New Shellharbour Hospital, 86 Dunmore Road, Dunmore NSW

Audit Number: MP203

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Site Audit Report

Document Information

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Prepared by:

Senversa Pty Ltd
ABN: 89 132 231 380
Level 24, 1 Market St, Sydney, NSW 2000
tel:+61 2 8252 0000
www.senversa.com.au

Prepared for:

Hutchinson Builders
23 Dunning Avenue
Rosebury 2018 NSW

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List of Acronyms

Acronym	Definition
Measures	
%	Per Cent
µg/L	Micrograms Per Litre
ha	Hectare
km	Kilometres
m	Metre
mbgl	Metres Below Ground Level
mg/kg	Milligrams Per Kilogram
mg/L	Milligrams Per Litre
ppm	Parts Per Million
ABC	Added Background Concentrations
ACL	Added Contaminant Limit
ACM	Asbestos Containing Material
ADWG	Australian Drinking Water Guidelines
AF	Asbestos Fines
ALS	Australian Laboratory Services
ANZECC	Australian And New Zealand Environment And Conservation Council
ANZG	Australian And New Zealand Guidelines
BaP	Benzo(A)Pyrene
BGL	Below Ground Level
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes & Naphthalene
CLM Act	Nsw Contaminated Land Management Act 1997
COC	Chain Of Custody
Council	Shellharbour City Council
CT	Certificate Of Title

Acronym	Definition
DGV	Default Guideline Value
DP	Deposited Plan
DQI	Data Quality Indicator
DQO	Data Quality Objective
EIL	Ecological Investigation Level
Envirolab	Envirolab Services Pty Ltd
EPA	Environment Protection Authority (Nsw)
ESL	Ecological Screening Level
Eurofin	Eurofin | Mgt
FA	Fibrous Asbestos
GIL	Groundwater Investigation Level
HIL	Health Investigation Level
HSL	Health Screening Level
IAA	Interim Audit Advice
LCS	Laboratory Control Sample
LEP	Local Environment Plan
LOR	Limit Of Reporting
Mercury	Inorganic Mercury Unless Noted Otherwise
Metals	As: Arsenic, Cd: Cadmium, Cr: Chromium, Cu: Copper, Ni: Nickel, Pb: Lead, Zn: Zinc, Hg: Mercury
ML	Management Limits
MS	Matrix Spike
NATA	National Association Of Testing Authorities
NC	Not Calculated
ND	Not Detected
NEHF	National Environmental Health Forum

Acronym	Definition
NEPM	National Environment Protection Measure
NHMRC	National Health And Medical Research Council
NL	Non-Limiting
n	Number Of Samples
OCPs	Organochlorine Pesticides
OEH	Office Of Environment And Heritage
OPPs	Organophosphorus Pesticides
PAHs	Polycyclic Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenyls
PFAS	Perfluoroalkyl And Polyfluoroalkyl Substances
pH	A Measure Of Acidity, Hydrogen Ion Activity
PID	Photoionisation Detector
PQL	Practical Quantitation Limit
PSH	Phase Separated Hydrocarbon
QA/QC	Quality Assurance/Quality Control
RAP	Remediation Action Plan
RPD	Relative Percent Difference
SAR	Site Audit Report
SAS	Site Audit Statement
SCEW	Standing Council On Environment And Water
SSDA	State Significant Development Application
SWL	Standing Water Level
TRHs	Total Recoverable Hydrocarbons
USEPA	United States Environmental Protection Agency
VENM	Virgin Excavated Natural Material
VOCs	Volatile Organic Compounds

Acronym	Definition
-	On Tables Is "Not Calculated", "No Criteria" Or "Not Applicable"

1.0 Introduction

A site contamination audit has been conducted in relation to the site at the New Shellharbour Hospital, 86 Dunmore Road, Dunmore NSW.

The audit was conducted to provide an independent review by an EPA Accredited Auditor of what management remains necessary before the land is suitable for any specified use or range of uses i.e. a “Site Audit” as defined in Section 4 (1) (b) (iii) of the NSW Contaminated Land Management Act 1997 (the CLM Act).

Development consent (SSD-57064458, issued on 12 August 2024) was granted by the Minister for Planning and Public Spaces for the construction and operation of a new seven storey hospital, including landscaping, internal roads and access, at-grade and multi-level car parking, utility/service connections and supporting infrastructure. The consent was subject to a number of requirements of which condition (B43) relates to contamination and requires a site audit statement as follows:

> *“Prior to the commencement of construction, the Applicant must submit a Validation Report prepared by a suitability qualified remediation consultant and verified by an EPA-accredited Site Auditor, which confirms the site has been appropriately remediated and is suitable for the Health Service Facility use. The Validation Report is to be submitted along with an Environmental Management Plan (if required) to the Planning Secretary and the Certifier”*

The audit was initiated to comply with condition (B43) of the DA approval and is therefore a statutory audit. Notification of the site audit (MP203) was forwarded to the EPA on 4 September 2024 (EPA Ref: DOC24/723672).

- Details of the audit are:
- Requested by: Max Elmes on behalf of Hutchinson Builders.
- Request/Commencement Date: 2 September 2024.
- Auditor: Melissa Porter.
- Accreditation No.: 0803.

The scope of the audit included:

- Review of the following reports:
  - ‘Targeted Detailed Site Investigation, Shell Heights South’ dated 4 May 2018 by Cardno (NSW/ACT) Pty Ltd (Cardno, 2018).
  - ‘Due Diligence Contamination Assessment, Site 15 – Dunmore Road, Dunmore NSW’ dated 13 November 2020 by JBS&G Australia Pty Ltd (JBS&G, 2020).
  - ‘Preliminary (Stage 1) Site Investigation, Proposed New Shellharbour Hospital Development. 86 Dunmore Road, Dunmore, NSW’ dated 30 September 2021 by JK Environments Pty Ltd (JKE, 2021a).
  - ‘Detailed (Stage 2) Site Investigation, Proposed New Shellharbour Hospital Development, 86 Dunmore Road, Dunmore, NSW’ dated 15 December 2021 by JKE (JKE, 2021b).
  - ‘Additional Groundwater Assessment, Proposed New Shellharbour Hospital Development, 86 Dunmore Road, Dunmore, NSW’ dated 13 October 2022 by JKE (JKE, 2022a).
  - ‘Remediation Action Plan (RAP), Proposed New Shellharbour Hospital Development, 86 Dunmore Road, Dunmore, NSW’ date 7 November 2022 by JKE (JKE, 2022b).
  - ‘New Shellharbour Hospital Early Works, Validation Report, 50 & 86 Dunmore Road, Dunmore NSW’ dated 10 October 2024 by JBS&G (JBS&G, 2024).
- A site visit by the auditor on 20 September 2024.
- Discussions with Hutchinson Builders and with JBS&G who undertook the investigation.

The investigations and remediation action plan were completed prior to the auditor's engagement and no discussion with Cardno and JKE was undertaken.

