

Appendix P

Remedial Action Plan – ENSR Australia Pty Ltd

Terms relating to chemical analysis methods				
AES	Atomic emission spectrometry			
CV-AAS	Cold vapour atomic absorption spectrometry			
GC/ECD	Gas chromatography/electron capture detector			
GC/FID	Gas chromatography/flame ionisation detector			
GC/NPD	Gas chromatography/nitrogen/phosphorus detector			
CG/MS	Gas chromatography/mass spectrometry			
GC/PID	Gas chromatography/photoionisation detector			
ICP	Inductively coupled plasma			
OES	Optical emission spectrometry			
P&T	Purge and trap			
Units				
ha	hectare		µg/kg	micrograms/kilogram
km	kilometre		µg/L	micrograms/litre
m	metre		ppb	parts per billion
mg/kg	milligrams/kilogram		ppm	parts per million
mg/L	milligrams/litre		t	tonne

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Executive Summary

Introduction

ENSR Australia Pty Limited (ENSR), a subsidiary of AECOM Corporation was engaged by APP Corporation Pty Limited (APP) on behalf of Healthscope to prepare a Remedial Action Plan (RAP) for the Newcastle Private Hospital (NPH) Extension, Lookout Road, Rankin Park NSW (the Site). The Site occupies an area of approximately 2,700 m².

Background

A preliminary site assessment was conducted in 2006 (HLA-Envirosciences, 1 November 2006; *Preliminary Environmental Site Assessment*; Proposed Newcastle Private Hospital Multi-Level Carpark, Lookout Road, Rankin Park NSW) to estimate the nature and extent of any impacted fill material within the proposed excavation area of the NPH Extension. Based on the results of this initial investigation and the Phase 1 ESA (ENSR, November 2008), asbestos containing material (ACM) was identified at the site. The results of that investigation form the basis for the development of this RAP.

Objectives and Scope of Work

The objective of this RAP is to manage the identified contamination risks at the Site to allow for the construction of the NPH Extension to proceed.

The RAP documents the scope and methodology proposed for remediation and validation of areas where impact by contamination has been identified.

The proposed remedial strategy has been developed in a manner consistent with current environmental guidelines and involves the following general components:

- Prior to any redevelopment works, the Carpark Areas (Areas 1 to 3) will require an intrusive assessment to classify any material to go off site and to confirm that the material remaining on Site is suitable for the proposed land use.
- Soils within the excavation footprint of the NPH Extensions (including Areas 1 to 3) identified to contain impacted fill material will be either removed from the Site and disposed of in an approved manner to a landfill licensed to receive the waste, or capped by a geotextile marker layer, with an ongoing management plan.
- All removal work will be carried out in accordance with the relevant Acts and Regulations, as defined in this RAP.
- Validation of the successful completion of the removal works, in accordance regulatory protocols described within this RAP.
- Any imported fill that may be required to reinstate excavation levels will be classified as virgin excavated natural material (VENM) or excavated natural material (ENM) as per the recently published NSW DECC (2008) Waste Classification Guidelines.
- Asbestos air monitoring will be carried out on-site whilst any soil remediation activities are conducted. The rates of asbestos air monitoring required will be determined by the Consultant in discussions with the Principal.
- Implementation of an environmental management plan/site management plan during remedial activities.

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- Preparation of an Environmental Management Plan to ensure the ongoing integrity of the capping system

Following the completion of the above activities, a Validation Report will be prepared documenting the remediation and validation works conducted at the Site that is anticipated to confirm that the Site is suitable for the proposed future (Hospital/Carpark) land use.

Should a final management approach be adopted involving the on-site containment of a proportion of the fill material, an ongoing Environmental Management Plan (EMP) will be required for the Site. This EMP would describe the nature and location of contamination remaining on-site, how this is to be managed and who will be responsible for ongoing management of the material. The EMP must be reasonably enforceable. The EMP would include details showing the location of the geotextile marker layer and precautions in the event of penetration of the marker layer.

This report has considered the requirements of the Director General's Environmental Assessment Requirements (ref: MP 08_0170, dated 29th September 2008).

The interim of opinion letter "*Review Advice No.4 – Site Audit for Newcastle Private Hospital Extension, New Lambton Heights, NSW*" dated 25 February 2009 is located in **Appendix D**.

