

# APPENDIX R

## Remedial Action Plan

Please note this plan is provided as information only and is subject to a Development Application being made to Kempsey Council Approval





# **Health Infrastructure NSW c/- Johnstaff Projects**

**Kempsey Hospital Redevelopment  
Remedial Action Plan**

July 2013

# Executive summary

Johnstaff Projects have been engaged by Health Infrastructure NSW to project manage the redevelopment of Kempsey District Hospital. Some lead contaminated soil has been remediated and validated however the resulting soil stockpile has not yet been disposed offsite.

Since this time, contractors working on the Kempsey District Hospital Redevelopment have identified soil impacted with asbestos whilst undertaking earthworks at the site in preparation for construction. These contractors undertook some test pitting and visual assessment of the vertical and lateral extent of impact. GHD were subsequently engaged to undertake a review of available documents containing information about the potential for contamination at the site. Following this review, GHD prepared a sampling analytical and quality plan (SAQP) aimed at assessing the extent of asbestos impact and to allow waste classification of soil requiring excavation and off-site disposal to prepare the area for construction of the proposed building.

Following review of the SAQP by the site auditor, GHD undertook the site investigation works described in this report. This comprised the excavation of 20 test pits through fill material and into natural soil using a small excavator. Samples of soil and potential asbestos containing material (ACM) were collected and sent for laboratory identification of asbestos, and analysis of heavy metals, total recoverable hydrocarbons (TRH), polycyclic aromatic hydrocarbons (PAH), organochlorine pesticides (OCP) and polychlorinated biphenols (PCB).

Results confirmed asbestos impact (both bonded and friable) through the fill material. Concentrations of all other chemicals of potential concern tested in the soil samples analysed were below the site investigation criteria for commercial/industrial (Hospital) land use. As such, remediation in the site assessment area appears to only be required for asbestos impacted soil.

The results of the assessment were also utilised to provide an in situ waste classification of the material requiring excavation and offsite disposal. In summary, all of the asbestos impacted material can be classified as Special Waste (Asbestos). Following excavation and validation of asbestos contaminated fill, natural soil to be excavated for construction of the proposed building can be classified as virgin excavated natural material (VENM) however if any man made material is identified in this material it must be stockpiled and classified separately. Approval to reuse VENM as backfill on site must be sought from the environmental consultant prior to it being undertaken. All material disposed offsite and reused on site must be tracked including recording the source, area and destination of all material.

All remediation works must be undertaken legally and in accordance with the health safety and environmental protection procedures outlined in this remediation action plan (RAP). All asbestos impacted material must be excavated by a contractor licensed for friable asbestos removal and legally transported and disposed offsite. All works must be supervised by an environmental consultant to observe whether any indicators of unexpected contamination are encountered during remediation and to conduct validation sampling.

GHD will incorporate the validation results into a validation report which will be utilised by the site auditor to prepare a site audit statement for issue to the DoP prior to development of the site.

This Executive Summary provides a brief overview of the more detailed information provided in the body of the RAP, and must be read in conjunction with the scope, limitations, assumptions and qualifications contained throughout this Report.

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# 1. Introduction

## 1.1 Background

GHD Pty Ltd (GHD) was commissioned by Johnstaff Projects (Johnstaff) to undertake additional site assessment and to utilise the results to prepare a Remedial Action Plan (RAP) for contaminated soil requiring removal as part of the proposed redevelopment at Kempsey Hospital, Kempsey, NSW (the site). The site location and site layout are shown on **Figures 1 and Figure 2, Appendix A, respectively**.

The investigation area includes only land in the vicinity of the areas requiring the removal of contaminated fill, as illustrated on **Figure 2**. This land is understood to potentially contain the former hospital landfill within the civil work zone redevelopment area of the Kempsey District Hospital grounds at 119 River Street, West Kempsey, NSW.

The extent of soil requiring removal was estimated by Coffs Harbour Demolitions as shown on enstruct Dwg 5027-ENS-CV-DWG-SA2-910 included in **Appendix A**. Further assessment by GHD was utilised to confirm and further assess the extent of asbestos impact identified.

*No part of this Remediation Plan is to be taken in isolation from the whole to represent the findings. It should be read in its entirety, including appendices and attachments, and is subject to the stated limitations.*

## 1.2 Purpose of this report

This Remediation Action Plan (RAP) has been prepared to:

- Identify the contaminants that require remediation and the waste classification of that material;
- Establish the most effective remedial strategy to render the site suitable for proposed Hospital (Industrial/Commercial) use;
- Detail the validation sampling that will be undertaken to measure the effectiveness of the remediation; and
- Detail the standards and guidelines that the remediation and validation sampling will follow.

## 1.3 Scope

The scope of works undertaken to prepare this RAP comprised the following:

- Collate and review existing data and identify the contaminants requiring remediation;
- Undertake additional investigations to address gaps in existing data;
- Document the relevant guidelines;
- Set the remedial goals and evaluate the remedial options;
- Define the remediation strategy and validation plan;
- Outline information to be documented in a Site Management Plan;
- Identify information which should be included in the Occupational Health & Safety Plan; and

- Outline contingency measures.

## 1.4 Key Environmental Guidelines

The remediation and validation activities undertaken at the site will be performed with reference to the following key guidance documents:

- The National Environmental Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013), NEPC 2013;
- AS 4482.1:2005 Guide to the Sampling and Investigation of Potentially Contaminated Soil – Non-volatile and Semi-volatile Compounds;
- NSW DEC (2006), “Contaminated Sites: Guidelines for NSW Site Auditor Scheme”;
- NSW DECC (2009), “Waste Classification Guidelines Part 1: Classifying Waste”; and
- NSW EPA (2011), “Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites”.

Asbestos management in NSW is controlled through the *Work Health and Safety Act 2011 (NSW)* and associated legislation including *Work Health and Safety Regulations 2011 (NSW)*. The most relevant section of the regulation is Chapter 8 Asbestos.

The following asbestos Codes of Practise (COP) are approved under Section 274 of the *Work Health and Safety Act 2011 (NSW)*:

- How to Manage and Control Asbestos in the Workplace, (2011) Safe Work Australia; and
- How to Safely Remove Asbestos, (2011) Safe Work Australia.

## 1.5 Asbestos Definitions

The following definitions are of relevance to this RAP.

**ACM** – an *asbestos containing material* which is in sound condition, although possible broken or fragmented, and the asbestos is bound in a matrix; for instance, asbestos fencing or vinyl tiles. This is also restricted to material that cannot pass through a 7 mm x 7 mm sieve. This sieve size is selected because it approximates the thickness of common asbestos cement sheeting and for fragments to be smaller than this would involve extreme mechanical action probably also associated with asbestos fibre release. The smaller fragments are covered by the third category described below. ACM usually represents a low human health risk.

**FA** – *fibrous asbestos* and encompasses friable asbestos material such as severely weathered ACM, and asbestos in the form of loose fibrous material such as insulation products. Friable asbestos is defined here as asbestos material that is in a degraded condition such that it can be broken or crumbled by hand pressure. Both ACM and FA can often be detected visually.

**AF** – *asbestos fines* include free fibres of asbestos, small fibre bundles and also ACM fragments that pass through a 7 mm x 7 mm sieve. Both FA and AF have the potential to generate or be associated with free asbestos fibres, which can pose an unacceptable inhalation risk if made airborne.