Interim Audit Advice (IAA No. 1) dated 23 September 2024 was prepared following review of the validation report by JBS&G. IAA No.1 provided review comments by the auditor. The IAA is included in Appendix C.

2.0 Site Details

2.1 Location

The site locality is shown on **Attachment 1, Appendix A**.

The site details are as follows:

- Street address: 86 Dunmore Road, Dunmore NSW 2529.
- Identifier: Lot 10 DP 1281639.
- Local Government: Shellharbour City Council.
- Site Area: Approximately 10 ha.

The boundaries of the site are well defined by streets/adjoining properties.

2.2 Zoning

The current zoning of the site is R2 – Low Density Residential (Shellharbour LEP 2013).

2.3 Adjacent Uses

The site is located within an area of residential properties and vacant pasture. The surrounding site uses include:

- North: Vacant grassed property with grassed large stockpiles of soil (silty gravelly clay) and Pittwater Road, Shellharbour Anglican College beyond. It is understood that the stockpiles were sourced from the residential properties (same owner).
- East: Dunmore Road and residential properties.
- South: Vacant pasture, Dunmore Road and residential properties.
- West: Railway line and Princes Highway further west.

An ephemeral creek line is located within the central portion of the site. This drains towards the southwest and a tributary to the west of the site. The tributary flows to Rocklow Creek approximately 1.1 km south of the site. A drainage pond is located approximately 200 m to the southwest of the site (part of the Boral Dunmore quarry).

JKE (2021a) noted that the Dunmore Rural fire station is located approximately 400 m to the south of the site. Given the fire station is downgradient, it is unlikely to pose a risk to the site.

Cardno (2018) and JKE (2021a) noted that the Dunmore Recycling Depot is located to the southeast or east (cross-gradient) of the site. Cardno (2018) noted that the Shellharbour City Council depot is also located approximately 75 m southeast (cross-downgradient) of the site. Given these are cross/downgradient, they are unlikely to pose a risk to the site.

2.4 Site Condition

Cardno noted the following during a site visit on 2 February 2018:

- The site was used for agricultural purposes including grazing for cattle and goats.
- Structures at the site included a residential dwelling, stables and sheds used for storage of household items and farm machinery including a tractor and empty steel drums. It was noted that the empty drums may have been used to storage equipment and materials associated with the stabling horses.
- Small volumes of petroleum and oil containers (>20L) were also noted in the sheds.
- Up to 20 stockpiles of soil were observed 60 m southwest of the residential dwelling. These included demolition waste such as concrete, brick rubble and asbestos containing material. Large qualities of asbestos cement sheeting were observed on the ground southwest of the residential building.

A similar site condition to the above was noted by JKE in 2021. JKE noted 15 stockpiles to the southwest of the structures.

JBS&G noted the following during a site visit on 8 June 2023:

- The site was mostly grassed with a dirt track leading to the existing structures on the site.
- The structures, including the residential dwelling, were in a dilapidated condition.
- The site was fenced and generally sloped to the southwest.
- Mounds/stockpiles were located to the south of the structures. JBS&G noted there were 13 stockpiles.

JBS&G noted that following remediation all structures had been demolished. The site had been stripped of most of the vegetation and all stockpiles removed.

The following was noted by the auditor during the site visit on 14 October 2024:

- Bulk earthworks with benching of the site through cut and fill to facilitate the new hospital site were completed. Exposed cuttings confirmed the material retained consisted of natural soil and rock.
- Geotechnically unsuitable natural material from the earthworks, layered with topsoil sourced from on-site, had been stockpiled over the southern portion of the site. These are elevated about 3m above the surrounding ground level to the south.
- Imported gravel had been placed on the access road with gravel and sand used along the high voltage line crossing centre of the site, west to east. One very small pile of sand remained at the surface.
- Beyond those areas, gassed natural ground levels remained with two dams, one constructed for the bulk earthworks and one a residual dam, both on the western boundary.
- Demountable site sheds remained at eastern boundary.

2.5 Proposed Development

It is understood that the site is to be redeveloped by Health Infrastructure as a hospital. NEPM (2013) states that the ‘commercial/industrial land use scenario’ is not applicable to a site used by more sensitive groups such as children and the elderly i.e., within hospitals and aged care facilities. For the purposes of this audit, the ‘public recreational open space’ and ‘residential with minimal opportunities for soil access’ land use scenarios are considered.

3.0 Site History

JKE provided a site history based on aerial photographs, site photographs, NSW EPA records, WorkCover dangerous goods records and Certificates of Title (CT) and is summarised in Table 3.1.

Table 3.1: Site History

Date	Activity
Prior to 1949	The site was leased to Blue Metal Quarries. However, JKE and JBS&G consider it unlikely that quarry activities occurred at the site given that the closest Blue Metal Quarry is understood to be located approximately 200 m to the southwest of the site.
1950 to 2023	The site was used for agricultural purposes (grazing land). A rural residential property with associated outbuildings was present at the site. The surrounding area was also used for agricultural purposes. Further development of the area continued from the 1980s through to the 2020s including a commercial/industrial facility to the southeast, golf course to the east, college to the north and residential development to the northeast.
2023 to present	The site is vacant. The rural residential property had been demolished.

The summary indicates that the site has been used for agricultural purposes (grazing) with a rural residential property until the recent development commenced in the early 2020s.

The auditor considers that the site history is broadly understood. There were no indicators of significant industrial uses on-site and in the surrounds that would have the potential to contaminate the site. The uncertainties include the filling history for the construction of the structures, however the auditor considers that these have been compensated for by the investigation and subsequent bulk earthworks.

4.0 Contaminants of Concern

JKE provided a list of the contaminants of concern and potentially contaminating activities. These have been tabulated in Table 4.1.

Table 4.1: Contaminants of Concern

Area	Activity	Potential Contaminants
Structures and Surrounding Area, Driveway, Stockpiled Materials	Fill material of unknown origin may have been placed at the site.	Metals, total recoverable hydrocarbons (TRHs), benzene, toluene, ethylbenzene and xylene (BTEX), polycyclic aromatic hydrocarbons (PAHs), organochlorine pesticides (OCPs), organophosphate pesticides (OPPs), polychlorinated biphenyls (PCBs) and asbestos.
Entire Site	Historical use of the site for agricultural purposes.	Metals, TRH, PAHs, OCPs, PCBs, per- and polyfluoroalkyl substances (PFAS) and asbestos.
Structures and Surrounding Area	Hazardous materials associated with former/current structures at the site.	Asbestos, lead and PCBs.

The auditor considers that the analyte list used by JKE adequately reflects the site history and condition.

5.0 Stratigraphy and Hydrogeology

Following a review of the reports provided, a summary of the site stratigraphy and hydrogeology was compiled as follows.

5.1 Stratigraphy

The sub-surface profile of the site is summarised in Table 5.1.