Development Summary

In summary the new development features are:

The proposed new 6 storey hospital building to the north of the Kingston Building will contain:

- Level B3 – Basement staff car park (74 car spaces) with a floor RL of 89.39 at eastern end of car park and 90.98 at western end of car park.
- Level B2 – Truck hardstand (floor RL 92.19), loading dock (floor RL 93.19), stores, plant room, and basement car park (floor RL 93.74) with 51 car spaces. As shown on the plans the Level B2 car park proposed will be connected to the existing Kingston Building car park.
- Level B1 – Basement car park (70 spaces) with a floor RL of 96.5 and plant room. As shown on the plans the Level B1 car park proposed will also be connected to the existing Kingston Building car park.
- Ground Floor – car park (31 spaces), plant room and 30 medical inpatient beds, with floor RL of 100.00. As shown on the plans, the ground floor will be linked to the existing Kingston Building ground floor.
- First Floor – 30 surgical inpatient beds, and plant room (floor RL 104.00). As shown on the plans, the first floor will also be linked to the existing Kingston Building first floor.
- Second floor - 8 medical suites, and plant room (floor RL 108.40). AS shown on the plans, the second floor will be linked to the existing Kingston Building second floor.
- A new loading dock and waste disposal area will also be provided under the new car park building with access from Jacaranda Drive.

The alterations and additions to the existing Kingston Building will include the following:

- The loading dock and some store areas will be relocated down to the new B3 podium level of the proposed new building, with entry from Jacaranda Drive.
- Ground floor – As shown via shading on the plans, ground floor alterations include a new supply services area and new kitchen.
- First floor – As shown via shading on the plans, the following alterations will be made:
 - The first floor plate will be extended above the landing dock to the east to accommodate two new operating theatres with ancillary services.
 - An additional steriliser will be provided adjacent to the existing sterilizer within the Central Sterile Department (CSD) which will also be expanded.
 - Addition of a new Stage 3 recovery area.
 - Addition of another new staff station.

Other features include:

- 13 additional ground level carparking spaces adjacent to Croudace and Kingston Building entries.
- Remediation of the site; to north of Kingston Building.
- A plan for an additional 11 car parking spaces near the Croudace Building will be managed under a separate development application.

Summary:

- Remediation of the site.
- An additional 60 inpatient beds in a new 6 storey hospital building.
- Alterations and additions to the existing Kingston Building including two additional operating theatres with additional support services.
- 250 car parking spaces (226 in-building car park spaces, 13 on-street spaces at front of hospital, and 11 on-street spaces to be managed under a separate development application).
- Loading/unloading facilities with access of Jacaranda Drive.
- Vehicle access to the proposed new building from Jacaranda Drive.
- Approximately 1000sqm of medical consultancy suites, comprising 8 medical suites in total.

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Remedial Action Plan

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1.0 Introduction

ENSR Australia Pty Limited (ENSR), a subsidiary of AECOM Corporation was engaged by APP Corporation Pty Limited (APP) on behalf of Healthscope to complete a Remedial Action Plan (RAP) for the Newcastle Private Hospital (NPH) Extension, Lookout Road, Rankin Park NSW (the Site). The location of the Site is defined on **Figure 1**. Site survey plans are included in **Appendix A**.

The area of the proposed developments occupies an area of approximately 3,600 m². Healthscope (formerly NIB Health Funds Limited) commissioned HLA-Envirosciences Pty Limited (HLA, now ENSR) to conduct a Preliminary Environmental Site Assessment (HLA, November 2006) of the Primary Civil Works Area to estimate the nature and extent of any impacted fill material within the proposed excavation area of the Multilevel Car Park (now referred to as the NPH Extension). Based on the results of this initial investigation, asbestos containing material (ACM) was identified at the Site. The results of that investigation form the basis for the development of this RAP.

This RAP replaces the previous RAP developed for the Site by HLA (HLA Ref: N4058602_RAP_19Jan07 and N4098403_RPT_4Nov08) in the light of changes to the proposed development and associated supplementary information.

The objective of this RAP is to manage the identified contamination risks at the Site to allow for the construction of the proposed NPH Extensions to proceed.

1.1 Development Summary

In summary the new development features are:

The proposed new 6 storey hospital building to the north of the Kingston Building will contain:

- Level B3 – Basement staff car park (74 car spaces) with a floor RL of 89.39 at eastern end of car park and 90.98 at western end of car park.
- Level B2 – Truck hardstand (floor RL 92.19), loading dock (floor RL 93.19), stores, plant room, and basement car park (floor RL 93.74) with 51 car spaces. As shown on the plans the Level B2 car park proposed will be connected to the existing Kingston Building car park.
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- Loading/unloading facilities with access of Jacaranda Drive.
- Vehicle access to the proposed new building from Jacaranda Drive.
- Approximately 1000sqm of medical consultancy suites, comprising 8 medical suites in total.

2.0 Scope of Work

This RAP documents the scope and methodology proposed for remediation and validation of areas where impact by ACM and other contamination has been identified. The scope of works and methodology are based on ENSR's current understanding of the nature and extent of contamination present at the Site and include the overall remedial strategy for the Site.