## 1.6 Limitations

*This Kempsey District Hospital, Remedial Action Plan ("RAP"):*

- 1. has been prepared by GHD Pty Ltd ("GHD") for JohnStaff Projects c/- Health Infrastructure NSW;*
- 2. may only be used and relied on by JohnStaff Projects c/- Health Infrastructure NSW;*
- 3. must not be copied to, used by, or relied on by any person other than JohnStaff Projects c/- Health Infrastructure NSW without the prior written consent of GHD and subject always to the next paragraph;*
- 4. may only be used for the purpose as stated in Section 1.2 of the RAP (and must not be used for any other purpose).*
- 5. May be used by and provided to the Site Auditor acting as an agent of JohnStaff Projects c/- Health Infrastructure NSW.*
- 6. May be used by and provided to the NSW EPA and the relevant planning authority for the purpose of meeting statutory obligations in accordance with the relevant sections of the CLM Act 1997 or the Environment Planning and Assessment (EP&A) Act 1979.*
- 7. Must not be copied to, used by, or relied on by any person other than those listed in the points above without the prior written consent of GHD and subject always to the next paragraph.*

*GHD and its servants, employees and officers otherwise expressly disclaim responsibility to any person other than JohnStaff Projects c/- Health Infrastructure NSW arising from or in connection with this RAP.*

*To the maximum extent permitted by law, all implied warranties and conditions in relation to the services provided by GHD and the RAP are excluded unless they are expressly stated to apply in this RAP.*

*The services undertaken by GHD in connection with preparing this RAP:*

- were limited to those specifically detailed in section 1.3 of this RAP and GHD proposal dated 26 June 2013, document number P356 Kempsey;*
- were undertaken in accordance with current profession practice and by reference to relevant environmental regulatory authority and industry standards, guidelines and assessment criteria in existence as at the date of this RAP and any previous site investigation and assessment RAPs referred to in the RAP.*

*The opinions, conclusions and any recommendations in this RAP are based on assumptions made by GHD when undertaking services and preparing the RAP ("Assumptions"), as specified throughout this RAP.*

*GHD expressly disclaims responsibility for any error in, or omission from, this Report arising from or in connection with any of the Assumptions being incorrect.*

*Subject to the paragraphs in this section of the RAP, the opinions, conclusions and any recommendations in this RAP are based on conditions encountered and information reviewed at the time of preparation of this RAP and are relevant until such times as the site conditions or relevant legislations changes, at which time, GHD expressly disclaims responsibility for any error in, or omission from, this RAP arising from or in connection with those opinions, conclusions and any recommendations."*

*This RAP is based solely on the investigations and findings contained in the reports referenced in the RAP (section 12) and on the conditions encountered and information reviewed at the time of each Attached Report. This RAP should be read in conjunction with the Attached Reports. It is also subject to all the limitations and recommendations in the Attached Reports.*

*GHD has prepared this RAP on the basis of information provided by JohnStaff Projects and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked (“Unverified Information”) beyond the agreed scope of work.*

*GHD expressly disclaims responsibility in connection with the Unverified Information, including (but not limited to) errors in, or omissions from, the RAP, which were caused or contributed to by errors in, or omissions from, the Unverified Information.*

*The opinions, conclusions and any recommendations in this RAP are based on information obtained from, and testing undertaken at or in connection with, specific sampling points and may not fully represent the conditions that may be encountered across the site at other than these locations. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.*

*Investigations undertaken in respect of this RAP are constrained by the particular site conditions, such as the location of buildings, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this RAP.*

*GHD has considered and/or tested for only those chemicals specifically referred to in this RAP and makes no statement or representation as to the existence (or otherwise) of any other chemicals.*

*Site conditions (including any the presence of hazardous substances and/or site contamination) may change after the date of this RAP. GHD expressly disclaims responsibility:*

- arising from, or in connection with, any change to the site conditions; and
- to update this RAP if the site conditions change.

*Except as otherwise expressly stated in this RAP GHD makes no warranty or representation as to the presence or otherwise of asbestos and/or asbestos containing materials (“ACM”) on the site. If fill material has been imported on to the site at any time, or if any buildings constructed prior to 1970 have been demolished on the site or material from such buildings disposed of on the site, the site may contain asbestos or ACM.*

*Subsurface conditions can vary across a particular site and cannot be exhaustively defined by the investigations carried out prior to this RAP. As a result, it is unlikely that the results and estimations expressed or used to compile this RAP will represent conditions at any location other than the specific points of sampling. A site that appears to be unaffected by contamination at the time of the reports attached to this RAP may later, due to natural causes or human intervention, become contaminated.*

*Except as otherwise expressly stated in this RAP, GHD makes no warranty, statement or representation of any kind concerning the suitability of the site for any purpose or the permissibility of any use, development or re-development of the site.*

*These Disclaimers should be read in conjunction with the entire RAP. This RAP must be read in full and no excerpts are taken to be representative of the findings of this RAP.*

## 2. Site identification and environmental setting

The investigation area includes only land in the vicinity of the areas requiring the removal of contaminated fill as illustrated on **Figure 2**. This land is understood to contain the former hospital landfill within the civil work zone redevelopment area of the Kempsey District Hospital grounds at 119 River Street, West Kempsey, NSW.

### 2.1 General site description

An Environmental Scientist completed a site inspection on 2 July 2012. Photographs collected during the site inspection and subsequent investigations undertaken on 10 July 2013, as referenced below, are provided in **0**. The following observations were made:

- The investigation area is a triangular parcel of recently disturbed land accessed from the Tozer Street entrance. The area is bounded by a temporary construction site fence which is secured each day. The main investigation area was covered by black plastic sheeting due to identified asbestos (Photo 1).
- The investigation area slopes towards the south-east, which appears consistent with the surrounding land. There is some localised variance to this as a result of recent demolition and site preparation works. There is no vegetation located with the investigation area, but several large trees are present on adjacent portions of the site. Infrastructure present on/near the investigation area comprises an aviation fuel store shed, temporary site offices, garbage bin store shed, morgue, brick shed and some concrete foot paths. A single stockpile was observed in the eastern portion of the investigation area (Photo 2).
- The surface of the investigation area generally comprised bare earth which had been exposed during recent site preparation works (Photo 3). The grassed areas to east and south appeared healthy and well maintained.
- A bitumen driveway was present adjacent to the western boundary of the investigation area. The driveway appeared to have been partially destroyed by recent demolition works.
- Scattered debris (from demolition rubble and historic filling) was observed both on and within soils in the investigation area. The debris generally comprised pieces of terracotta pipe, bricks, glass, ceramics, ash and food wrappers (Photo 4). Bonded asbestos cement fragments (Photo 5) and friable asbestos materials (Photo 6) were also recorded within the investigation area.
- The surrounding land use to the north was open space (possibly a large residential allotment), to the east was residential, to the south was the local cemetery and to the west were the hospital grounds and the Macleay River further west.

### 2.2 Topography and drainage

The closest surface water to the site is the Macleay River, which is located approximately 150 m to the southwest. The site inspection indicated the site slopes to the southeast. The regional groundwater flow direction is likely to be to southeast, in line with the curve of the Macleay River.

Surface water on the investigation area is likely to infiltrate through the unsealed surface or transfer southeast as overland flow to an open drain within the cemetery grounds.

### 2.3 Geology and soils

The Hastings 1:250,000 geological map shows that the site is underlain by the Kempsey Beds comprising of mudstone, sandstone and includes conglomerate where mapped and pebbly sandstone.

### 2.4 Hydrogeology

A search of the NSW Office of Water (NOW) records in October 2012 (Coffey, 2012) indicated that there were no bores within a 500m radius of the site. The closest bore with available information was 630m from the site beyond the Macleay River. Available information on this bore is summarised below.

**Table 1 Summary of Groundwater Bore Information**

Bore Number	Authorised Use	Total Depth of Bore (m) Distance*, Direction & Gradient* from Site.	Standing Water Level (m)	Water Bearing Zones (m)
GW053230	Domestic Stock	23.70	630m, DG, SW 12.80	13.4 – 14.0 21.0 – 26.10

## 3. Previous Investigations

The site has been subject to environmental investigations in 2012 by Coffey. **Section 3.1** provides a summary of the previous investigation.