Table 5.1: Stratigraphy

Depth (mbgl)	Subsurface Profile
0.0 – 0.4	Fill (silty clay).
0.4 – 1.3	Silty/sandy clay, silty/sandy gravel and clayey silt.
1.3 to Depth	Shale, sandstone and latite.

Mbgl – metres below ground level

The auditor considers that the depth of fill and underlying stratigraphy have been adequately characterised.

Field screening and laboratory assessment by JKE (2021b) indicate that the natural soil at the site is not considered to be acid sulfate soil (ASS) or potential acid sulfate soil (PASS).

5.2 Hydrogeology

Groundwater investigations have been undertaken at the site. Depth to groundwater over the site is between 2.2 and 7 mbgl. Groundwater is considered likely to flow to the southwest to west.

Registered bores (108) for stock and monitoring purposes are located within a 2 km radius of the site. The search was conducted by JKE (2021a). The standing water levels (SWL) were approximately 0.3 mbgl to 5 mbgl.

The nearest surface water receptor is a tributary to the west of the site that flows to Rocklow Creek located approximately 1 km to the south of the site. A drainage pond is also located approximately 200 m to the west of the site. The surface water flow from the site is likely to be to the southwest and to the tributary.

The auditor considers that the hydrogeology has been adequately characterised.

6.0 Evaluation of Quality Assurance and Quality Control

The auditor has assessed the overall quality of the data by review of the information presented in the referenced reports, supplemented by field observations. The data sources are summarised in Table 6.1 The auditor's assessment follows in
Table 6.2 and

Table 6.3.

Table 6.1: Summary of Investigations

Investigation	Location – Media	Analytical Data Obtained
Cardno (2018)	Soil.	Metals, TRH, BTEX, PAHs, phenols, PCBs, OCPs, OPPs and asbestos.
JKE (2021b)	Soil and groundwater.	Soil: Metals, TRH, BTEX, PAHs, phenols, PCBs, PFAS, OCPs, OPPs and asbestos. Water: Metals, TRH, BTEX, PAHs, volatile organic compounds (VOCs) and PFAS.
JKE (2022b)	Groundwater.	Water: TRH and BTEX.

Table 6.2: QA/QC – Sampling and Analysis Methodology Assessment

Sampling and Analysis Plan and Sampling Methodology	Auditor's Opinion
Data Quality Objectives (DQOs): Cardno (2018) and JKE (2021b) defined specific DQOs in accordance with the seven-step process outlined in EPA (2017) Guidelines for the NSW Site Auditor Scheme. JKE (2022b) did not define specific DQOs.	The DQOs defined by Cardno (2018) and JKE (2021b) were considered appropriate for the investigations conducted. On the basis that JKE (2022b) have clearly stated the project objectives and have designed effective sampling strategies to achieve them, overall the auditor considers that the omission of specific DQOs does not affect the outcome of the audit.
Sampling Pattern and Locations: Soil: Investigation locations were spaced using a systematic and judgemental approach to gain coverage of the majority of the site and then specifically around the structures. Further samples also targeted the stockpiles. The various fill materials at the site were targeted for sampling. Groundwater: Monitoring wells were installed in the northeast (up-gradient), northwest (cross-upgradient), central and southeast (cross-downgradient) portions of the site. **Sampling Density:** Soil: The sampling density of 120 grid locations over approximately 10 ha exceeds the minimum recommended by EPA (2022) Sampling Design Guidelines. The coverage provides a 95% confidence of detecting a residual hot spot of approximately 22 m diameter. 21 locations were targeted around the structures. 85 samples were collected from the stockpiles (3 samples per stockpile). The stockpiles were all reported less than 75 m^3 in JKE (2021b). This sampling density of 3 samples per stockpile meets the minimum recommended by NEPM (2013). The individual stockpile volumes were not reported in Cardno (2018). However, given the sampling density was met during JKE (2021b) there is sufficient information.	These investigation locations adequately target the main areas of concern. With regards asbestos, given that all impacted fill was removed from the site and excavation validated (see Section 10), the auditor is satisfied that the sampling was appropriate. The sampling density was appropriate.

Sampling and Analysis Plan and Sampling Methodology	Auditor's Opinion
The sampling densities for asbestos were not doubled based on the Western Australian Department of Health (WADoH) (2009) Guidelines for the Assessment and Management of Asbestos-Contaminated Soils in Western Australia. However, samples analysed for asbestos were collected as outlined in NEPM (2013) (Schedule B1). Groundwater: A total of 4 groundwater wells were installed at the site.	
Sample Depths: Samples were collected and analysed from a range of depths, with the primary intervals being within the shallow fill (0.0-0.1 mbgl) and natural soil (0.5-0.6 mbgl). Samples were also collected and analysis from each of the stockpiles.	This sampling strategy was appropriate and adequate to characterise the primary material types present on site.
Well Construction: Groundwater: The monitoring wells were typically installed to depths of 10.6-14.7m mbgl, with screen intervals of 6-9 m placed in gravel. Wells were constructed of 50 mm uPVC. A bentonite seal of 1 m thickness was placed above the screen and the well backfilled with soil cuttings to the ground surface. The SWL intersects the screen interval in most wells with the exception of MW16.	Whilst it is preferable for monitoring wells to screen over a discrete short vertical interval, considering the site-specific conditions and as only one well screened below the standing water level, the wells are sufficient to provide an indication of the groundwater conditions at the site.
Sample collection method: Soil: Sample collection was by hand from the excavator bucket or directly from the excavation. Groundwater: Wells were installed by spiral augers, developed with a pump and samples were collected by low flow peristaltic pump with dedicated sample tubing.	The sample collection method was found to be acceptable.
Decontamination procedures: Soil: Sampling equipment was cleaned with detergent followed by potable water. Details on frequency of decontamination was not explicitly reported. New gloves were reportedly used for each new sample. Groundwater: Dedicated sampling equipment was used for each well. New gloves were reportedly used for each new sample. Decontamination of augers between locations was not explicitly reported. No discussion was provided on whether gloves were used in JKE (2022b).	Results reported for soil and groundwater indicate a low likelihood of cross contamination (see Sections 8 and 9). Overall, the decontamination procedure is acceptable.
Sample Handling and Containers Samples were placed into prepared and preserved sampling containers provided by the laboratory and chilled during storage and subsequent transport to the labs. Samples for asbestos analysis were placed in plastic zip-lock bags. It is unknown if groundwater samples to be analysed for heavy metals were field filtered. The metals concentrations reported may therefore be over- or under-estimated depending on the groundwater pH.	Metals within the groundwater may be over- or under-estimated. Results for groundwater samples (see Section 9) reported low detections of metals. Overall, the sample handling is acceptable.
Chain of Custody (COC): Completed chain of custody forms were provided in the report.	Acceptable.
Detailed Description of Field Screening Protocols: Soil: Field screening for volatiles was undertaken using a PID. Groundwater: Field parameters were measured during well sampling and development.	Acceptable.

