	Asbestos	-	D	ND	**D**	**D**	ND	ND	ND	**D**	**D**	ND	ND	ND	ND

D = Detect
ND = Non Detect

Ref: ILC - CO - D&R - ENVIRHOD00634AA

Table LR3 Asbestos ONLY Results
ILC @ Enfield

			Field ID	WRS12 0.3/S5	WRS12 0.1/W5	WRS12 0.3/W5	WRS12 0.5	WRS12 0.5/S5	WRS32	WRS32	WRS32	WRS32	WRS32	WRS32	WRS32
			Sample Depth	0.3	0.1	0.3	0.5	0.5	0.45-0.55/S5	0.6-0.7/S5	0.15-0.25/W5	0.35-.45/W5	0.25-0.35/E5	0.45-0.55/E5	0.05-0.15/N5
			Sample Date	16/01/2009	16/01/2009	16/01/2009	16/01/2009	16/01/2009	19/01/2009	19/01/2009	19/01/2009	19/01/2009	19/01/2009	19/01/2009	19/01/2009
Chemical Group	**Chemical Name**	**Units**	**EQL**												
Asbestos	Asbestos	-	D	**D**	**D**	ND	ND	ND	ND	ND	**D**	ND	ND	ND	ND

D = Detect
ND = Non Detect

Ref: ILC - CO - D&R - ENVIRHOD00634AA

Table LR3 Asbestos ONLY Results
ILC @ Enfield

			Field ID	WRS32	WRS32	ABS 1	ABS 1	ABS 1	ABS 1	ABS 2	ABS 2	ABS 2	ABS 2	ABS 3	ABS 3
			Sample Depth	0.25-0.35/N5	0.2-0.3	0-0.1	0.4-0.5	0.9-1	1.6-1.7	0-0.1	0.5-0.6	1-1.1	1.9-2	0-0.1	0.5-0.6
			Sample Date	19/01/2009	19/01/2009	19/01/2009	19/01/2009	19/01/2009	19/01/2009	19/01/2009	19/01/2009	19/01/2009	19/01/2009	19/01/2009	19/01/2009
Chemical Group	**Chemical Name**	**Units**	**EQL**												
Asbestos	Asbestos	-	D	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

D = Detect
ND = Non Detect

Ref: ILC - CO - D&R - ENVIRHOD00634AA

Table LR3 Asbestos ONLY Results
ILC @ Enfield

			Field ID	ABS 3	ABS 3	ABS 4	ABS 4	ABS 4	ABS 4	ABS 5	ABS 5	ABS 5	ABS 5	ABS 6	ABS 6
			Sample Depth	1.5-1.6	1.9-2	0-0.1	0.5-0.6	1.5-1.6	1.9-2	0-0.1	0.5-0.6	1-1.1	1.5-1.6	0-0.1	0.5-0.6
			Sample Date	19/01/2009	19/01/2009	19/01/2009	19/01/2009	19/01/2009	19/01/2009	19/01/2009	19/01/2009	19/01/2009	19/01/2009	19/01/2009	19/01/2009
Chemical Group	**Chemical Name**	**Units**	**EQL**												
Asbestos	Asbestos	-	D	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

D = Detect
ND = Non Detect

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Table LR3 Asbestos ONLY Results
ILC @ Enfield

			Field ID	ABS 6	ABS 6	ABS 7	ABS 7	ABS 7	ABS 7	ABS 8	ABS 8	ABS 8	ABS 8	ABS 9	ABS 9
			Sample Depth	1-1.1	1.9-2	0-0.1	0.5-0.6	1-1.1	1.9-2	0-0.1	0.5-0.6	1.5-1.6	1.9-2	0-0.1	0.5-0.6
			Sample Date	19/01/2009	19/01/2009	19/01/2009	19/01/2009	19/01/2009	19/01/2009	19/01/2009	19/01/2009	19/01/2009	19/01/2009	19/01/2009	19/01/2009
Chemical Group	**Chemical Name**	**Units**	**EQL**												
Asbestos	Asbestos	-	D	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

D = Detect
ND = Non Detect

Ref: ILC - CO - D&R - ENVIRHOD00634AA

Table LR3 Asbestos ONLY Results
ILC @ Enfield

			Field ID	ABS 9	ABS 9	ABS 10	ABS 10	ABS 10	ABS 10	ABS 11	ABS 11	ABS 11	ABS 11
			Sample Depth	1-1.1	1.5-1.6	0-0.1	0.5-0.6	1-1.1	1.9-2	0-0.1	0.5-0.6	1-1.1	1.5-1.6
			Sample Date	19/01/2009	19/01/2009	19/01/2009	19/01/2009	19/01/2009	19/01/2009	19/01/2009	19/01/2009	19/01/2009	19/01/2009
Chemical Group	**Chemical Name**	**Units**	**EQL**										
Asbestos	Asbestos	-	D	ND	ND	**D**	ND	ND	ND	ND	ND	ND	ND

D = Detect
ND = Non Detect

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Table LR4 RPD Assessment

ILC @ Enfield

			SDG	66756-R	66756-R		66756-R	66756-R		66756-R	66756-R		66756-R	66756-R		66771	66771		66771	66771		66838	66838		66838	66838	
			Field_ID	BD20 0.5/N5	DUP1	**RPD**	BH34 1.0/E5	DUP2	**RPD**	BH21 0.2/W5	DUP4	**RPD**	BH30 0.0-0.1/N4	DUP5	**RPD**	BH11 0.2/S5	DUP 6	**RPD**	BH11 0.2/N5	DUP 7	**RPD**	TP9 1.0/W5	DUP 8	**RPD**	TP7 0.5/ N5	DUP 11	**RPD**	BH36 3.0/ S5	DUP 12	**RPD**
			Sampled_Date-Time	14/01/2009	14/01/2009		14/01/2009	14/01/2009		14/01/2009	14/01/2009		14/01/2009	14/01/2009		15/01/2009	15/01/2009		15/01/2009	15/01/2009		15/01/2009	15/01/2009		16/01/2009	16/01/2009		16/01/2009	16/01/2009	
Chem_Group	**ChemName**	**Units**	**EQL**																											
Inorganics	Moisture	%	1	**10.0**	**17.0**	**52**	27.0	27.0	0	**7.0**	**12.0**	**53**	**10.0**	**14.0**	**33**	12.0	15.0	22	**20.0**	**13.0**	**42**	15.0	18.0	18	8.0	10.0	22	23.0	22.0	4
Metals	Arsenic	mg/kg	3										19.0	15.0	24															
	Copper	mg/kg	0.5 (Primary): 5 (Interlab)							220.0	250.0	13																		
	Zinc	mg/kg	0.5 (Primary): 5 (Interlab)																											
TPH	TPH C10 - C14 Fraction	mg/kg	20 (Primary): 50 (Interlat	**5600.0**	**8300.0**	**39**	<20.0	<20.0	0							<20.0	<20.0	0	**2500.0**	**960.0**	**89**	<20.0	<20.0	0	<20.0	<20.0	0	<20.0	<20.0	0
	TPH C15 - C28 Fraction	mg/kg	50 (Primary): 100 (Interla	**8700.0**	**13000.0**	**40**	<50.0	<50.0	0							76.0	58.0	27	**5900.0**	**3300.0**	**57**	<50.0	<50.0	0	<50.0	<50.0	0	<50.0	<50.0	0
	TPH C29-C36 Fraction	mg/kg	50 (Primary): 100 (Interla	**210.0**	**310.0**	**38**	<50.0	<50.0	0							<50.0	<50.0	0	380.0	420.0	10	<50.0	<50.0	0	<50.0	<50.0	0	<50.0	<50.0	0

*RPDs have only been considered where a concentration is greater than 5 times the EQL.
**High RPDs are in bold (Acceptable RPDs for each EQL multiplier range are: 30 (5-10 x EQL); 30 (10-30 x EQL); 30 (> 30 x EQL))
***Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory

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Table LR4 RPD Assessment

ILC @ Enfield

			SDG	66838	66838		66838	66838		66857	66857		66857	66857		66857	66857		66857	66857		66889	66889		66889	66889		66889	66889	
			Field_ID	BH36 3.2/ N5	DUP 13	**RPD**	SS6 0.2/ W5	DUP 14	**RPD**	BD 8 0.5/ W5	DUP 16	**RPD**	BD 8 0.5/ S5	DUP 17	**RPD**	BH 13 0-0.1/ E5	DUP 18	**RPD**	WRS 2 0.1-0.2/E5	DUP 19	**RPD**	BH42 0.5/W3	DUP26	**RPD**	BH45 2.0/S5	DUP27	**RPD**	BH45 2.0/E5	DUP28	**RPD**
			Sampled_Date-Time	16/01/2009	16/01/2009		16/01/2009	16/01/2009		19/01/2009	19/01/2009		19/01/2009	19/01/2009		19/01/2009	19/01/2009		19/01/2009	19/01/2009		21/01/2009	21/01/2009		21/01/2009	21/01/2009		21/01/2009	21/01/2009	
Chem_Group	**ChemName**	**Units**	**EQL**																											
Inorganics	Moisture	%	1	18.0	19.0	5	18.0	16.0	12	20.0	17.0	16	22.0	17.0	26	26.0	21.0	21	9.0	12.0	29	23.0	21.0	9	15.0	13.0	14	19.0	17.0	11
Metals	Arsenic	mg/kg	3																											
	Copper	mg/kg	0.5 (Primary): 5 (Interlab)													220.0	180.0	20												
	Zinc	mg/kg	0.5 (Primary): 5 (Interlab)																											
TPH	TPH C10 - C14 Fraction	mg/kg	20 (Primary): 50 (Interlat	<20.0	<20.0	0	<20.0	<20.0	0	<20.0	22.0	10	41.0	59.0	36				<20.0	<20.0	0	**<20.0**	**640.0**	**188**	<20.0	<20.0	0	<20.0	<20.0	0
	TPH C15 - C28 Fraction	mg/kg	50 (Primary): 100 (Interla	<50.0	<50.0	0	**190.0**	**310.0**	**48**	<50.0	160.0	105	**320.0**	**450.0**	**34**				<50.0	<50.0	0	**<50.0**	**4100.0**	**195**	<50.0	<50.0	0	<50.0	<50.0	0
	TPH C29-C36 Fraction	mg/kg	50 (Primary): 100 (Interla	<50.0	<50.0	0	250.0	210.0	17	<50.0	<50.0	0	<50.0	<50.0	0				<50.0	<50.0	0	**<50.0**	**5000.0**	**196**	<50.0	<50.0	0	<50.0	<50.0	0

*RPDs have only been considered where a concentration is greater than 5 time
**High RPDs are in bold (Acceptable RPDs for each EQL multiplier range are:
***Interlab Duplicates are matched on a per compound basis as methods vary b

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Table LR4 RPD Assessment

ILC @ Enfield

			SDG	66890	66890		66890	66890		66890	66890		66890	66890		66890	66890		66890	66890		66756-R	Interlab_D		66756-R	Interlab_D		66771	Interlab_D		66771
			Field_ID	BD51 0.5/W5	DUP20	**RPD**	BD51 0.7/E5	DUP21	**RPD**	BD50 0.7/N5	DUP22	**RPD**	BH12 0.2/W5	DUP23	**RPD**	BH12 0.2/S5	DUP24	**RPD**	BD25 0.5/E6	DUP25	**RPD**	BH34 1.0/E5	DUP 2A	**RPD**	BH21 0.2/W5	DUP 4A	**RPD**	BH11 0.2/S5	DUP 6A	**RPD**	TP9 1.0/W5
			Sampled_Date-Time	20/01/2009	20/01/2009		20/01/2009	20/01/2009		20/01/2009	20/01/2009		20/01/2009	20/01/2009		20/01/2009	20/01/2009		20/01/2009	20/01/2009		14/01/2009	14/01/2009		14/01/2009	14/01/2009		15/01/2009	15/01/2009		15/01/2009
Chem_Group	**ChemName**	**Units**	**EQL**																											
Inorganics	Moisture	%	1	**10.0**	**19.0**	**62**	17.0	16.0	6	23.0	17.0	30	14.0	14.0	0	15.0	15.0	0	15.0	17.0	13	27.0			7.0			12.0			15.0
Metals	Arsenic	mg/kg	3																											
	Copper	mg/kg	0.5 (Primary): 5 (Interlab)																					220.0	230.0	4				
	Zinc	mg/kg	0.5 (Primary): 5 (Interlab)	**210**	**42**	**133**	33.0	34.0	3																					
TPH	TPH C10 - C14 Fraction	mg/kg	20 (Primary): 50 (Interlab	**330.0**	**450.0**	**31**	<20.0	<20.0	0	**83.0**	**140.0**	**51**	880.0	910.0	3	<200.0	<20.0	0	**36.0**	**200.0**	**139**	<20.0	<50.0	0				<20.0	<50.0	0	<20.0
	TPH C15 - C28 Fraction	mg/kg	50 (Primary): 100 (Interla	**6300.0**	**4400.0**	**36**	<50.0	<50.0	0	**150.0**	**260.0**	**54**	5600.0	4700.0	17	**2700.0**	**1500.0**	**57**	**140.0**	**660.0**	**130**	<50.0	<100.0	0				76.0	<100.0	0	<50.0
	TPH C29-C36 Fraction	mg/kg	50 (Primary): 100 (Interla	**4300.0**	**1400.0**	**102**	<50.0	<50.0	0	<50.0	<50.0	0	9300.0	7600.0	20	3100.0	3300.0	6	**52.0**	**370.0**	**151**	<50.0	<100.0	0				<50.0	<100.0	0	<50.0

*RPDs have only been considered where a concentration is greater than 5 time
**High RPDs are in bold (Acceptable RPDs for each EQL multiplier range are:
***Interlab Duplicates are matched on a per compound basis as methods vary b

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Table LR4 RPD Assessment

ILC @ Enfield

			SDG	Interlab_D		66857	Interlab_D		66857	Interlab_D		66838	Interlab_D		66838	Interlab_D		66890	Interlab_D		66890	Interlab_D		66890	Interlab_D		66889	Interlab_D		66889
			Field_ID	DUP 8A	**RPD**	BD 8 0.5/ W5	DUP16A	**RPD**	BH 13 0-0.1/ E5	DUP18A	**RPD**	BH36 3.0/ S5	DUP12A	**RPD**	SS6 0.2/ W5	DUP14A	**RPD**	BD51 0.5/W5	DUP20A	**RPD**	BD50 0.7/N5	DUP22A	**RPD**	BH12 0.2/S5	DUP24A	**RPD**	BH42 0.5/W3	DUP26A	**RPD**	BH45 2.0/S5
			Sampled_Date-Time	15/01/2009		19/01/2009	19/01/2009		19/01/2009	19/01/2009		16/01/2009	16/01/2009		16/01/2009	16/01/2009		20/01/2009	20/01/2009		20/01/2009	20/01/2009		20/01/2009	20/01/2009		21/01/2009	21/01/2009		21/01/2009
Chem_Group	**ChemName**	**Units**	**EQL**																											
Inorganics	Moisture	%	1			20.0			26.0			23.0			18.0			10.0			23.0			15.0			23.0			15.0
Metals	Arsenic	mg/kg	3																											
	Copper	mg/kg	0.5 (Primary): 5 (Interlab)						**220.0**	**1100.0**	**133**																			
	Zinc	mg/kg	0.5 (Primary): 5 (Interlab)																											
TPH	TPH C10 - C14 Fraction	mg/kg	20 (Primary): 50 (Interlab)	<50.0	0	<20.0	85.0	124				<20.0	<50.0	0	<20.0	<50.0	0	330.0	350.0	6	**83.0**	**300.0**	**113**	<200.0	<50.0	0	**<20.0**	**270.0**	**172**	<20.0
	TPH C15 - C28 Fraction	mg/kg	50 (Primary): 100 (Interla	<100.0	0	**<50.0**	**510.0**	**164**				<50.0	<100.0	0	190.0	120.0	45	**6300.0**	**4500.0**	**33**	**150.0**	**640.0**	**124**	**2700.0**	**1300.0**	**70**	**<50.0**	**1800.0**	**189**	<50.0
	TPH C29-C36 Fraction	mg/kg	50 (Primary): 100 (Interla	<100.0	0	<50.0	<100.0	0				<50.0	<100.0	0	250.0	150.0	50	**4300.0**	**2300.0**	**61**	<50.0	<100.0	0	3100.0	2700.0	14	**<50.0**	**2200.0**	**191**	<50.0

*RPDs have only been considered where a concentration is greater than 5 time
**High RPDs are in bold (Acceptable RPDs for each EQL multiplier range are:
***Interlab Duplicates are matched on a per compound basis as methods vary b