### 3.1 Summary of previous reports

#### 3.1.1 Coffey Phase 1 Environmental Assessment (2012)

Coffey Geotechnics Pty Ltd (Coffey) was engaged by the enstruct Group Pty Ltd on behalf of Health Infrastructure NSW to undertake a Phase 1 Environmental Site Assessment (Phase 1 ESA) for the proposed Stage 1 and Civil Works Zone redevelopments within the Kempsey District Hospital located within 119 River Street, West Kempsey NSW.

The Phase 1 ESA objective was to identify any past or present potentially contaminating activities on the site, provide a preliminary assessment of site contamination and, if necessary, to provide a basis for a more detailed investigation.

In summary, the site history prepared for the Stage 1 and Civil Work Zones redevelopment areas within the Kempsey District Hospital grounds showed that the hospital was constructed in the early 1940's. A review of the earliest available historical 1957 aerial photographs showed original hospital buildings within the northern portion of the Stage 1 area, which included the former nurse quarters. The aerial photographs indicated that the former boiler and laundry buildings and the fumigation building were constructed sometime between 1957 and 1967 and the incinerator and coke storage buildings were constructed between 1967 and 1979.

Interviews with Kempsey District Hospitals Acting Assistant Engineer suggested that the fill embankment observed to the southeast of the boiler and laundry building was filled during construction of the boiler and laundry building in the early 1960's. Observations made by Coffey during their site walkover found no visual evidence of contamination.

A review of NSW WorkCover records found no evidence of underground storage tanks (USTs) being present within the hospital grounds. A review of the limited records held by Kempsey Shire Council for the period 1991 to 2002 included hospital plans identifying the small building to the southwest of the boiler and laundry building as the coal (coke) storage building. The former incinerator was once located in a building to the south of the boiler and laundry buildings at the base of the embankment within the Stage 1 area. This building is now used for waste storage and cleaning of bins.

The findings from the site history assessment and site walkover identified four (4) areas of environmental concern (AECs). These AECs were associated with the former activities and current landuses of the site, they included the former laundry and boiler room, incinerator, fumigation and coke storage buildings, the existing diesel AST, former nurse quarters building, and the fill embankments constructed of unknown material within the site.

Based on the findings of the Phase 1 ESA a more detailed investigation (Phase 2 ESA) was recommended.

#### 3.1.2 Coffey Phase 2 Environmental Assessment (2013)

Coffey Geotechnics Pty Ltd (Coffey) was engaged by the enstruct Group Pty Ltd to undertake the Phase 2 Environmental Site Assessment (Phase 2 ESA) for the Stage 1 and Civil Works

Zone redevelopment Kempsey District Hospital located at 119 River Street, West Kempsey NSW.

As noted above, the Phase 1 ESA identified four (4) areas of environmental concern (AECs), including:

- AEC 1 – Embankments (suspected fill) (southeast of boiler and laundry building and associated with the helipad)
- AEC 2 – Boiler Room, Incinerator, Coke Storage and Fumigation buildings, and the diesel above ground storage tank
- AEC 3 – Former Nurse Quarters Building
- AEC 4 – Broad screening over the balance of the site

The field investigation program was design to assess the potential contamination present in each of the AECs. The Phase 2 ESA including the drilling of five (5) boreholes within the fill embankments (AEC1) to the east of the boiler room building and associated with the construction of the helipad. Surface soil sampling and one borehole were undertaken within the remaining three (3) AECs. During the field investigation no signs of surface staining or hydrocarbon odours were observed. Minor coal and ash fragments were identified in BH6 (0.5 – 1.4m) and BH14 (0.6 – 1.3m) and in surface soils during collection of sample SS10.

The lab results indicated that 41 of the 42 samples analysed reported levels of potential contaminants of concern below adopted investigation criteria. The exception was surface sample SS10 reporting concentration of lead (960mg/kg) above the adopted soil investigation level (SIL) of 600mg/kg. Surface sample SS10 was collected from adjacent to the eastern wall of the boiler room building. The source of the elevated levels of lead was attributed to flaking paint (potential lead based paint) observed on the eaves around the building.

Asbestos containing materials (ACM) including fibre cement sheeting and potential lead based paint, on buildings timber eaves, was observed within the site. The ACM was reported to be in relatively good condition and no asbestos was detected in the surface soil samples analysed. Several of the buildings proposed to be demolished within the Stage 1 area were noted to contain ACM and potential lead based paint coatings. Coffey recommended that prior to redevelopment of the Stage 1 area that a detailed Hazardous Materials survey was undertaken to identify and quantify the amount of asbestos and potential lead based paint materials present.

The report stated that findings from the field investigation and laboratory results indicated that the elevated lead concentrations within AEC2 and the presence of ACM and potential lead based paint within the hospital buildings in Stage 1 warrant further investigation and remediation. Coffey concluded that Implementation of these recommendations would allow for the site to be made suitable for its intended future redevelopment.

### **3.1.3 Coffey Site Validation Assessment Lead Contamination (2013)**

On 6 May 2013 Coffey undertook validation of a hotspot of lead contamination in the vicinity of surface sample location SS10. Lead impacted soil was excavated to an area of 6m by 4.5m and to a depth of between 1.6-1.8m. Following excavation, five soil validation samples were collected and all returned results below the adopted site investigation criteria.

The excavated soil was stockpiled and sampled for waste classification.

### **3.1.4 Coffey Site Validation Assessment Lead Contamination (2013)**

In May 2013, Coffey collected two soil samples from the soil stockpile generated during remediation of the hotspot of lead contaminated soil in the vicinity of surface soil sample SS10. The soil samples were analysed and subsequently the stockpile was classified as general solid waste.

## **3.2 GHD Data Gap Assessment**

Since completion of the Phase 2 ESA, site preparation works have begun at Kempsey Hospital. The laundry and boiler room building has been demolished and lead contamination identified by Coffey has been remediated and validated.

Contractors working on the site identified asbestos fragments, bottles and ash within fill material requiring removal for the construction of the proposed building illustrated on the enstruct Dwg 5027-ENS-CV-DWG-SA2-910 included in **Appendix A**. Anecdotal evidence indicated that this area of the site may have been the former hospital landfill. As these issues had not been evident from the previous reports, further investigations were required to address these data gaps, as well as provide further information on the volume and waste classification of material to be removed.

To address these data gaps, GHD prepared a sampling analytical and quality plan entitled *Kempsey District Hospital Redevelopment, Sampling Analytical and Quality Plan* (July 2013) aimed at assessing the extent of asbestos impact and to allow waste classification of soil requiring excavation and off-site disposal to prepare the area for construction of the proposed building. The SAQP was reviewed by the site auditor and GHD undertook the fieldworks described in the SAQP, summarised in **Section 5** below.

## 4. Data Quality Objectives

A process for establishing data quality objectives for an investigation site has been defined by the NSW DEC Guidelines for the NSW Site Auditor Scheme (2nd ed, 2006).

The Data Quality Objective (DQO) Process will be applied to the investigation, as described below, to ensure that data collection activities are appropriate and achieve the project objectives.

The DQO process involves seven steps as follows:

- Step 1 - State the problem
- Step 2 - Identify the decision
- Step 3 - Identify inputs to the decision
- Step 4 - Define the study boundaries
- Step 5 - Develop a decision rule
- Step 6 - Specify limits on decision errors
- Step 7 - Optimise the design for obtaining data.

The DQO steps defined above have been addressed as follows.

### 4.1 Step 1 - State the problem

A former landfill containing asbestos, ash and bottles has been identified and requires remediation as part of the proposed hospital redevelopment.

The project is being undertaken in order to:

- Provide data on the presence, extent, concentration and potential migration of contamination.
- Use the data to develop a plan for remediation and validation of the impacted area.

### 4.2 Step 2 - Identify the decisions

Previous investigations have provided some preliminary data on the contamination status of the site. However, recent works have also indicated a former hospital landfill may exist in in this area, containing contamination requiring remediation.

