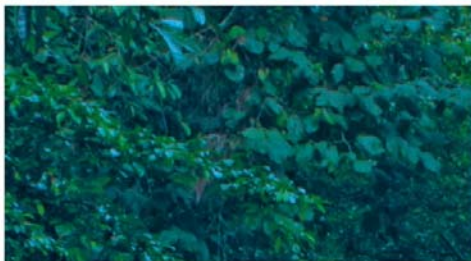
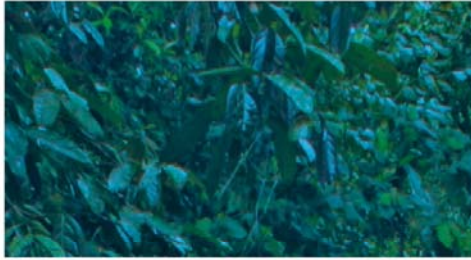


SITE MANAGEMENT PLAN
ASBESTOS IN SOIL
HILLVIEW LIFESTYLE VILLAGE
597 KALAMUNDA ROAD
HIGH WYCOMBE, WA



**SITE MANAGEMENT PLAN
ASBESTOS IN SOIL
HILLVIEW LIFESTYLE VILLAGE
597 KALAMUNDA ROAD
HIGH WYCOMBE, WA**

Prepared for:

Hillview Lifestyle Village
PO Box 6423
EAST PERTH WA 6892

Report Date: 1 April 2010

Report Ref: EP2009/127, V3
Project Ref: ENVIPERT00855AA R1C

Written/Submitted by:

Reviewed/Approved by:



PP. Cherie Elder
Environmental Scientist

Ron D'Ercole
Principal Environmental Consultant

1 April 2010

Hillview Lifestyle Village
PO Box 6423
EAST PERTH WA 6892

Attention: Mr I Nichol

Dear Ian

**RE: ASBESTOS IN SOIL, SITE MANAGEMENT PLAN,
597 KALAMUNDA ROAD, HIGH WYCOMBE**

Coffey Environments Pty Ltd is pleased to present the Asbestos in Soil Site Management Plan for Hillview Lifestyle Village located at 597 Kalamunda Road, High Wycombe, WA.

Please do not hesitate to contact the undersigned should you wish to discuss any aspect of the report.

For and on behalf of Coffey Environments Pty Ltd



Ron D'Ercole
Principal Environmental Consultant

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1	ENVIPERT00855AA_R01B.doc	Draft V2	31 July 2009	National Lifestyle Villages	RD
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ABBREVIATIONS

µm	Micro meters
ACM	Asbestos-Containing Material
AF	Asbestos Fines
AHD	Australian Height Datum
ANZECC	Australian and New Zealand Environment and Conservation Council
AS	Australian Standard
bgl	below ground level
BYO	bring your own
CCP	Community Consultation Plan
cm	centimetre
CoPC	Chemicals of Potential Concern
CS	Contaminated Site
DEC	Department of Environment and Conservation
DEP	Department of Environmental Protection (now DEC)
DoH	Department of Health (WA)
EMP	Environmental Management Plan
EPA	Environmental Protection Authority
f/mL	fibres per millilitre
FA	Fibrous Asbestos
fibres/mL	fibres per millilitre
g	gram
GDA	Geocentric Datum of Australia
GSWA	Geological Survey of Western Australia

ABBREVIATIONS

ha	hectare
HLV	National Lifestyle Villages
HSP	Health and Safety Plan
kg	kilogram
kg/m³	kilogram(s) per cubic metre
LTSMP	Long-Term Site Management Plan
m	metre
m/d	metre(s) per day
m²	square metre(s)
mg/L	milligram(s) per litre
mm	millimetre
MOT	Memorial on Title
NATA	National Association of Testing Authorities
NE	north-east
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure
NHMRC	National Health and Medical Research Council
NOHSC	National Occupational Health and Safety Commission
NW	north-west
NZS	New Zealand Standard
PPE	Personal Protective Equipment
SE	south-east
SMP	Site Management Plan

ABBREVIATIONS

SW	south-west
SWMS	Safe Work Method Statement
w/w	weight per weight
WIN	Water Information Network
WRC	Water and Rivers Commission

EXECUTIVE SUMMARY

Coffey Environments Pty Ltd (Coffey Environments) was contracted by Hillview Lifestyle Villages (HLV) to prepare an Asbestos in Soil Site Management Plan (SMP) for 597 Kalamunda Road, High Wycombe, WA (the Site) (see Figure 1).

Background

HLV has been developing a residential village on the Site and as part of the development works has recently uncovered a spread of asbestos debris within soils during earthwork activities. Coffey Environments understands that HLV arranged for Statewide Demolition to remove horse stables and a house that then occupied its 14 hectare site in High Wycombe in 2006. It is believed that the asbestos debris may have originated from the horse stables and house which may not have been removed completely during demolition.

In accordance with the enHealth guideline *Management of Asbestos in the Non-occupational Environment* (2005) and the Department of Health (DoH) (2009), *Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia*, a preliminary inspection of the soil/material over the Site was undertaken by a Coffey Environments' representative on 12 June 2009. Initial surface inspection of the remaining vacant lots on the Site observed asbestos cement fragments located sporadically across the surface soils.

Nature of the Park Home Development

The Hillview Lifestyle Village is an approximately 10ha medium density housing development for over 45s. The village community concept has been conceived, designed, built and managed by National Lifestyle Villages. The concept involves future residents purchasing the actual dwellings, however, the land area is leased on a weekly period for secure term of the life of the village (e.g. 60 years). Two hundred and sixty six (266) individual, contemporary designed, free standing homes on Lot sizes generally less than 250m² (approx 13m wide x 19m long) have been constructed (as of March 2010 only nine Lots remain undeveloped). Each developed Lot has approximately 80% sealed surfaces either has a structure erected (e.g. housing, car port) or a paved area, leaving less than 40m² of garden area that is planted, routinely mulched and maintained by Hillview Lifestyle Village grounds staff. The Village management has a policy in place in which residents may only place additional plants in pots and are not permitted to plant into the garden bed surface soils.

Approximately 20% of the development area consists of a shared use recreational facility, which includes club house, tennis courts, indoor and outdoor swimming pools, gym, sauna, bowling green, a family centre and a facility maintenance workshop. An asphalt sealed parking area for boats and caravans is also included in this area. Hillview Lifestyle Village grounds staff routinely mulch and maintain garden beds throughout the site.

Objectives

The objective of this SMP is to provide a risk assessment, present the proposed remediation and validation methodology to enable the completion of development works at the Site and outline ongoing requirements for the management of the Site. The SMP discusses:

- background information on the Site including location of areas where contamination was identified;
- identification of the hazards and exposure pathways;
- methods of managing exposure to reduce the risk;

EXECUTIVE SUMMARY

- identifying activities, which would require specific management if carried out in the suspected impacted areas such as those activities that may intersect/disturb the affected materials;
- environmental management, health and safety and control measures (for example if exposure pathways are created by penetrating into areas with remnant asbestos-containing materials (ACM) such as by excavation);
- monitoring and maintenance requirements; and
- responsibility for implementation of the plan.

Qualitative Risk Assessment

After identifying the potential exposure pathways and receptors for the Site a qualitative risk table was produced as per Table ES1.

**TABLE ES1
QUALITATIVE RISK ¹**

	Probability	Consequence	Qualitative Risk
On-Site Qualitative Human Health Risk			
Workers/occupiers at the Site, in the event they breathe contaminated dust.	C) Area currently undergoing earth works.	3) Exposure to asbestos fibres may give rise to adverse health condition.	H
Workers conducting subsurface excavations at the Site, in the event they breathe contaminated dust.	C) Area currently undergoing earth works.	3) Exposure to asbestos fibres may give rise to adverse health condition.	H

¹ Notes: Risk (AS/NZS 4360:1999)

Likelihood	Consequences				
	Insignificant 1	Minor 2	Moderate 3	Major 4	Catastrophic 5
A (almost certain)	H	H	E	E	E
B (likely)	M	H	H	E	E
C (possible)	L	M	H	E	E
D (unlikely)	L	L	M	H	E
E (rare)	L	L	M	H	H

E: extreme risk, immediate action required;

H: high risk, senior management action required;

M: moderate risk, management responsibility must be specified;

L: low risk, manage by routine procedures.

EXECUTIVE SUMMARY

**TABLE ES1
QUALITATIVE RISK ²**

	Probability	Consequence	Qualitative Risk
Off-Site Qualitative Human Health Risk			
Workers/occupiers/public off-site, in the event they breathe contaminated dust.	C) Area currently undergoing earth works.	3) Exposure to asbestos fibres may give rise to adverse health condition.	H
Off-site Qualitative Ecological Risk			
Fauna impacts.	E)	1)	L

Remediation Strategy

Following a remediation option review of the advantages and disadvantages of the three main remediation strategies, the preferred remedial strategy was identified. Based on discussions with the Client, it was assessed that the excavation and removal off-site (dig and dump) of the ACM impacted soil is the preferred remedial management method for dealing with the buried ACM fragments. The ACM observed across the surface of the Site will be remediated via hand-pick. All ACM fragments and impacted soils will be appropriately disposed to a suitably licensed landfill facility. These decisions were based upon the following.

- The risk of dust produced by heavy vehicular traffic and earthwork activities generating disturbance of soil during site works is deemed high, therefore buried ACM fragments cannot be left in-situ.
- Can be implemented in a relatively short time frame.
- It is believed the majority of surface ACM is within the surface 10cm soils of the site and therefore would visually identifiable via an emu-bob exercise.
- As portions of the site have already been built upon it would be difficult to cover the site with a barrier to a sufficient depth (e.g. 0.5-1.0m of clean soil).

² Notes: Risk (AS/NZS 4360:1999)

Likelihood	Consequences				
	Insignificant 1	Minor 2	Moderate 3	Major 4	Catastrophic 5
A (almost certain)	H	H	E	E	E
B (likely)	M	H	H	E	E
C (possible)	L	M	H	E	E
D (unlikely)	L	L	M	H	E
E (rare)	L	L	M	H	H

E: extreme risk, immediate action required;

H: high risk, senior management action required;

M: moderate risk, management responsibility must be specified;

L: low risk, manage by routine procedures.

EXECUTIVE SUMMARY

- Short-term risks generated by the disturbance of on-site ACM fragments can be minimised by utilising appropriate equipment, techniques and personal protective equipment.
- Relatively simple methodologies to implement.

The off-site removal option would effectively manage ongoing asbestos health risk on-site, however, limitations to off-site removal include the following.

- Increased short-term risk of potentially generating airborne asbestos fibres due to the disturbance of ACM on-site; and
- Creating a potential long-term risk at the licensed asbestos landfill due to the new location of the ACM and additional load on landfill.

Conclusion

Due to the nature of the park home development, it is assessed that the removal of impacted material will result in the Site being suitable for the remainder of the required residential development works. Notwithstanding the above, where suspect ACM is unearthed in the future then this material shall be managed in accordance with this SMP.

Where non-compliance with the SMP requirements is identified, corrective action will be implemented immediately. Corrective action may include control measures in addition to notification to the relevant authorities, if required.

The findings of this report should be read in the context of the statement of limitations attached to this report.

DEC Site Summary Form



Department of
Environment and Conservation

Site Summary Form – Contaminated Site Assessment

For completion by the person(s) submitting a report(s) to be assessed by the Department of Environment and Conservation (DEC) as per the information requirements of the DEC *Reporting on Site Assessments (2001)* guideline. Completing this form enables DEC to maintain accurate records for the site.

Please note: A completed site summary form must accompany each report submitted to DEC for assessment. Each box must be filled out appropriately. Please do not write “refer to report” in any section. Copies of all relevant/current Certificates of Title must accompany this form.

Site location details:

Site name (e.g. where site may be known by a common/business name)

Lot no. **House no.** **Street**

Suburb **State** **Postcode**

Crown Reserve (if applicable)

Certificate(s) of Title (or equivalent)

Where the subject site comprises of multiple certificates of title, please list all certificates:...n/a.....
Where substances have migrated beyond the cadastral boundaries of the subject site, please provide the addresses, relevant Certificates of Title documentation and owners details for all offsite properties impacted (includes soil and/or groundwater), as an attachment to this form.

Is a hard copy of Certificate of Title and associated sketch for all listed sites attached? (Y/N)

WAPC reference no. (where applicable)

Current Owner/Occupier details:

Site owner (Name and address)

Site owner company ACN/ABN

Site occupier (name and address)

Site occupier company ACN/ABN

Site status (at time of reporting):

Proposed land use (e.g. high density residential/child care facility)

Identified substances and relevant media (e.g. benzene in soil and groundwater, xylene in soil only)

Asbestos (Y/N)	<input type="text" value="Y"/>	Health Risk Assessment (Y/N)	<input type="text" value="N"/>	Community health concerns identified (Y/N)	<input type="text" value="N"/>	Radiological issues (Y/N)	<input type="text" value="N"/>
Air quality issues (Y/N)	<input type="text" value="N"/>	Past/present landfill (Y/N)	<input type="text" value="N"/>	Potential human exposure to identified substances > DEC’s Health Investigation Levels or equivalent (Y/N)	<input type="text" value="N"/>	Other human health issues (Y/N)	<input type="text" value="N"/>

Specify other health issues.....

Asbestos In Soil, Site Management Plan,
Hillview Lifestyle Village, High Wycombe

Where 'yes' is recorded for at least one of the above categories, please submit two copies of the report(s) (relevant documentation) to DEC for referral to the Department of Health (or Radiological Council, in the case of radiological issues)

Are site activities licensed under the *Environmental Protection Act 1986*? (Y/N)

N

Where laboratory analysis has been undertaken, is the laboratory NATA accredited for all analytes and analytical methodologies used? (Y/N) (If not, why not?)

Y

Community Consultation: (as per the DEC's *Community Consultation (December 2006)* guideline)

Community consultation program commenced/proposed (Y/N)

Y

Are consultation program details (e.g. community consultation plan) provided in attached report (Y/N)

N
Separate
Document

History of Investigation:

Have previous site investigations been undertaken? (Y/N - if yes, please provide details below)

N
Visible 7 laboratory
identification of ACM

Report title, date and author:

N/A

Declaration:

The information contained in this site summary form is a true representation of the information contained in the attached report(s)/document(s).

Full name (print) Ron D'Ercole

Position held Principal Environmental Consultant

Signature



Date

8/4/2010

Please ensure that a hardcopy of the current Certificate(s) of Title and associated sketch accompanies the site summary form. DEC cannot proceed with the assessment of the report if this information is not provided.

DEC Registrar Only

Registrar name:

Signature :

CoT verified (Y/N)

Owner details verified (Y/N)

Complete form (Y/N)

Awaiting Classification (Y/N)

Awaiting Re-Classification (Y/N)

Incomplete Form (Y/N)

LWQB Assessment Officer:

Comments/Actions :

Date of data entry:

1 INTRODUCTION

Coffey Environments Pty Ltd (Coffey Environments) was engaged by Hillview Lifestyle Villages Pty Ltd (HLV) to prepare an Asbestos in Soil Site Management Plan (SMP) for 597 Kalamunda Road, High Wycombe, WA (the 'Site') (see Figure 1).

This SMP applies to the whole Site during the remediation phase and for future management of the Site. These controls extend to all tenants, staff, maintenance personnel and construction workers and site visitors.

The 'Site Owner' referred to in this SMP is the person or people who represent HLV on the site, whether or not they are actively managing the Site.

1.1 Background

The 10.3 hectare Site is located on the southern corner of the intersection of Abernethy and Kalamunda Roads in the Shire of Kalamunda, approximately 13 kilometres east of the Perth central business district. The Site, owned by HLV, currently is zoned "Special Use 17" - Park Home Village under the Shire of Kalamunda planning scheme and described on Certificate of Title, 2717/368. It is understood there are no known plans to change the Site's zoning.

The preliminary Site history review indicates that the Site has been used for farming. Since 2006, HLV has been developing a residential village (transportable homes on individual Lots) and as part of the initial activities HLV arranged for Statewide Demolition to remove horse stables and a house that then occupied the Site. The Site has been mostly developed with a number of new park homes currently established and occupied, with an area in the north-west corner currently vacant and pending development (Figure 2). Recent development works have uncovered some suspect asbestos-containing material (ACM)³ debris within soils during earthwork activities (i.e. fragments of flat asbestos cement sheeting). It is believed that the suspect ACM debris identified on Lot 226 Ridge Hill Drive may have originated from the demolition of horse stables. Site Management advised that some suspect ACM fragments had been previously confirmed as containing asbestos.