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Table LR4 RPD Assessment

ILC @ Enfield

			SDG	Interlab_D	
			Field_ID	DUP27A	**RPD**
			Sampled_Date-Time	21/01/2009	
Chem_Group	**ChemName**	**Units**	**EQL**		
Inorganics	Moisture	%	1		
Metals	Arsenic	mg/kg	3		
	Copper	mg/kg	0.5 (Primary): 5 (Interlab)		
	Zinc	mg/kg	0.5 (Primary): 5 (Interlab)		
TPH	TPH C10 - C14 Fraction	mg/kg	20 (Primary): 50 (Interlab	<50.0	0
	TPH C15 - C28 Fraction	mg/kg	50 (Primary): 100 (Interla	<100.0	0
	TPH C29-C36 Fraction	mg/kg	50 (Primary): 100 (Interla	100.0	67

*RPDs have only been considered where a concentration is greater than 5 time
**High RPDs are in bold (Acceptable RPDs for each EQL multiplier range are:
***Interlab Duplicates are matched on a per compound basis as methods vary b

Coffey Environments Pty Ltd ABN 45 090 522 759
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Ref: ILC - CO - D&R - ENVIRHOD00634AA

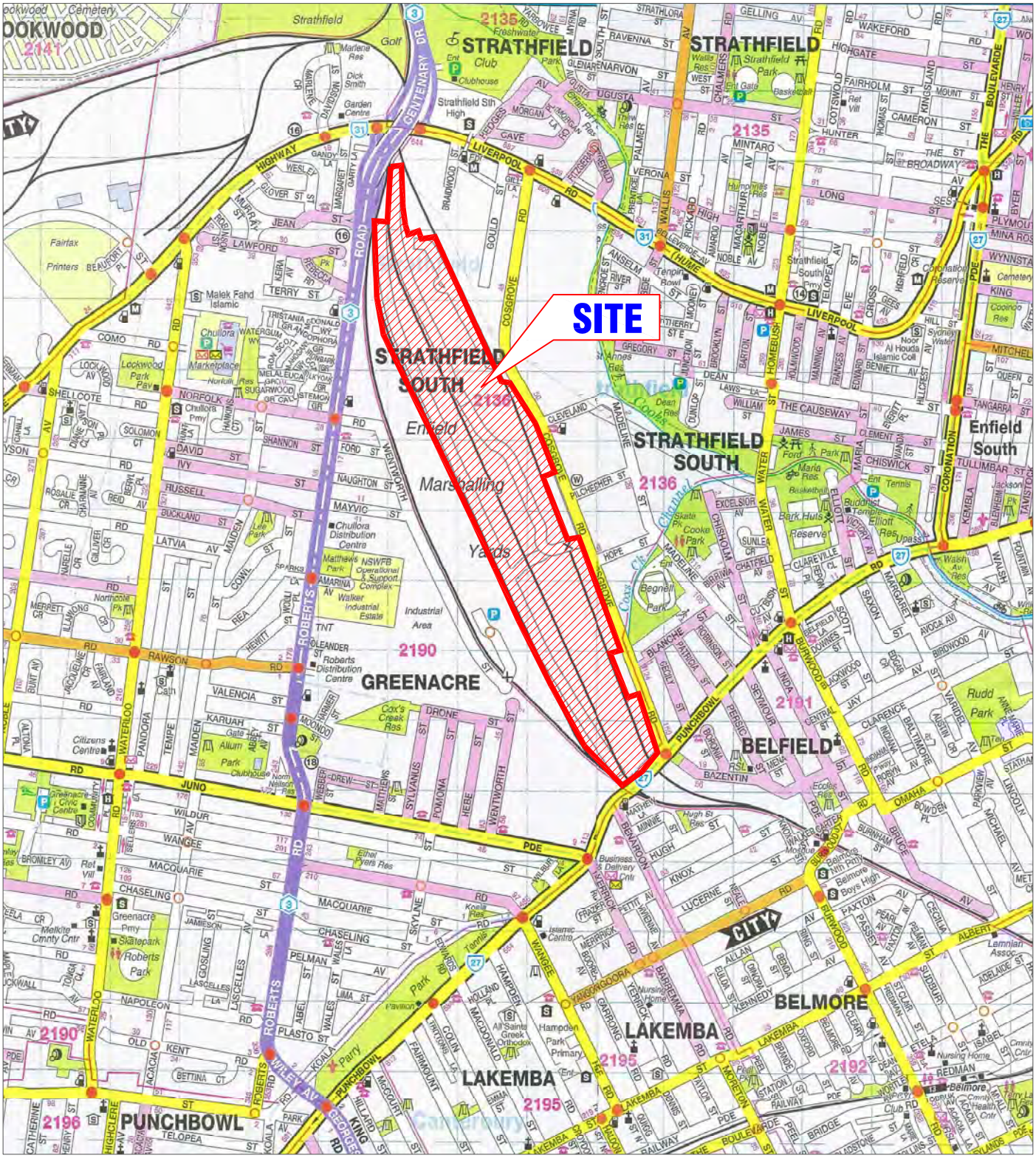
Table X

Table LR5 Field Rinsate Results
ILC @ Enfield

			SDG	66771	66857	66889	66890
			Field ID	QCA	QCB	QCD	QCC
			Sample Date	15/01/2009	19/01/2009	21/01/2009	20/01/2009
			Sample Type	Rinsate	Rinsate	Rinsate	Rinsate
Chemical Grou	**Chemical Name**	**Units**	**EQL**				
Metals	Copper	mg/l	0.001		<0.001		
	Zinc	mg/l	0.001				**0.007**
TPH	TPH C10 - C14 Fraction	µg/L	100	<100	<100	<100	<100
	TPH C15 - C28 Fraction	µg/L	200	<200	<200	<200	<200
	TPH C29-C36 Fraction	µg/L	200	<200	<200	<200	<200

Figures

Remediation Action Plan
for Known Soil Contamination
Intermodal Logistics Centre @ Enfield



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 - RAP	
date	03.03.09	SYDNEYPORTS FIRST PORT, FUTURE PORT		
scale	AS SHOWN		title: SITE LOCALITY PLAN	
original size	A4		project no: ENVIRHOD00634AA-D02	figure no: FIGURE 1

BOUNDARY CO-ORDINATES

CP	EASTING	NORTHING
CP1	322244.88	6246483.30
CP2	322218.97	6246511.72
CP3	322155.85	6246585.54
CP4	322124.33	6246626.39
CP5	322105.03	6246649.55
CP6	322078.17	6246681.84
CP7	322062.07	6246700.00
CP8	322007.36	6246750.43
CP9	321951.21	6246825.93
CP10	321521.33	6247698.31
CP11	321471.85	6247815.33
CP12	321390.60	6248047.55
CP13	321380.78	6248093.35
CP14	321378.51	6248121.21
CP15	321373.59	6248155.00
CP16	321347.89	6248280.14
CP17	321344.13	6248314.53
CP18	321342.24	6248451.69
CP19	321363.38	6248451.10
CP20	321371.07	6248552.72
CP21	321387.73	6248626.86
CP22	321423.64	6248629.95
CP23	321424.79	6248609.98
CP24	321422.96	6248590.06
CP25	321419.98	6248550.18
CP26	321420.88	6248510.20
CP27	321425.59	6248470.49

BOUNDARY CO-ORDINATES

CP	EASTING	NORTHING
CP29	321447.87	6248391.52
CP30	321479.99	6248406.63
CP31	321488.96	6248387.58
CP32	321525.15	6248404.61
CP33	321679.21	6248077.13
CP34	321687.78	6248064.95
CP35	321729.86	6247977.48
CP36	321753.10	6247988.68
CP37	321887.92	6247763.81
CP38	321945.11	6247616.01
CP39	321921.12	6247605.88
CP40	321977.83	6247474.50
CP41	321982.57	6247466.54
CP42	321998.48	6247478.10
CP43	322201.72	6246953.33
CP44	322175.58	6246943.20
CP45	322250.89	6246747.92
CP46	322277.33	6246757.93
CP47	322336.40	6246605.17
CP48	322340.02	6246587.87
CP49	322339.27	6246569.76
CP50	322333.88	6246558.88

SEPARABLE PORTION 4 CO-ORDINATES

CP	EASTING	NORTHING
CP98	321937.85	6247566.09
CP99	321883.85	6247539.85
CP100	321905.03	6247493.56
CP101	321932.56	6247406.04
CP102	321967.02	6247320.18
CP103	321979.83	6247312.25
CP104	322053.73	6247335.35
CP105	322007.14	6247261.59
CP106	322102.35	6247141.00
CP107	321553.15	6248031.43
CP108	321584.39	6247871.85
CP109	321582.19	6247843.60
CP110	321639.65	6247738.50
CP111	321659.94	6247751.34
CP112	321692.71	6247710.23
CP113	321774.77	6247661.25
CP114	321801.71	6247677.95
CP115	321740.50	6247807.79
CP116	321701.43	6247913.60
CP117	321716.65	6247921.36
CP118	321727.91	6247940.96
CP119	321715.93	6247946.20