Sufficient data is required to enable a remediation action plan to be prepared.

To allow such a plan to be made, it is necessary to consider the following questions:

What is the extent (both laterally and vertically) of contamination across the investigation area?

Is contamination present above the applicable guidelines, when analysed in statistically sound manner?

Where contamination has occurred, does it have the potential to adversely impact on human health and/or environmental receptors?

What remediation (or management) and validation of contaminated material is likely required to render the area suitable, from a contamination perspective for the proposed redevelopment?

What is the waste classification of material requiring disposal?

### **4.3 Step 3 - Identify inputs to the decision**

The sampling program has been designed to provide sufficient information to allow evaluation of the questions set out in Section 4.2.

This will be achieved by:

Undertaking supplementary sampling and analysis of soil (to provide sufficient site coverage and a valid data set upon which to base subsequent decisions).

Comparing the data against applicable guidelines to evaluate the potential for contamination to adversely impact upon human health and/or environmental receptors and for waste classification purposes.

Evaluating whether or not the subject area of the Site is suitable (from a contamination perspective) for ongoing use under its current zoning and whether any contamination remediation and/or management are required.

The outcome of these initial analyses will be used to address the questions set out in Section 4.2.

### **4.4 Step 4 - Define the study boundaries**

The lateral boundaries of the study area are the vicinity of where site assessment identified contaminated fill as depicted on Figure 2. The assessment will aim to delineate the lateral extent of contaminated soil requiring removal.

The vertical boundary shall be the depth to which filling appears to have occurred in which contaminated material requiring removal may be present.

### **4.5 Step 5 - Develop a decision rule**

Project analytical data will be compared to appropriate NSW EPA made or endorsed guidelines.

On the basis of this initial comparison, plus an assessment of potential contaminant exposure pathways, a decision will be made in regard to the requirements for management and/or remediation of contamination in the assessment area.

### **4.6 Step 6 - Specify limits on decision errors**

Two primary decision error-types may occur due to uncertainties or limitations in the project data set:

- a. An investigation area may be deemed to pose no unacceptable risk, when in fact it does. This may occur if contamination is 'missed' due to limitations in the sampling plan, or if the project analytical data set is unreliable.
- b. An investigation area may be deemed to pose an unacceptable risk, which in fact it does not. This may occur if the project analytical data set is unreliable, due to inappropriate sampling, sample handling, or analytical procedures.

To minimise the potential for decision errors, data quality indicators (DQIs) have been determined, for completeness, comparability, representativeness, precision and accuracy.

The DQIs for sampling techniques and laboratory analysis of collected samples defines the acceptable level of error required for this investigation. The data quality objectives will be assessed by reference to data quality indicators as follows:

- Data Representativeness - expresses the degree which sample data accurately and precisely represents a characteristic of a population or an environmental condition. Representativeness is achieved by collecting samples in an appropriate pattern across the site, and by using an adequate number of sample locations to characterise the site. Consistent and repeatable sampling techniques and methods are utilised throughout the sampling:
  - The soil sampling program proposed by GHD aims to assess whether contamination poses any unacceptable risk to human health and/or the environment.
  - Additional testing may be required following the initial program if the extent of contamination is not adequately delineated or if potential contamination sources are not adequately investigated.
- Completeness - defined as the percentage of measurements made which are judged to be valid measurements. The completeness goal is set at there being sufficient valid data generated during the study. If there is insufficient valid data, then additional data are required to be collected.
- Comparability - is a qualitative parameter expressing the confidence with which one data set can be compared with another. This is achieved through maintaining a level of consistency in techniques used to collect samples and ensuring analysing laboratories use consistent analysis techniques and reporting methods.
- Precision - measures the reproducibility of measurements under a given set of conditions. The precision of the data is assessed by calculating the Relative Percent Difference (RPD) between duplicate sample pairs.

$$RPD(\%) = \frac{|C_o - C_d|}{C_o + C_d} \times 200$$

Where Co = Analyte concentration of the original sample  
Cd = Analyte concentration of the duplicate sample

GHD adopts a nominal acceptance criteria of +/- 30% RPD for field duplicates and splits for inorganics and a nominal acceptance criteria of +/- 50% RPD for field duplicates and splits for organics, however it is noted that this will not always be achieved, particularly in heterogeneous soil or fill materials, or at low analyte concentrations.

- Accuracy - measures the bias in a measurement system. Accuracy can be undermined by such factors as field contamination of samples, poor preservation of samples, poor sample preparation techniques and poor selection of analysis techniques by the analysing laboratory. Accuracy is assessed by reference to the analytical results of laboratory control samples, laboratory spikes, laboratory blanks and analyses against reference standards. The nominal “acceptance limits” on laboratory control samples are defined as follows:

\* Laboratory spikes – 70-130% for metals / inorganics 60-140% for organics

\* Laboratory duplicates - <30% for metals / inorganics, <50% for organics

\* Laboratory blanks - <practical quantitation limit

Accuracy of field works is assessed by examining the level of contamination detected in equipment blanks. Equipment blanks should return concentrations of all organic analytes as being less than the practical quantitation limit of the testing laboratory.

#### **4.7 Step 7 - Optimise the design for obtaining data**

To optimise the design of the investigations a sampling and analytical program for remediation validation has been prepared.

# 5. Contamination Status

## 5.1 GHD Investigations

As noted in **Section 3.2** contractors working on the site identified asbestos fragments, bottles and ash within fill material requiring removal for the construction of the proposed building illustrated on enstruct Dwg 5027-ENS-CV-DWG-SA2-910 included in **Appendix A**. On the 10<sup>th</sup> July 2013 GHD undertook further assessment to gain an appreciation as to the extent and degree of contamination in this area and to inform this RAP.

GHD's investigations comprised 20 test pits (TP01 to TP20) which were excavated in the investigation area (as shown on **Figure 2**) until natural soil was encountered to a maximum depth of 2.4 m (Test Pit Logs are presented in Appendix E). Soils were sampled and analysed in accordance with the methodology outlined in GHD (2013) Sampling and Analysis Quality Plan (SAQP). Three soil samples were also collected and composited (to form Composite 1) from a small soil stockpile in the assessment area (Figure 2). A sample of suspected synthetic mineral fibre (SS BS\_0) was also collected from adjacent to test pit TP05 and was analysed for the presence of asbestos.

Field quality assurance comprised the collection of soil samples from the centre of the excavator bucket using clean nitrile gloves at all sample locations. All samples were placed into laboratory prepared glass jars or plastic bags.

The results of field blind duplicates collected and analysed are as follows:

Asbestos Presence/absence TP08-0.2 (QA03) – No asbestos detected in both samples.

TRH/PAH/HM – TP05-0.2 (QA02) and TP08-0.2 (QA03) – RPDs acceptable based on the low concentrations of contaminants detected.

The Eurofins MGT also conducted their own internal quality assurance and quality control assessment procedures. The results of their assessments were considered to be adequate for the purpose of this study.

**Appendix C** contains the Soil Analysis Result Tables and **Figure 2**, **Appendix A** depicts the results of the soil sampling and analysis. The laboratory certificates are presented in Appendix D.

All results were below the adopted site investigation guidelines described in **Section 7** (and generally below the laboratory PQL for the majority of analytes) with the exception of one sample which contained an elevated concentration of lead TP05 (1.8m) (2,600 mg/kg). This result was suspected to be a small particle of lead impacted material within the sample jar. As such, three additional sub samples were analysed from the jar and all returned results below the adopted site investigation criteria. The lead exceedence is not considered to be representative of the contaminants in the soil and has been excluded from the data set. Statistical evaluation of all other lead results is not required because they all fall below the adopted site investigation criteria.

Analysis of cement sheeting fragments and samples of fibrous material, (collected during GHD's field works) confirmed that bonded and friable asbestos materials are present on site, as detailed on the laboratory report in **Appendix D** and summarised in the results table in **Appendix C**. The locations and depths where asbestos was encountered are illustrated on Figure 2.