Sampling and Analysis Plan and Sampling Methodology	Auditor's Opinion
Calibration of Field Equipment: Field calibration records were provided for the PID and water quality meter by JKE (2021b and 2022b). Calibration records were not provided for the PID in Cardno (2018).	No volatile contaminants were identified in the soil at the site (see Section 8). Overall, the calibration of field equipment is acceptable.
Sampling Logs: Soil logs are provided within the report, indicating sample depth and lithology. PID readings were reported in the report by Cardno (2018) and the soil laboratory analytical tables by JKE (2021b). Groundwater field sampling records were provided, indicating SWL, field parameters, methodology and observations.	Acceptable.

Table 6.3: QA/QC – Field and Lab Quality Assurance and Quality Control

Field and Lab QA/QC	Auditor's Opinion
Field Quality Control Samples: Field quality control samples including trip blanks, trip spikes, rinsate blanks, field intra-laboratory and inter-laboratory duplicates were undertaken. JKE (2021b and 2022b) did not collect inter-laboratory duplicates. The inter-laboratory duplicates stated by JKE (2021b) were analysed by the same laboratory as the primary and intra-laboratory duplicates. However, Envirolab are NATA accredited to ISO17025 (Accreditation No 2901) and provided a summary of external proficiency testing undertaken by NATA, together with results of internal laboratory proficiency testing. The results were found to be acceptable. No rinsate was prepared in Cardno (2018) and JKE (2022b). However, given that samples were collected during soil sampling using disposable gloves from the excavator and dedicated sampling equipment was used for each groundwater location the lack of rinsates does not detract from the reliability of the data. Groundwater duplicates were less than the required 1 in 10 for PFAS sampling. Given PFAS results (see Section 9) reported below available criteria this is considered acceptable.	Acceptable.
Field Quality Control Results: The results of field quality control samples were generally within appropriate limits. The following exceptions were noted: RPDs for the intra-laboratory and inter-laboratory soil duplicate samples for several metals ranged from 31 to 191% and intra-laboratory soil duplicate samples for PAHs ranged from 35 to 120% and for PFAS ranged from 40 to 100%. RPDs for the intra-laboratory groundwater duplicates sample for chloroform (40%), TRH (61%) and lead (143%).	Overall, in the context of the dataset reported, the elevated RPD results are not considered significant and the field quality control results are acceptable.
NATA Registered Laboratory and NATA Endorsed Methods: Laboratories used included: ALS, Envirolab and Eurofins | mgt. Laboratory certificates were NATA stamped.	Acceptable.
Analytical Methods: Analytical methods were included in the laboratory test certificates. ALS, Envirolab and Eurofin | mgt provided brief method summaries of in-house NATA accredited methods used based on USEPA and/or APHA methods (excluding asbestos) for extraction and analysis in accordance with the NEPM (2013). Asbestos identification was conducted by ALS and Envirolab using polarised light microscopy with dispersion staining by method AS4964-2004 Method for the Qualitative Identification of Asbestos Bulk Samples.	The analytical methods are considered acceptable for the purposes of the site audit, noting that the AS4964-2004 is currently the only available method in Australia for analysing asbestos. DOH (2009) and enHealth (2005) state that "until an alternative analytical technique is developed and validated the AS4964-2004 is recommended for use".

Field and Lab QA/QC	Auditor's Opinion
Holding Times: Review of the COCs and laboratory certificates indicate that the holding times had been met with the exception of some soil samples in JKE (2021b) analysed for pH, TRH, BTEX, PAHs, OCPs, OPPs and PCBs.	Acceptable.
Practical Quantitation Limits (PQLs): Soil: PQLs (except asbestos) were less than the threshold criteria for the contaminants of concern. Asbestos: The limit of detection for asbestos in soil was 0.01% w/w. Groundwater: PQLs were less than the threshold criteria for the contaminants of concern.	Soil (except asbestos): Overall the soil PQLs are acceptable. Asbestos: In the absence of any other validated analytical method, the detection limit for asbestos is considered acceptable. A positive result would be considered to exceed the "no asbestos detected in soil" criteria, providing this is applied within a weight of evidence approach to assess the significance of the exceedance, accounting for the history of the site and frequency of the occurrence. Groundwater: Overall the groundwater PQLs are acceptable.
Laboratory Quality Control Samples: Laboratory quality control samples including laboratory control samples, matrix spikes, surrogate spikes, blanks, internal standards and duplicates were undertaken by the laboratory. Duplicates were not undertaken for several batches of soil samples in JKE (2021b) and for groundwater samples in JKE (2022b).	Acceptable.
Laboratory Quality Control Results: The results of laboratory quality control samples were generally within appropriate limits, with the following exceptions: RPDs for laboratory soil duplicates for several metals, TRH, PAHs, VOCs and PFAS were outside the control limits. Low spike recovery recorded for an OCP and some metals.	In the context of the dataset reported, the elevated RPD and low spike recoveries are not considered significant and the laboratory quality control results are acceptable.
Data Quality Indicators (DQI) and Data Evaluation (Completeness, Comparability, Representativeness, Precision, Accuracy): Predetermined data quality indicators (DQIs) were set for laboratory analyses including blanks, replicates, duplicates, laboratory control samples, matrix spikes, surrogate spikes and internal standards. These were discussed with regard to the five category areas. There was limited discussion regarding actions required if data do not meet the expected objectives.	An assessment of the data quality with respect to the five category areas has been undertaken by the auditor and is summarised below.

In considering the data as a whole the auditor concludes that:

- The data is likely to be representative of the overall site conditions.
- The sampling densities for asbestos were not doubled based on the Western Australian Department of Health (WADoH) (2009) Guidelines for the Assessment and Management of Asbestos-Contaminated Soils in Western Australia. However, all fill around the asbestos impacted areas has been removed from the site. Overall, the data is considered complete.
- Inter-laboratory duplicates were not collected during two sampling events however the primary and intra-laboratory is NATA accredited. Sufficient replicate samples were collected and analysed for PFAS soil samples however not for PFAS groundwater samples. Given PFAS was not reported above the available criteria in soil and groundwater this is acceptable. Overall, there is a high degree of confidence that data is comparable for each sampling and analytical event.
- The primary laboratory provided sufficient information to conclude that data is of sufficient precision.
- Overall, in the context of the dataset reported, the elevated RPD results and low spike recoveries are not considered significant. The data is likely to be accurate.

7.0 Environmental Quality Criteria

The auditor has assessed the results against Tier 1 criteria from National Environmental Protection Council (NEPC) National Environmental Protection (Assessment of Site Contamination) Measure 1999, as Amended 2013 (NEPM, 2013). Other guidance has been adopted where NEPM (2013) is not applicable or criteria are not provided. Based on the proposed development, the criteria for 'residential with minimal opportunities for soil access' and 'public recreational open space land use scenarios' were referred to.