In accordance with the enHealth guideline *Management of Asbestos in the Non-occupational Environment* (2005) and the Western Australian Department of Health (DoH) (2009), *Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia*, a preliminary inspection of the soil/material over the Site was undertaken by a Coffey Environments' representative on 12 June 2009. Initial surface inspection of the remaining vacant lots along Ridge Hill Drive identified suspect ACM fragments located sporadically across the surface soils. In addition, fill was identified across parts of the site which may also account for the presence of the asbestos debris.

³ Asbestos cement is predominantly a mixture of cement and asbestos which when in a dry state has a density greater than 1 tonne per cubic metre (1,000kg/m³). It is a light grey and hard material, which generally contains 2%-15% asbestos fibre, but can occasionally contain up to 40% in a bound matrix of Portland cement or autoclaved calcium silicate.

As per Department of Environment and Conservation (DEC) Contaminated⁴ Site Management Series reporting guidelines (Department of Environmental Protection, 2001), this Site Management Plan (SMP)⁵ was undertaken in conjunction with a Community Consultation Plan (CCP) (Coffey Ref. ENVIPERT00855AA R2A) to provide a risk assessment, present the proposed remediation and validation methodology to enable the completion of development works at the Site and outline ongoing requirements for the management of the Site.

In consideration of the development occurring on the Site the SMP recommended remediation of the vacant portions of the Site is undertaken and a CCP is completed prior to these works occurring. It was assessed that the removal of all buried ACM impacted soils (i.e. dig and dump), emu-bob of the surface of the entire Site, disposal of all ACM and impacted soils to an approved designated asbestos landfill and the subsequent validation of the inferred impacted areas along with the in-situ management of random remnant ACM fragments are the preferred remedial methods.

Due to the nature of the park home development, it is assessed that the removal of impacted material will result in the Site being suitable for the remainder of the required development works.

1.1.1 Nature of the Park Home Development

The Hillview Lifestyle Village is an approximately 10ha medium density housing development for over 45s. The village community concept has been conceived, designed, built and managed by National Lifestyle Villages. The secure, gated community (with video connection to the main gate) concept involves future residents purchasing the actual dwellings, however, the land area is leased on a weekly period for secure term of the life of the village (e.g. 60 years). Two hundred and sixty six (266) individual, contemporary designed, free standing homes on Lot sizes generally less than 250m² (approx 13m wide x 19m long) have been constructed (as of March 2010 only 9 Lots remain undeveloped).

⁴ A contaminated site is defined in the Contaminated Sites Act 2003 (the 'CS Act') as "land or water [surface and groundwater] containing a substance above background concentrations that presents or has the potential to present a risk of harm to human health or the environment". In other words, the contaminated site has the potential to cause risk to human health, the environmental value or to the environment.

⁵ The Hierarchy of Controls refers to the preferred order of control measures for addressing occupational health and safety risks and generally includes the following:

- elimination (e.g. complete removal of asbestos);
- substitution (e.g. replacement of asbestos insulation with less hazardous materials such as fibreglass or rock wool);
- isolation (e.g. Enclose/cap asbestos with a solid barrier);
- engineering controls (e.g. dust suppression via water and chemicals);
- administration controls (e.g. policies and procedures for safe work practices [cleaning, decontamination and waste disposal]); and
- personal protective equipment (e.g. use of respirators while working with asbestos).

Each developed Lot has approximately 80% sealed surfaces either has a structure erected (e.g. housing, car port) or a paved area:

- Housing unit ~70-90m² (dwelling design may vary);
- Driveway and carport ~40m²;
- Patio ~15m²;
- Veranda ~10m²;
- Shed ~4m²;
- Rainwater Tank ~2m²; and
- Other paved areas ~10m².

Less than 40m² of garden area is planted, routinely mulched and maintained by Hillview Lifestyle Village grounds staff. The Village management has a policy in place in which residents may only place additional plants in pots and are not permitted to plant into the garden bed surface soils. As part of Residential Site Agreement, all front gardens and common areas are maintained by Hillview Lifestyle Village.

Approximately 20% of the total development area consists of shared use areas including the following.

- Clubhouse facilities including stage and dance floor
- BYO bar
- First class gourmet kitchen for large functions
- Winter lounge
- Pool and darts room
- Internet kiosk
- Library
- Indoor heated swimming pool
- Spa
- Sauna
- Spacious deck area
- Squash court
- Bocce green
- Croquet courts
- Fully equipped gymnasium
- Shuffle board
- Lifestyler workshop

- Family Centre with outdoor swimming pool and BBQ area for entertaining visiting families and friends
- Art house for arts and crafts
- Full sized and half sized tennis court
- Bowls green
- Landscaped outdoor entertaining areas with a pizza oven and barbecues
- Secure caravan and boat parking area, along with wash-down area
- Professionally maintained and appropriately selected Australian landscaping, using water-wise native plants

Examples of the Site features with lot details and typical dwelling layout plans are included in Appendix A.

1.2 Objectives

The objective of this SMP is to provide a risk assessment, present the proposed remediation and validation methodology to enable the completion of development works at the Site and outline ongoing requirements for the management of the Site. The SMP discusses:

- background information on the Site including location of areas where contamination was identified;
- identification of the hazards and exposure pathways;
- methods of managing exposure to reduce the risk;
- identifying activities, which would require specific management if carried out in the suspected impacted areas such as those activities that may intersect/disturb the affected materials;
- environmental management, health and safety and control measures (for example if exposure pathways are created by penetrating into areas with remnant ACM such as by excavation);
- monitoring and maintenance requirements; and
- responsibility for implementation of the plan.

1.3 Scope of Works

The SMP details the proposed remedial strategy (based upon review of all available information) and enables the selection of an effective management strategy, which is practical, achieves desired outcomes and is socially and environmentally acceptable. The scope of work comprised:

- summary of site characteristics;
- presentation of proposed guidelines and risk assessment criteria;
- presentation of remedial options and selection of a remedial strategy;
- presentation of the remedial strategy;
- proposed validation plan;

- management control procedures; and
- long-term (ongoing) management.

1.4 Implementation of the SMP

Only suitably qualified consultants and/or contractors shall be commissioned by the Site Owner, their representatives, or by site tenants with the prior approval of the Site Owner, to undertake works with the potential to disturb impacted soils.

1.5 Responsibilities

The responsibilities under the SMP of parties involved in works in impacted areas are summarised in Table A. These responsibilities do not replace any other regulatory responsibilities of the parties in undertaking works at the Site and do not include all responsibilities.

**TABLE A
RESPONSIBILITIES OF PARTIES**

Title	Responsibilities for Activities Undertaken in Impacted Soils	Comments
Site Owner	Ensure that site occupants/workers are aware of the SMP and associated procedures. Update SMP as necessary. Maintain records and documentation relevant to the SMP. Ensure occupants/workers are provided with current version of SMP and are appropriately briefed. Consider rectification works where required.	The Site Owner will seek expert advice as appropriate.
Owner's Representative	Approve consultants and contractors for undertaking works. Approve or have approved Health and Safety Plans (HSPs), Environmental Management Plans (EMPs) and Safe Work Method Statements (SWMSs). Coordinates the implementation of the SMP on behalf of the Site Owner.	Appointed by Site Owner.

TABLE A
RESPONSIBILITIES OF PARTIES

Title	Responsibilities for Activities Undertaken in Impacted Soils	Comments
Occupants/ Workers	<p>Acknowledge and adhere to the requirements of the SMP.</p> <p>Refrain from any act that could put themselves or any other person at risk of exposure to asbestos fibres.</p> <p>Obtain approval from Site Owner for consultants and contractors undertaking works.</p> <p>Manage works including consultants and contractors such that their works are carried out in accordance with SMP protocols.</p> <p>Confirm with the Site Owner that works are being undertaken in accordance with procedures set out in SMP.</p> <p>Notify Site Owner of any non-conformance with the SMP and corrective actions.</p> <p>Provide to Site Owner and maintain survey plans of excavations and as-built drawings.</p>	
Approved Consultant	Undertake works or provide advice in accordance with the requirements of the SMP.	Suitably qualified by relevant authority and commissioned by Site Owner or Owner's Representative (with approval from Site Owner).
Approved/ Licensed Contractor	Undertake works in accordance with the requirements of the SMP.	Suitably qualified by relevant authority and commissioned by Site Owner or Owner's Representative (with approval from Site Owner).

2 SITE DETAILS

2.1 Site Identification

The Site identification details are summarised below in Table B.

TABLE B
SITE IDENTIFICATION DETAILS

Site Name	Hillview Lifestyle Village, High Wycombe.	
Site Address	597 (Lot 100) Kalamunda Road, High Wycombe, WA, 6057.	
Certificate of Title	Deposited Plan 59834 Volume 2717/Folio 368 (Appendix B).	
Approx. Coordinates of Site Boundary (GDA 94)	SW	Northing 6466759.57S Easting 404948.92E
	NW	Northing 6466967.08S Easting 405089.53E
	NE	Northing 6466681.92S Easting 405380.85E
	SE	Northing 6466517.05S Easting 405204.27E
Site Area	Lot 100 - 103,462m ² (as per Landgate). Specific site area as identified on Figure 2 - 9,200m ²	
Site Owner	Hillview Lifestyle Village Pty Ltd.	
Site Occupier	Hillview Lifestyle Village.	
Land Use	The Site has been mostly developed with a number of new park homes currently established and occupied, with an area in the north-west corner currently vacant and pending development (Figure 2).	
Proposed Land Use	Park homes (to maximum residential density of R25).	
Local Government Authority	Shire of Kalamunda.	
Zoning	'Special Use 17' - Park Home Village.	
Heritage (including Aboriginal Heritage pursuant to <i>Aboriginal Heritage Act 1972</i>)	Not within scope of this investigation.	
Previous Environmental Reports/ Investigations	There are no known environmental investigations or reports for the site.	
Locality Map	See Figure 1.	

2.2 Site History

Coffey Environments understands the Site has been used historically for farming and was cleared of structures, including a horse stable and house, circa 2006 by Statewide Demolition. It is believed ACM debris may have been left on the site following demolition works.

A site inspection on 12 June 2009 by Coffey Environments personnel observed the potential for uncontrolled fill to be present across parts of the site which may also account for the presence of the asbestos debris.

2.3 Neighbouring Land Uses

The neighbouring land uses of the Site are detailed below.

- North-east: Kalamunda Road, Public Purposes (Commonwealth Government) land used for soil recycling and semi-rural residential properties.
- South-east: Residential.
- South-west: Ollie Worrell Park and primary school.
- North-west: Abernethy Road and local open space.

3 ENVIRONMENTAL SETTING

3.1 Topography

The Site is situated approximately 22m Australian Height Datum (AHD) on flat to gently undulating land. The Site surface is generally flat. The site has been cut and filled for levelling purposes, however, from plans obtained from the client it appears the fill used was reworked natural soils from the Site.

3.2 Geology

The Perth region overlies the central portion of the Perth Basin, which comprises up to 12,000m of sedimentary rock. The following superficial formation units underlie the Site, from youngest to oldest (GSWA, 1986).

- Superficial geology is characterised by Bassendean Sand fixed dunes comprising quartz sand with interspersed swamp and lacustrine deposits
- The superficial formations are underlain regionally by the Kardinya Shale Member of the Osborne Formation, which consists of moderately to tightly consolidated interbedded siltstones and shales, of Cretaceous age (Davidson, 1995), at a depth of less than approximately 5 metres below ground level (mbgl).

3.3 Surface Hydrology

The nearest surface water body is the swamp at Ollie Worrell Park to the immediate south-west of the Site and Munday Swamp approximately 500m south-west of the Site.

3.4 Hydrogeology

Water bearing beds and aquifers potentially occur under the following conditions beneath the Site.

The uppermost unconfined aquifer is located within the sediments of the Bassendean Sands Formation. This aquifer forms part of the Cloverdale groundwater area, one of several groundwater divisions making up the superficial aquifer of the Perth Basin. The results of interpretation of groundwater characteristics of the area investigated are summarised as follows (Davidson, 1995; WRC, 2004):

- The unconfined aquifer is underlain by the Kardinya Shale Member of the Osborne Formation, which is generally considered an aquitard. The Osborne Formation is in turn underlain by the Leederville Formation aquifer.
- Based on local topography (approximately 22mAHD) and the nearby presence of Ollie Worrell Park, groundwater depth is expected⁶ to be between approximately 8m below ground level (bgl) or 14mAHD (WRC, 2004).

⁶ Groundwater depth under the Site is available either from the Department of Environment (DEC) Groundwater Atlas (2004) or the WRC WIN database.

- It is inferred that groundwater flow is likely to be to the north-west toward the Swan River.
- Groundwater levels are expected to fluctuate due to seasonal rainfall recharge by approximately 0.5-1.0 m. The watertable elevation is highest during September-October and lowest during April-May.
- Typically, hydraulic conductivities of sandy soils are in the order of 8 to 16 metres per day (m/d).
- Generally, groundwater yields within sands are medium with localised high yields associated within sandy horizons. The superficial aquifer is likely to have potential to be a viable groundwater resource, including for domestic irrigation purposes.
- Based on predicted salinity contouring (250 to 1000 milligrams per litre (mg/L)), the highest beneficial use of groundwater in the vicinity of the Site is for human drinking purposes (<1,000mg/L).
- The vulnerability of groundwater to contamination is 'high' due to the depth to watertable (i.e. approx 8mbgl) and the relatively low chemical attenuation properties of sandy soils (Davidson, 1995; WRC, 1997).

Groundwater Resources and Beneficial Uses

A 'Bore Search' of the WRC WIN database has not been undertaken for the Site.

4 EXPOSURE PATHWAY ANALYSIS

Based on anecdotal evidence obtained from the Site Owner, observations from a site walkover and based on the assumption that suspect ACM fragments found at the Site are asbestos-containing (the fragments were subsequently confirmed as ACM), the following chemicals of potential concern (CoPC) from on-site sources were identified.

- Asbestos in ACM fragments from the demolition of former buildings on-site.
- Asbestos in ACM fragments in fill at the site.

An 'exposure pathway' is a means by which a population or individual ('receptor') may be exposed to site-derived contaminants. Human receptors assessed for the proposed site development include on-site workers, off-site workers, on-site residents, future residents and visitors. Potential exposure pathways were evaluated for completeness based on the existence of:

- a source of chemical contamination;
- a mechanism for release of contamination from identified sources;
- a contaminant retention or transport medium (e.g. soil, air, groundwater, etc);
- potential receptors of contamination; and
- a mechanism for chemical intake by receptors at the point of exposure (i.e. ingestion, dermal contact or inhalation).

Whenever one or more of the exposure pathway elements are missing, the exposure pathway is incomplete i.e. there is no exposure and therefore no risk to human health and/or the environment.

Asbestos types, health effects and risk assessment are further discussed in Appendix C.

With respect to the ACM uncovered during earth working activities and observed across the surface of the vacant areas of the Site, the qualitative risk assessment for asbestos included the consideration of the following.

- *The location and condition of the asbestos*

Fragments of ACM were identified in buried debris and scattered across surface soils at the Site as shown on Figure 2. Based on the number of fragments observed across the surface of the Site it is considered possible (although the probability is considered low) that a 0.01% weight per weight (w/w) (i.e. 10g asbestos cement per 1kg soil) may be exceeded. The fragments of ACM observed on the surface soils during the site walkover appeared to be in good condition (i.e. not friable⁷) and sporadic. Site Management advised that ACM fragment on the surface of soil is likely a result of soil originating from the source of buried ACM (Lot 226) and spread on surface soils of other Lots (see Figure 2).

⁷ Friable asbestos is in the form of a powder, or can be crumbled, pulverized or reduced to powder by hand pressure when dry.

- *The type (e.g. cement sheet, vinyl tiles)*

There are two different types of ACM fragments that have been observed on the Site.

The first is a flat sheet asbestos cement which is dimpled on one side and is painted on the alternate side either white, pink or green, which may have originated from a building roof or walls.

The second type of ACM fragments are corrugated asbestos cement which may have originated from an old fence. Laboratory analysis⁸ of representative samples was still in progress at the time of the SMP development, however, results were subsequently obtained and confirmed asbestos content of the debris (Appendix D).