As such, remediation of asbestos impacted soil in the civil works zone is required. Results revealed that the material to be excavated and that within the small stockpile is classified as **Special Waste (Asbestos)** if it is to be disposed offsite.

## 6. Conceptual Site Model

### 6.1 Contaminants of Concern

Based on the outcomes of environmental assessment conducted to date, the contaminants of potential concern (COPC) in soil beneath the site are:

- Asbestos Containing Materials;
- Fibrous Asbestos; and
- Asbestos Fines.

### 6.2 Conceptual Site Model

The following conceptual site model (CSM) has been developed based on GHD's understanding of the site setting, including geology, hydrogeology and surrounding land use in order to identify potentially significant source-pathway-receptor (SPR) linkages in respect of risks to human health and the environment.

#### 6.2.1 Sources

The primary source of the COPC was identified by GHD as fill material with asbestos containing material. Fill material was identified across the majority of the investigation area, though concentration and depth was increased in the area of the suspected location of the former hospital landfill.

#### 6.2.2 Pathways

The primary pathways through which humans could be exposed to the sources of contamination are considered to be:

- Inhalation of asbestos fibres from disturbance of asbestos contaminated soils.

#### 6.2.3 Receptors

When evaluating potential adverse health effects to people from exposure to a contaminated site all potentially exposed populations should be considered.

For the site, the key populations or receptors of interest are considered to include:

- On-site workers during redevelopment of the site.
- On site future occupiers including staff and patients.
- Intrusive maintenance (utility) workers (on-site).

The potential SPR linkages are summarised in **Table 2** along with comment on whether the linkages are considered to be complete based on the most recent assessments.

**Table 2 - Conceptual Site Model**

Source	Pathway	Receptor	Risk posed
Soil impacted with Asbestos (ACM, FA and AF)	Inhalation of asbestos fibres, either during direct contact with the material or indirectly within generated dust containing AF	Future site users	Moderate where surface soils are impacted and no barrier to exposure exists.
		Local off site users	Moderate where surface soils are impacted
		Ecological systems	N/A as asbestos is not an ecological contaminant.
		On site workers during development, excavation or future maintenance works	High potential for direct contact with ACM or impacted soils

# 7. Basis for Assessment

## 7.1 Relevant guidelines

The framework for the contamination assessment made herein, was developed in accordance with guidelines “made or approved”, by the Department of Environment, Climate Change and Water (DECCW), under Section 105 of the *Contaminated Land Management Act, 1997*. These guidelines include, but are not limited to the following:

- NSW EPA (1995), Contaminated Sites: Sampling Design Guidelines
- NEPM (2013), “National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013 (No. 1)”, National Environment Protection Council (NEPC)
- NSW DECC (2009), Waste Classification Guidelines Part 1: Classifying Waste
- NSW DECC (2009), Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997
- NSW EPA (2011) Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites

## 7.2 Assessment criteria (soil)

The assessment criteria against which the project analytical data is compared have been taken from those guidelines made or approved by the NSW EPA.

### 7.2.1 Health Based Criteria

Health-based soil Investigation Levels (HILs) are provided for a range of different exposure settings, which are based on the nature of the use(s) for which the land is currently used and/or it's approved use(s). Given that the site assessment area is proposed to be redeveloped for Hospital (commercial/industrial) land use, this assessment is based on exposure setting D, herein referred as (HIL(D)).

Health-based screening levels (HSLs) have been developed that consider human health effects of exposure to petroleum hydrocarbons (from petroleum products e.g. petrol, diesel) in soil, groundwater and soil vapour from vapour intrusion and direct contact with soil. The HSLs were generated with the assistance of a project advisory group that included more than 20 professionals (including those that represented NSW EPA) and was reviewed by internationally recognised experts in the fields of soil vapour and toxicology.

### 7.2.2 Calculated 95% UCL<sub>avg</sub> Concentration for Comparison to the Guidelines

When comparing specific layers or bodies of material against the HIL criteria, the data set is separated to ensure that only materials of similar composition are included for comparison. For example, when calculating the 95%UCL<sub>avg</sub> (Upper Confidence Limit of the arithmetic average contaminant concentration) for a particular contaminant concentration in a given volume of material for the purposes of comparison against the relevant site criteria, only the data for the samples collected for that particular material is used in the calculation. This is known as a homogenous sample population.

The guidelines indicate that the calculated 95% UCL<sub>avg</sub> concentrations for each parameter can be compared to the HIL criteria and represent acceptable concentrations of parameter assuming the following:

- The calculated 95% UCL<sub>avg</sub> concentration does not exceed the respective criteria;
- No single concentration within the data set exceeds 250% of the respective criteria for each parameter; and
- The standard deviation of the data set must not to exceed 50% of the respective criteria for each parameter.

**Table** provides a summary of the adopted criteria used to assess soil contamination levels at the site.

### 7.3 Asbestos criteria

The assessment criteria against which the project validation data will be compared have been taken from the WA DOH, 2009 guidelines. The soil asbestos validation criteria adopted for this investigation are summarised in the following table.

**Table 3 – Adopted Asbestos Criteria**

Parameter	Land Use	Criteria
FA and AF	All site uses	0.001 % w/w
ACM	Residential use, day care centres, preschools	0.01 % w/w
	Residential, minimal soil access	0.04 % w/w
	Parks, public open spaces, playing fields etc	0.02 % w/w
	Commercial/ Industrial	0.05 % w/w

The FA and AF criterion of 0.001% w/w remains fixed for all site uses because the means to determine concentration differences at this level of detection is difficult. As noted above, for the purposes of this investigation it has been assumed that significant Fibrous Asbestos (FA) and Asbestos Fines (AF) are not present (based on previous samples not detecting asbestos in soils), and concentrations can be based on ACM alone.

The concentration of asbestos in soil attributable to ACM contamination is calculated as follows:

$$\text{\% Soil Asbestos} = \frac{\text{\% Asbestos Content x ACM (kg)}}{\text{Soil Volume (L) x Soil Density (kg/L)}}$$

In addition, for remediation purposes the top 10 cm of soil should also be free of any visible asbestos, partly for risk reassurance purposes.

**Table 4 – Adopted Soil Criteria**

Parameter	Health-Based Criteria (HIL D Commercial/Industrial) (mg/kg)
Arsenic	3,000
Cadmium	900
Chromium (III+VI)	3,600
Copper	240,000
Lead	1,500
Nickel	6,000
Zinc	400,000
Total Mercury (inorganic)	730
Total Polycyclic Aromatic Hydrocarbons (PAHs)	4,000
Benzo(a)pyrene Total Potency Equivalent	40
Total Polychlorinated Biphenyls (PCBs)	7
Aldrin+Dieldrin	45
Chlordane	530
DDT + DDD + DDE	3,600
Endosulfan (and its epoxide)	2,000
Endrin	100
Heptachlor	50
Hexachlorobenzene	80
Methoxychlor	2,500

a) In the absence of Total Cr guideline (CrVI) guideline has adopted.

### 7.3.1 Waste Classification Guidelines

A summary of the waste classification levels which were used to evaluate measured chemical concentrations in soil requiring offsite disposal is provided in **Table 4**.

**Table 4 – Waste Criteria**

Parameter	Waste Classification Guidelines (with TCLP data)(a)			
	General Solid Waste		Solid Waste	
	CT (mg/kg)	TCLP (mg/L)	CT (mg/kg)	TCLP (mg/L)
Arsenic	100	-	400	-
Cadmium	20	-	80	-
Chromium	100	-	400	-
Lead	100	5	400	20
Mercury	4	-	16	-
Nickel	40	-	160	-
Benzo(a)pyrene	0.8		3.2	-

a) Values as outlined in Table 1 of NSW DECC (2008) *Waste Classification Guidelines*.