The auditor has assessed the **soil** data provided with reference to Tier 1 (screening) criteria from the following:

- Human Health Assessment:
  - Health Based Investigation Levels (HIL B and HIL C).
  - Soil Health Screening Levels (HSL A/B and HSL C) for Vapour Intrusion. The most conservative criteria were adopted i.e. assumed depth to source < 1 m and sand.
  - CRC CARE (2011) Direct Contact (HSL B, HSL C and intrusive maintenance worker).
  - Asbestos Health Screening Levels (HSL B and HSL C).
  - HEPA, 2020. PFAS National Environmental Management Plan[1] (NEMP) released by the National Chemicals Working Group of the Heads of EPAs Australia and New Zealand (HEPA).
- Ecological Assessment:
  - Ecological Screening Levels (ESL Urban Residential) assuming coarse/fine soil.
  - Ecological Investigation Levels (EIL Urban Residential). The published range of the added contaminant values (ACL) have been applied as an initial screen.
- Management Limits (ML Residential/Open Space) assuming coarse soil.
- Aesthetics:
  - The auditor has considered the need for remediation based on the 'aesthetic' contamination as outlined in the NEPM (2013).

For chemicals where a guideline was not available from the sources listed above, the soil criteria has been used for screening.

The auditor has assessed the **groundwater** data provided with reference to Tier 1 (screening) criteria from the following:

- Human Health Assessment:
  - NEPM (2013) Groundwater Health Screening Levels (HSL A/ B, and HSL C) for vapour intrusion (sand, 2 to <4 m).
  - NHMRC and NRMMC (2011) Australian Drinking Water Guidelines (ADWG) for potable use.
  - HEPA, 2020. PFAS National Environmental Management Plan (NEMP) released by the National Chemicals Working Group of the Heads of EPAs Australia and New Zealand (HEPA).

[1] The draft PFAS NEMP 3.0 is currently released for public consultation, and it is not finalised nor endorsed by NSW EPA. However, it is new state of knowledge and therefore, adopting a conservative approach, the draft guideline values should be considered when interpretating the results and conclusions.

- Ecological Assessment:
  - Groundwater Investigation Levels (GILs) listed in NEPM (2013) for protection of aquatic ecosystems referenced in ANZECC (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality. The ANZECC 2000 guidelines have been updated in ANZG (2018) Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia. (Available at www.waterquality.gov.au/anz-guidelines). The Default Guideline Values (DGV) provided are concentrations of toxicants that should have no significant adverse effects on the aquatic ecosystem. The fresh water 95% level of protection was adopted. Some have been modified based on bioaccumulation or acute-toxicity or potential toxicity to particular species.
  - HEPA, 2020. PFAS National Environmental Management Plan (NEMP) released by the National Chemicals Working Group of the Heads of EPAs Australia and New Zealand (HEPA). The guideline value (GV) for 95 % level of protection was adopted for assessing direct toxicity and the 99 % value is adopted to assess bioaccumulation.

For chemicals where a guideline was not available from the sources listed above, the soil criteria has been used for screening.

7.1 Consultants Environmental Quality Criteria

The environmental quality criteria referenced by the auditor are consistent with those adopted by JKE (2021b) and JBS&G for the validation report with the exception of the following:

- JKE and JBS&G used the site specific EILs derived from the average results of pH and CEC at the site during JKE (2021b).

Given the results obtained, the auditor considers that these discrepancies do not affect the overall conclusions reached by JKE, JBS&G and the auditor.

8.0 Evaluation of Soil Analytical Results

Samples were analysed for a variety of contaminants including metals, petroleum hydrocarbons, PAHs, pesticides, PCBs, phenols, PFAS and asbestos. The analytical results are summarised below in Table 8.1.

The results have been assessed against the environmental quality criteria. Soil sampling locations are shown as **Attachments 2 to 4, Appendix A**.

Table 8.1: Evaluation of Soil Analytical Results – Summary Table (mg/kg)

Analyte	N	Detections	Maximum	n > Human Health Screening Criteria (NEPM, 2013) or HEPA (2020)	n > Terrestrial Ecological Screening Criteria (NEPM, 2013) or HEPA (2020)
Lead	244	244	486	0 above HIL B of 1200 mg/kg 0 above HIL C of 600 mg/kg	0 above Generic ACL (urban residential) of 1,100 mg/kg
Benzene	206	0	<PQL	0 above HSL A/B 0-1 m, sand of 0.5 mg/kg HSL C 0-1 m, sand NL	0 above ESL (urban residential) (fine) of 65 mg/kg
Toluene	206	0	<PQL	0 above HSL A/B 0-1 m, sand of 160 mg/kg HSL C 0-1 m, sand NL	0 above ESL (urban residential) (fine) of 105 mg/kg
Ethyl benzene	206	0	<PQL	0 above HSL A/B 0-1 m, sand of 55 mg/kg HSL C 0-1 m, sand NL	0 above ESL (urban residential) (fine) of 125 mg/kg
Total Xylenes	206	0	<PQL	0 above HSL A/B 0-1 m, sand of 40 mg/kg HSL C 0-1 m, sand NL	0 above ESL (urban residential) (fine) of 45 mg/kg
TRH C6-C10	244	0	<PQL	0 above ML (urban residential) of 800 mg/kg	
TRH >C10-C16	244	0	<PQL	0 above ML (urban residential) of 1,000 mg/kg	
F1 (TPH C6–C10 minus BTEX)	244	0	<PQL	0 above HSL A/B 0-1 m, sand of 45 mg/kg HSL C 0-1 m, sand NL	0 above ESL (urban residential) (coarse/fine) of 180 mg/kg
F2 (TPH >C10–C16 minus naphthalene)	244	0	<PQL	0 above HSL A/B 0-1 m, sand of 110 mg/kg HSL C 0-1 m, sand NL	0 above ESL (urban residential) (coarse/fine) of 120 mg/kg
F3 (TRH >C16-C34)	244	5	340	0 above ML (urban residential) of 3,500 mg/kg	
F4 (TRH >C34-C40)	244	3	180	0 above ML (urban residential) of 10,000 mg/kg	
Naphthalene	244	0	<PQL	0 above HSL A/B 0-1 m, sand of 3 mg/kg HSL C 0-1 m, sand NL	0 above Generic ESL (urban residential) of 170 mg/kg