The proposed remedial strategy involves the following general components:

- Soils containing and presumed to contain ACM will be removed from the Site and disposed of in an appropriate manner to a landfill licensed to receive asbestos waste.
- All removal work will be carried out in accordance with the relevant Acts and Regulations.
- Validation of the successful completion of the removal works, in accordance regulatory protocols described within this RAP.
- Any imported fill that may be required to reinstate excavation levels will be classified as virgin excavated natural material (VENM) as per NSW DECC (2008) Waste Classification Guidelines.
- Asbestos air monitoring will be carried out on site whilst any soil remediation activities are conducted.
- Implementation of an environmental management plan/site management plan during remedial activities.
- Preparation of an Environmental Management Plan to ensure the ongoing integrity of the capping system

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3.0 Site Identification and Description

The following details describe the Site.

Table 1: Site Identification and Description

Item	Description
Current Site Owner	Hunter New England Health
Proposed Site Occupier	Healthscope Limited
Site Address	14 Lookout Road, New Lambton Heights NSW, 2305
Lot and DP Numbers	Lot 132 DP 1053492, Lot 2 DP 1080386, SP 60845 and SP 74793
Titles of Remediation Areas	Primary Civil Works: within Lot 132 DP 1053492 and Lot 2 DP 1080386
	Area 1 (Surface carpark alignment): within Lot 2 DP 1080386 and SP 60845
	Area 2 (Surface carpark alignment): within SP 60845
	Area 3 (Surface carpark alignment): within SP 74793 and SP60845
Site Survey	Appendix A
County and Parish	Northumberland and Newcastle
Local Government Authority	Newcastle City Council
Current Zoning	5(a) Special Uses – Hospital
Current Land Use	Primary Civil Works: Vacant – open space
	Areas 1, 2 and 3: Commercial/Industrial (Hospital Operations)
Proposed Land Use	Proposed Newcastle Private Hospital Extension – Hospital and carpark
Geographical Coordinates (AMG)	151°42' E, 32°55' S
Approximate Site Elevation (m AHD)	95
Approximate Site Area (m ²)	2,700 (Primary Civil Works) 900 (Surface Carpark Areas)
Site Location and Layout Plan	Figure 1

Notes: AMG – Australian Map Grid
AHD – Australian Height Datum

The Site extends west from the NPH Kingston Building (Healthscope) to adjacent the existing Hydrotherapy Rehabilitation Pool building, as identified in **Figure 1**. The proposed use for the Site is the construction of a multi-level carpark and surface parking for the use of staff and visitors to NPH.

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Prepared for:
Healthscope (c/o APP Corporation)
PO Box 1285
Newcastle NSW 2300



Remedial Action Plan

Newcastle Private Hospital Extension, New Lambton Heights, NSW

ENSR Australia Pty Ltd (ENSR)

May 2009

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4.0 Directions

In this RAP:

- The "Principal" is Healthscope c/o APP Corporation Pty Ltd.
- The "Consultant" is a suitably qualified and experience contaminated land management consultant who will be responsible to the Principal. The Consultant is to be accredited by the National Association of Testing Authorities, Australia (NATA) for asbestos fibre counting. The Consultant will have access to the Site at all times and will provide this RAP, Consultancy, Inspections, Assessments, Air Monitoring, Clearances, technical inquiries, Waste Classification, Validation and provide directions and monitoring of the asbestos removal works. All communications by the Consultant relating to the performance of the RAP by others will be through the Principal.
- The "Site Auditor" is Phil Hitchcock of Environ.
- The "Principal Contractor" will be the AS1 licensed asbestos removalist responsible for the total project and particularly the supervision and provision of all asbestos removal services.

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5.0 Previous Investigations

5.1 Phase 1 Environmental Site Assessment, Proposed Newcastle Private Hospital Extension, Lookout Road, New Lambton Heights NSW

A Phase 1 Environmental Site Assessment (ESA) was undertaken by ENSR at 14 Lookout Road, New Lambton Heights, NSW in February 2009. The Site is currently owned by Hunter New England Area Health Service (Hunter New England Health). The Site comprises an area of approximately 3,600 m².

The scope of work undertaken was as follows:

- Review of historical information relating to the Site including NSW Land and Property Information, Land Titles documents, the Section 149 Certificates, groundwater bore information, historical aerial photographs, dangerous goods information and geological and hydrogeological information;
- Review reports of any available previous investigations undertaken at the Site;
- Site inspection to assist with the identification of potential on- and off-site sources of contamination, to determine access restriction (if any) and to note the general condition of the Site; and
- Preparation of the Phase 1 ESA report discussing the methodologies used, the results of the investigation and providing conclusions regarding the suitability of the Site for the proposed land use.