## 8. Remedial Options

### 8.1 Objectives and extent of remediation

The overall goal is to remediate the asbestos impacted fill material and to remove from site the soil (both contaminated and virgin excavated natural material) requiring excavation to facilitate construction of the proposed building.

The extent of remediation is currently understood to include the vicinity of the test pit locations as illustrated on Figure 2 where GHD and Coffs harbour Demolitions have identified asbestos impacted fill material. It is expected that impacted fill material will be excavated to the depth of natural soil. If fill material is still present in the walls of the resulting excavation additional site assessment including test pitting with reference to the sampling density and methodology outlined in NEPM 2013 will be utilised to confirm whether remediation should be extended.

The objective of the RAP is to document the processes required to address the identified soil contamination so that the site is made suitable (from a contamination perspective) for hospital (commercial/industrial) land use.

### 8.2 Remedial options

Given that asbestos impacted soil will require excavation as part of the proposed construction works, management of this material must be undertaken. It could be excavated and placed in an engineered containment cell on site and the cell could be managed under a site management plan however GHD understands that Health Infrastructure NSW prefers that this material is disposed offsite.

As such, the impacted material must be excavated, chased out and the resulting excavation validated. The nominated remediation zone is planned to be excavated to natural soil. GHD has pre-classified areas of fill material for offsite disposal in accordance with the *Waste Classification Guidelines*. The contaminated soil (including that within the soil stockpile from the lead remediation undertaken by others) has been classified as Special Waste (**Asbestos**). Following excavation and validation of asbestos contaminated fill, natural soil to be excavated for construction of the proposed building can be classified as virgin excavated natural material (VENM) for offsite disposal however if any man made material is identified in this material it must be stockpiled and classified separately.

Approval to reuse VENM as backfill on site must be sought from the environmental consultant prior to it being undertaken. All material disposed offsite and reused on site must be tracked including recording the source, area and destination of all material.

# 9. Remedial Works Plan

## 9.1 Overview and scope

The scope of remediation to be carried out, based on the selected approach, is envisaged to comprise removal and chasing out of asbestos contaminated material from within the civil works zone.

## 9.2 Roles and responsibilities

The Remediation Contractor will be responsible for undertaking the remedial works and all relevant approvals required to undertake the works.

The Environmental Consultant will be required to liaise with the Remediation Contractor, and provide an independent review and validation of the remedial works.

## 9.3 Preliminaries and approvals

Prior to commencing remedial works, all relevant licences and approvals must be obtained by the Site owner and/or Remediation Contractor from the relevant authorities including the Client.

Prior to the establishment at the site, the Remediation Contractor must possess plans, programmes, licences, certificates and other documents necessary for the commencement of the work. All such plans must be completed and approved by the relevant consent authority (where required). These documents are anticipated to include, but not limited by, the following:

- A detailed work programme;
- Insurance Certificates;
- WorkCover Authority notifications;
- A management plan and procedures covering all aspects of the work, including:
  - Occupational Health and Safety;
  - Environmental Management;
  - Project Management; and
  - Emergency Response Procedures.

It is the responsibility of the Remediation Contractor to prepare and obtain all appropriate documentation prior to the commencement of the works.

Following provision and approval of these documents, the Remediation Contractor will mobilise all necessary plant, equipment and amenities as required to complete the project in accordance with these requirements.

Given that there is excavation in areas of known friable asbestos contamination, a supervisor licensed for the management of friable and bonded asbestos is required on site at all times during remediation.

## 9.4 Stage 2- site establishment

Prior to site establishment, all staff involved in the remedial works must be aware of, and provided with all relevant documents necessary for the commencement of work.

Prior to any work commencing, the Remediation Contractor shall delineate, barricade and manage the nominated remediation work area in accordance with WorkCover requirements. The extent of the remediation required will be verified with the Environmental Consultant on site.

Accesses to the work area will be determined by the Remediation Contractor. The site shall be accessible only to personnel inducted for work within the work area.

### **9.5 Stage 3- removal of contaminated soils**

The excavation work must be undertaken as follows:

- a) Sequencing of the work is to be agreed with the Client and the Environmental Consultant prior to commencement of the works;
- b) All necessary environmental control and OH&S measures must be implemented prior to the commencement of any excavation work, and it must be ensured that such measures are properly implemented and maintained throughout the work period. This includes taking the appropriate measures to avoid dust generation and any migration of potential contaminants;
- c) All excavation work and stockpiled material must be carried out so to prevent cross-contamination of unexcavated and/or uncontaminated areas of the site; and
- d) Appropriate coverage of stockpiles during storage to minimise infiltration of rainwater mobilising potential contaminants and/or generation of dust.

All excavation work is to use equipment and techniques that will protect from damage all existing buildings, hard stand areas, and buried services.

Following excavation and offsite disposal of soils, the excavation should be surveyed and validated (as per **Section 8**) prior to backfilling.

### **9.6 Stage 4 - Demobilisation**

Following completion of remediation works, the Remediation Contractor shall be responsible for removing all plant, equipment and general rubbish generated through the remediation process.

### **9.7 Stage 5 - Reporting**

An appropriately qualified Environmental Consultant should produce a validation report detailing the completion of the remediation works. The report should be completed in accordance with the NSW EPA (2011) *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites*.

# 10. Validation Plan

## 10.1 Validation soil sampling

### 10.1.1 Remediation Area (area subject to previous investigation by GHD)

It is Health Infrastructure NSW's desire that asbestos impacted fill material be removed from site. As such, for the purpose of remediation validation, excavation will be extended to natural soil where practicable. If excavation is terminated in fill material visually observed to be free from asbestos soil validation samples (500 ml) will be collected (targeting fill stratigraphy's most likely to be contaminated) on a 10 metre grid to validate visual observations.

### 10.1.2 Beyond the Remediation Area

If it is evident that fill material exists beyond the remediation of the area subject to previous investigations by GHD additional site investigations may be necessary. Additional investigation would be undertaken in accordance with the density and methodology specified in NEPM 2013 to confirm whether additional remediation is required. This process will require discussion with the client and site auditor prior to it being undertaken. Approval for this additional work would also be required from the client prior to additional assessment being undertaken.

## 10.2 Soil sampling methodology

All soil validation samples will be collected in bulk (500 ml) to allow laboratory analysis for the presence of asbestos.

Duplicate samples will be collected at a frequency of no less than 1 in 20 samples for blind and split duplicates each; i.e. a combined frequency of 1 per 10 samples.

## 10.3 Laboratory analysis

In accordance with the guidelines, each validation soil sample shall be analysed for asbestos. The soil sample results shall be compared to the asbestos guidelines in NEPM 2013.

## 10.4 Remediation documentation

GHD will.

- document excavation activities;
- visually confirm that the extent of excavation has removed all fill material;
- ensuring cradle to grave waste tracking by maintaining and reviewing disposal docket.

Photographs of the excavation will be taken as part of the validation works. The extent of the completed excavation shall be surveyed by the Contractor.

## 10.5 Reporting

A report shall be prepared following successful remediation and validation of the site. This report shall contain all relevant information and shall be prepared with reference to the following guidelines:

- NSW EPA (2011) Contaminated sites: guidelines for consultants reporting on contaminated sites; and

- Department of Environment and Conservation NSW (2006) – Contaminated sites: Guidelines for the NSW site auditor scheme (2nd edition).

# 11. Asbestos Management Procedure During Earth Works

## 11.1 General Information

During the earth works required for the site, as there is known asbestos contamination on site the following procedures will be required to be adhered to, to ensure there is no inadvertent exposure to asbestos.

Asbestos management in NSW must be undertaken in accordance with the *Work Health and Safety Act 2011 (NSW)* and associated legislation including *Work Health and Safety Regulations 2011 (NSW)*. The most relevant section of the regulation is Chapter 8 Asbestos.