- *If it is friable or non-friable*

The observed pieces of ACM in both buried debris and surface soils consisted of relatively intact (i.e. not friable) fragments of ACM with sharp broken edges. The ACM appeared to be of high density inferring that due to structural requirements the asbestos is in a heavy cemented matrix.

The fragments showed evidence of breakage possibly due to the demolition of former buildings. The observed pieces of ACM with sharp edges usually had each face relatively intact, with broken edges where fibres can be released. When asbestos cement is broken, chrysotile asbestos⁹ fibres tend to pull out from one of the edges and remain tenaciously embedded inside the separated edge. In general, chrysotile asbestos fibres are very strong and flexible and resist becoming dislodged and airborne. Crocidolite¹⁰ and especially amosite¹¹ asbestos fibres are brittle and break off relatively easily, even though the majority of these fibres break in line with the asbestos cement fracture and remain mostly embedded. The physical nature of the asbestos minerals is that even when abraded, the fibres tend to split longitudinally into fine fibres rather than break into shorter ones.

- *If the nature or location of any work to be carried out is likely to disturb the asbestos.*

Due to the earthworks planned for the completion of the park home development the fragments of ACM observed on-site may be further broken if not removed prior to works recommencing.

- *If the asbestos is liable to further damage or deterioration*

Refer to above comment. Weathering of ACM may increase deterioration.

⁸ Qualitative identification of asbestos types in bulk samples by polarised light microscopy, including dispersion staining technique.

⁹ Chrysotile or white asbestos is a member of the Serpentine mineral group and when airborne, an occupational exposure standard of 0.1 fibres per millilitre of air (fibres/mL) sampled applies.

¹⁰ Crocidolite or blue asbestos is a member of the Amphibole mineral group and has an occupational exposure standard of 0.1 fibres/mL.

¹¹ Amosite or brown asbestos is a member of the Amphibole mineral group and has an occupational exposure standard of 0.1 fibres/mL.

- *If there are any inaccessible areas that are likely to contain asbestos*

Most of the Site has already been built upon and during the development below ground services (depth of 800mm), fencing (depth of 600mm), cutting all 'building pads' to a depth of 300mm to enable the park home to sit flush with the road, constructing foundations, etc., have not uncovered buried ACM. Consequently, it is unlikely that ACM is buried beneath existing park homes.

- *The likelihood of possible exposure*

The health risk from asbestos cement relates to the release of asbestos fibres into the air and these fibres being respired. ACM in 'good' condition is generally low risk hazardous materials but require specialised handling and disposal. Where asbestos fibre cement is broken, damaged, abraded or mishandled, fibres can become loose and airborne posing a risk to human health. The remaining vacant lots will be developed for park homes in the near future which will include further excavations.

4.1 Potential Exposure Pathways

Exposure pathways are natural and/or man-made and based on a review of the Site geology/hydrogeology and infrastructure. Potential exposure pathways were identified below in Table C.

**TABLE C
POTENTIAL RELEASE MECHANISMS AND EXPOSURE**

Exposure Pathway				Receptors	Pathway Complete
Source	Release Mechanism and Medium	Exposure	Exposure Route		
Waste debris	Retention in soil. Migration in soil and dust.	Direct contact	<input type="checkbox"/> ingestion	<input checked="" type="checkbox"/> Off-site public and occupants of premises.	✓
	Wind blown dust during development works including development of surface areas.		<input type="checkbox"/> dermal	<input checked="" type="checkbox"/> Occupants of the site.	✓
	Movement off-site through erosion of soil or surface water run-off (e.g. stormwater drains).		<input checked="" type="checkbox"/> inhalation	<input checked="" type="checkbox"/> Workers conducting subsurface excavations at the Site.	✓

4.2 Potential Receptors

Receptors are defined as persons, structures, utilities, ecological receptors and water supply wells that are or may be adversely affected by CoPCs. Potential receptors located on, or surrounding the Site, which have exposure pathways that may be complete, include the following:

- workers, occupants and members of the public (site visitors) on or adjacent to the Site in the event they inhale dust.

4.3 Qualitative Risk

Qualitative risk assessment of impact to the potential receptors is conducted based on the standard for risk management (AS/NZS 4360:1999), known sources (soil impacts) versus risk based DoH guidelines, potential exposure pathways and potential receptors. Qualitative risk assessment of impact on the potential receptors is summarised in Table D.

**TABLE D
QUALITATIVE RISK**

	Probability	Consequence	Qualitative Risk ¹²
On-Site Qualitative Human Health Risk			
Workers conducting subsurface excavations at the Site, in the event they breathe contaminated dust.	C) Area currently undergoing earth works.	2) Exposure to asbestos fibres may give rise to adverse health condition ¹³ . The observed moist asbestos cement fragments are unlikely to produce fibres of a type and nature that could adversely generate health effects ¹⁴ .	M
Occupiers and visitors at the Site, in the event they breathe contaminated dust.	C) Area currently undergoing earth works and there are nearby residences.	2) Exposure to asbestos fibres may give rise to adverse health condition. The observed moist asbestos cement fragments are unlikely to produce fibres of a type and nature that could adversely generate health effects.	M
Off-Site Qualitative Human Health Risk			
Workers/occupiers/public off-site, in the event they breathe contaminated dust.	C) Area currently undergoing earth works.	3) Exposure to asbestos fibres may give rise to adverse health condition. The observed moist asbestos cement fragments are unlikely to produce fibres of a type and nature that could adversely generate health effects.	M

¹² Consequence of impact and the probability of it occurring.

¹³ 'Risk to health' means the likelihood that a substance will cause harm to health in the circumstances of its use.

¹⁴ Shape and size influence respirability of airborne asbestos fibres. Fibres >8µm long and <0.25µm diameter and with an aspect ratio of ≥10, are considered the most dangerous. Fibres between 20 and 100µm in length tend to be more carcinogenic. Fibres >100µm are not considered respirable.

**TABLE D
QUALITATIVE RISK**

	Probability	Consequence	Qualitative Risk ¹²
Off-Site Qualitative Ecological Risk			
Fauna impacts.	E)	1)	L

Notes: Risk (AS/NZS 4360:1999)

Likelihood	Consequences				
	Insignificant 1	Minor 2	Moderate 3	Major 4	Catastrophic 5
A (almost certain)	H	H	E	E	E
B (likely)	M	H	H	E	E
C (possible)	L	M	H	E	E
D (unlikely)	L	L	M	H	E
E (rare)	L	L	M	H	H

E: extreme risk, immediate action required;

H: high risk, senior management action required;

M: moderate risk, management responsibility must be specified;

L: low risk, manage by routine procedures.

5 REMEDIATION CRITERIA

The Qualitative Risk Assessment and this SMP were developed in accordance with the following standards and guidelines.

- Western Australian DoH (2009) Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia.
- enHealth (2005) Management of Asbestos in the Non-occupational Environment.
- Australian Standards AS 4482.1: Guide to the Sampling and Investigation of Potentially Contaminated Soil (Standards Australia, 2005).
- Department of Environmental Protection (DEP) (now DEC) Contaminated Sites Management Series Guideline - Development of Sampling and Analysis Programs (DEP, 2001a).
- National Environment Protection Council (NEPC) (1999) National Environment Protection (assessment of site contamination) Measure (NEPM).

5.1 Rationale for Appropriateness of Assessment Levels

The Site is to initially be intrusively investigated, remediated and validated. Following validation the subject area is proposed for use as residential park homes. Investigations for the CoPC utilised the recent Western Australian DoH (2009) document titled *Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia*, which adopts <0.01% w/w for asbestos-containing material (ACM) in sound condition, to classify a site as uncontaminated. The 0.04% w/w investigation criteria for ACM in soil is considered applicable as the site will be residential use with limited access to soils.

Groundwater assessment guidelines are not applicable for this CoPC.

Assumptions and limitations of assessment levels

The 0.01% w/w asbestos cement in soil is the given value in the WA DoH guideline in the assessment of contaminated sites and it is uncertain if this can be extrapolated to where workers are continually working in the area. The current accepted guideline for asbestos fibres¹⁵ in soil is 0.001% asbestos w/w and the occupational exposure standard is 0.1 fibres per millilitre of air (f/mL). Scientific discussion related to having a separate guideline for asbestos cement in soil has involved the evaluation of the lower risk of asbestos cement in soil from the perspective of potential respirable asbestos fibres being released into the atmosphere.

¹⁵ Asbestos fibres include both fibrous asbestos (FA) and asbestos fines (AF) as defined by the DoH, 2009.

In applying the 0.04% w/w asbestos cement in soil, the asbestos content of the asbestos cement fragments is based on the higher concentration of 15%. This value is considered at the higher concentration value of asbestos cement products used in Australia and in some cases the asbestos in fibre cement fragments could be higher or lower than this estimate. ACM fragments in sound condition must **not** be able to pass through a 7mm by 7mm sieve to be considered applicable for the 0.04% guideline. Any ACM fragments smaller than 7mm by 7mm are considered to be asbestos fibres.

6 REMEDIATION OPTIONS

All control strategies must consider exposure risk and the most effective means to minimise the risk. Exposure risk for asbestos is a factor of:

- generation of asbestos fibres in air;
- potential receptors; and
- implemented control of parameters.

The control parameters can be determined by applying the Hierarchy of Controls. The Hierarchy of Controls refers to the preferred order of control measures for addressing health and safety risks and generally includes the following:

- elimination/substitution and process modification - controlling the hazard at source or replacing one substance or activity with a less hazardous one;
- engineering controls - installing guards on machinery, extraction systems;
- administration controls - policies and procedures for safe work practices; and
- use of personal protective equipment (PPE).

Each level of the hierarchy should be applied in a way that is appropriate to the activity and consistent with the risk assessment and each should only be considered after review of the ones above it. Most situations require several levels of the hierarchy to be used in order to adequately control the risk associated with exposure. In this way, residual risks should be dealt with by the next level of the hierarchy.

The selection of the most appropriate control options will be based on a number of factors such as exposure risks, cost, disruption to works and ongoing administrative controls. The risk of exposure from removing asbestos, for example, needs to be balanced against the long-term administrative costs of managing in-situ. The control measures used for the Site will focus on minimising long-term disturbance, restricting airborne materials and the prevention of fibre inhalation.

6.1 Remediation Hierarchy

The remediation hierarchy adopted by the DEC is based on the approach to remediation and management outlined in the ANZECC/NHMRC Guidelines for the Assessment and Management of Contaminated Sites in Australia and New Zealand (ANZECC/NHMRC, 1992) and the EPA Guidance Statement for Remediation Hierarchy for Contaminated Land (2000).

The ANZECC Guidelines provide a preferred hierarchy of options for site clean up and/or management which are as follows:

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

If the above cannot be implemented then other options that should be considered include:

- removal of contaminated soil to an approved facility, followed, where necessary, by replacement with appropriate material; or
- consolidation and isolation of the soil on-site by containment with a properly designed barrier.

If remediation is likely to cause a greater adverse effect than would occur if left undisturbed then remediation should not proceed. In cases where it is not viable to remediate large quantities of soil with low levels of contamination, alternative strategies might need to be considered or developed. The appropriateness of any particular option will vary depending on a range of local factors.

6.2 Remediation Option Review

There are a range of different management options and remediation approaches/technologies that are available for contaminated sites. Some of these remediation technologies are proven while others have not yet been successfully implemented, particularly in Australia and/or there is limited local expertise for implementation.

The remedial requirements for the Site relate to the presence of ACM contaminated soils.

The available soil remediation methods and technologies applicable to ACM from the WA DoH (2009) guideline indicated the following potential options as outlined in Table E below.

**TABLE E
COMPARISON OF REMEDIAL OPTIONS**

Management Options	Description
Management in-situ	Management in-situ comprises providing a barrier (a cap) preventing or reducing the contact between site users and the contaminated soil. This SMP needs to ensure the integrity of the cap is maintained and that any work penetrating the cap is undertaken in accordance with adequate health and safety measures and environmental controls.
Treatment on-site	Treatment on-site involves hand picking, tilling or screening the soil for ACM.
Excavation and removal off-site	Excavation and removal off-site requires the contaminated soil to be excavated and disposed of at a licensed landfill following waste controls in order to reduce the risk from transport.

A comparison of the options is provided in Table F below.

**TABLE F
ADVANTAGES AND DISADVANTAGES OF REMEDIAL OPTIONS**

Option	Advantages	Disadvantages
Management in-situ	<p>Minimal soil disturbance and therefore minimal dust generation.</p> <p>Less risk from transport of contaminated materials.</p> <p>Minimisation of the amount of sampling necessary.</p> <p>Lower initial costs.</p> <p>Minimise amount of material going to landfill.</p>	<p>Restrictions on land use and a Memorial on Title (MOT).</p> <p>Restrictions on-site excavations.</p> <p>Requirement for ongoing maintenance of cap.</p> <p>Requirement for ongoing management plan.</p> <p>Level of the Site to be raised.</p>
Treatment on-site (hand picking, tilling or screening)	<p>No requirement for ongoing management plan.</p> <p>No requirement for ongoing maintenance of cap.</p> <p>A MOT is not required.</p> <p>No further restriction of land use.</p> <p>Minimise the amount of validation sampling required.</p> <p>Minimise amount of material going to landfill.</p>	<p>Only applicable where ACM is in surface soils and well delineated.</p> <p>Some risk of dust generation.</p> <p>Only applicable where contamination includes a very small risk of free asbestos fibre bundles.</p>
Excavation and removal off-site	<p>No further restriction of land use.</p> <p>Reduced time delay for implementation.</p> <p>No requirement for ongoing management plan.</p> <p>In most cases a MOT is not required.</p> <p>No requirement for ongoing maintenance of cap.</p>	<p>Cost of disposal to landfill.</p> <p>Some risk of dust generation.</p> <p>Some risk from transport of materials.</p> <p>Use of valuable landfill space.</p>

6.3 Rationale for Selection of Preferred Remedial Strategy

With respect to the management of ACM in soil, it is generally understood that ACM (fibrocement) in 'good' condition is generally low risk hazardous material but requires specialised handling and disposal.

The Enhealth (2005) *Guidelines for the Management of Asbestos in the Non-Occupational Environment* indicate that the removal of soil contaminated with asbestos material should be considered when all other options are unsuitable as it poses the highest risk of generating airborne fibres, and the problem is relocated elsewhere. However, it may be the most appropriate strategy if enforcing any restrictions

into the future would be problematic. Proposed site activities such as intrusive contaminated site investigations warrant this approach.

The WA DoH guidelines (2009) also states that as well as being a planned method of general remediation it may also be favoured for contingency purposes. For instance once whatever form of remediation has been undertaken and development commences, if more ACM or free fibre is found, the excavation and removal from site will often be the easiest action to take, particularly for localised contamination.

The excavation and removal of the buried asbestos fibre cement impacted materials to an appropriately licensed landfill facility would address the ongoing risk from identified asbestos impacted materials. Dust minimisation strategies could be implemented for this management method. This remediation strategy is deemed suitable for this Site due to the risk posed to on-site workers from increased disturbance during the proposed excavations for the remaining park home developments.

Due to the immediate risk posed by the ACM observed sporadically across the surface of the Site, the remedial approach to ACM fragments shall be via hand-picking (e.g. 'emu-bob') by visual inspection of the soil surface and manual collection of the ACM fragments observed. Racking of the soil surface (approximately 10cm depth) is to be undertaken and a final inspection of the surface should not observe any ACM.

Based on discussions with the Client, it was assessed that the excavation and removal off-site ('dig and dump') of the asbestos impacted soil would be the preferred remedial management method for dealing with the buried ACM fragments. The ACM impacted soils will be appropriately disposed to a suitably licensed landfill facility.

Any removal of ACM shall be undertaken in accordance with NOHSC: 2002 [1988]¹⁶ and Western Australian Environmental Protection (Controlled Waste) Regulations 2004¹⁷. ACM disposal shall be in conformance with the Landfill Waste Classification and Waste Definitions 1996 (As amended) (July 2005)¹⁸. These decisions were based upon the following.

- The risk of dust produced by heavy vehicular traffic and earthwork activities generating disturbance of soil during site works is deemed high, therefore buried ACM fragments cannot be left in-situ.
- Can be implemented in a relatively short time frame.

¹⁶ NOHSC (2005) Code of Practice for the Safe Removal of Asbestos 2nd Edition [NOHSC:2002 (2005)].

¹⁷ Part 1 Reg 3(5) and Reg 3(6) make it clear that asbestos waste is not covered by the Controlled Waste Regulations apart from those provisions contained in Part 3 Division 6 and regulation 53.