Analyte	N	Detections	Maximum	n > Human Health Screening Criteria (NEPM, 2013) or HEPA (2020)	n > Terrestrial Ecological Screening Criteria (NEPM, 2013) or HEPA (2020)
Benzo(a)pyrene	244	26	1.2	-	**1 above ESL (urban residential) (coarse/fine) of 0.7 mg/kg**
BaP TEQ	244	2	1.5	0 above HIL B 4 mg/kg 0 above HIL C 5 mg/kg	-
Total PAHs	244	32	13	0 above HIL B 400 mg/kg 0 above HIL C 300 mg/kg	-
Total Phenols	50	0	<PQL	0 above HIL B 45,000 mg/kg 0 above HIL B 40,000 mg/kg	-
Arsenic	244	71	24	0 above HIL B 500 mg/kg 0 above HIL C 300 mg/kg	0 above Generic EIL (urban residential) of 100 mg/kg
Cadmium	244	5	1	0 above HIL B 150 mg/kg 0 above HIL C 90 mg/kg	-
Chromium	244	244	41	0 above HIL B 500 mg/kg 0 above HIL C 300 mg/kg	0 above most conservative ACL (urban residential) of 190 mg/kg
Copper	244	244	**200**	0 above HIL B 30,000 mg/kg 0 above HIL C 17,000 mg/kg	**150 above most conservative ACL (urban residential) of 60 mg/kg**
Mercury	244	2	0.8	0 above HIL B 120 mg/kg 0 above HIL C 13 mg/kg	-
Nickel	244	244	18	0 above HIL B 1200 mg/kg 0 above HIL C 1200 mg/kg	0 above most conservative ACL (urban residential) of 30 mg/kg
Zinc	244	244	**498**	0 above HIL B 60,000 mg/kg 0 above HIL C 30,000 mg/kg	**31 above most conservative ACL (urban residential) of 70 mg/kg**
Endrin	226	1	1.2	0 above HIL B 20 mg/kg 0 above HIL C 20 mg/kg	-
Endosulfan	226	1	1.3	0 above HIL B 400 mg/kg 0 above HIL C 340 mg/kg	-
Methoxychlor	226	1	0.2	0 above HIL B 500 mg/kg 0 above HIL C 400 mg/kg	-
Aldrin & Dieldrin	226	1	2.6	0 above HIL B 10 mg/kg 0 above HIL C 10 mg/kg	-
DDT + DDD + DDE	226	1	0.2	0 above HIL B 600 mg/kg 0 above HIL C 400 mg/kg	-
Heptachlor	226	1	1	0 above HIL B 10 mg/kg 0 above HIL C 10 mg/kg	-

Analyte	N	Detections	Maximum	n > Human Health Screening Criteria (NEPM, 2013) or HEPA (2020)	n > Terrestrial Ecological Screening Criteria (NEPM, 2013) or HEPA (2020)
Other OCPs	226	0	<PQL	0 above HIL B and HIL C	-
Chlorpyrifos	226	1	1		
Other OPPs	226	0	<PQL	0 above HIL B and HIL C	0 above Generic EIL (Urban Residential)
PCBs	137	0	<PQL	0 above HIL B 1 mg/kg 0 above HIL C 1 mg/kg	-
Asbestos (presence/absence)	94	0	ND	-	-
Asbestos (FA/AF)	79	0	<PQL	0 above HSL B 0.001% 0 above HSL C 0.001%	-
Asbestos (ACM)	79	0	<PQL	0 above HSL B 0.04% 0 above HSL C 0.02%	-
PFOS	17	12	0.0004	-	0 above HEPA 1 mg/kg 0 above HEPA 0.01 mg/kg
PFHxS + PFOS	17	12	0.0005	0 above HEPA 0.01 mg/kg	-
PFOA	17	0	<0.0001	0 above HEPA 0.1 mg/kg	0 above HEPA 10 mg/kg 0 above HEPA 0.005 mg/kg

n number of samples

- No criteria available/used

NL Non-limiting

<PQL Less than the practical quantitation limit

*Note: The numbers presented in the above table have been complied and transcribed manually from data tabulated by the consultants and thus some errors may be present. Any such errors are not considered by the auditor to be significant in the overall context and amount of data reviewed and conclusions drawn regarding the site during the audit.

All soil analytical results reported less than detection for BTEX, phenols and PCBs. TRH F3 and F3, PAHs, OCPs, OPPs and PFAS were detected in shallow fill samples and the stockpiles however below site criteria. PID results reported less than 3 ppm.

Metals were detected in fill and natural soil samples with copper and zinc above ecological criteria at numerous locations in both fill (including in the stockpiles) and natural. However, given the proposed land use as a hospital it is unlikely that these exceedences would pose an unacceptable ecological risk. It is noted that due to the criteria applied by JKE (2021b) (see Section 7.1), JKE (2021b) reported exceedences of the ecological criteria for copper and zinc within the stockpiles.

As the impacted fill material was subsequently removed from site, the results were used to support the waste classification results as discussed in Section 13.3.

Asbestos as bonded ACM has been identified within three stockpiles by Cardno (2018) and one stockpile by JKE (2021b). Asbestos as bonded ACM has also been identified on the surface within the vicinity of the structures at the site.

In the auditor's opinion, the soil analytical results are consistent with the site history and field observations. Remediation of the asbestos impacted fill was undertaken (refer to **Section 10.0**).

9.0 Evaluation of Groundwater Analytical Results

Groundwater samples were collected from four wells by JKE (2021b) in October 2021 and JKE (2022b) in May 2022. These were submitted for metals, petroleum hydrocarbons, PAHs, VOCs and PFAS. The results have been assessed against the environmental quality criteria. The analytical results are summarised below in **Table 9.1.**

The groundwater monitoring well network consisted of four wells installed on the site to the northeast, northwest, central and southeast (**Attachments 3 and 4, Appendix A**).

Table 9.1: Summary of Maximum Groundwater Investigation Analytical Results (µg/L)

Analyte	n	Detections	Maximum	n > HSL A/B and C sand, 2-<4 m NEPM (2013) or HEPA (2020)	n > GILs Marine NEPM (2013) or ANZG (2019)
TRH C_6-C_{10} less BTEX (F1)	8	1	29	0 above HSL A/B for sand, 1,000 µg/L HSL C for sand, NL	-
TRH >C_{10}-C_{16} less naphthalene (F2)	8	1	110	0 above HSL A/B for sand, 1,000 µg/L HSL C for sand, NL	-
TRH >C16-C34	8	0	<PQL	-	-
TRH >C34-C40	8	0	<PQL	-	-
Benzene	8	0	<PQL	0 above HSL A/B for sand, 800 µg/L HSL C for sand, NL	0 above 950 µg/L
Toluene	8	0	<PQL	HSL A/B for sand, NL HSL C for sand, NL	-
Ethyl benzene	8	0	<PQL	HSL A/B for sand, NL HSL C for sand, NL	-
Xylene	8	0	<PQL	HSL A/B for sand, NL HSL C for sand, NL	0 above 200 µg/L
Naphthalene	4	0	<PQL	HSL A/B for sand, NL HSL C for sand, NL	0 above 16 µg/L
Benzo(a)pyrene	4	0	<PQL	-	-
Arsenic	4	0	<PQL	-	0 above 13 µg/L
Cadmium	4	0	<PQL	-	0 above 0.2 µg/L
Chromium	4	0	<PQL	-	0 above 0.2 µg/L
Copper	4	1	2	-	**1 above 1.4 µg/L**
Lead	4	0	<PQL	-	0 above 3.4 µg/L