SEPARABLE PORTION 4 CO-ORDINATES

CP	EASTING	NORTHING
CP120	321746.63	6247948.97
CP121	321420.71	6248446.82
CP122	321412.73	6248497.17
CP123	321410.67	6248538.76
CP124	321415.00	6248610.23
CP125	321414.23	6248629.14

SEPARABLE PORTION 5 CO-ORDINATES

CP	EASTING	NORTHING
CP93	321808.46	6247765.60
CP94	321780.16	6247824.17
CP95	321798.42	6247832.67
CP96	321907.07	6247599.30
CP97	321880.90	6247586.42

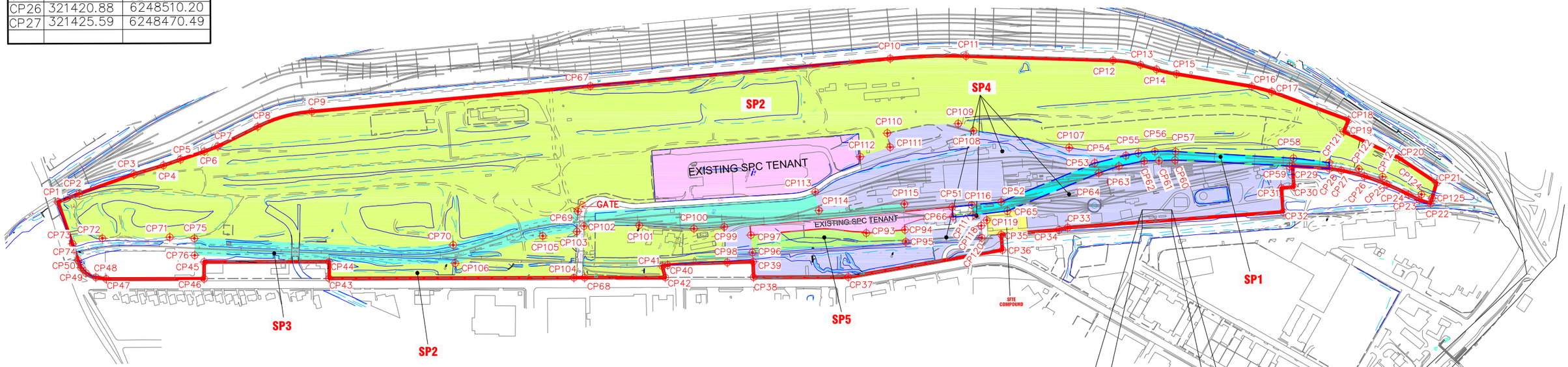
SEPARABLE PORTION 2 AND SEPARABLE PORTION 3 CO-ORDINATES

CP	EASTING	NORTHING
CP67	321744.19	6247246.04
CP68	322047.22	6247352.16
CP69	321947.86	6247301.96
CP70	322075.06	6247127.05
CP71	322232.91	6246679.39
CP72	322275.32	6246574.75
CP73	322301.67	6246531.35
CP74	322324.52	6246550.22
CP75	322219.94	6246718.47
CP76	322246.23	6246729.13

SEPARABLE PORTION 1 CO-ORDINATES

CP	EASTING	NORTHING
CP28	321429.81	6248450.94
CP51	321716.33	6247884.34
CP52	321678.91	6247957.76
CP53	321562.01	6248080.58
CP54	321531.57	6248124.87
CP55	321520.43	6248143.05
CP56	321507.86	6248167.87
CP57	321495.52	6248200.02
CP58	321435.20	6248388.58
CP59	321450.47	6248387.23
CP60	321509.04	6248204.35
CP61	321519.57	6248179.69
CP62	321529.04	6248156.75
CP63	321552.09	6248120.38
CP64	321575.05	6248092.98
CP65	321689.20	6247972.92
CP66	321730.68	6247891.29

NOTE:
SEPERABLE PORTION 1 IS OUTSIDE THE SCOPE OF THE RAP.



BUILDING 8 CO-ORDINATES

CP	EASTING	NORTHING
CP77	321612.73	6248197.37
CP78	321615.76	6248198.82
CP79	321612.47	6248205.64
CP80	321609.45	6248204.19
CP81	321606.20	6248212.60
CP82	321600.96	6248223.46
CP83	321602.97	6248224.43
CP84	321608.21	6248213.57

CP	EASTING	NORTHING
CP85	321611.99	6248211.11
CP86	321614.22	6248212.22
CP87	321615.57	6248209.51
CP88	321613.34	6248208.40
CP89	321611.48	6248207.13
CP90	321608.95	6248206.15
CP91	321607.80	6248209.10
CP92	321610.33	6248210.09

SOURCE:
SPC DRAWING SEDP115A

revision	description	drawn	approved	date

drawn	MV
approved	CC
date	03.03.09
scale	AS SHOWN
original size	A3

coffey environments
SPECIALISTS IN LIVING AND WORKING PLACES

SYDNEYPORTS
FIRST PORT, FUTURE PORT

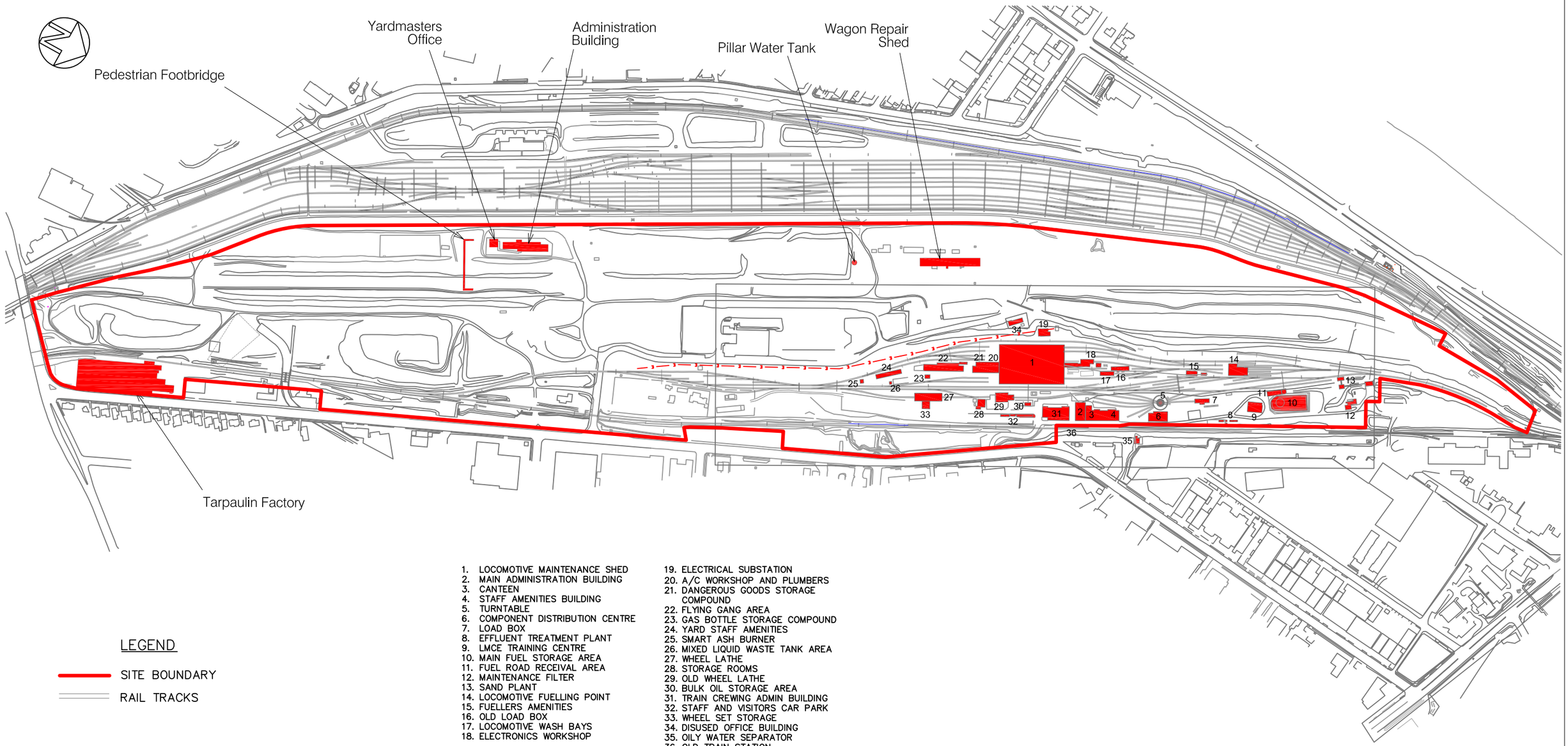
client: SYDNEY PORTS CORPORATION

project: ILC ENFIELD DEMOLITION AND REMEDIATION

title: SITE LAYOUT WITH SEPARABLE PORTIONS - RAP

project no: ENVIRHOD00634AA-D02

figure no: FIGURE 2



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

LEGEND

SITE BOUNDARY

RAIL TRACKS

SOURCE: SPC DRAWING SEDP079B

revision	description	drawn	approved	date

0 70 140 210 280 350

SCALE 1:7000 (A3) METRES

drawn	MV
approved	CC
date	03.03.09
scale	AS SHOWN
original size	A3

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SYDNEYPORTS
FIRST PORT, FUTURE PORT