¹⁸ The Landfill Waste Classification and Waste Definitions 1996 (As amended) (July 2005) defines Special Waste Type 1 as waste which includes asbestos and asbestos cement products. The definition includes (1) stabilised asbestos waste in bonded matrix (e.g. asbestos cement sheeting) and (2) Asbestos fibre and dust waste (e.g. dust resulting from the removal of thermal or acoustic insulating materials or from processes involving asbestos material, and dust from ventilation collection systems).

- It is believed the majority of surface ACM is within the surface 10cm soils of the site and therefore would visually identifiable via an emu-bob exercise.
- As portions of the Site have already been built upon it would be difficult to cover the site with a barrier to a sufficient depth (e.g. 0.5-1.0m of clean soil).
- Short-term risks generated by the disturbance of on-site ACM fragments can be minimised by utilising appropriate equipment, techniques and personal protective equipment (PPE).
- Relatively simple methodologies to implement.

Limitations

The off-site removal option would effectively manage ongoing asbestos health risk on-site, however, limitations to off-site removal include the following.

- Increased short-term risk of potentially generating airborne asbestos fibres due to the disturbance of ACM on-site; and
- Creating a potential long-term risk at the licensed asbestos landfill due to the new location of the ACM and additional load on landfill.

7 DEVELOPMENT OF SITE MANAGEMENT PLAN

A SMP involves selecting the appropriate remedial method(s) or management strategies for a site, ensuring that all relevant factors relating to the Site have been taken into consideration. The SMP is formulated on the basis of information documented in the following guidelines.

- DoH, 2009, Guidelines for the Assessment, Remediation and Management of Asbestos Contaminated Sites in Western Australia - Draft for Public Comment.
- enHealth, 2005, Management of asbestos in the non-occupational environment.
- EPA, 2000, Guidance for the Assessment of Environmental Factors: Guidance Statement for Remediation Hierarchy for Contaminated Land No. 17.
- DEP, 2001a, Development of Sampling and Analysis Programs.

This SMP should be read in conjunction with all aforementioned documents and relevant limitations.

7.1 Identification of Remedial Goals

The remedial goals for the Site are the following.

- Manage the CoPC (i.e. ACM) in a manner that is environmentally responsible, complies with statutory requirements and reduces liability.
- Safeguard personnel, occupants and the public from the potential hazards of asbestos fibres by minimising the release of dust into the atmosphere.
- Safeguard personnel, occupants and the public from the potential hazards of asbestos fibres by eliminating exposure pathways to impacted soil.
- Remove all visible ACM from the site during the remediation process.
- Segregate all visible ACM impacted material and temporarily stockpile in an appropriate manner.
- Validate the area via a systematic test pit grid at double the DEP, 2001a guideline density to ensure no visible asbestos in soil impacts remain on-site (e.g. $9,200\text{m}^2 = 42$ sample locations at double density).
- Removal of ACM contaminated soil/material to an approved facility.
- Maintain the ACM debris management plan to protect and maintain the Site into the future.

7.2 Remediation Details

Excavation of the buried ACM impacted soils will be completed to at least 30cm below and 1m beyond the likely limits of potential impacts. Care should be taken with the excavator when digging out the impacts to move forwards into the pit in a systematic method rather than dig randomly.

Due to the possibility that ACM fragments may exist on the surface of the soil both across the site and following the removal of the buried impacted soils, an 'emu-bob' of the Site will be conducted to remove any visible fragments. A superficial intrusive inspection of suspected ACM impacted areas is to be conducted such as 'raking' of the suspect areas. ACM fragments will be 'double bagged', labelled and transported to an appropriate licensed landfill facility.

Should future site activities expose any further buried suspect ACM, all materials are to be dealt with in accordance with management strategies as outlined within this SMP.

Test pitting using a systematic grid pattern at double DEP, 2001a guideline densities across the site (e.g. 42 sample locations for a 9,200m² area) and minimum of two per Lot will be implemented following the removal of impacted materials as a validation technique to determine if ACM remains both at surface and beneath the surface. Test pits are to be a minimum of 0.3m wide, 1.0m long and 0.1m into natural soils at depth. In addition to the systematic grid pattern investigation, visibly impacted or historically identifiable areas will be validated in a judgemental manner should systematic locations fail to encompass these areas.

In the event that ACM is encountered within test pits, further excavations will be undertaken in the immediate vicinity of the test pit until 'clean' soil remains and the remaining soil validated. Pit dimensions are to be recorded and ACM fragments are to be weighed to facilitate a weight for weight calculation of asbestos in soil. Where ACM fragments are considered friable, in limpet form or appear to be in poor condition, soil samples will be obtained for asbestos fibre in soil analysis.

7.2.1 Removal of Asbestos Fragments from Surface Soil

ACM fragments observed sporadically across the Site should be removed immediately via a 'hand pick' and 'raking' by qualified personnel, packaged appropriately (in accordance with Section 9) and disposed off-site to an appropriate facility licensed to accept asbestos waste, see Appendix E for appropriate waste disposal procedures.

The qualified personnel removing surface ACM should adhere to the removal of ACM debris protocols as detailed in Appendix F and wear the appropriate PPE (if required) as detailed in Appendix G.

7.2.2 Stockpiling and Transporting Asbestos Impacted Materials

The objectives of stockpiling and removing the impacted material are to:

- remove the risk or long-term exposure to asbestos fibres on-site;
- minimise the dust generated during the stockpiling and transportation process; and
- manage the impacted material appropriately off-site.

The DoH guidelines (2009) states that dust control measures should be instigated and may include the following:

- wetting of soil before disturbing it;
- using dust suppressants or covers on soil stockpiles;
- installing wind barriers;
- using sheltered areas wherever possible;
- monitoring meteorological conditions and minimising or stopping work when they are adverse (e.g. high winds);
- covering or wetting down the soil to be transported on or off-site;
- wetting down the soil and covering of truck loads;

- regulating the speed of vehicles;
- minimising access to contaminated areas, especially by vehicles; and
- implementing a community dust complaint and response system.

7.2.3 Validation

Staged Progress Reporting

Each stage of remediation and validation should record the inspection conducted and clearly document the processes (e.g. through photographs) of:

- the initial and ongoing hand-picks for ACM on the surface of the Site;
- the excavation, stockpiling and removal of inferred asbestos impacted material; and
- the test pitting across the site using a double sampling density as recommended by the minimum amount of sampling locations set out in the DEP (2001a) guideline to validate the remediation process.

All documentation should be held with this SMP for regulatory approval and future reference.

Stockpiles

Any impacted soils excavated and stored temporarily in stockpiles on the Site, in accordance with Section 9, will require validation of the surface beneath the stockpile. The validation of the temporary stockpile storage area should be documented.

7.3 Remediation Schedule

The Site Owner in conjunction with the contractor is to develop a schedule appropriate to achieve the remediation objectives.

7.3.1 Hours of Operation

To be determined by the Site Owner and contractor with consideration of on-site occupants and local surrounds.

7.3.2 Site Personnel Contact Details During Remediation

To be determined and advised by the Site Owner and contractor. A 'nominated officer' should be identified and responsible for inductions, planning, control and monitoring measures including compliance with work procedures, legislation, codes and best practice.

8 GENERAL SITE REQUIREMENTS

Activities which may present a risk of exposure of subsurface ACM and the release of airborne asbestos fibres include, but are not limited to:

- loss of cover currently on the Site due to wind or water erosion (remediation phase);
- increased heavy vehicular traffic on the Site during remediation works (remediation phase); and
- any further disturbance of the ground such as traffic, erosion, etc. (post-development phase).

8.1 Remediation Phase

The management measures used in the remediation phase should include:

- restriction of access to the Site to avoid disturbing the impacted soils;
- notification at the Site to warn workers, occupants and public of the potential risk of asbestos;
- restriction of excavator/vehicular speeds in the impacted soil area to reduce the risk of generating airborne fibres;
- intrusive activities (if any) to be conducted in accordance with Section 9;
- regular inspections of the surface of the Site for ACM, which should be removed in accordance with Section 9, Appendix E and Appendix F; and
- consideration of the items in the remediation checklist in Appendix H.

8.2 Long-Term Site Management Plan

Where suspect ACM is unearthed in the future it is recommended the material shall be managed in accordance with this SMP.

Following the implementation of the removal of all visible ACM, remedial activities and the subsequent validation of the Site, it is considered that a Long-Term Site Management Plan (LTSMP) will not be required to effectively manage any potential risk from possible remnants of ACM left in soils beneath the Site.

Where non-compliance with the SMP requirements is identified, corrective action will be implemented immediately. Corrective action may include the control measures detailed in Section 9 in addition to notification to the relevant authorities, if required.

Any clean fill brought onto the Site should be sufficiently validated as per Section 7.2.3.

It is a responsibility of the Site Owner to provide an updated copy of the SMP to all future workers involved with excavations.

8.2.1 Planned Works

Any works penetrating the surface soils are required to be referred to the Site Owner with considerations to managing impacted soils, prior to commencement. The management control procedures in Section 9 should be referred to and discussed with a focus on PPE, dust control and correct asbestos waste disposal as detailed within Appendices E, F and G of this SMP.

8.2.2 Inadvertent Exposure

Accidental or inadvertent exposure of materials potentially containing asbestos should be immediately reported to the Site Owner and incident response procedures implemented. If soils potentially containing ACM have been excavated or encountered then PPE, dust control and correct asbestos waste disposal procedures should be implemented in accordance with Section 9 and Appendices E, F and G of this SMP.

9 MANAGEMENT CONTROL PROCEDURES

9.1 Site Management and Work Control Procedures

Where a fragment of suspect ACM is uncovered or when there is deemed to be an increased risk of exposure to workers, the site management procedures detailed below shall be implemented.

9.1.1 Plans

The method of works should be pre-planned so that risks to workers, occupants and the public can be assessed and minimised. Appropriate site preparations may include the creation of a Safe Work Method Statement (SWMS), Health and Safety Plan (HSP) and Environmental Management Plan (EMP).

The SWMS should discuss the objectives and order of the works, the equipment and procedures to be adopted and the potential for exposure.

The HSP should include as a minimum the supply of appropriate PPE for personnel undertaking the work (including respirators/dust masks), dust control measures (i.e. water sprays) and take into consideration the health risks associated with a hazard.

The EMP should include soil, water, waste, noise and dust management, monitoring and emergency response.

9.1.2 Site Induction

Prior to intrusive works on the Site, all personnel involved with site works shall be given a Site Induction by a suitably qualified person or as a minimum have read and understood this SMP and the associated risks at the Site.

9.1.3 Access

The work site should be cordoned off if there is a risk to the non-designated workers from entering the Site. This may involve restricting access to the entire Site or sections of it deemed to be a risk. As a minimum unauthorised personnel must be restricted from entering the boundaries of the intrusive work area, temporary ACM stockpiles and ACM disposal bins. These areas should be clearly defined and contain warning signs to indicate asbestos works. All barriers and warning signs are to remain in place until intrusive works have been completed and all ACM has been removed off-site.

Where possible, the number of personnel working in an impacted area should be kept to a minimum.

9.1.4 Personal Protective Equipment

All personnel working in a risk area must wear the appropriate PPE. Appropriate PPE is to be worn, as outlined in Appendix G, in situations in which there is a risk of exposure to asbestos fibres. As a minimum this would include a P2 dust mask. The wearing of the disposable coveralls is considered discretionary at this Site.

Used disposable PPE shall be disposed of within plastic bags as described in Section 9.

9.1.5 Dust Control

Dust control should act to minimise dust creation and its movement off-site. For the intention of dust control the following measures should be implemented if feasible:

- wetting down ACM soils where safe to do so;
- constant wetting down and/or coverage of temporary ACM stockpiles;
- covering or wetting down the soil to be transported on or off-site;
- regulating the speed of vehicles on-site to minimise disturbance;
- minimising access to contaminated areas, especially by vehicles;
- monitoring meteorological conditions and halting works if adverse weather conditions are predicted;
- the placement of wind barriers; and
- the creation of an enclosed space for excavations in or around the impacted works area.

9.1.6 Stormwater Management

Stormwater on-site should be directed away from impacted areas to minimise the potential for fibres to migrate off-site.

9.1.7 Encountering ACM in Soils

As far as practicable any encountered ACM should be removed intact, minimising breakage. Should breakage occur, all fragments are to be collected for disposal. Unnecessary breaking or abrasion of ACM shall not be permitted.

Appropriate removal of ACM in soils shall be conducted in accordance with Section 9 and Appendix F.

9.1.8 Asbestos Waste Disposal

The transport and disposal of asbestos waste must comply with the relevant legislation. Any removal of ACM shall be undertaken in accordance with NOHSC: 2002 [1988]) and Western Australian Environmental Protection (Controlled Waste) Regulations 2004. ACM disposal shall be in conformance with the Landfill Waste Classification and Waste Definitions 1996 (As amended) (July 2005). Approval for transport of waste is required in most jurisdictions.

Any encountered asbestos waste material shall be placed in heavy duty 0.2mm (minimum thickness) clear plastic bags. These bags shall be labelled with an appropriate warning to the effect that the bag contains asbestos and that dust creation and inhalation of dust shall be avoided. Bags shall be twisted tightly, folded over and the neck secured in the folded position with wire ties, adhesive tape, or any other effective method.

In cases where the asbestos contamination cannot be isolated, appropriate measures should be taken to minimise the generation of airborne fibres during the transfer, packaging, transport and disposal of the waste. Asbestos should be transported in a covered, leak-proof or lined vehicle to prevent any release of airborne fibres. Any vehicle used to transport asbestos should be cleaned before leaving the site at which asbestos material is removed from the vehicle to avoid transportation of contamination.

Disposal will be to a recognised hazardous waste disposal site (approved/licensed landfill site). Disposal at the Site shall not be permitted. A disposal receipt is to be supplied to the Site Owner for documentation purposes. Further asbestos waste disposal details are stated in Appendix E.

9.1.9 Stockpiles

Stockpiles of asbestos impacted material must be clearly labelled as such and covered to minimise dust generation.

It is a requirement that stockpiles of potentially contaminated soils:

- are temporary;
- be covered and/or wet down to minimise dust generation;
- signs erected clearly labelling it as ACM; and
- follow the correct waste disposal procedures, as detailed in Section 9.

9.1.10 Community Consultation

A Community Consultation Plan (CCP) should be considered for the remediation and ongoing management of the Site. At a minimum the current site occupants should be notified of the status of the Site and any planned remedial works.

9.1.11 Air Monitoring

Air monitoring is not normally required when dealing with asbestos cement products in 'good' condition, as the material is stable and fibres are unlikely to become airborne, however, on-site air monitoring should be considered if the risk to workers and/or occupants is deemed high.

Also it should be noted that asbestos air sampling can also help provide confidence in dust control measures, can be used to allay community concerns in sensitive situations and may also be necessary for occupational purposes.

If required for public health reasons, then para-occupational sampling is considered the most practical method for the evaluation of airborne asbestos at contaminated sites. Suitable guidance on relevant sampling and assessment strategies is provided by the enHealth asbestos guidelines (2005, Appendix II, page 49). DoH also supports the enHealth advice that "dust levels should remain sufficiently low for measured asbestos concentrations to be below the practical lower detection limit of 0.01f/mL".

Air sampling results should not be used to support conclusions that asbestos fibre release from impacted soils has not occurred or to justify the use of less stringent site management measures.

Air monitoring information is detailed in Appendix I.

9.1.12 Emergency and Incident Response

Emergency situations may include a truck rollover while transporting ACM impacted soil to landfill, strong winds or rain which accelerates surface erosion or any other accidental spillage of ACM.

An asbestos material 'incident' will typically involve the discovery or dislodgment of asbestos materials that do not pose an immediate threat of asbestos fibre being inhaled.

Emergency and incident response entails restriction of access to the area, notification to the Site Owner and implementation of management procedures as detailed in Appendix J.

9.1.13 Noise Control

Best practice noise management principles and practices shall be implemented on-site during remediation activities, in accordance with AS2436-1981 *Guide to Noise Control on Construction, Maintenance and Demolition Sites* and Environmental Protection (Noise) Regulations 1997.

9.1.14 Odour Control

There should be no potential for odours to be generated during the removal of asbestos material or the development process.

9.1.15 Roads, Traffic and Transport Networks

Traffic disruption in and around the inferred impacted area shall be kept to a minimum. Expected traffic on-site may include trucks and excavators to manoeuvre soils and debris around the Site. Contractors and other site workers shall park off-site in a safe and legal manner.