Analyte	n	Detections	Maximum	n > HSL A/B and C sand, 2-<4 m NEPM (2013) or HEPA (2020)	n > GILs Marine NEPM (2013) or ANZG (2019)
Mercury	4	0	<PQL	-	0 above 0.06 µg/L
Nickel	4	3	4	-	0 above 11 µg/L
Zinc	4	4	6	-	0 above 8 µg/L
Chloroform	4	3	27	-	**1 above 3 µg/L**
Other VOCs	4	0	<PQL	-	-
PFOS	4	0	<0.01	0 above HEPA (2018) of 0.13 µg/L (95% species protection level) 0 above HEPA (2018) of 0.00023 µg/L (99% species protection level)	-
PFHxS + PFOS	4	0	<0.01	0 above HEPA (2018) of 0.07 µg/L (drinking water) 0 above HEPA (2018) of 0.7 µg/L (recreational water)	-
PFOA	4	0	<0.01	0 above HEPA (2018) of 220 µg/L (fresh water) 0 above HEPA (2018) of 0.56 µg/L (drinking water) 0 above HEPA (2018) of 5.6 µg/L (recreational water) 0 above HEPA (2018) of 220 µg/L (99% species protection level) 0 above HEPA (2018) of 19 µg/L (99% species protection level)	-

n number of samples

- No criteria available/used

<PQL Less than the practical quantitation limit

All groundwater analytical results reported less than detection for TRH, BTEX and PAHs. PFAS was detected in one well however no compounds were reported above available criteria. Metals were also detected with one sample above the freshwater guidelines for copper.

In the auditor's opinion, the groundwater analytical results are consistent with the site history and field observations. The auditor is satisfied that no further investigations are needed and that the site criteria for residential with minimal soil access and public open space land uses have been met.

10.0 Evaluation of Remediation

10.1 Remediation Required

Based on the investigations completed by Cardno and JKE, the contaminants of concern that have been targeted by remediation and validation are summarised in Table 10.1**.** The site was impacted by bonded asbestos identified on the surface of the site within the vicinity of the structures. A number of stockpiles to the southwest of the structures had also been impacted by asbestos containing material as well as copper and zinc above the ecological criteria.

The RAP was prepared by JKE prior to auditor engagement and therefore has not been reviewed.

Remediation was undertaken by Hutchinson Builders who engaged World Wide Demolitions (WWD) licenced asbestos removalists and civil contractor Cleary Brothers (CB) under supervision of RARE Environmental (RARE) between May and December 2023. Environmental consulting was provided by JBS&G.

Table 10.1: Remediation Undertaken

Description	Extent of Remediation	Remediation Undertaken
Asbestos (bonded) identified at the surface:	Surface fill within the vicinity of the structures (see **Attachment 5, Appendix A**).	Excavation and offsite disposal of asbestos impacted fill.
Asbestos (bonded) and Metals Impacted Stockpiles:	Stockpiles to the southwest of the structures (see **Attachment 5, Appendix A**).	Excavation and offsite disposal of asbestos and metal impacted fill.

In the auditor's opinion, remediation works undertaken were appropriate. Validation results and testing are discussed in Section 0.

The sequence of remedial works was as follows:

- Excavation of impacted material within the remediation area (around the structures) and disposal offsite (see Section 10.2.4).
- Collection of validation samples from excavation base (see Section 10.2.2). Inspection of excavation base by JBS&G.
- Removal of the eight impacted stockpiles and disposal offsite (see Section 10.2.4).
- Collection of validation samples from stockpile footprints (see Section 10.2.2). Inspection of stockpile footprints by JBS&G.
- Identification of six unexpected finds and assessment for offsite disposal. Removal of impacted material from six unexpected finds and disposal offsite (see Section 10.2.5).
- Inspection of soil following removal of the six unexpected finds locations by JBS&G. Collection of validation samples from one stockpile footprint (see Section 10.2.2).
- Validation of imported materials (see Section 10.2.5).

10.2 Validation Activities

Validation activities are summarised in **Table 10.2.**

Table 10.2: Validation Activities

Element	Works Undertaken	Verification
Asbestos contaminated soil around structures (approximately 3,600 m^2).	A surface scrape of 100 mm across the impacted area. Surface scrapes continued until no visible signs of contamination including odours, staining, excessive anthropogenic inclusions were identified. Followed by offsite disposal of impacted soil.	Inspection during excavation of fill material by JBS&G for visible signs of contamination. Collection of validation samples from the base of the excavation in accordance with the RAP (refer to Section 10.2.2 for analytical results). It is noted that validation samples were analysed for lead from one area of the excavation in accordance with the RAP. JBS&G considered lead to be a concern as they applied HIL A criteria (as discussed in Section 7.1). Inspection of excavation base by licenced asbestos assessor from JBS&G.
Stockpiles (between 11.5 and 70 m^3).	Removal of the stockpiles and offsite disposal. Surface scrape of 100 mm across the stockpile footprint. Surface scrapes continued until no visible signs of contamination including odours, staining, excessive anthropogenic inclusions were identified. Followed by offsite disposal of impacted soil.	Inspection during excavation of fill material by JBS&G for visible signs of contamination. Collection of validation samples from the base of the excavation in accordance with the RAP (refer to Section 10.2.2 for analytical results). Inspection of excavation base by licenced asbestos assessor from JBS&G.
Unexpected Finds (UF) within surface fill (ACM impacted material at five locations and fibrous asbestos material at one location) (between approximately 20 and 150 m^3).	Excavation of surface soil continued until no visible signs of contamination including ACM, odours or staining were identified. Followed by offsite disposal of impacted soil.	Inspection following excavation of each UF by JBS&G for visible signs of contamination. Collection of validation samples from excavation base of one UF where fibrous asbestos was identified (refer to Section 10.2.2 for analytical results). Inspection of excavation base of all UF by licenced asbestos assessor from JBS&G and WSP.

In the auditor's opinion, remediation works undertaken were appropriate.

10.2.1 Evaluation of Quality Assurance and Quality Control

The auditor has assessed the overall quality of the data in **Table 10.3** by review of the information presented in the validation report.

Table 10.3: QA/QC Summary

QAQC	Consultant Reports	Auditor Comments
Sampling and Analysis Methodology Assessment.	• Data quality indicators were predetermined by JBS&G for the validation assessment. • Validation samples: Samples were collected across the base of the excavation within the vicinity of the structures and the footprint of the stockpiles. Density was in accordance with the RAP. Validation sampling observations provided. • Samples were collected by hand. • Importation samples: collected at the source site by hand or at the site by excavator. • Disposable gloves were generally reported as being used for each sample event. • Samples were reported to have been placed in laboratory supplied sample jars and transferred in a chilled esky or placed within zip lock plastic bags for asbestos samples. • A PID was not used during validation sampling. A PID was used during sampling onsite of some imported material. Calibration certificates were not provided.	Overall, the sampling and analysis methodology assessment was acceptable.
Field and Lab Quality Assurance and Quality Control.	• NATA accredited laboratories Envirolab and Eurofins | mgt were used. • Field replicates, trip blanks and trip spikes were generally collected with some elevated RPDs for several metals, TRH and PAHs. • Laboratory quality control sampling was conducted (controls were meet with the exception of a duplicate for Envirolab).	In the context of the dataset reported, the elevated RPD results are not considered significant and the field and laboratory quality control results are acceptable. Overall, the field and lab quality assurance and quality control was acceptable.