Works must also be undertaken in accordance with the following asbestos Codes of Practice (COP) are approved under Section 274 of the *Work Health and Safety Act 2011 (NSW)*:

- How to Manage and Control Asbestos in the Workplace, (2011) Safe Work Australia; and
- How to Safely Remove Asbestos, (2011) Safe Work Australia.

All personnel who are required to remove any asbestos based products must be trained in the risks and appropriate procedures and requirements for safe removal.

### 11.1.1 Personal Protective Equipment (PPE) Requirements

The following personal protective equipment (PPE) must be utilised if the following procedures are utilised on site:

- Disposable nitrile gloves;
- Disposable booties;
- Disposable Type 5 coveralls;
- Disposable P2 filtered half face respirator;
- Safety glasses; and
- Hard hat.

All disposable PPE used for the duration of the works should be disposed of as asbestos waste and placed into dedicated asbestos waste bags.

For non-disposable PPE such as hard hat and safety glasses, decontamination procedures should be utilised i.e. wet wiping of the PPE for later use as a precautionary measure and then placed into asbestos waste bags for future use on asbestos related work activities.

### 11.1.2 Asbestos Fibre Air Monitoring

During the earth work phase, asbestos fibre air monitoring should be undertaken by to assess the airborne fibre concentrations on the site boundary and demonstrate the risk potential to workers on Site.

The air monitoring devices should be placed on the boundaries of the site and air monitoring should be conducted for the full duration of the earth works. The locations will be based on:

- Location of excavation works;

- Weather conditions (monitors shall be placed downwind where possible to assess for off-site migration of fibres); and
- Proximity to neighbouring properties.

The sample collection and analysis shall be conducted in accordance with the Membrane Filter Method for Estimating Airborne Asbestos Dust. The analysis will be performed by a NATA registered laboratory and reported on endorsed certificates.

The samples shall be collected from the site boundaries. The concentration of fibres at the site boundaries should be <0.01 fibres/mL of air. Concentrations of asbestos fibres shall be dealt with as follows:

- <0.01 f/mL. Action: Continue with control measures;
- Between 0.01 f/mL and 0.02 f/mL. Action: Review control measures; and
- Greater than or equal to 0.02 f/mL. Action: Stop work, notify WorkCover NSW and only recommence works when the cause of the elevated concentrations is remedied.

Air monitoring results shall be issued to the John Staff Projects representative as soon as air monitoring results become available.

## **11.2 Asbestos Management Procedures**

During the excavation works, it is important for workers and contractors to continuously inspect the soil that is removed and stockpiled, for asbestos cement sheet fragments or fibrous asbestos material. This procedure should be followed if any amounts of asbestos cement sheet fragments or fibrous asbestos are identified during the earth works process by workers.

For example, earth works without the use of PPE for asbestos only can proceed on the basis that the ground surface area throughout the site has been remediated beforehand. Once fragments have been identified through visual inspection, the following procedure must be adhered to.

### **11.2.1 Management of Asbestos Contamination (fibrous asbestos and/or fragments)**

As fibrous asbestos and asbestos cement sheet fragments are expected during remediation the following procedure must be adhered to, to allow works to continue and to make the area safe for workers:

- (1) Set up an exclusion zone with barrier tape of at least 10 metres (minimum) from the area where asbestos has been identified;
- (2) Erect warning signs to advise other workers in the site not to enter the area;
- (3) Utilise dust suppression techniques on a regular basis i.e. heavy wetting water spray, over the identified asbestos contamination. The worker conducting this should fit the PPE as outlined prior to undertaking dust suppression techniques;
- (4) Utilise a contractor licensed to manage bonded and friable asbestos to remove the identified asbestos contamination;
- (5) Remediate as required and recommended by the licensed asbestos assessor / occupational hygienist;

- (6) Disassemble exclusion zone and ensure all asbestos waste bags are placed into asbestos waste bins and dispose of at a registered waste facility.

### **11.3 Stockpile Management (if required) and Waste Disposal**

If an assessment conducted by a licensed asbestos assessor / occupational hygienist identifies asbestos contamination and recommends the contamination is stockpiled on site prior to removal, the movement and stockpiling of asbestos contaminated soil needs to be carefully managed and monitored to prevent cross contamination of soils.

The management and tracking of stockpiled materials on site shall be the responsibility of the Licensed Contractor. If stockpiles need to be relocated, they must be relocated onto plastic sheeting to reduce the potential for cross contamination.

The management and tracking of stockpiled materials should be recorded on a site diagram and daily site logs. These documents should be updated daily and kept in the site office. The daily site log should record the area in which work was conducted for that day, general description of the works completed, movement of materials onsite, movement of materials offsite, etc. The site diagram will record the locations and types of the stockpiled materials.

Any soil stockpiles with asbestos contamination produced by the excavation after a visual inspection conducted by the licensed asbestos assessor / occupational hygienist will require to be removed off site by the licensed asbestos contractor to a registered waste facility licensed to accept asbestos waste.

Controlled wetting of waste should be employed, where practicable, to reduce dust emission during both truck loading and bag sealing. Excessive water logging should be avoided as the excess of contaminated water may leak out of the bags or the trucks, thereby creating a future source of airborne dust.

Where soil is to be loaded into trucks for off-site disposal the following shall apply:

- Undertake loading or unloading of soil as close as possible to the stockpiles to prevent the spread of loose material around the site;
- Soil shall be wet prior to loading;
- The truck shall be lined with two ply 200 µm polythene prior to loading;
- The load shall be covered during transportation to reduce dust generation; and
- The truck shall be cleaned and decontaminated on completion of the works in a designated decontamination area.

Asbestos waste shall be disposed of at a site and in a manner as approved by the Local and State authorities. Documentary evidence of the disposal shall be collected and provided to the client. This will include name of the authorised waste facility, weighbridge docket and registration number of vehicle for every disposal. Online waste tracking forms shall be completed in a form approved by the NSW EPA.

The management of material on-site shall be conducted in accordance with the Licensed Contractors Materials Tracking Plan.

## 11.4 Reinstatement and On-going Site Management

Any further excavation planned on the site should follow the same procedure as for this project. This RAP should be adhered to and implemented to avoid un-investigated ground disturbance and inadvertent exposure to asbestos or other contamination.

Material used to reinstate excavations must be classified as:

- VENM according to the requirements of the *Waste Classification Guidelines* (DECC, 2009); or
- ENM according to the requirements of the *Excavated Natural Material Exemption* (DECC, 2012); or
- Off site sourced engineering or landscape materials, including clay, gravel, sand, soil or rock.

Documentation outlining the classification of material proposed to be imported to site must be verified as adequate by the environmental consultant prior to it being imported to site. Source site investigation and/or material assessment may be required if documentation is not available or inappropriate.

## 11.5 Unexpected finds protocol

The area of the site to be remediated contains fill material known to contain:

- bonded and friable asbestos;
- medicine bottles;
- cloth;
- ash and coal;
- synthetic mineral fibres; and
- demolition waste including concrete, brick, pipes and tiles.

Due to the heterogeneous nature and unknown source of fill material at the site, there is also the potential that unexpected contamination may be identified during asbestos remediation and/or site construction. Potential sources of contamination could include but may not be limited to:

- Fill material containing anthropogenic inclusions (e.g. ash/tar/slag/bitumen);
- Soil exhibiting staining/odours;
- Waste Drums;
- Hospital Waste;
- Gross quantities of other wastes (e.g. glass bottles, demolition waste etc.); and
- Buried structures (e.g. underground tanks).

If during investigation or remediation soil or waste is uncovered that is noticeably stained, has an odour or is suspected to be contaminated (outside the known scope), then work should cease in that area. The soil or material should be assessed by an Environmental consultant, and sampled for known or possible contaminants.

A further report and/or special procedures may have to be undertaken if significant contamination is found on laboratory analysis.