9.2 Contingency

Table G explains the triggers, management and consequential actions of impacts that may occur at the Site during remediation or development processes.

TABLE G
TRIGGERS, MANAGEMENT AND CONSEQUENT ACTIONS OF IMPACTS

Trigger	Type of impact	Management		Consequent Actions
		HLV	Contractor	
Site Supervisor observes while on-site.	<ul style="list-style-type: none"> - Dust¹⁹ - Noise²⁰ - Traffic²¹ - Odour²² 	Cease operations, record date and time of incident for future reference.	Cease operations, record date and time of incident for future reference.	<p>Review operations to mitigate impacts generated.</p> <p>Contractor communicates with HLV contact for significant²³ impacts.</p>
Occupant or public - complaint - during on-site operations.	<ul style="list-style-type: none"> - Ground Vibration²⁴ 	<p>Obtain full details from caller and log.</p> <p>Immediately contact Site Supervisor to assess impacts.</p>	<p>Review impacts from current activities.</p> <p>Cease or modify current operations to reduce impacts, if necessary.</p>	HLV contact to respond to complainant and log response.

¹⁹ As per the *Land development sites and impacts on air quality (1996)* guideline states, “if visible dust is crossing the property boundary the potential for adverse dust impacts exists and control measures should be implemented”. Site Supervisor will monitor.

²⁰ If the Site Supervisor is required to speak loudly at the perimeter of the fence in order to be heard this is deemed to be excessive noise.

²¹ Excessive vehicle movement - as determined by the Site Supervisor.

²² Objectionable odour at perimeter of fence - as determined by the Site Supervisor.

²³ Significant impacts are deemed to be in regard to sensitive receptors e.g. Residences.

²⁴ Excessive ground vibrations at perimeter of fence - as determined by the Site Supervisor.

TABLE G
TRIGGERS, MANAGEMENT AND CONSEQUENT ACTIONS OF IMPACTS

Trigger	Type of impact	Management		Consequent Actions
		HLV	Contractor	
Occupant or public - complaint - after hours.	- Wastes ²⁵ - Other ²⁶	HLV contact will review all after hours messages the following working day. Obtain full details and log. If deemed urgent contact Site Supervisor.	Review impacts from previous activities. Cease or modify future operations to reduce impacts, if necessary.	HLV to contact complainant detailing action taken, if any, and log response.
Occupant or public - general enquiry/concern.	No specific impact	Obtain full details and log. HLV contact to discuss concerns with enquirer.	NA.	Implement changes to operations, if necessary, and log.

If there are an excessive number of complaints recorded during remediation or development activities, HLV may have to inform the DEC and revise the current SMP.

²⁵ The loss of liquid or solid waste containment - as determined by the Site Supervisor. Any impacted soils must be dealt with as per SMP.

²⁶ Can be a perception of a negative impact which may not be measurable or have guidelines or standards to determine.

10 CONCLUSION AND RECOMMENDATIONS

10.1 Remedial Measures

It was assessed that an emu-bob of the surface of the entire Site, removal of all buried ACM impacted soils (i.e. dig and dump) and disposal to an approved designated asbestos landfill and the subsequent validation of the inferred impacted areas along with the ongoing management of random ACM fragments are the preferred remedial methods.

Due to the nature of the park home development, it is assessed that the removal of impacted material will result in the Site being suitable for the remainder of the required development works. Notwithstanding the above, where suspect ACM is unearthed in the future then this material shall be managed in accordance with this SMP.

It is a responsibility of the Site Owner to provide an updated copy of the SMP to all occupiers/workers and contractors until the Site is considered 'safe'.

Where non-compliance with the SMP requirements is identified, corrective action will be implemented immediately. Corrective action may include control measures in addition to notification to the relevant authorities, if required.

<p>The findings of this report should be read in the context of the statement of limitations attached to this report.</p>

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Water and Rivers Commission (2004) Perth Groundwater Atlas, Second Edition. Perth: Department of Environment, December 2004.

12 STATEMENT OF LIMITATIONS

(please refer over the page)

Important information about your **Coffey** Environmental Report

Uncertainties as to what lies below the ground on potentially contaminated sites can lead to remediation costs blow outs, reduction in the value of the land and to delays in the redevelopment of land. These uncertainties are an inherent part of dealing with land contamination. The following notes have been prepared by Coffey to help you interpret and understand the limitations of your report.

Your report has been written for a specific purpose

Your report has been developed on the basis of a specific purpose as understood by Coffey and applies only to the site or area investigated. For example, the purpose of your report may be:

- To assess the environmental effects of an on-going operation.
- To provide due diligence on behalf of a property vendor.
- To provide due diligence on behalf of a property purchaser.
- To provide information related to redevelopment of the site due to a proposed change in use, for example, industrial use to a residential use.
- To assess the existing baseline environmental, and sometimes geological and hydrological conditions or constraints of a site prior to an activity which may alter the sites environmental, geological or hydrological condition.

For each purpose, a specific approach to the assessment of potential soil and groundwater contamination is required. In most cases, a key objective is to identify, and if possible, quantify risks that both recognised and unrecognised contamination pose to the proposed activity. Such risks may be both financial (for example, clean up costs or limitations to the site use) and physical (for example, potential health risks to users of the site or the general public).

Scope of Investigations

The work was conducted, and the report has been prepared, in response to specific instructions from the client to whom this report is addressed, within practical time and budgetary constraints, and in reliance on certain data and information made available to Coffey. The analyses, evaluations, opinions and conclusions presented in this report are based on those instructions, requirements, data or information, and they could change if such instructions etc. are in fact inaccurate or incomplete.

Subsurface conditions can change

Subsurface conditions are created by natural processes and the activity of man and may change with time. For example, groundwater levels can vary with time, fill may be placed on a site and pollutants may migrate with time. Because a report is based on conditions which existed at the time of the subsurface exploration, decisions should not be based on a report whose adequacy may have been affected by time. Consult Coffey to be advised how time may have impacted on the project and/or on the property.

Interpretation of factual data

Environmental site assessments identify actual subsurface conditions only at those points where samples are taken and when they are taken. Data derived from indirect field measurements and sometimes other reports on the site are interpreted by geologists, engineers or scientists to provide an opinion about overall site conditions, their likely impact with respect to the report purpose and recommended actions. Actual conditions may differ from those inferred to exist, because no professional, no matter how well qualified, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than assumed based on the facts obtained. Nothing can be done to change the actual site conditions which exist, but steps can be taken to reduce the impact of unexpected conditions. For this reason, parties involved with land acquisition, management and/or redevelopment should retain the services of Coffey through the development and use of the site to identify variances, conduct additional tests if required, and recommend solutions to unexpected conditions or other problems encountered on site.

Important information about your **Coffey** Environmental Report

Your report will only give preliminary recommendations

Your report is based on the assumption that the site conditions as revealed through selective point sampling are indicative of actual conditions throughout an area. This assumption cannot be substantiated until project implementation has commenced and therefore your report recommendations can only be regarded as preliminary. Only Coffey, who prepared the report, is fully familiar with the background information needed to assess whether or not the report's recommendations are valid and whether or not changes should be considered with redevelopment or on-going use of the site. If another party undertakes the implementation of the recommendations of this report there is a risk that the report will be misinterpreted and Coffey cannot be held responsible for such misinterpretation.

Your report is prepared for specific purposes and persons

To avoid misuse of the information contained in your report it is recommended that you confer with Coffey before passing your report on to another party who may not be familiar with the background and the purpose of the report. In particular, a due diligence report for a property vendor may not be suitable for satisfying the needs of a purchaser. Your report should not be applied for any purpose other than that originally specified at the time the report was issued.

Interpretation by other professionals

Costly problems can occur when other professionals develop their plans based on misinterpretations of a report. To help avoid misinterpretations, retain Coffey to work with other professionals who are affected by the report. Have Coffey explain the report implications to professionals affected by them and then review plans and specifications produced to see how they have incorporated the report findings.

Data should not be separated from the report

The report as a whole presents the findings of the site assessment and the report should not be copied in part or altered in any way. Logs, figures, laboratory data, drawings, etc. are customarily included in our reports and are developed by scientists, engineers or geologists based on their interpretation of field logs (assembled by field personnel), field testing and laboratory evaluation of field samples. This information should not under any circumstances be redrawn for inclusion in other documents or separated from the report in any way.

Contact Coffey for additional assistance

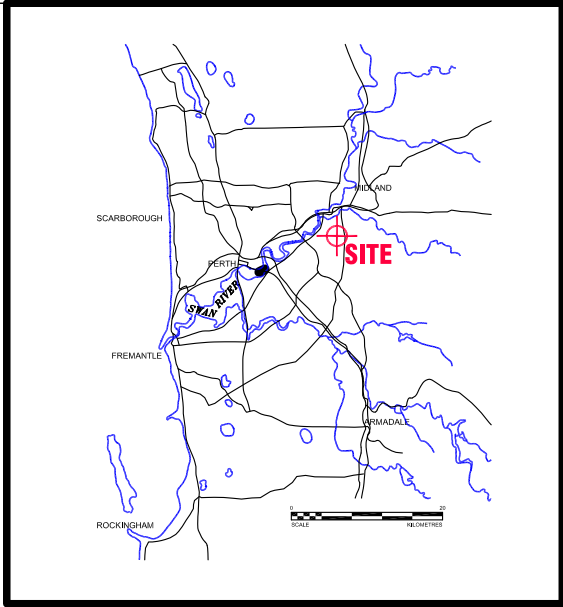
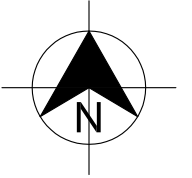
Coffey is familiar with a variety of techniques and approaches that can be used to help reduce risks for all parties to land development and land use. It is common that not all approaches will be necessarily dealt with in your environmental site assessment report due to concepts proposed at that time. As a project progresses through planning and design toward construction and/or maintenance, speak with Coffey to develop alternative approaches to problems that may be of genuine benefit both in time and cost.

Responsibility

Environmental reporting relies on interpretation of factual information based on judgement and opinion and has a level of uncertainty attached to it, which is far less exact than other design disciplines. This has often resulted in claims being lodged against consultants, which are unfounded. To help prevent this problem, a number of clauses have been developed for use in contracts, reports and other documents. Responsibility clauses do not transfer appropriate liabilities from Coffey to other parties but are included to identify where Coffey's responsibilities begin and end. Their use is intended to help all parties involved to recognise their individual responsibilities. Read all documents from Coffey closely and do not hesitate to ask any questions you may have.

Figures

**Asbestos In Soil, Site Management Plan,
Hillview Lifestyle Village, High Wycombe**



GENERAL AREA MAP



LOCAL AREA MAP

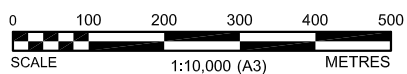
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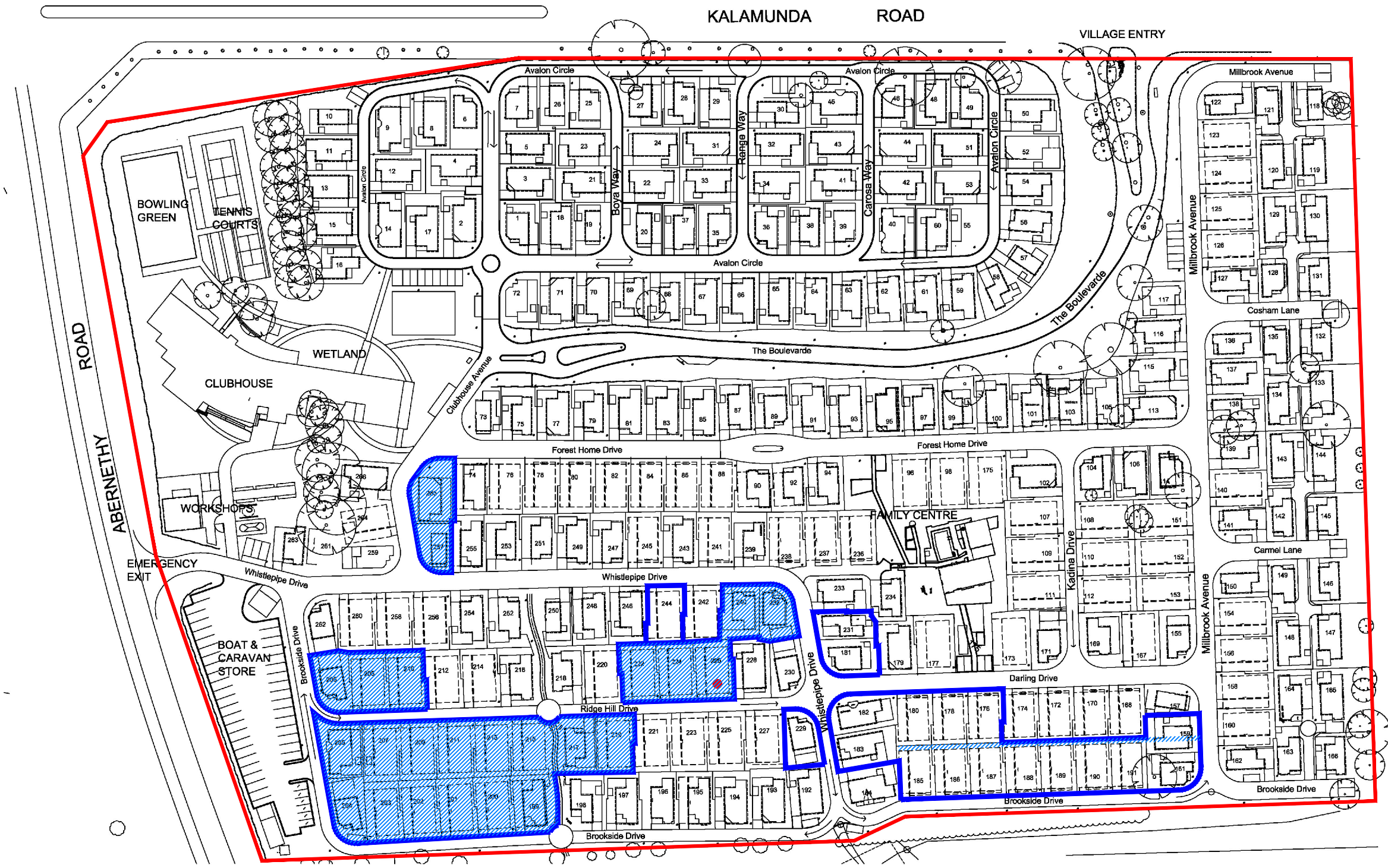
Drawing Title:
REGIONAL LOCATION

		Suite 2 53 Burswood Rd Burswood, WA 6100 Ph: (08) 9355 7100 Fax: (08) 9355 7111	
Rev	Date	Revision Details	Drn
A	26.06.09	SMP ISSUE	LZ

Client:	NATIONAL LIFESTYLE VILLAGES
Project:	SITE MANAGEMENT PLAN ASBESTOS IN SOIL HILLVIEW LIFESTYLE VILLAGE
Location:	597 (LOT 100) KALAMUNDA ROAD HIGH WYCOMBE, WESTERN AUSTRALIA

Drawn	Date
LZ	26.06.09
Project - Drawing No.	Figure No.
ENVIPERT00855AA-D01	1
	Rev.
	A





EXISTING GREEN TITLE LOTS

LEGEND

- 597 (LOT 100) KALAMUNDA ROAD - SITE BOUNDARY
- INSPECTED SITE BOUNDARIES
- SUSPECT ACM OBSERVED ON SURFACE SOILS
- BURIED - SUSPECT ACM OBSERVED