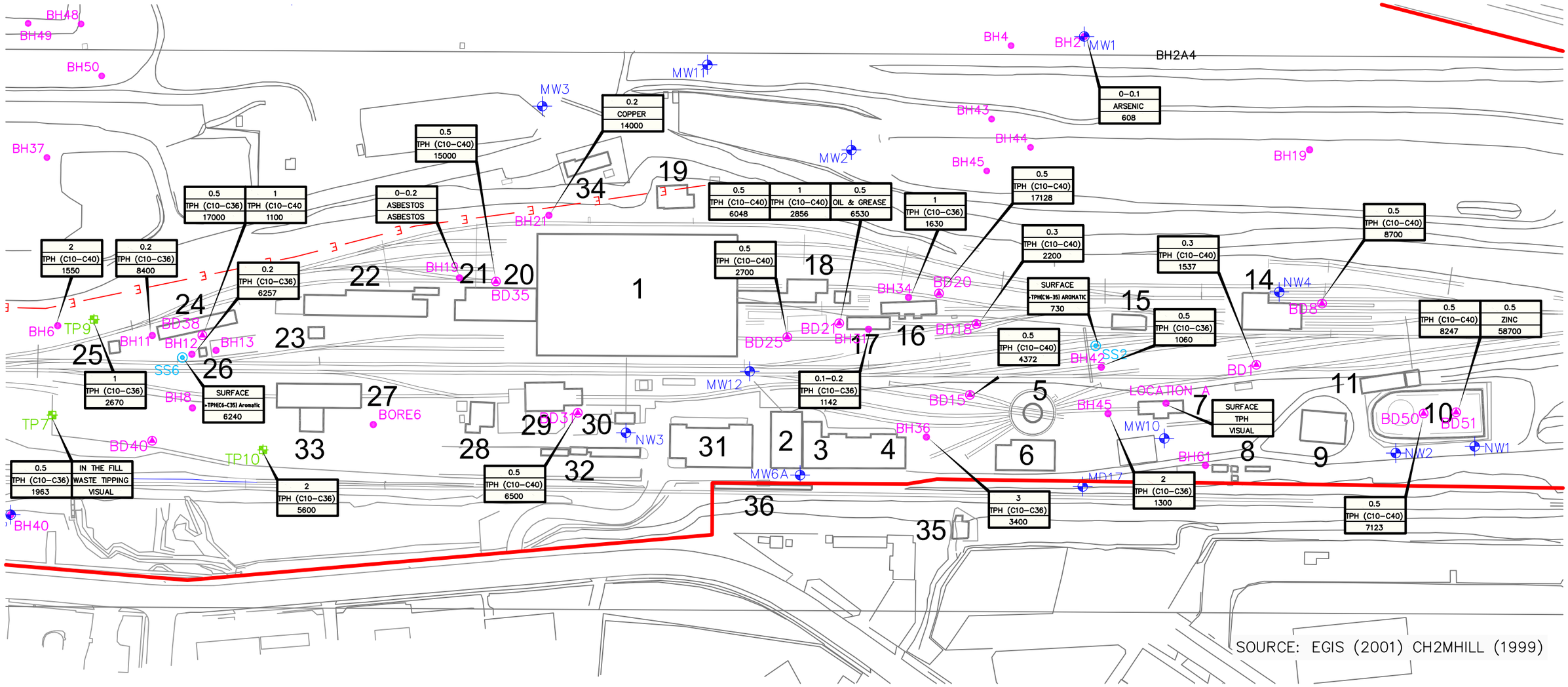
client: SYDNEY PORTS CORPORATION

project: ILC ENFIELD DEMOLITION AND REMEDIATION - RAP

title: SITE LAYOUT WITH BUILDING PLAN - RAP

project no: ENVIRHOD00634AA-D02

figure no: FIGURE 3



SOURCE: EGIS (2001) CH2MHILL (1999)

NOT TO SCALE

LEGEND

- TP — TESTPIT LOCATIONS
- BD — SOIL SAMPLE LOCATIONS
- BH — BORE HOLE LOCATIONS
- SS — SURFACE SAMPLE LOCATIONS
- RAIL TRACKS
- EXTRACT BOUNDARY
- SITE BOUNDARY

mg/kg MILLIGRAMS PER KILOGRAM

DEPTH	(metres)
CONTAMINANT	
CONCENTRATION	(mg/kg)

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	CC
date	20.03.09
scale	AS SHOWN
original size	A3

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SPECIALISTS IN LIVING AND WORKING PLACES

SYDNEYPORTS
FIRST PORT, FUTURE PORT

client: SYDNEY PORTS CORPORATION

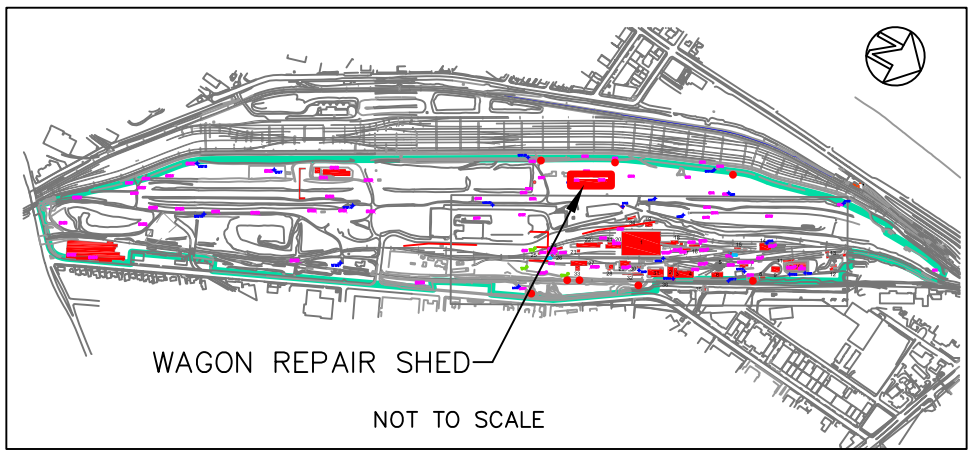
project: ILC ENFIELD DEMOLITION AND REMEDIATION

title: DELINEATION ASSESSMENT LOCATIONS FOR DELEC - RAP

project no: ENVIRHOD00634AA-D02

figure no: FIGURE 4A

A3



WRS15 WRS14 WRS16 WRS17 WRS20 WRS13 WRS7 WRS18 WRS19 WRS6 WRS21 WRS22 WRS12/N5 WRS12 WRS12/E5 WRS12/W5 WRS12/S5 WRS5 WRS23 WRS24 WRS4 WRS25 WRS26 WRS11 WRS27 WRS28 WRS10 WRS3 WRS2/N5 WRS9/N5 WRS29 WRS30 WRS2/E5 WRS2/W5 WRS2 WRS9 WRS9/E5 WRS9/W5 WRS9/S5 WRS8 WRS31 WRS32/N5 WRS1 WRS32/W5 WRS32 WRS32/E5 WRS32/S5

0–0.1	0–0.1
TPH (C10–C36)	COPPER
1817	8010

BH13

0–0.1
TPH (C10–C36)
1244

0.1
ASBESTOS
–

0.3
ASBESTOS
–

0.1
ASBESTOS
–

0.3
ASBESTOS
–

0–0.1	0–0.1
TPH (C10–C36)	ASBESTOS
16166	–

0–0.1	0.3
ASBESTOS	ASBESTOS
–	–

0.3
ASBESTOS
–

0.3
ASBESTOS
–

0–0.1
ASBESTOS
–

BH12

0.15–0.25
ASBESTOS
–

0–0.1	0–0.1
ASBESTOS	TPH (C10–C36)
–	1196

100m

LEGEND

- SITE BOUNDARY
- SEALED SURFACE
- BH• BORE HOLE LOCATIONS
- WRS× BORE HOLE LOCATIONS
- mg/kg MILLIGRAMS PER KILOGRAM
- NAD NO ASBESTOS DETECTED