The ESA concluded that the Primary Civil Works area of the Site has been extensively filled and may be affected by contaminants associated with fill materials, in particular asbestos. A minor quantity of material (identified by Northrop as approximately 300 m³) will be removed from Areas 1 to 3 which will require assessment prior to offsite disposal. These Carpark areas will also require an intrusive assessment to confirm that the material remaining on Site is suitable for the proposed land use.

The development works proposed for the Site will involve a total excavation of approximately 20,000 m³ of soil, while the maximum volume of the impacted fill materials has been estimated at approximately 9,600 m³. This excludes bulking factors subsequent to removal. It is noted that these volumes are preliminary estimates and should not be relied upon by remediation contractors or for budgetary purposes.

ENSR recommends that this RAP be carried out to ensure the safe removal of impacted fill materials prior to commencing the proposed development. Once removed, the fill materials and any other associated material should be disposed of at an appropriately licensed facility.

Removal of the fill materials will reduce the risk to human and environmental health from heavy metal and asbestos contamination at the Site and enable the proposed development to proceed. A VENM assessment will be required prior to the excavation and disposal of any VENM from the Site.

5.2 HLA-Envirosciences - Preliminary Environmental Site Assessment, Proposed Newcastle Private Hospital Multi-Level Carpark, Lookout Rd, Rankin Park NSW, November 2006

A preliminary environmental site assessment was undertaken by HLA-Envirosciences in October/November 2006. The aim of this investigation was to identify the likely nature and extent of impacted fill in the excavation area, report on site condition, and provide a preliminary environmental assessment of site contamination.

The assessment consisted of the excavation of nine test pits from between 2.0 and 3.2 m bgs. A total of twelve soil samples were taken and analysed for the following contaminants of primary concern:

- Total Metals (As, Cd, Cr, Cu, Ni, Pb, Zn, Hg) - 12 samples;
- Polycyclic aromatic hydrocarbons (PAH) - 12 samples;
- Total Petroleum Hydrocarbons (TPH) and Phenols – four samples;
- Semi Volatile Organic Compounds (SVOCs) – one sample;
- Asbestos fibres in Soil – two samples;
- Asbestos identification analysis for suspected asbestos fragments – three samples;
- TCLP leach samples for a suite of metals (as above) and PAHs – 12 samples; and
- ASTM leach samples for a suite of metals (as above) and PAHs – 10 samples.

Prior to and during test pit excavation works, a number of potentially impacted fill materials within the excavation area were identified, including:

- Broken suspected asbestos cement sheeting along the length of the upper bench;
- Variable slag-like material on the batter; and
- Construction and demolition waste throughout the upper bench (soil, bricks, corrugated iron, suspected Asbestos Containing Material (ACM), concrete, plastic fragments, steel/plastic/ceramic pipe, ceramic tiles, hessian bag fragments, insulated copper wire and vehicle tyres).

The key results of the preliminary environmental site assessment are listed below:

- The presence of low levels of PAHs and heavy metals were identified at a number of locations on the site below the assessment criteria for open space or commercial land uses.
- Asbestos was detected in samples from the Site including loose asbestos fibres in soil and suspected ACM sheet containing Chrysotile asbestos in two of the five samples taken. The presence of ACM in soils at the Site make exposed soils unsuitable for the proposed use of the Site and mean that impacted soils will require disposal as asbestos waste.
- Using the total and leachable concentrations of contaminants identified during the analytical testing, and the number and location of samples selected for analysis, the fill material can be classified in accordance with the NSW DECC (2008) *Waste Classification Guidelines Part1: Classifying Waste as Asbestos Waste*. Asbestos waste can be received at General Solid Waste Landfills licensed to receive this material.
- Fill material at the site contains fragments of moulded and sheeted asbestos cement material, and asbestos fibres in soil, which would meet the current definition of containing 'friable asbestos' as defined in the NSW Occupational Health and Safety Regulation 2001 and in guidance documentation produced by the NSW WorkCover Authority.

Results for asbestos fibre air monitoring were below the approved asbestos-in-air assessment method detection limit of 0.01 fibres per millilitre of air.

Initial volume estimates of material to be excavated and disposed of off-site were provided by APP as 10,500 m³ based on the initial proposed total excavation depth of 6.2 m bgs. The total depth of the impacted fill material was reported to be greater than the total depth of test pit excavations which were reported to be less than or equal to 3.4 m bgs. The estimated excavation volume was between 54% and 70 % of the total material to be excavated.

The report also recommended that a specification be prepared to cover the removal of any asbestos contaminated material.

Uncertainties relating to the Preliminary Environmental Site Assessment were that the depth of fill was not established in TP06, TP07, TP08 and TP09 to the west of the Site. This uncertainty has been accommodated in this RAP.