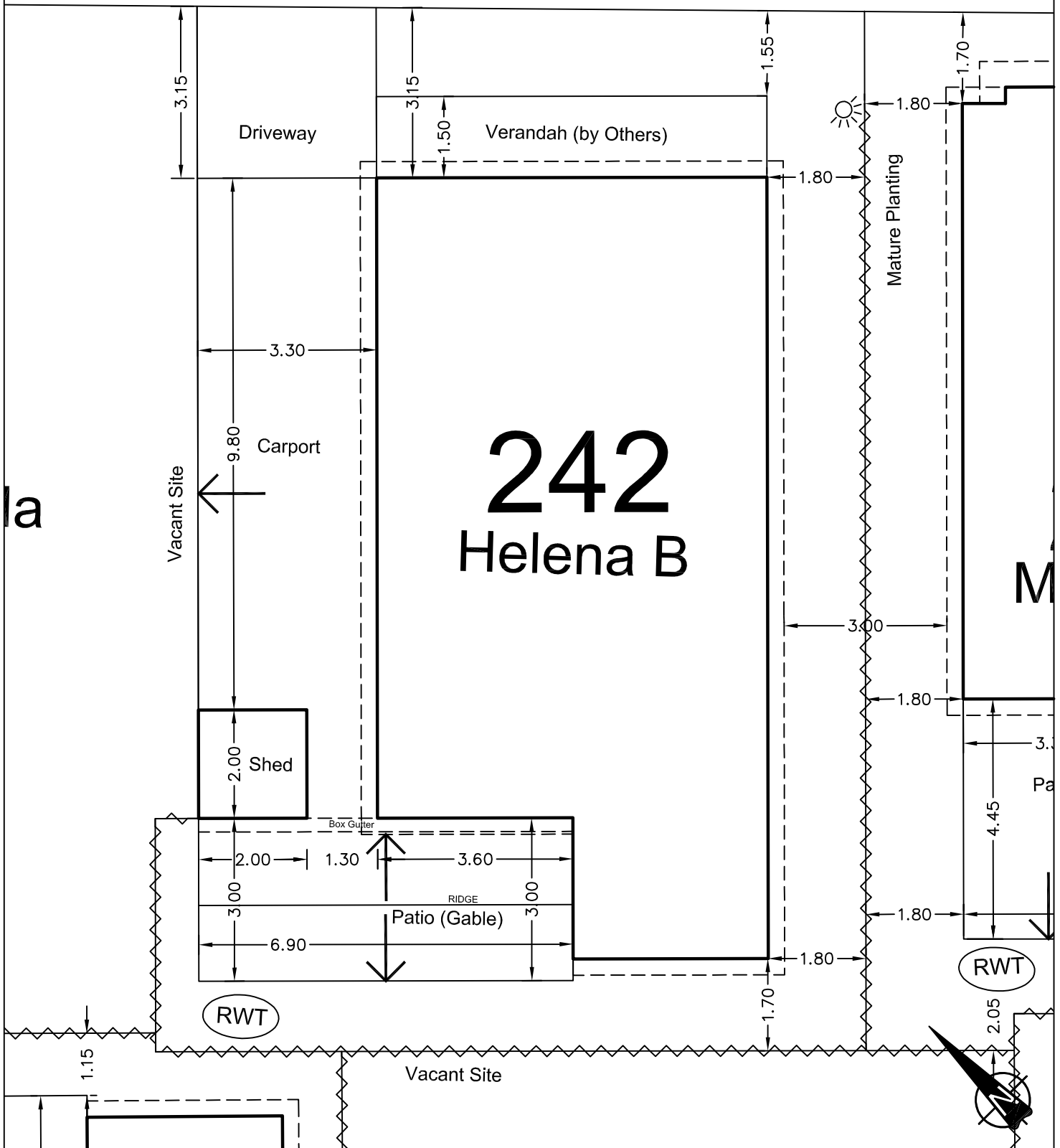
NOTE: ALL REMAINING LOTS NOT OUTLINED HAVE AN EXISTING DWELLING OR HAVE BEEN PREPARED FOR A DWELLING

<p style="font-size: 8px; margin-top: 5px;">Suite 2 53 Burswood Rd Burswood, WA 6100 Ph: (08) 9355 7100 Fax: (08) 9355 7111</p>	Client:	Project:	Drawing Title:						
	NATIONAL LIFESTYLE VILLAGES	SITE MANAGEMENT PLAN ASBESTOS IN SOIL HILLVIEW LIFESTYLE VILLAGE	SITE DETAILS PLAN						
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A	26.06.09	SMP ISSUE							
Rev	Date	Revision Details							
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LZ	26.06.09	Figure No.							
SCALE	1:1500 (A3)	METRES							

Appendix A: Site Features and Lot Layout Plans

**Asbestos In Soil, Site Management Plan,
Hillview Lifestyle Village, High Wycombe**

Whistlepipe Drive



FINAL SITE PLAN

Lot Number 242	Client Petersen	House Type Helena B	Road Name Whistlepipe Drive	Sales Person RN
--------------------------	---------------------------	-------------------------------	---------------------------------------	---------------------------

Date **30.01.2009**
 Scale **1:100**
 Drawn By **RC/BLO**

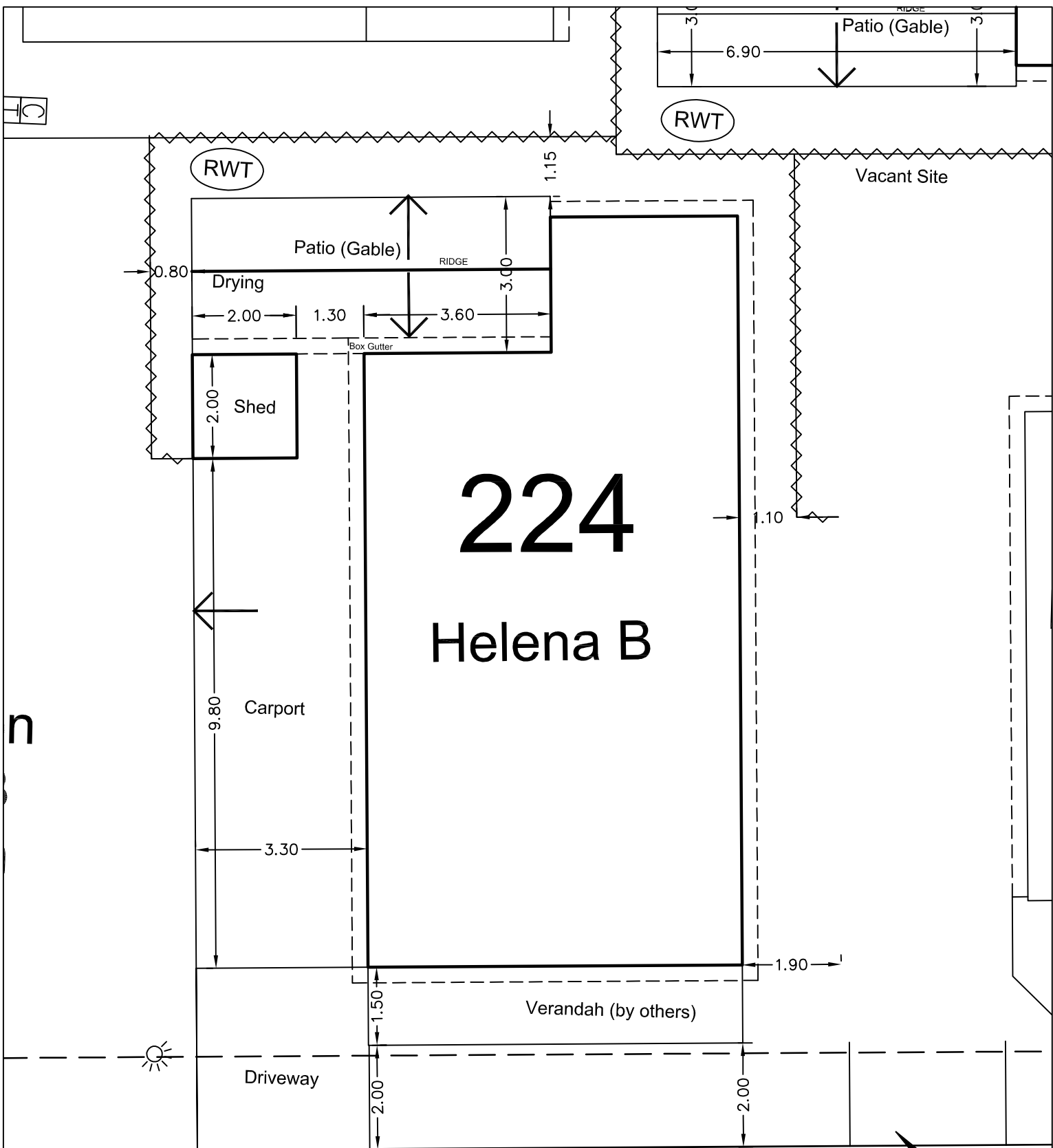
Covered Area Total: 70.40m ²	Rev	Date	Description
	A	30/01/09	PATIO ROOF CHANGED TO GABLE
Comm/Pit & Power Dome			
Light Bollard			
Fire Hydrant			

Req. **BLO**

National Lifestyle Villages

Hillview - High Wycombe

Please note: All efforts have been made to ensure the accuracy of this drawing. However some dimensions in relation to boundary's may change due to construction constraints.



Ridge Hill Drive

INITIAL SITE PLAN

Lot Number 224	Client FLINT	House Type Helena B	Road Name Ridge Hill Drive	Sales Person PW	Date 30.01.2009
					Scale 1:100
					Drawn By HAZ

Covered Area Total: 70.4m ²	Rev	Date	Description	Req.
	X	XX/XX/XX	XXXX	XX
Comm/Pit & Power Dome				
Light Bollard				
Fire Hydrant				

Please note: All efforts have been made to ensure the accuracy of this drawing. However some dimensions in relation to boundary's may change due to construction constraints.

Appendix B: Certificate of Title

**Asbestos In Soil, Site Management Plan,
Hillview Lifestyle Village, High Wycombe**

WESTERN



AUSTRALIA

REGISTER NUMBER 100/DP59834	
DUPLICATE EDITION N/A	DATE DUPLICATE ISSUED N/A

RECORD OF CERTIFICATE OF TITLE
UNDER THE TRANSFER OF LAND ACT 1893

VOLUME 2717 FOLIO 368

The person described in the first schedule is the registered proprietor of an estate in fee simple in the land described below subject to the reservations, conditions and depth limit contained in the original grant (if a grant issued) and to the limitations, interests, encumbrances and notifications shown in the second schedule.

R. Roberts



REGISTRAR OF TITLES

LAND DESCRIPTION:

LOT 100 ON DEPOSITED PLAN 59834

REGISTERED PROPRIETOR:
(FIRST SCHEDULE)

HILLVIEW LIFESTYLE VILLAGE PTY LTD OF LEVEL 1, 22 EASTBROOK TERRACE, EAST PERTH
(AF K928498) REGISTERED 2 JUNE 2009

LIMITATIONS, INTERESTS, ENCUMBRANCES AND NOTIFICATIONS:
(SECOND SCHEDULE)

1. *J875304 NOTIFICATION CONTAINS FACTORS AFFECTING THE WITHIN LAND. LODGED 16.8.2006.
2. *K425984 MORTGAGE TO COMMONWEALTH BANK OF AUSTRALIA REGISTERED 27.11.2007.
3. *K592378 CAVEAT BY TERENCE DAVID ALBERT IZZARD, CARMELA JOSEPHINE IZZARD AS TO PORTION ONLY LODGED 12.5.2008.

Warning: A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required.
* Any entries preceded by an asterisk may not appear on the current edition of the duplicate certificate of title.
Lot as described in the land description may be a lot or location.

-----END OF CERTIFICATE OF TITLE-----

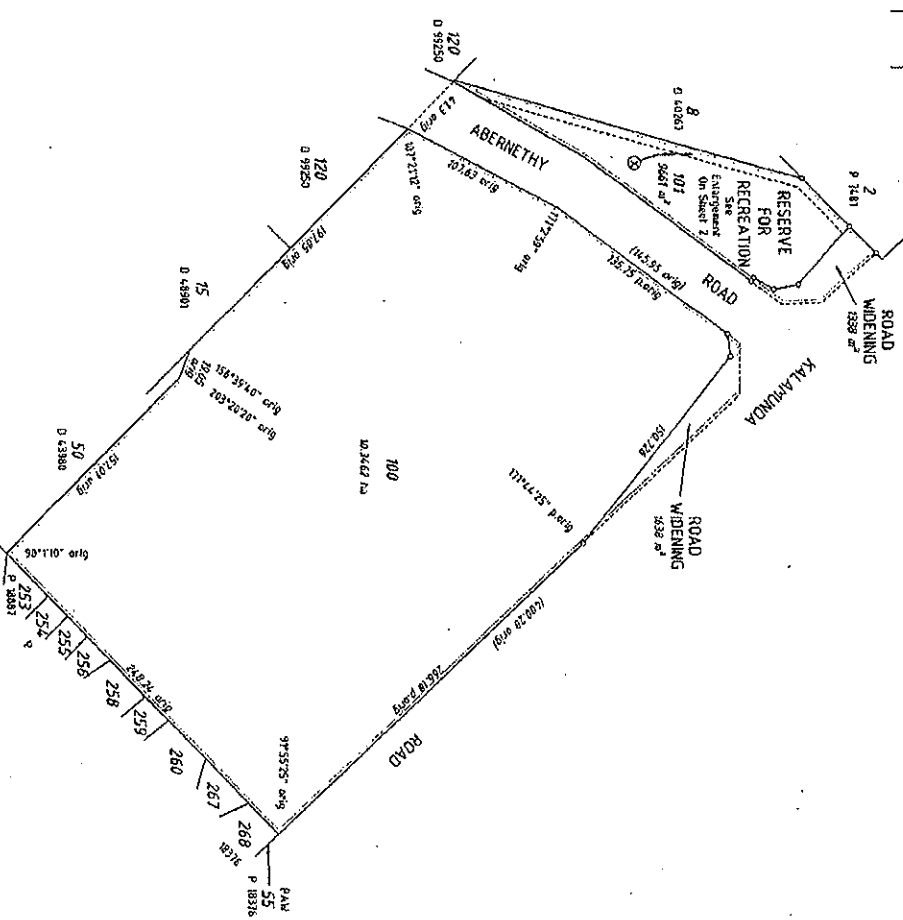
STATEMENTS:

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents or for local government, legal, surveying or other professional advice.

SKETCH OF LAND: DP59834 [SHEET 1].
PREVIOUS TITLE: 2183-882.
PROPERTY STREET ADDRESS: NO STREET ADDRESS INFORMATION AVAILABLE.
LOCAL GOVERNMENT AREA: SHIRE OF KALAMUNDA.

NOTE 1: DUPLICATE CERTIFICATE OF TITLE NOT ISSUED AS REQUESTED BY DEALING K425984

VERSION	AVAILABILITY	APPROVED BY	DATE
2	AUDIT REQUIREMENTS	E. HORSUM	8-12-08



SUBJECT	PURPOSE	STATUTORY REFERENCE	ORGAN	LAND BOUNDARY	BEHNFIT TO	COMMENTS
LOT 100	RESERVE FOR RECREATION	SEC 152 OF THE PDA ACT	THIS PLAN	LOT 101	SITE DOCUMENT	NO CHANGE & INCREASE OF THE SUBJECT'S AREA

INTERESTS AND NOTIFICATIONS

SCALE 1:2000 @ A2
 ALL DISTANCES ARE IN METRES

TYPE	FREEHOLD
PURPOSE	SUBDIVISION
PLAN OF	LOTS 100, 101 AND ROAD WIDENINGS
DISTRICT	SWAN
TOWNSHIP	SSA - NO
FILE	ESSEX, JAMES
LOCALITY	LOT 5
LOCAL AUTHORITY	D 34078
SHIRE OF KALAMUNDIA	CT 2187/802
WORK	ESUD, BODOS
DATE	06/04/01 2121
SCALE	1:2000 @ A2
THE STATEMENT OF THE REGISTERED SURVEYOR'S CERTIFICATE - REG 54	
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Printed by
Landgate
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 Perth WA 6150
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DP 59834 (01)

59834
 DEPOSITED PLAN
 ORIGINAL 2 SHEETS
 SHEET 1 OF 2

A2 ORIGINAL

Appendix C: Asbestos in Soil Risk Assessment Discussion

**Asbestos In Soil, Site Management Plan,
Hillview Lifestyle Village, High Wycombe**

ASBESTOS IN SOIL RISK ASSESSMENT DISCUSSION

Asbestos Cement in Soil Guidelines - WA

The definition of asbestos under WA Health (Asbestos) Regulations 1992 Reg 5.42 is:

"...the fibrous form of mineral silicates belonging to the serpentine and amphibole groups of rock forming minerals and includes actinolite, amosite (brown asbestos), anthophyllite, crocidolite (blue asbestos), chrysotile (white asbestos), tremolite, or any material containing one or more of those materials".

There are two main types of asbestos as detailed below.