DEPTH	(metres)
CONTAMINANT	
CONCENTRATION	(mg/kg)

0 3 6 9 12 15
SCALE 1:300 METRES

SOURCE: CH2MHILL (1999)

drawn	MV
approved	IR
date	16.06.09
scale	AS SHOWN
original size	A3

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SYDNEYPORTS
FIRST PORT, FUTURE PORT

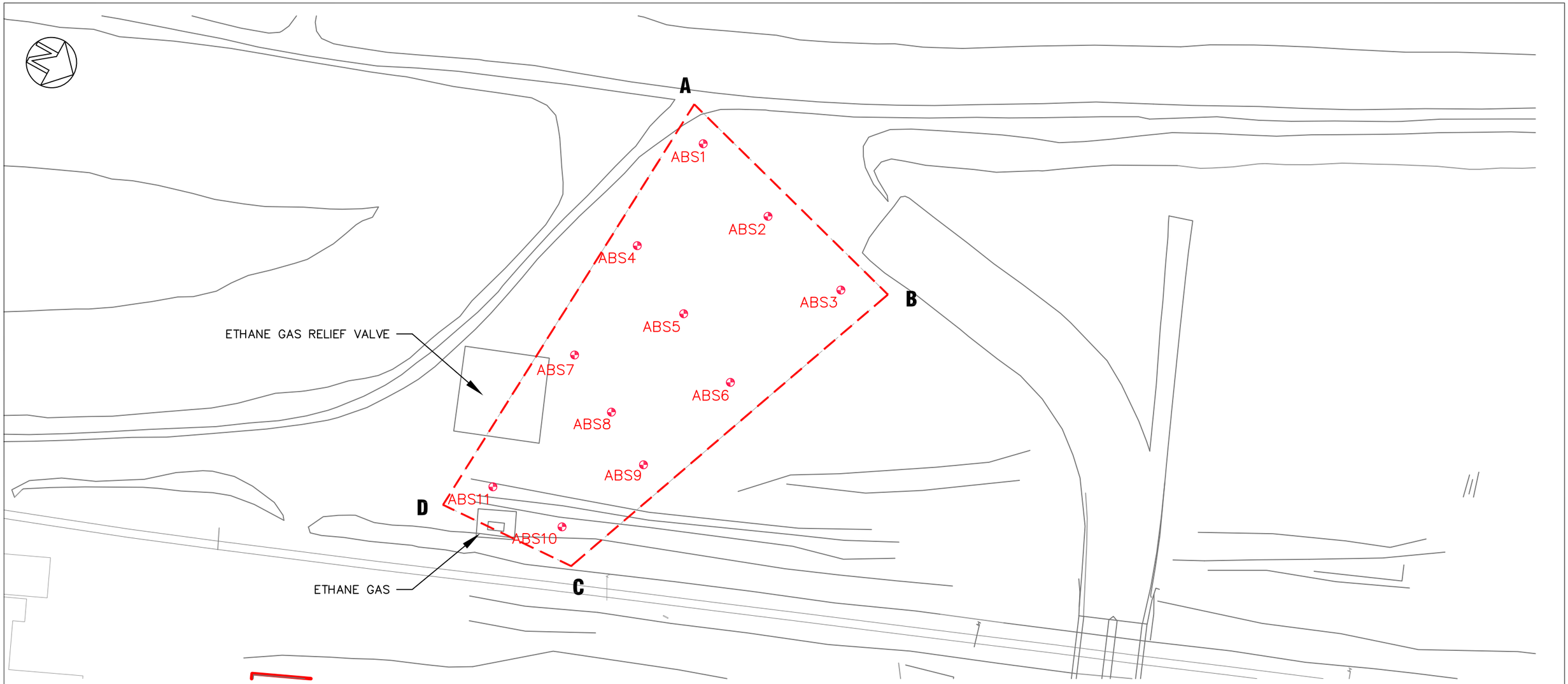
client: SYDNEY PORTS CORPORATION

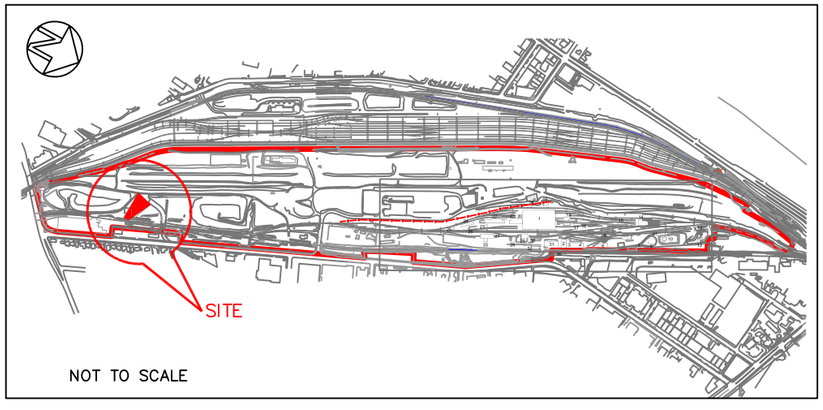
project: ILC ENFIELD DEMOLITION AND REMEDIATION