If the material assessed requires remediation, approval from the appropriate regulatory authority to remediate contaminants other than asbestos will be required. Following any additional remediation (if required) validation will be required, the results of which should be included in the validation report.

#### **11.5.1 Management of asbestos contamination during future excavations**

If asbestos cement sheet fragments or fibrous asbestos are identified during any future excavation (following the completion of remediation) the following procedure must be adhered to, to allow works to continue and to make the area safe for workers:

- (1) Set up an exclusion zone with barrier tape of at least 10 metres (minimum) from the area where asbestos has been identified;
- (2) Erect warning signs to advise other workers in the site not to enter the area; and
- (3) Engage a suitable qualified consultant to assess the asbestos impact and to recommend management measures.

## 12. Conclusion

Johnstaff Projects on behalf of Health Infrastructure NSW requested GHD provide a Remedial Action Plan to deal with remediation of site asbestos contamination and allow the proposed hospital redevelopment to proceed.

The proposed remedial method nominated is excavation and offsite disposal of all contaminated soils. These materials (including that within the soil stockpile generated during the remediation of a hotspot of lead contaminated soil by others) are classified as Special Waste (Asbestos) for waste disposal purposes. Following excavation and validation of asbestos contaminated fill, natural soil to be excavated for construction of the proposed building can be classified as virgin excavated natural material (VENM) for offsite disposal, however if any man made material is identified in this material it must be stockpiled and classified separately. Approval to reuse VENM as backfill on site must be sought from the environmental consultant prior to it being undertaken. All material disposed offsite and reused on site must be tracked including recording the source, area and destination of all material.

Following excavation, GHD will undertake soil validation and a validation report will be prepared. GHD considers the site civil works area can be remediated so that it is suitable for the proposed hospital redevelopment.

## 13. References

- Contaminated Land Management Act 1997”
- Coffey (2012), Phase 1 Environmental Site Assessment Stage 1 and Civil Works Zone Redevelopment Kempsey District Hospital, Kempsey NSW;
- Coffey (2013), Phase 2 Environmental Site Assessment Stage 1 and Civil Works Zone Redevelopment Kempsey District Hospital, Kempsey NSW;
- Coffey (2013), Site Validation Assessment – Lead Contamination, Kempsey District Hospital, Kempsey NSW;
- Coffey (2013), Waste Classification, Kempsey District Hospital, Kempsey NSW;
- GHD (2013), Kempsey District Hospital redevelopment, Sampling Analytical and Quality Plan.
- NEPM (2013). National Environment Protection (Assessment of Site Contamination) Measure, National Environment Protection Council (NEPC).
- NSW DEC (2006), “Contaminated Sites: Guidelines for NSW Site Auditor Scheme”.
- NSW DECC (2009), “Waste Classification Guidelines Part 1: Classifying Waste”.
- NSW EPA (2011), “Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites”.
- Safe Work Australia (2011), *How to Manage and Control Asbestos in the Workplace*; and Safe Work Australia (2011), *How to Safely Remove Asbestos*.

## **Appendices**

# **Appendix A** - Figures

Figure 1- Site Location

Figure 2-Site Layout

enstruct Dwg 5027-ENS-CV-DWG-SA2-910



Schematic Diagram Only - Not to Scale

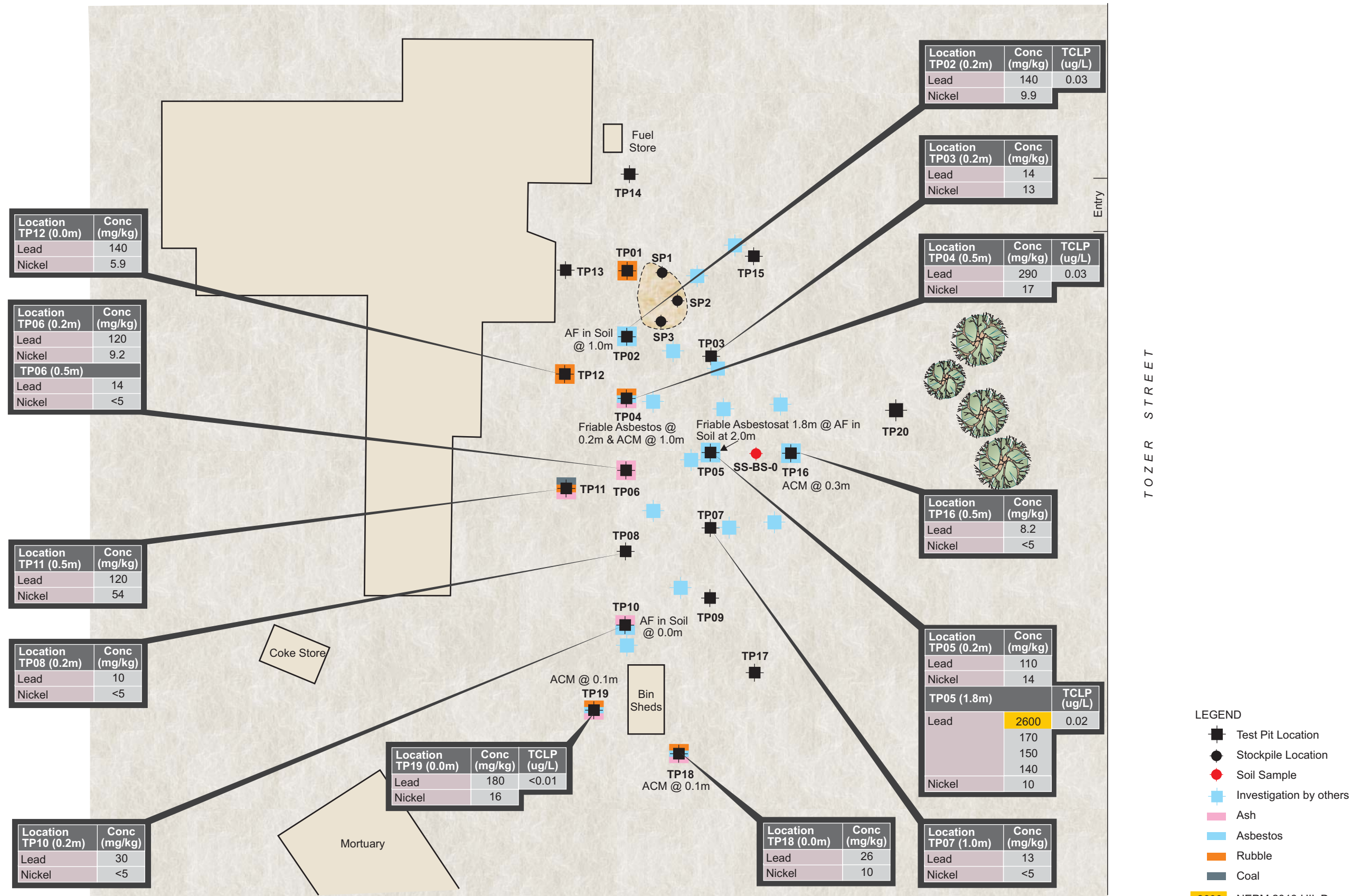


Johnstaff Projects  
Kempsey Hospital Redevelopment

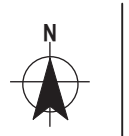
Site Location

Job Number	22-16893
Revision	A
Date	17 July 2013

Figure 1



- LEGEND**
- Test Pit Location
  - Stockpile Location
  - Soil Sample
  - Investigation by others
  - Ash
  - Asbestos
  - Rubble
  - Coal
- 2600** NEPM 2013 HIL D



Schematic Diagram Only - Not to Scale



Johnstaff Projects  
Kempsey Hospital Redevelopment  
**Soil Assessment Results**

Job Number 22-16893  
Revision A  
Date 17 July 2013

**Figure 2**



## **Appendix B** - Photographs