- The serpentine fibre has a curved or wavy appearance (snake-like) and is more likely to break into long and thin particles. Almost 90 % of asbestos that occurs today belongs to this type. Chrysotile or white asbestos is a kind of serpentine. Chrysotile (white asbestos), which was used mainly for the manufacture of packing and friction materials such as brake and clutch linings, has been banned since the 31 December 2003. White asbestos use in fibre cement was phased out in Australia in 1989.
- The amphibole fibres are straight and long and they include amosite (brown asbestos), crocidolite (blue asbestos), actinolite and anthophyllite. The use of amosite (brown asbestos) and crocidolite (blue asbestos) was banned in Australia in the mid 1980s. Blue asbestos use in fibre cement was phased out in Australia in 1967 and brown in 1984.

In general, asbestos-cement¹ products contain a high percentage of chrysotile² asbestos, with considerably less amosite³ asbestos, and occasionally crocidolite⁴ asbestos.

The enHealth document – *Management of Asbestos in the Non-occupational Environment (2005)* provides a useful summary of asbestos in soil issues and is referred to by the WA Department of Health.

The risk assessment for asbestos should include consideration of:

- the location and condition of the asbestos;
- the type (e.g. cement sheet, vinyl tiles);
- if it is friable or non-friable;

¹ Asbestos cement is predominantly a mixture of cement and asbestos which when in a dry state has a density greater than 1tonne per cubic metre (1000 kg/m³). It is a light grey and hard material, which generally contains 2% - 15% asbestos fibre, but can occasionally contain up to 40% in a bound matrix of Portland cement or autoclaved calcium silicate.

² Chrysotile or white asbestos is a member of the Serpentine mineral group and when airborne, an occupational exposure standard of 0.1 fibres per millilitre of air (fibres/mL) sampled applies.

³ Amosite or brown asbestos is a member of the Amphibole mineral group and has an occupational exposure standard of 0.1 fibres/mL.

⁴ Crocidolite or blue asbestos is a member of the Amphibole mineral group and has an occupational exposure standard of 0.1 fibres/mL.

- if the asbestos is liable to further damage or deterioration;
- if there are any inaccessible areas that are likely to contain asbestos;
- the likelihood of possible exposure; and
- if the nature or location of any work to be carried out is likely to disturb the asbestos.

The health risk from asbestos cement relates to the release of asbestos fibres into the air and these fibres being respired.

Imray and Neville (1993) suggested a level of <0.001% asbestos w/w (or 10 mg/kg) in soil to classify a site as uncontaminated, but they also argued that **buried asbestos does not pose a human health risk, as risk relates to the potential to generate airborne respirable asbestos fibres**⁵.

The NSW Australian Contaminated Land Consultants Association (ACLCA, 2001) proposed a level of 0.01% w/w asbestos fibres in soil. In contrast, the United States Environmental Protection Authority (USEPA) use higher clean-up levels of 0.25% to 1.0% w/w. The Victorian Occupational Health Safety (asbestos) Regulations 2003 has adopted a conservative approach of 0.001 % w/w limit for construction materials that contain asbestos.

The Western Australian Department of Health (DoH) document (2009) *Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia* adopts a criteria of <0.01% w/w for asbestos-containing materials (ACM) in sound condition to classify a the most sensitive landuse as uncontaminated. The guideline specifies investigation criteria of 0.001% asbestos in soil w/w for free fibre materials such as fibrous asbestos, free fibre and ACM fragments less than 7mm by 7mm (DoH, 2009). The DoH has specified different levels of investigation criteria based on proposed land use and the nature of asbestos contamination as summarised in Table A.

Table A: DoH Asbestos in Soil Investigation Criteria

DoH Investigation Criteria	Nature of Asbestos Contamination	Proposed Land Use of site
0.001% w/w	Fibrous Asbestos (FA), Asbestos Fines (AF), severely weathered ACM or ACM fragments <7mm x 7mm.	All land uses
0.01% w/w	ACM (>7mm x 7mm)	Residential use, day care centres, preschools etc.
0.04% w/w	ACM (>7mm x 7mm)	Residential, minimal soil access
0.02% w/w	ACM (>7mm x 7mm)	Parks, public open space, playing fields etc.
0.05% w/w	ACM (>7mm x 7mm)	Commercial / Industrial

Source: DoH, 2009.

⁵ Shape and size influence respirability of airborne asbestos fibres. Fibres >8 µm long and <0.25 µm diameter and with an aspect ratio of ≥10, are considered the most dangerous. Fibres between 20 and 100 µm in length tend to be more carcinogenic. Fibres >100 µm are not considered respirable.

Scientific discussion related to having a separate guideline for asbestos cement in soil has involved the evaluation of the lower risk of asbestos cement in soil from the perspective of potential respirable asbestos fibres being released into the atmosphere.

Asbestos Classifications

The WA DoH has three classifications for the nature of asbestos contamination on sites as presented in Table B.

Table B: DoH Nature of Asbestos Classifications

Nature of Asbestos Contamination	Definition	Examples
Asbestos-Containing Material (ACM)	In sound condition Asbestos is bound in a matrix Fragments >7mm by 7mm	Asbestos fencing, vinyl tiles, roof tiles, electrical switchboards
Fibrous Asbestos (FA)	Friable asbestos material which can be broken or crumbled by hand pressure. Loose fibrous material	Severely weathered ACM Non-bonded asbestos fabric Insulation products
Asbestos Fines (AF)	Free fibres of asbestos ACM fragments <7mm by 7mm	Asbestos free fibres, small fibre bundles

Source: DoH, 2009.

Human Health Issues

Asbestos is a carcinogenic substance. Health risks arise from the inhalation⁶ of asbestos fibres into the lungs. Larger fibres are usually cleared by normal physiological processes but smaller fibres (less than 3 microns) may cause serious health effects, such as asbestosis, mesothelioma, lung cancer and pleural disease, which can take up to fifty years to develop. The risk is greater with increased exposure and even minor exposures can have serious health effects.

Asbestos is a carcinogenic substance i.e. known to cause cancer. Health risks arise from the inhalation of asbestos fibres into the lungs. Larger fibres are usually cleared by normal physiological processes but smaller fibres (less than 3 microns in width) may cause serious health effects, such as asbestosis, mesothelioma, lung cancer and pleural disease that can take up to fifty years to develop. The risk is greater with increased levels of exposure and also on a cumulative basis on different occasions.

There are four major health effects caused by exposure to asbestos:

Asbestosis

Asbestosis is a chronic chest disease that is caused by inhalation of high concentrations of asbestos fibres. The condition can develop 10 to 20 years after initial exposure. Asbestos fibres initially damage cell membranes in the lungs. As a result, the lung tissue becomes hardened and forms scars (fibrosis). In the initial stages, asbestos-related fibrosis is mostly in the outer lung tissues. As the disease progresses, fibrosis becomes widespread throughout the lung. The hardening lung tissue restricts

⁶ The former term "respirable" fibres, has now been replaced by "thoracic" fibres. Thoracic fibres are those capable of reaching any part of the respiratory system below the larynx.

oxygen intake, making breathing difficult. Fibrosis also lessens the lungs' ability to process oxygen and remove carbon dioxide waste. This is known as restrictive lung disease as it reduces the total lung capacity. A person suffering from asbestosis is vulnerable to pneumonia and bronchitis and can die from their effects.

Benign Pleural Disease

Benign Pleural Disease commonly occurs before fibrosis. It happens in the lining of the lung (pleura). Patches of thickening of the pleural membrane are known as pleural plaques. The plaques show up on an X-ray and are an indicator of past asbestos exposure.

Mesothelioma

Mesothelioma is a cancer of the lung lining (pleura). It can result from even low level exposures. Crocidolite (blue asbestos) and amosite (brown or grey asbestos) have the most potent documented effects in producing this tumour. This type of cancer can take up to 50 years to develop after initial exposure to asbestos. It is an aggressive cancer and is extremely painful.

Lung Cancer

Lung cancer (of the bronchial tubes, lung and alveoli) can also develop after exposure to asbestos. Asbestos is one of a large number of agents linked to the development of lung cancer. Workers who were exposed to asbestos and who smoked or were exposed to second-hand smoke run a much greater risk of getting lung cancer.

Exposure Standards

The DoH (2009) and enHealth (2005) have adopted the limit for asbestos air-quality for protecting the public around contaminated sites of 0.01f/mL by using the membrane filter method.

The National Occupational Health and Safety Commission (NOHSC, 1994) has designated Asbestos under 'hazardous substances' through inhalation of fibres. The NOHSC [NOHSC: 1003 (1995) Updated 2003] has set 0.1 fibres/mL⁷ TWA (Time-weighted Average Values) as the maximum airborne asbestos fibre levels that workers can be exposed. The exposure standards represent airborne concentrations which, according to current knowledge, should neither impair the health of nor cause undue discomfort to nearly all workers. However, it should be noted that the exposure standards do not represent 'no-effect' levels which guarantee protection to every worker. The above TWA exposure standards apply to long-term exposure to a substance over an eight-hour day, for a five-day working week.

Asbestos in the Workplace

Health (Asbestos) Regulations 1992 Regulation 5.43 requires the employer, main contractor, a self-employed person or the person having control of the workplace to identify and assess risks from hazardHealth (Asbestos) Regulations 1992 Regulation 5.43 requires the employer, main contractor, a self-employed person or the person having control of the workplace to identify and assess risks from

⁷ No standard should be applied without reference to the Guidance Note on the Interpretation of Exposure Standards for Atmospheric Contaminants in the Occupational Environment [[NOHSC:3008\(1995\)](#)], and to the related documentation.

hazards in relation to asbestos in accordance with the Guide to the Control of Asbestos Hazards in Buildings and Structures [NOHSC:3002(1988)]⁸. Section 5 of this Guide requires the identification of any hazards that may arise from the risk of exposure to asbestos and 5.3 of this section requires a register to be kept. WA employers are required to maintain a "register" in the workplace of any asbestos products found in that workplace. This is mainly in relation to thermal and acoustic insulation material but it also includes the need to maintain registers wherever asbestos products, including AC (asbestos cement) materials, are found at a workplace.

WorkSafe WA is the Western Australian Government agency responsible for the administration of the *Occupational Health and Safety Act 1984*.

Management of Asbestos Cement in Soil

With respect to the **in-situ** management of 'asbestos impacted' sites, it is generally recognised (e.g. DoH) that there should be no asbestos-cement that is visible on the surface. However, because of the possibility that some asbestos-cement fragments are just below the surface and may become easily uncovered by wind, rain or slight surface disturbance, there is a practical need to include some "safety" factor. Appropriate site management of 'asbestos impacted' soil, has been considered in the past to encompass capping the asbestos waste with a layer of 'clean' soil or a vegetative cover. The thickness of 'clean' soil should be such to prevent likely disturbance of the asbestos by human activities and weathering (i.e. soil erosion). The use of a warning barrier (e.g. geotextile fabric printed with a warning message) between the 'clean' soil and the impacted soil is another precautionary measure that can be used. The access and disturbance of soil can additionally be minimised by grassing or paving an area.

Alternative management options include the screening of the asbestos waste from the soil or the complete removal of the contaminated soil to an appropriately managed licensed landfill facility. These alternatives would come at an increased cost and possibility of fibre release to the atmosphere but would address the ongoing risk of the in-situ management of the asbestos impacted soil.

It may be necessary and appropriate to adopt the hierarchy of control⁹ and undertake personal and/or environmental monitoring for asbestos fibres in air during soil management, particularly if conditions are conducive to generating dusts. Air monitoring provides a valuable line of evidence that the level of disturbance during site works has not liberated 'free' and respirable asbestos fibres, and therefore has not resulted in any unacceptable health risks.

⁸ Replaced with the Code of Practice for the Management and Control of Asbestos in Workplaces [NOHSC: 2018 (2004)].

⁹ The Hierarchy of Controls refers to the preferred order of control measures for addressing occupational health and safety risks and generally includes the following:

- elimination (eg. complete removal of asbestos);
- substitution (eg. replacement of asbestos insulation with less hazardous materials such as fibreglass or rock wool);
- isolation (e.g. Enclose/cap asbestos with a solid barrier);
- engineering controls (e.g. dust suppression via water and chemicals);
- administration controls (e.g. policies and procedures for safe work practices [cleaning, decontamination and waste disposal]); and
- personal protective equipment (e.g. use of respirators while working with asbestos).

Contaminated Sites Act 2003

Where soil is suspected to be contaminated¹⁰ with asbestos it would fall under the *Contaminated Sites Act 2003* and should be reported to the Department of Environment and Conservation (DEC) pending further investigations.

Working With Asbestos-Containing Materials

In WA, asbestos is regulated under the following Acts and Regulations.

- *Occupational Safety and Health Act 1984*;
- Health (Asbestos) Regulations 1992;
- Occupational Safety and Health Regulations 1996;
- National Code of Practice for the Safe Removal of Asbestos (National Occupational Health and Safety Commission) 2.nd Edition [NOHSC:2002(2005)]; and
- Department of Health, 2009, Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia.

The *Occupational Safety and Health Act 1984* stipulates the requirements for working with asbestos and the removal of asbestos. An employer must identify and implement measures to prevent the uncontrolled disturbance of asbestos-containing material while construction work is carried out. Water blasting of asbestos containing material is prohibited. An employer must also ensure that employees and other persons contracted to carry out asbestos work are informed of the dangers involved and of precautions that should be taken.

A controller of premises must ensure that a register is kept, in which the type, condition and location of all asbestos and asbestos-containing material in any place of work is recorded.

A license is required to carry out the removal or encapsulation of installed thermal or acoustic insulation that contains asbestos.

¹⁰ A contaminated site is defined in the Contaminated Sites Act 2003 (the 'CS Act') as "land or water [surface and groundwater] containing a substance above background concentrations that presents or has the potential to present a risk of harm to human health or the environment". In other words, the contaminated site has the potential to cause risk to human health, the environmental value or to the environment.

Appendix D: Certificates of Analysis - ACM Debris

**Asbestos In Soil, Site Management Plan,
Hillview Lifestyle Village, High Wycombe**

Analytical Report

Job No : Hillview Lifestyle Village
094256

Client: Coffey Environments
Address: Suite 2, 53 Burswood Rd
Victoria Park
WA 6100

Contact: Burswood Reception
E-mail: receptionist_burb@coffey.com
Fax: 08 9355 7111
Client Reference: ENVIPERT00855AA
Date Sampled: 15/06/2009
Date Received: 8/07/2009
Date Reported: 9/07/2009
Sampled By: S Healey
Location: Hillview Lifestyle Village

Test Method: Qualitative identification of asbestos types in bulk samples by polarised light microscopy, including dispersion staining technique using MPL Laboratories Method WILAB 1. Accreditation does not cover the identification of Synthetic Mineral Fibres.



Approved Identifier
Sue Nash



Approved Signatory
Lalanee Rupasinghe



This document is issued in accordance with NATA's accreditation requirements. AN: 2220

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Date Printed 9/07/2009

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EXTRAORDINARY OUTCOMES**

ABN 92 114 364 046

Analytical Report

Job No : 094256

Lab Id	External Idents	Sample Type	Dimensions	Result
094256-001	Type 1 White	Fibre Cement	60x50x3mm	Chrys, Croc
094256-002	Type 2 Pink	Fibre Cement	45x40x3mm	Chrys, Croc
094256-003	Type 3 Green	Fibre Cement	45x40x3mm	Chrys, Amos
094256-004	Type 4 Cor	Fibre Cement	80x40x3mm	Chrys, Amos

Analytical Report

Job No : 094256

Report Comments

Key to results on previous pages:

NAD = No Asbestos Detected

Chrys = Chrysotile Asbestos Detected

Amos = Amosite Asbestos Detected

Croc = Crocidolite Asbestos Detected

SMF = Fibres Consistent with Synthetic Mineral Fibres

UMF = Unknown Mineral Fibres Detected

FIM = Fibrous Insulation Material

EMB = Electrical Mounting Board

Notes:

- If Unknown Mineral Fibres (UMF) are detected by polarised light microscopy including dispersion staining confirmation by another independent technique may be required.

- Bonded asbestos material may need to be disintergrated. This procedure can lead to difficulties isolating and identifying fibres and another independent analytical technique may be recommended.

- Asbestos found to be non- homogenous within samples is reported as "hand picked".

Result Comments

Date Printed

9/07/2009

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EXTRAORDINARY OUTCOMES

ABN 92 114 364 046

Appendix E: Waste Disposal Procedures

**Asbestos In Soil, Site Management Plan,
Hillview Lifestyle Village, High Wycombe**

DISPOSAL OF ASBESTOS WASTE

All buried impacted soils should be assumed to be contaminated with asbestos cement material (ACM) and disposed off-site as 'Asbestos Waste' in accordance with the WA Department of Environment and Conservation's (DEC) *Landfill Waste Classification and Waste Definitions 1996* guideline.