title: DELINEATION ASESSMENT LOCATIONS FOR WAGON REPAIR SHED - RAP

project no: ENVIRHOD00634AA-D02

figure no: FIGURE 4B





LEGEND

- ASBESTOS ASSESSMENT AREA
- RAIL TRACKS
- ABS — SAMPLING LOCATIONS

GPS REFERENCE POITNS	EASTING	NORTHING
A	322020	6246574
B	322028	6246622
C	322100	6246603
D	322104	6246578

revision	description	drawn	approved	date

0 7 14 21 28 35
SCALE 1:700 (A3) METRES

drawn	MV
approved	CC
date	29.01.09
scale	AS SHOWN
original size	A3

coffey environments
SPECIALISTS IN LIVING AND WORKING PLACES

SYDNEYPORTS
FIRST PORT, FUTURE PORT

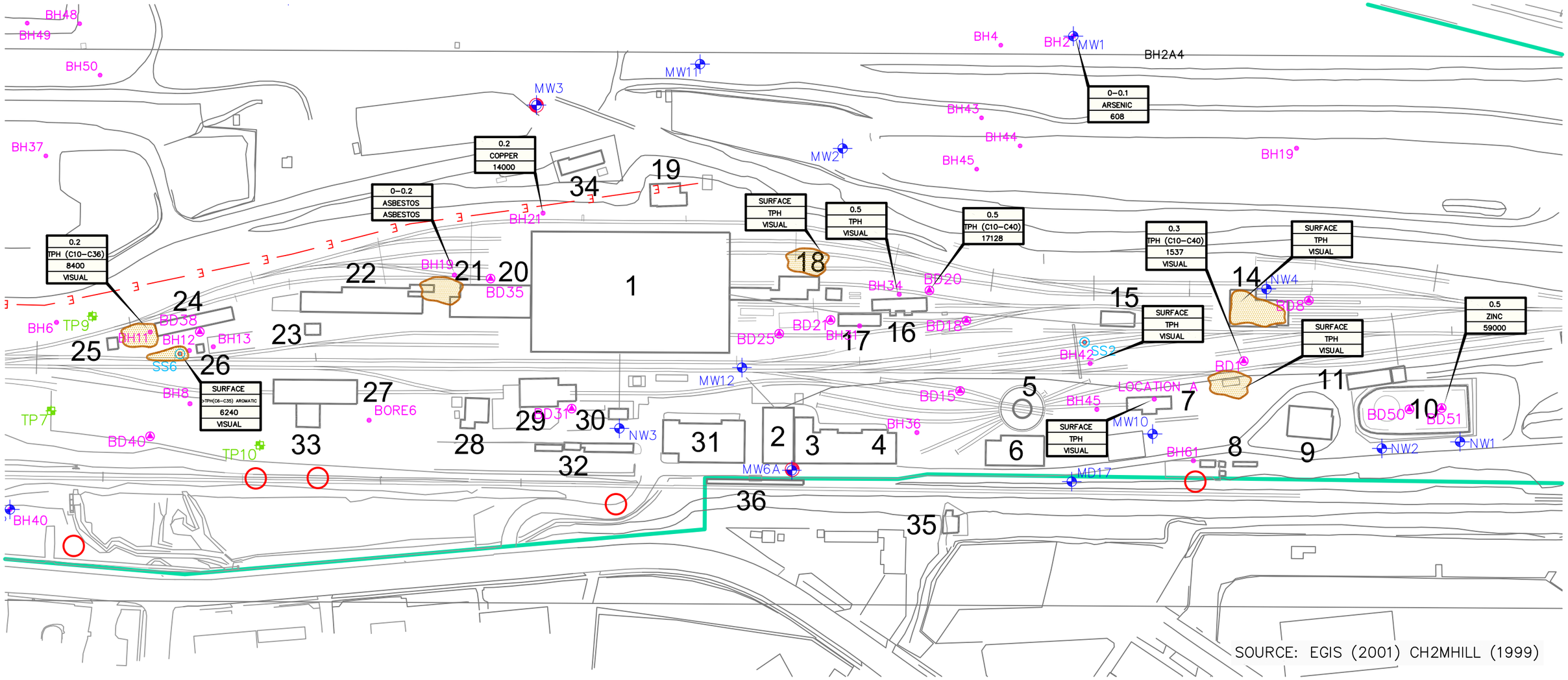
client: SYDNEY PORTS CORPORATION

project: ILC ENFIELD DEMOLITION AND REMEDIATION

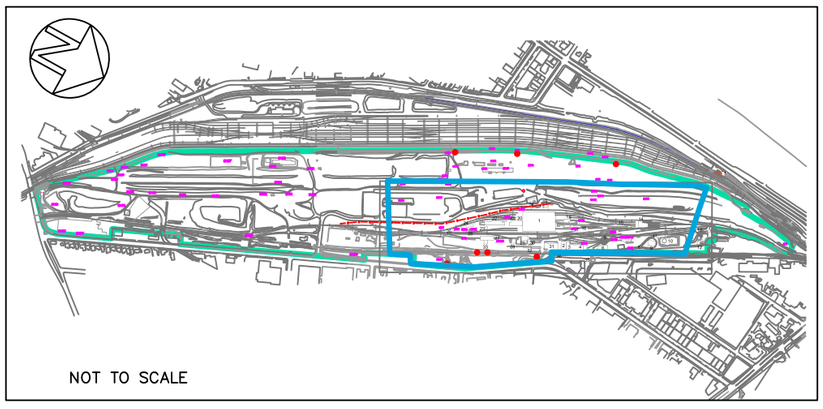
title: DELINEATION ASSESSMENT LOCATIONS FOR ASBESTOS BRAKE SHOE BURIAL GROUND - RAP

project no: ENVIRHOD00634AA-D02

figure no: FIGURE 4C



SOURCE: EGIS (2001) CH2MHILL (1999)



NOT TO SCALE

LEGEND

- TP — TESTPIT LOCATIONS
- BD — SOIL SAMPLE LOCATIONS
- BH — BORE HOLE LOCATIONS
- SS — SURFACE SAMPLE LOCATIONS
- RAIL TRACKS
- EXTRACT BOUNDARY
- SITE BOUNDARY
- STAINING

mg/kg MILLIGRAMS PER KILOGRAM

DEPTH	(metres)
CONTAMINANT	
CONCENTRATION	(mg/kg)

NOTE:
TRACK AREAS SHOULD BE RE–ASSESSED AFTER BALLAST DEMOLITION/REMOVAL FOR VISUAL. TPH STAINING AND POTENTIAL REMEDIATION REQUIREMENTS.

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	CC
date	20.03.09
scale	AS SHOWN
original size	A3

coffey environments
SPECIALISTS IN LIVING AND WORKING PLACES

SYDNEYPORTS
FIRST PORT, FUTURE PORT

client: SYDNEY PORTS CORPORATION

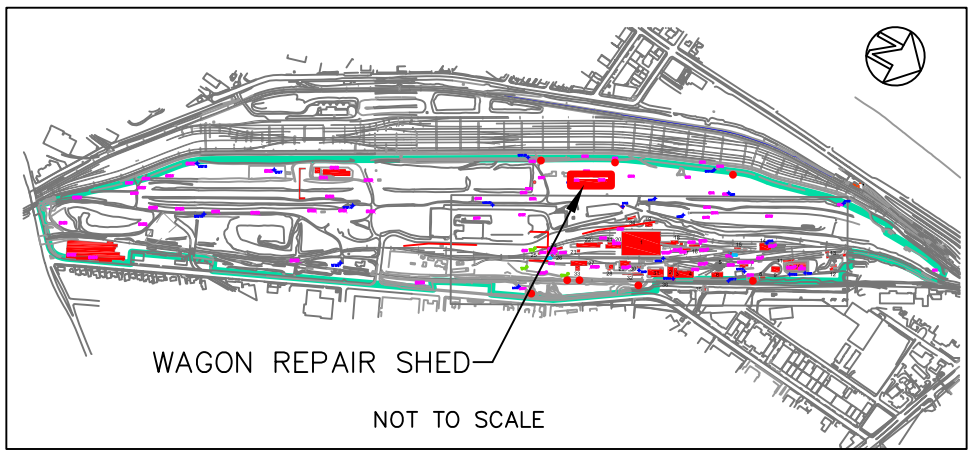
project: ILC ENFIELD DEMOLITION AND REMEDIATION

title: EXCEEDENCE LOCATIONS FOR DELEC - RAP

project no: ENVIRHOD00634AA-D02

figure no: FIGURE 5A

A3



WRS15 WRS14 WRS16 WRS17 WRS13 WRS7 WRS20 WRS18 WRS19 WRS6 WRS21 WRS22 WRS5 WRS23 WRS24 WRS4 WRS25 WRS26 WRS11 WRS3 WRS27 WRS28 WRS10 WRS2/N5 WRS29 WRS30 WRS9/N5 WRS2/W5 WRS2 WRS2/E5 WRS9/W5 WRS9 WRS9/E5 WRS2/S5 WRS31 WRS32/N5 WRS9/S5 WRS8 WRS1 WRS32/W5 WRS32 WRS32/E5 WRS32/S5 WRS12/N5 WRS12 WRS12/E5 WRS12/W5 WRS12/S5

0–0.1	0–0.1
TPH (C10–C36)	COPPER
1817	8010

BH13

0.1
ASBESTOS
–

0.3
ASBESTOS
–

0.1
ASBESTOS
–

0.3
ASBESTOS
–

0–0.1	0–0.1
TPH (C10–C36)	ASBESTOS
16166	–

0–0.1	0.3
ASBESTOS	ASBESTOS
–	–

0.3
ASBESTOS
–

ASBESTOS WAS DETECTED AT DELINEATION SAMPLE LOCATION WRS30A14.

0.3
ASBESTOS
–

0–0.1
ASBESTOS
–

0–0.1
ASBESTOS
–

BH12

0.15–0.25
ASBESTOS
–

0–0.3
ASBESTOS
ASBESTOS

100m

15m

LEGEND

- SITE BOUNDARY
- SEALED SURFACE
- BH• BORE HOLE LOCATIONS
- WRS× BORE HOLE LOCATIONS
- mg/kg MILLIGRAMS PER KILOGRAM
- NAD NO ASBESTOS DETECTED

DEPTH	(metres)
CONTAMINANT	
CONCENTRATION	(mg/kg)