5.3 Douglas Partners - Geotechnical Investigation, Proposed Carpark, Newcastle Private Hospital, New Lambton Heights NSW, June 2007

A geotechnical investigation was conducted by Douglas Partners (DP) in June 2007 for a proposed car park at the NPH site. The aim of the investigation was to provide comment on the subsurface conditions, the excavatability and footing design parameters.

The investigation consisted of:

- the drilling of three bores;
- the excavation of five test pits;
- laboratory testing;
- engineering analysis; and
- review of two previous geotechnical investigations in 1996 and 1997.

The investigation found that fill varied from 1.0 m to 5.6 m below ground surface. Underlying the fill in two test pits was between 1.5 and 1.9 m of topsoil (brown clayey silt) followed by clay to between 1.7 and 2.0 m. Bedrock (conglomerate or sandstone) was identified in most locations at between 1.0 and 11.5 m bgs.

No free groundwater was observed although drilling fluids obscured observations at two bore locations.

DP understood that excavations of up to 6 m deep were proposed, however the building design has been altered significantly since this report was issued. DP also identified the need for a waste classification assessment to be undertaken.

5.4 General Summary of Previous Reports

ENSR consider previous reports to be reliable and provide a satisfactory level of detail for development of this RAP.

Current design information suggests that maximum excavation depth is approximately 8.5 m which is 2.3 m greater than the depth used in the Preliminary Environmental Site Assessment. The total volume to be removed is approximately 20,000 m³. The in-situ volume of impacted material has been initially estimated at approximately 9,600 m³. This excludes bulking factors subsequent to removal. It is also noted that these volumes are preliminary estimates and should not be relied upon by remediation contractors or other budgetary purposes.

Note that sampling from the Preliminary ESA (November 2006) did not include Surface Parking Areas 1 to 3. These areas will be addressed by intrusive sampling and waste classification prior to the excavation works. The total volume of the material was estimated by Northrop to be approximately 300 m³. The proposed sampling methodology is covered under **Section 9.5**.

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6.0 Site Conditions and Surrounding Environment

6.1 Current Land Use

6.1.1 Primary Civil Works

At the time of reporting, the area was unoccupied and contained healthy vegetation. The Site is a part of the Newcastle Private Hospital and is directly adjacent to the main hospital building.

6.1.2 Surface Carpark Area

At the time of reporting, the areas in the Surface Car Park Alignment sections were utilised as follows:

- Area 1 – Sealed bitumen roadway (Teahouse Road) and short term parking outside the Kingston Building with a central roundabout which was unsealed with a cement curb perimeter;
- Area 2 – An existing bitumen car park with unsealed areas on the south and north sides of the area with some trees and a cement curb perimeter; and
- Area 3 – Unsealed area with some trees and a cement curb perimeter. Currently unused but occasionally used by visitors for parking.

6.2 Surrounding Land Use

Current land use surrounding the entire Site was:

- North – The John Hunter Hospital second access road is located immediately adjacent to the Site, followed by relatively dense bushland.
- East – Possum Place Child Care Centre and the residential area of New Lambton Heights.
- South – Existing hospital car parking immediately adjacent and additional hospital infrastructure further south..
- West – The Hydrotherapy Pool Building and existing car parking areas followed by bushland and the main John Hunter Hospital Complex.

Adjacent sites are either unused or used for residential, accesses or hospital purposes. The Hospital and residential areas are located topographically higher than the Site, while the second access road and bushland is down gradient to the Site. It was noted in the Preliminary Site Assessment completed by HLA in August 2006 (HLA, August 2006) for the access road adjacent to the Site (prepared for a different client) that there was a variety of potentially contaminated fill materials along the length of the investigation area. The fill material contained asbestos cement sheeting fragments, slag and incinerator waste and hospital waste. The filled area is topographically lower than the Site and is now sealed. Based on local topography, the nature of land use in the surrounding area and previous assessments, the potential for impact to the subject Site from off-Site sources is considered to be low.

6.3 Topography and Drainage

The Site is elevated at approximately 95 m AHD, and is located on the side of a north facing hill, with a moderate to steep slope to the north. The Site is located on the headwaters of the closest surface water body, Dark Creek, some 500 m to the north of the Site.

No surface water flow was observed during the site investigations, nor was any local perched groundwater encountered during sampling activities.

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6.4 Regional and Site Geology

Review of geological information sourced from the Department of Mines, NSW Newcastle Geological Series Sheet SI 56-2 (1966) for the Site indicated that with respect to regional geology in the vicinity of the Site located on Newcastle Coal Measures which consists of conglomerate, sandstone, tuff, shale and coal. This is underlain by the Tomago Coal measures consisting of shale, mudstone, sandstone, tuff and coal.