Waste Containers

Solid asbestos waste, in this case ACM, should be collected in heavy duty (approximately 0.2 mm) thick polyethylene bags or other approved containers. It is recommended that a maximum bag size of 1200 mm (length) x 900 mm (width) be observed. Bags should be filled to no more than 50% capacity and preferably not exceed 16 kg, and the contents of the bag should be wet before sealing.

To reduce bag rupture and to minimise asbestos contamination, asbestos waste should be double-bagged (once at the work area and a second time away from the work area, but before leaving the work site enclosure). Where large metal storage bins or 'kibbles' are provided in or immediately next to the work 'removal' area, a single bag may be adequate. In these circumstances, washing down of the bags in the work 'removal' area would be satisfactory method of contamination control.

To prevent bag rupture and for ease of handling, the loaded weight of the bag should not exceed limits consistent with good manual handling practice.

Each bag or other container should be labelled on its outermost surface, with the following warning statement:

CAUTION – ASBESTOS

SERIOUS INHALATION HEALTH HAZARD

AVOID CREATING DUST

Bags or primary containers that have been used to store asbestos material should not be re-used, and containers marked as above should not be used for any other purpose.

Asbestos is considered a hazardous waste material and approved disposal contractors must be used to dispose of this waste in accordance with relevant State or Territory Regulations and DEC guidelines.

Record of Asbestos Waste Disposal

A manifest of contaminated asbestos waste which has been removed from the site should be compiled. These records should be stored together with a receipt from the licensed disposal facility where the waste was disposed of.

Temporary Storage

Provisions for temporary storage of the waste materials in an environmentally responsible manner prior to disposal should be undertaken. This should include measures such as:

- Placement of materials in lined skips with the skip securely covered or in plastic bags; and
- Dust suppression.

Appendix F: Removal of Asbestos Cement Debris

**Asbestos In Soil, Site Management Plan,
Hillview Lifestyle Village, High Wycombe**

REMOVAL OF MINOR ASBESTOS CONTAINING MATERIAL (ACM) DEBRIS (E.G. ASBESTOS CEMENT DEBRIS)

The following is a brief summary of appropriate precautions and steps in dealing with minor asbestos containing material (ACM)¹ debris.

Any removal of ACM shall be undertaken in accordance with NOHSC: 2002 [1988]² and Western Australian Environmental Protection (Controlled Waste) Regulations 2004³.

ACM disposal shall be in conformance with the Landfill Waste Classification and Waste Definitions 1996 (As amended) (July 2005)⁴.

Conditions

- All visible ACM debris is to be removed from the area such that any risk of asbestos fibre inhalation has been effectively eliminated.
- The use of personal protective equipment (PPE) consisting of a half face (class P2) disposable or particulate filter (cartridge) respirator is recommended as minimum where there is a potential for asbestos dust generation.
- All personnel who are required to remove any ACM will be educated in the health effects and the need for care in the safe removal.
- Where intrusive works identify a risk of exposure to asbestos, all work procedures shall be conducted in accordance with the site's asbestos in soil Site Management Plan (SMP).

Procedure

A competent person should conduct removal of small quantities of ACM debris by the following procedure.

- The area shall be immediately assessed and appropriate precautions implemented for the protection of all residents, workers and general public, in accordance with the SMP.
- Where there is a potential for asbestos fibre release the ACM debris material must be wet down by misting with water prior to handling⁵. Use disposal gloves when handling ACM debris and dispose these with the ACM debris.
- Where there is a potential for asbestos fibre contamination⁶ in soil or ACM debris is believed to extend below the surface soil, the area shall be wet down and any excavation or other intrusive works shall be undertaken in accordance with the SMP⁷.

¹ Asbestos cement is predominantly a mixture of cement and asbestos which when in a dry state has a density greater than 1tonne per cubic metre (1000 kg/m³). It is a light grey and hard material, which generally contains 2% - 15% asbestos fibre, but can occasionally contain up to 40% in a bound matrix of Portland cement or autoclaved calcium silicate.

² NOHSC (2005) Code of Practice for the Safe Removal of Asbestos 2nd Edition [NOHSC:2002(2005)]

³ Part 1 Reg 3(5) and Reg 3(6) make it clear that asbestos waste is not covered by the Controlled Waste Regulations apart from those provisions contained in Part 3 Division 6 and regulation 53.

⁴ The Landfill Waste Classification and Waste Definitions 1996 (As amended) (July 2005) defines Special Waste Type 1 as waste which includes asbestos and asbestos cement products. The definition includes (1) stabilised asbestos waste in bonded matrix (e.g. asbestos cement sheeting) and (2) Asbestos fibre and dust waste (e.g. dust resulting from the removal of thermal or acoustic insulating materials or from processes involving asbestos material, and dust from ventilation collection systems).

⁵ The dry removal method should only be used where the wet method is not suitable due to live electrical conductors present, where major electrical equipment could be permanently damaged or where a hazard may be present. In some instances vacuum cleaners designed for asbestos removal (HEPA) can be used.

- The ACM debris must be separated from other material for disposal where that is reasonably practicable and wrapped or otherwise contained in a manner that prevents asbestos fibres entering the atmosphere during transportation on a road (e.g. placed into a heavy duty clear polyethylene bag (approximately 0.2 mm thick)).
- Plastic bags containing ACM debris shall be twisted tightly, folded over and the neck secured in the folded position with wire ties, adhesive tape, or any other effective method and appropriately labelled or marked with the words “CAUTION ASBESTOS” in letters not less than 50 mm high.
- If ACM debris is present in top soil (assumed to be minor impacts), scrape upper layer of top soil, such that negligible asbestos debris remains, and dispose of this material with the ACM debris.
- ACM debris is to be disposed to an approved landfill in accordance with the Landfill Waste Classification and Waste Definitions 1996 (As amended) (July 2005).

⁶ A contaminated site is defined in the Contaminated Sites Act 2003 (the ‘CS Act’) as “land or water [surface and groundwater] containing a substance above background concentrations that presents or has the potential to present a risk of harm to human health or the environment”. In other words, the contaminated site has the potential to cause risk to human health, the environmental value or to the environment.

⁷ The Hierarchy of Controls refers to the preferred order of control measures for addressing occupational health and safety risks and generally includes the following:
elimination (e.g. complete removal of asbestos);
substitution (e.g. replacement of asbestos insulation with less hazardous materials such as fibreglass or rock wool);
isolation (e.g. Enclose/cap asbestos with a solid barrier);
engineering controls (e.g. dust suppression via water and chemicals);
administration controls (e.g. policies and procedures for safe work practices [cleaning, decontamination and waste disposal]); and
personal protective equipment (e.g. use of respirators while working with asbestos).

Appendix G: Personal Protective Equipment

**Asbestos In Soil, Site Management Plan,
Hillview Lifestyle Village, High Wycombe**

PERSONAL PROTECTIVE EQUIPMENT

Personal Protective Equipment (PPE), which for the purposes of this report includes Respiratory Protective Equipment (RPE), should only be used when other desirable control methods are not feasible or residual risk requires further controls. All PPE that cannot be effectively decontaminated should be disposed of as asbestos waste.

The type of PPE required should be based on risk assessment. For instance a P1 disposable respirator may be appropriate for inspection purposes but a full face; positive pressure demand air-line respirator would be required for friable asbestos removal work in an enclosure. PPE requirements should be in accordance with the Code of Practice for the Safe Removal of Asbestos 2nd Edition [NOHSC:2002 (2005) Appendix C]. Table 4, pages 75 and 76 of the aforementioned code may be particularly useful.

In managing asbestos the following should be considered:

- No smoking is to be permitted during site works.
- Workers handling asbestos or ACM should wash their hands thoroughly in warm soapy water before eating, drinking, smoking or using toilet facilities.
- If clothing is contaminated it should be removed and disposed as recommended.

Respiratory Protective Devices

Where the above controls do not reduce atmospheric contaminants to acceptable levels, approved and suitable respiratory protective devices should be provided and used. As outlined in Australian Standard AS 1716, such suitable devices include air purifying respirators.

- As a minimum an approved class P2 face mask or respirator should be worn when there is deemed to be a potential risk of exposure to asbestos fibres.

Disposable Coveralls

Disposable coveralls with fitted hoods and cuffs may be worn and disposed of as asbestos waste. Fitted hoods should always be worn over respirator straps/hoods and eye wear.

In some circumstances where disposable protective clothing may not be appropriate i.e. fire hazard, re-useable types may be used if effective laundering can be established.

If undergarments or clothing is contaminated it should be removed and disposed as recommended, unless there is a laundering facility available capable of laundering asbestos contaminated clothing.

Footwear and Gloves

Appropriate safety footwear such as steel-capped rubber-soled shoes or gumboots should be provided for all asbestos works. This footwear must remain in the asbestos work area for the duration of the asbestos works. On completion of the asbestos works the safety footwear must be either effectively decontaminated or disposed of as asbestos waste.

The use of protective gloves should be worn at all times when handling asbestos waste. On completion of the asbestos works, all gloves used should be disposed of as asbestos waste.

Minor Works

The following procedure must be implemented if there is a probability of disturbance to asbestos.

- Disposable coveralls, including a hood shall be worn.
- An approved Class P2 facemask or respirator shall be worn during the works.
- There shall be no direct contact with any identified asbestos.
- Before leaving the work areas, with mask still in position, the surface of the coveralls and exposed body parts shall be decontaminated.
- Coveralls shall be removed (with mask still on) and placed in an asbestos waste bag which shall then be sealed and labelled.

Decontamination

Decontamination of PPE used by personnel and equipment used during works shall occur before leaving the Site. Decontamination can be via a suitable vacuum cleaner or wet down method.

Appendix H: Remediation Checklist

**Asbestos In Soil, Site Management Plan,
Hillview Lifestyle Village, High Wycombe**

REMEDIATION CHECKLIST

As the Site has asbestos containing material (ACM) debris present in soils, any remediation works conducted on the Site must conform to relevant regulations and the SMP. Buried debris and surface soil on the Site is to be treated as suspect ACM contaminated and is to be handled and disposed of accordingly.

Contractors engaged to undertake remediation on-site are to address the following, as a minimum, prior to works commencement:

- Seek permission from Site Owner on all aspects of remedial works.
- Determine if stakeholder consultation is required and contractor requirements with regard to the Stakeholder Consultation Plan.
- Consider the preparation of a Safe Work Method Statement¹ (SWMS), Health and Safety Plan² (HSP) and Environmental Management Plan³ (EMP) with due regard for the ACM present at the Site.
- Undertake site inductions or provide SMP to relevant parties.
- Implement access restrictions including fencing, if required.
- Implement signage, if required.
- Implement dust control measures, such as wetting down.
- Determine if storm water management is required for the entire Site or work area and implement.
- Determine if air monitoring is required.
- Ensure all personnel are wearing the appropriate PPE and a sufficient quantity is available for all site workers for the full duration of works.
- Where management of ACM impacted material is required, ensure dust management is undertaken.
- Install ACM disposal equipment, such as lined bins or 0.2mm polyethylene bags and a temporary storage and disposal strategy. As well as obtain relevant approvals from Landfill Operator for disposal of ACM to an appropriately licensed landfill.
- Validate ACM impacted subject area to a 'tolerable' or 'safe' level.
- Determine if stockpiling of ACM is required and obtain a sufficient cover and/or sprinkler system for wetting down.
- Transport of ACM impacted material in suitable vehicles (where required use plastic lining and suitably covered loads to reduce dust risk).
- Obtain sufficient quantities of clean fill materials to backfill, if required.
- Ensure sufficient validation of clean fill is conducted prior to installation.
- Document placement of clean fill.
- Determine if noise control measures are required.
- Determine if traffic management measures are required.
- Determine procedure for regular visual inspection of surface for ACM and appropriate removal if found.

¹ The SWMS should discuss the objectives and order of the works, the equipment and procedures to be adopted and the potential for exposure.

² The HSP should include as a minimum the supply of appropriate PPE for personnel undertaking the work (including respirators/dust masks), dust control measures (i.e. water sprays) and take into consideration the health risks associated with the hazard.

³ The EMP should include soil, water, waste, noise and dust management, monitoring and emergency response.

Appendix I: Airborne Asbestos Monitoring

**Asbestos In Soil, Site Management Plan,
Hillview Lifestyle Village, High Wycombe**

AIRBORNE ASBESTOS MONITORING - GENERAL

Air monitoring for asbestos fibre should be conducted prior to the start of any asbestos control or removal procedure, or when there is an asbestos condition that may pose a potential risk to the residents, occupants, visitors, construction and maintenance personnel.

The Western Australian Department of Health in their 2009 guideline supports the enHealth (2005) guideline specifying asbestos concentrations for protecting the public around a contaminated site to be less than 0.01 fibres/mL and PM₁₀ dust levels less than the National Environment Protection (Ambient Air) Measure 24 hour guideline of 50 µg/m³.

Asbestos monitoring must be carried out by a qualified occupational hygienist (or equivalent) and follow the procedures under the Membrane Filter Method for Estimating Airborne Asbestos Dust (NOHSC 1988). Testing for the number of asbestos fibres in a sample must be carried out by a laboratory accredited by NATA (the laboratory testing authority) for asbestos counting.

A sample of air is collected from the worker's breathing zone and the number of fibres in a set volume of air are counted under a microscope to determine exposure levels. The results are compared against the current occupational exposure standard for airborne asbestos fibres.

Monitoring is used to assist in the risk assessment process but should not be used as the only criteria. Five levels of air monitoring are used.

Baseline Air Monitoring

Prior to the start of any asbestos control or removal procedure, the effected area shall be subject to asbestos air monitoring to establish the background airborne respirable fibre concentration. The resulting data shall be recorded for future reference.

Event Air Monitoring

During any asbestos control or removal procedure, the affected area and adjacent areas (if applicable) shall be subject to asbestos fibre air monitoring. This is to ensure airborne respirable fibre concentration remain within the exposure standards as determined by WorkSafe Australia.

Clearance Air Monitoring

Following any asbestos control or removal procedure, the affected area shall be subjected to asbestos fibre air monitoring. The Workplace Manager shall ensure that no occupation of the area occurs until the airborne respirable fibre concentration is below the control standard of 0.01 fibres/mL.

Routine and Periodic (Planned) Air Monitoring

In circumstances where an existing asbestos situation is considered to be a hazard (e.g. limpet asbestos insulation remaining in a ceiling space), the Workplace Manager shall arrange for routine air monitoring to be conducted periodically. The monitoring is to ensure that airborne respirable fibre concentrations are below the exposure standards as determined by WorkSafe Australia.

Emergency and Incident Air Monitoring

In the event of an emergency or incident, the Workplace Manager shall arrange for asbestos air monitoring and ensure that no occupation of the area occurs until the airborne respirable fibre concentration is below the control standard of 0.01 fibres/mL.

Air monitoring will be implemented and documented by the consultant controlling the testing. Copies of the results shall be supplied to the Site Manager.

Appendix J: Emergency and Incident Response

**Asbestos In Soil, Site Management Plan,
Hillview Lifestyle Village, High Wycombe**

EMERGENCY AND INCIDENT CONTROL PROCEDURES

The protocols described below shall only be conducted where safe to do so.

Emergency Situations

Situations where life or property is considered to be at immediate risk, e.g. fire in asbestos contaminated area or a cyclone (strong wind) event. The following protocols shall be implemented:

- Evacuate all workers, residents and general public.
- Seal off or otherwise isolate the area and restrict access if possible.
- Advise the Site Owner.
- Determine “clean up” or other remedial action as per Section 10 and checklist provided in Appendix E of Site Management Plan (SMP).
- Conduct remedial action.
- Conduct clearance air monitoring, if required.
- Document the situation.

Incident Situations

Situations not previously identified where there are potential for exposure to asbestos, e.g. ACM spill (from truck rollover), accidental uncovering of ACM fragments on-site shall be handled as per below:

- Isolate the area and impose access restrictions.
- Consult the SMP.
- Advise the Site Owner.
- Determine “clean up” or other remedial action, as per Section 10 and checklist provided in Appendix E of SMP.
- Conduct remedial action.
- Conduct clearance air monitoring, if required.
- Document the situation.

Note: Trucks engaged for remedial works should have their own emergency and incident response protocols.