0 3 6 9 12 15
SCALE 1:300 METRES

SOURCE: CH2MHILL (1999)

drawn	MV
approved	IR
date	16.06.09
scale	AS SHOWN
original size	A3

coffey environments
SPECIALISTS IN LIVING AND WORKING PLACES

SYDNEYPORTS
FIRST PORT, FUTURE PORT

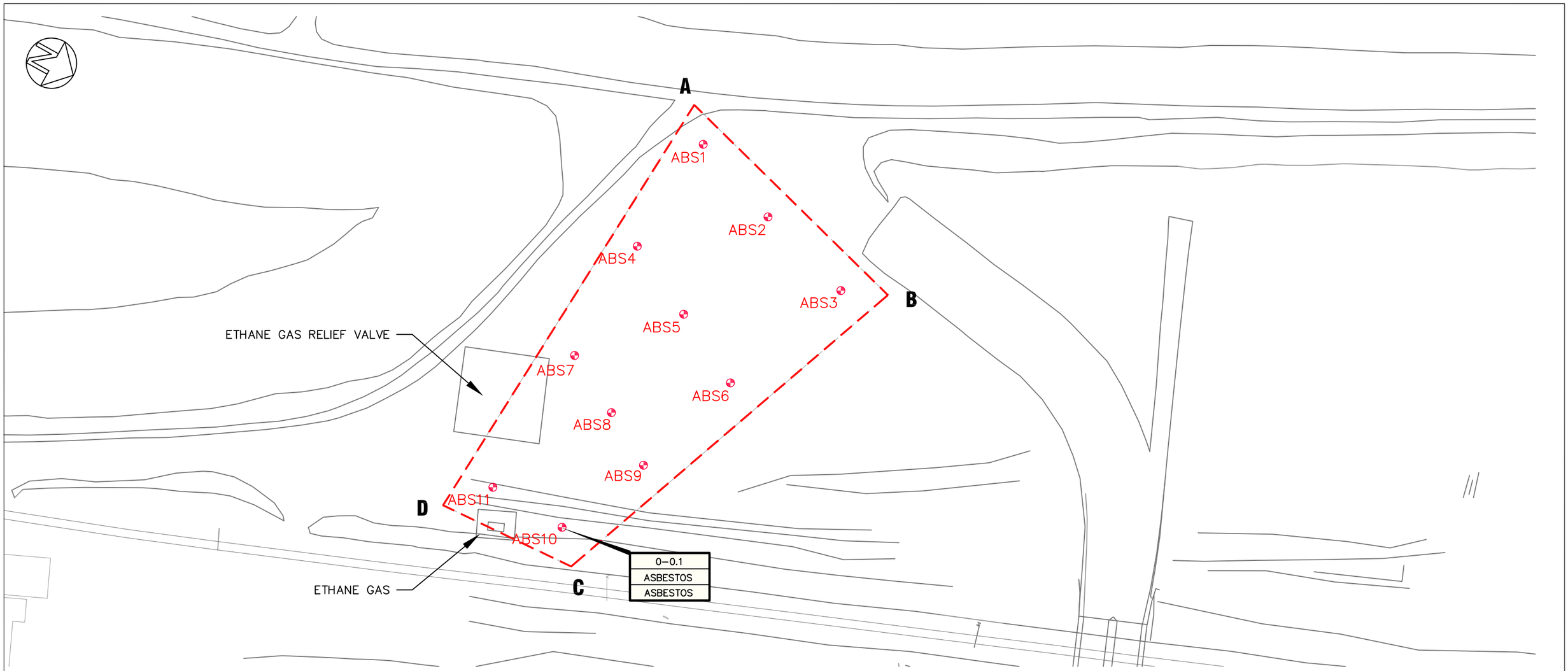
client: SYDNEY PORTS CORPORATION

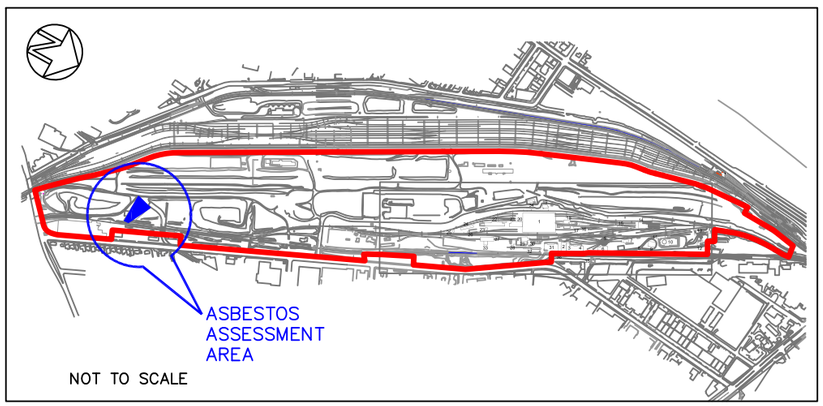
project: ILC ENFIELD DEMOLITION AND REMEDIATION

title: EXCEEDENCE LOCATIONS FOR WAGON REPAIR SHED - RAP

project no: ENVIRHOD00634AA-D02

figure no: FIGURE 5B





LEGEND

ASBESTOS ASSESSMENT AREA

RAIL TRACKS

ABS SAMPLING LOCATIONS

DEPTH	(metres)
CONTAMINANT	
CONCENTRATION	(mg/kg)

GPS REFERENCE POITNS	EASTING	NORTHING
A	322020	6246574
B	322028	6246622
C	322100	6246603
D	322104	6246578

revision

description	drawn	approved	date

0 7 14 21 28 35
SCALE 1:700 (A3) METRES

drawn	MV
approved	CC
date	20.03.09
scale	AS SHOWN
original size	A3

coffey environments
SPECIALISTS IN LIVING AND WORKING PLACES

SYDNEYPORTS
FIRST PORT, FUTURE PORT

client: SYDNEY PORTS CORPORATION

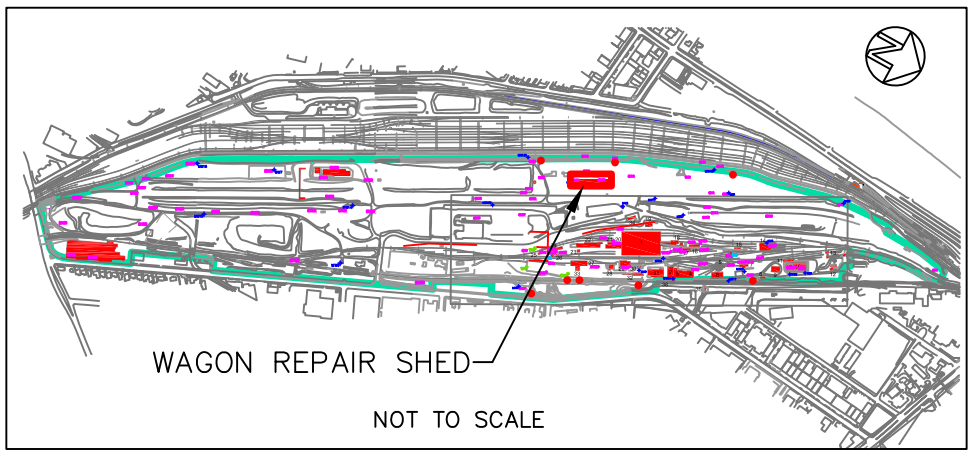
project: ILC ENFIELD DEMOLITION AND REMEDIATION

title: EXCEEDANCE LOCATIONS FOR ASBESTOS BRAKE SHOE BURIAL GROUND - RAP

project no: ENVIRHOD00634AA-D02

figure no: FIGURE 5C

A3



WRS15 WRS14 WRS16 WRS17 WRS7 WRS20 WRS13 WRS18 WRS19 WRS6 WRS21 WRS22 WRS12/N5 WRS12 WRS12/E5 WRS12/W5 WRS5 WRS23 WRS12/S5 WRS24 WRS4 WRS25 WRS26 WRS11 WRS3 WRS27 WRS28 WRS10 WRS2/N5 WRS29 WRS9/N5 WRS2/W5 WRS2 WRS2/E5 WRS30 WRS9/W5 WRS9 WRS9/E5 WRS2/S5 WRS31 WRS9/S5 WRS8 WRS1 WRS32/N5 WRS32 WRS32/E5 WRS32/W5 WRS32/S5

BH13 BH12

100m

15m

0–0.1	0–0.1
TPH (C10–C36)	COPPER
1817	8010

0.1
ASBESTOS
–

0.3
ASBESTOS
–

0.1
ASBESTOS
–

0.3
ASBESTOS
–

0–0.1	0.3
ASBESTOS	ASBESTOS
–	–

0.3
ASBESTOS
–

ASBESTOS WAS DETECTED AT DELINEATION SAMPLE LOCATION WRS30A14.

0–0.1
ASBESTOS
–

0–0.1	0–0.1
TPH (C10–C36)	ASBESTOS
16166	–

0–0.3
ASBESTOS
ASBESTOS

0.15–0.25
ASBESTOS
–

LEGEND

- SITE BOUNDARY
- SEALED SURFACE
- AREA PROPOSED TO BE REMEDIATED
- BH• BORE HOLE LOCATIONS
- WRS× BORE HOLE LOCATIONS
- mg/kg MILLIGRAMS PER KILOGRAM
- NAD NO ASBESTOS DETECTED

DEPTH	(metres)
CONTAMINANT	
CONCENTRATION	(mg/kg)

0 3 6 9 12 15
SCALE 1:350 (A3) METRES

SOURCE: CH2MHILL (1999)

drawn	MV
approved	IR
date	16.06.09
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: AREA TO BE REMEDIATED WITH IN WAGON REPAIR SHED FOOTPRINT

project no: ENVIRHOD00634AA-D02

figure no: FIGURE 5D