Based on intrusive investigations conducted by HLA and DP, the sub surface conditions encountered at the Site comprised fill overlying a stiff-hard clay and conglomerate siltstone/sandstone at depth. The fill profile thickened from east (2.3 m depth) at the NIB Private Hospital building to west (5.6 m depth – refer to DP, June 2007; Borehole 1) near the Hydrotherapy Pool, overlying natural material.

The fill material was primarily encountered on the upper section of the north-facing steep battered slope and consisted of crushed brick, large pieces of construction waste, concrete, moulded and sheeted ACM, coarse gravel, clay fragments, steel and plastic pipe, iron, dark brown clay and organic matter.

The DP, 2007 report identified similar types of waste to that of the HLA, 2006 report with the additional finding of a steel drum in Test Pit 104 (refer to DP, 2007).

6.5 Regional and Site Hydrogeology

No groundwater was encountered during sampling activities conducted by HLA or DP, however based on local topography and geology, groundwater would be expected to flow in a northerly direction towards Dark Creek.

A groundwater bore search was undertaken due to the topographical and geological setting of the Site and expected depth to groundwater, however no groundwater wells were located within a 1 km radius of the Site.

7.0 Basis for Assessment Criteria

7.1 Soil Criteria

The current assessment criteria used in NSW to evaluate soil analytical results based on the Contaminants of Potential Concern (CoPC) are based on the following key guidelines:

- NSW EPA, 1994. *Guidelines for Assessing Service Station Sites*;
- NSW DEC, 2006. *Guidelines for the NSW Site Auditor Scheme (2nd Edition)*; and
- NEPC, 1999. *NEPM National Environment Protection (Assessment of Site Contamination) Measure*.

The guidelines to evaluate soil analytical results currently applied in NSW, present a range of Health-Based Soil Investigation Levels (SILs), provisional Phytotoxicity-Based Investigation Levels (PBILs), Ecological Investigation Levels (EILs), sensitive land use thresholds and expected background concentration ranges for urban redevelopment sites in NSW. Application of these guidelines is briefly described below.

SILs

The SILs described in the NSW DEC (2006) and NEPC (1999) guidelines are based on the National Environmental Health Forum (NEHF) levels devised by Imray and Langley (1996) and subsequently incorporated in the 1999 NEPM. A series of guideline levels are provided for various substances for the protection of human health based on four specific land use and exposure scenarios including:

- SIL₁ Residential with gardens and accessible soil (home-grown produce contributing less than 10% fruit and vegetable intake; no poultry), including children's day care centres, preschools and primary schools, or town houses or villas.
- SIL₂ Residential with minimal access to soil including high-rise apartments and flats.
- SIL₃ Parks, recreational open space, playing fields including secondary schools.
- SIL₄ Commercial or industrial.

For the assessment of petroleum hydrocarbon contamination, the NSW DEC (2006) guidelines refer to the use of the *Guidelines for Assessing Service Station Sites* (NSW EPA, 1994). These guidelines contain threshold concentrations for contaminants in soil and provide for the protection of human and environmental health assuming a sensitive land use. SILs specifically for the lower volatility aliphatic and aromatic petroleum hydrocarbon components are provided in NEPC (1999) for the various land use scenarios described above.

The NSW DEC (2006) assessment process also stipulates that the impact of contaminants on ground and surface water, potential degradation of building structures and affects of chemical mixtures need to be considered.

PBILs & EILs

The PBILs (NSW DEC 2006) and EILs (NEPC 1999) have been devised for the protection of plants, and are designed to be applied as single number criteria indicative of environmental effect. Their use has significant limitations since phytotoxicity depends on soil and species parameters, therefore they are intended to be applied as a screening guide only. The NSW DEC (2006) decision process for assessing urban redevelopment sites stipulates that the PBILs need to be considered on sites used for either residential purposes, or land uses including parks, recreational open space and secondary schools.

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Distribution

Remedial Action Plan

Newcastle Private Hospital Extension, New Lambton Heights, NSW

May 2009

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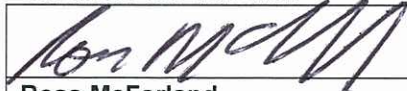
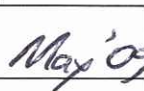


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ENSR notes that the PBILs are for sandy loams with a pH 6 to 8 and the soils on the Site are generally characterised as fill, clays, clayey sands and sandy clayey silts. Use of these PBILs has significant limitations as phytotoxicity depends on soil and species parameters in ways that are not fully understood and are intended for use as a screening guide only.

Asbestos

As stated in the NSW DEC Guidelines for the NSW Site Auditor Scheme (2nd Edition, 2006), there are currently no national or DEC-endorsed guidelines relating to human health or environmental investigation of material containing asbestos on sites. The guidelines state that until such guidelines become available, auditor must exercise their professional judgement when assessing whether a site is suitable for a specific use in the light of evidence that asbestos may be a contaminant of concern.

The collection and storage of asbestos waste is regulated under the Occupational Health and Safety Regulation 2001 by WorkCover NSW.

There are particular requirements for asbestos waste in the Protection of the Environment Operations (Waste) Regulation 2005. Auditors must check that documentation is produced for the disposal of asbestos at appropriate waste facilities in accordance with the Regulation.

Waste Classification Criteria

The NSW DECC (2008), *Waste Classification Guidelines, Part 1: Classifying Wastes* will be used to classify material for disposal. The waste classification analysis will be performed for the contaminants of concern:

- TPH/BTEX,
- PAHs,
- leachable metals,
- OCPs/PCBs.

Virgin Excavated Natural Material Criteria

Natural material to be re-used offsite will be classified against the criteria provided in the Excavated Natural Material Exemption 2008 (ENM), issued under the Protection of the Environment Operations (Waste) Regulation 2005 – General Exemption Under Part 6, Clause 51 and 51A. The ENM criteria is the most stringent criteria available and will be used in conjunction with field screening methods (PID, visual and olfactory observations).

Deleterious Contaminants on Building Structures

There are currently no established Australian criteria for assessing the above contaminants for their deleterious effects on building structures. However, contaminants identified to have a deleterious effect on building structures include:

- Ammonia;
- Sulphate;
- Aluminium;
- Iron;
- Salts of sodium; and
- Petroleum based Substances.

These contaminants of concern were primarily identified by UK Department for Environment, Food and Rural Affairs and The UK Environment Agency, *Potential Contaminants for the Assessment of Land*, UK, 2002.

In the absence of Australian guidelines for protection of structures, the above UK guidance has been considered for screening purposes.

Adopted Soil Assessment Criteria

The results of the preliminary site assessment and the geotechnical investigation identified minimal soil impact by the Contaminants of Potential Concern. On the basis of these results, the site assessment criteria for validation purposes for classification sampling will be limited to the following:

- There is no current NSW EPA endorsed numerical criterion for asbestos in soil and to assess the impact of these materials, the judgemental approach described in NSW DEC (2006) and enHealth (2005) has been adopted.
- Polycyclic Aromatic Hydrocarbons (PAHs), 8 Heavy Metals (As, Cd, Cr, Cu, Hg, Ni, Pb, Zn), Organo Chlorine Pesticides (OCPs) and Polychlorinated Biphenyls (PCBs) results will be assessed against the NSW DEC (2006) SILs NEHF F levels for commercial/industrial land use; and
- Total Petroleum Hydrocarbons (TPH) / Benzene, Toluene, Ethyl benzene, Xylenes (BTEX) results will be assessed against the NSW EPA (1994) guidelines.
- The NSW DECC (2008) Waste classification criteria will be used to classify material to be transported off-site. The ENM exemption will be used where applicable. VENM material generated on Site will be assessed against the ENM criteria.

The above criterion will be applicable for VENM imported to the Site or exported from the Site and Validation sampling.

Any fill material remaining in-situ will be covered with the geotextile marker layer with a 500 mm soil barrier or hardstand/paving. Natural soil levels exposed following excavation works will be sampled and analysed for asbestos fibres in soil only. The assessment criteria will be 'no reported asbestos fibres in soil' using polarised light microscopy for natural exposed soils.

Based on current information at the Site, contaminants of concern which have deleterious effects on building structures are not considered to be present and therefore will not be considered in any sampling. This assumption is based on the fact that all exposed surfaces of the building structure will be on VENM.

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8.0 Site Characterisation

The following is a summary of Site conditions encountered where significant soil contamination was identified.

Sub surface conditions encountered at the Site comprised a fill layer overlaying a hard clay and siltstone profile. Variable surface layers of fill material were encountered to depths of 2.3 m to 5.6 m bgs, although fill may extend beyond this depth.

The results of the soil assessment are described in more detail in **Section 5.2** of this RAP. Except for asbestos, results were reported to be either below the level of reporting, or generally less than the nominated land use criteria. The reported exceptions were a total PAH result (TO02_0.5m) of 47.5 (compared to a criterion of 40 mg/kg), and a Benzo(a)pyrene result (in the same sample location - TO02_0.5m) of 2.9mg/kg (compared to a criterion of 2 mg/kg).

The results of TCLP and ASTM leaching tests suggested low leaching potential for the 16 priority PAHs and for the selected heavy metals tested.

There were observations of visible medical wastes / biological hazards reported during the earlier investigations at the Site, however nearby road cutting works identified small pockets of these materials within general fill.

The fill material was observed during trenching works to become unstable at depth.

Groundwater was not encountered at the Site.

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9.0 Remedial Action Plan

9.1 Remediation Goal

The goal of the proposed remedial works is to provide practical management of the contamination with the aim of reducing risks associated with the Site to a level consistent with the proposed landuse (commercial / industrial).

9.2 Remedial Options

The remedial goal will be achieved based on the controlled excavation and disposal of ACM impacted fill material as asbestos waste. This approach has been adopted based on the Primary Civil Works construction technique (primarily excavation with minor fill component) and the volume of historical filling present at the Site. This method is also consistent for the additional surface carpark areas (Area 1 to 3)

There are potentially a range of other remedial options available for the impacted material, however, practical constraints and project-specific delivery requirements defined by APP have negated the further consideration of alternative approaches. The recommended remedial approach is a proven technique that can address the human health and environmental concerns whilst allowing the construction of the proposed redevelopment of the Site in an environmentally sustainable manner that takes into consideration project delivery demands.

9.3 Remedial Strategy

9.3.1 Primary Civil Works

The proposed use for the Site is a multi level hospital extension including both carparking and hospital wards. Aesthetics are not considered to be relevant as the Site will be capped by a concrete slab or a geotechnical marker covered by between 0.5 m of clean fill. Areas to be landscaped will require a layer of 1.0 m of clean fill, primarily for landscaping purposes (see below). Based on the assessment activities completed to date, and the presence of asbestos fibres and fragments in soil as well as certain general fill, to render the Site suitable for the proposed development works and future landuse, the proposed remedial strategy involves the following general components:

- Fill material within the excavation footprint of the proposed hospital extension assumed to contain ACM will be removed from the Site. Removal will be nominally to the base of natural material with disposal in an approved manner to a landfill licensed to receive the asbestos waste (refer to **Section 11.0** of this RAP). Any fill disturbed during excavation for construction will be disposed of off-site in the above manner. Re-use of fill will be strictly controlled and limited to areas of the Site where in-situ contaminated material is already present. No asbestos waste storage cells will be placed on top of validated natural material. All removal work will be carried out in accordance with the relevant Acts and Regulations, as defined in this RAP;
- Material identified as natural material (clayey silt, silty clay, weathered sandstone and conglomerate) that is not impacted by fragments of ACM or any other waste/fill material will be classified as VENM by a sampling regime. Sampling can either be undertaken in-situ (prior to remedial works) or ex-situ (during remedial works);
- Any imported fill that may be required to reinstate excavation levels will be classified as VENM as per NSW DECC (2008) Waste Classification Guidelines. Imported material will be minimised and will be only utilised where VENM from the site cannot be re-used;

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Glossary of Terms

General Terms	
ACM	Asbestos containing material(s)
ANZECC	Australian and New Zealand Environment and Conservation Council
AHD	Australian Height Datum
APHA	American Public Health Association
ASS	Acid Sulfate Soil
AST	Above ground Storage Tank
BaP	Benzo(a)pyrene (a PAH)
BTEX	Benzene, toluene, ethylbenzene and xylenes
DEC	(former) NSW Department of Environment and Conservation
DECC	NSW Department of Environment and Climate Change
DoP	NSW Department of Planning
DQOs	Data Quality Objectives
DQIs	Data Quality Indicators
EPA	(former) NSW Environment Protection Authority
EMP	Environmental Management Plan
ENM	Excavated Natural Material
HASP	Health and Safety Plan
HRA	Health Risk Assessment
Heavy metals	Generally, arsenic (a metalloid), cadmium, chromium, copper, mercury, nickel, lead and zinc
LOR	Level of reporting
NEHF	National Environmental Health Forum
NEPC	National Environment Protect Council
NEPM	National Environmental Protection Measure
NSW EPA	(former) New South Wales Environment Protection Authority
OCPs	Organochlorine pesticides
OH&S	Occupational Health & Safety
OPPs	Organophosphorus pesticides
PAHs	Polynuclear Aromatic Hydrocarbons
PCBs	Polychlorinated biphenyls
PID	Photoionisation detector
PQL	Practical quantitation level (or limit)
PSH	Phase Separated Hydrocarbon
QA/QC	Quality Assurance/Quality Control
RAP	Remedial Action Plan
RPD	Relative Percent Difference
SAQP	Sampling, Analytical and Quality Plan
SMP	Soil or Site Management Plan
SVOC	Semi-volatile Organic Compound
SWL	Standing Water Level
TPH	Total petroleum hydrocarbons
UCL	Upper Confidence Limit (on mean)
USEPA	United States Environment Protection Agency
UST	Underground Storage Tank
VOC	Volatile Organic Compound

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