Overall, the auditor considers the quality assurance and quality control acceptable for the validation undertaken.

10.2.2 Evaluation of Soil Validation Analytical Results

A summary of the results has been tabulated below in **Table 10.4**. Validation sample locations are shown in Attachment 6, Appendix A**.**

Table 10.4: Evaluation of Validation Analytical Results – Summary Table (mg/kg)

Analyte	N	Detections	Maximum	n > Human Health Screening Criteria	n > Terrestrial Ecological Screening Criteria
Lead	19	19	110	0 above HIL B of 500 mg/kg 0 above HIL C of 600 mg/kg	0 above Generic ACL (urban residential) of 1,100 mg/kg
Copper	7	7	170	0 above HIL B 30,000 mg/kg 0 above HIL C 17,000 mg/kg	6 above most conservative ACL (urban residential) of 60 mg/kg
Zinc	1	1	120	0 above HIL B 60,000 mg/kg 0 above HIL C 30,000 mg/kg	1 above most conservative ACL (urban residential) of 70 mg/kg
Asbestos (ACM)	2	0	0	0 above HSL B 0.04% 0 above HSL C 0.02%	-
Asbestos (FA/AF)	2	0	<0.001	0 above HSL B 0.001% 0 above HSL C 0.001%	-

n number of samples

- No criteria available/used

NL Non-limiting

<PQL Less than the practical quantitation limit

Metals were detected however all reported below human health criteria. Copper and zinc were reported above ecological criteria. However, given the proposed land use as a hospital it is unlikely that these exceedences would pose an unacceptable ecological risk. It is noted that due to the criteria applied by JBS&G (see Section 7.1), JBS&G reported copper and zinc within the ecological criteria.

Asbestos (FA/AF and ACM) were not detected at the footprint of the fibrous asbestos unexpected find.

10.2.3 Retained Fill

The fill outside of the excavation and stockpile footprints was assessed as part of JKE (2021b). The results discussed in Section 8 indicate that the material is suitable to remain onsite.

10.2.4 Material Disposed Off-Site

The following material was listed as disposed offsite by JBS&G:

- 282.9 m^3 of green waste.
- 55.4 m^3 of demolition waste (bricks & concrete).
- 0.6 m^3 of steel.
- 15.7 m^3 of asbestos.
- 673 m^3 of general solid waste.
- 553.2 m^3 of General Solid Waste (non-putrescible) mixed with Special Waste (Asbestos). The auditor notes that the material tracking register provided in the validation report has a total of 1,362.84 tonnes General Solid Waste (non-putrescible) mixed with Special Waste (Asbestos) disposed offsite. With a density of 1.9 tonnes per m^3 as used by JBS&G this would be 717.3 m^3.
- 22.3 m^3 of non-destructive digging (NDD) Liquid Waste.

Further discussion of disposal and classification is provided in **Section 13.0**.

10.2.5 Imported Material

Approximately 30,550 m^3 of VENM was imported to create temporary vehicle access, carparking areas and for service installation. Classifications were provided as summarised in **Table 10.5**.

Table 10.5: Imported Material

Source Site	Volume imported (m^3)	Material Description (Consultant)	Site History/ Supplier Information	Summary of Validation Data	Auditor Comments
Unknown	30,000	VENM (silty gravelly clay)	Unknown - JBS&G state that the stockpile was previously located to the north of the site.	30 samples collected by JKE from the material after importation to the site. No visible or olfactory signs of contamination were observed by JKE. Results were low for metals and non detect for organics. No asbestos detected.	Sufficient sampling and analysis of the material has been undertaken to determine suitability to be used at the site. The material is acceptable.
Cleary Brothers quarry in Albion	30	Rock 20-70mm	Quarried material.	Three samples collected by JBS&G from the source site. Results were low for metals and non detect for organics. Copper and zinc above ecological criteria. No asbestos detected.	Similar values of copper and zinc were identified within the natural and fill at the site and given the proposed land use the elevated copper and zinc are considered unlikely to pose an ecological unacceptable risk. The material is acceptable.
Cleary Brothers quarry in Albion	30	Rock 70-200mm	Quarried material.	Three samples collected by JBS&G from the source site. Results were low for metals and non-detect for organics. No asbestos detected. Copper and zinc above ecological criteria.	Similar values of copper and zinc were identified within the natural and fill at the site and given the proposed land use the elevated copper and zinc are considered unlikely to pose an ecological unacceptable risk. The material is acceptable.
Cleary Brothers quarry in Albion	30	DGS40	Quarried material.	Three samples collected by JBS&G from the source site. Results were low for metals and non-detect for organics. No asbestos detected. Copper above ecological criteria.	Similar values of copper were identified within the natural and fill at the site and given the proposed land use the elevated is considered unlikely to pose an ecological unacceptable risk. The material is acceptable.
Cleary Brothers quarry in Albion	468.8	Gerroa Sand	Quarried material.	Three samples collected by JBS&G from the source site. Results were low for metals and non-detect for organics. No asbestos detected.	The material is acceptable.
Dapto Sand and Supersoils in Kembla Grange	50	Grey Fill Sand	Quarried material.	Three samples collected by JBS&G from the source site. Results were low for metals and PAHs and non-detect for other organics. No asbestos detected.	The material is acceptable.

In the auditors opinion the imported material is acceptable given the following:

- Material has been assessed by JBS&G and JKE in accordance with the RAP.
- Inspection of material was undertaken by JBS&G at the source site and following importation with the exception of the 30,000 m^3 of VENM from an unknown source. Sufficient sampling and analysis of the material has been undertaken to determine suitability. The auditor considers it is suitable to remain on site.
- Material results were consistent with VENM.
- Supplier information is generally sufficient to determine source location and consistency of material type.

10.3 Auditor's Opinion

The auditor concludes that excavations and stockpile footprints for asbestos impacted soils at the site have been adequately validated.

11.0 Contamination Migration Potential

Following removal of ACM impacted fill, the auditor considers that there would be little or no potential for migration of contamination form the site in surface water or dust. In the auditors' opinion, there is no evidence of significant migration of contamination and little potential for future migration given the remedial works proposed.

12.0 Assessment of Risk

Following removal of fill within the remediation area, the auditor considers that the risk of any remaining undetected contamination is low. The expected conditions at the site are natural (silty/sandy clay, silty/sandy gravel and clayey silt) and bedrock (shale, sandstone and latite) with no odour or staining.

Shallow fill remains outside of the remediation area comprising silty clays with no odour or staining. Based on assessment of results against relevant guidelines and consideration of the overall investigation and remediation, it is the auditor's opinion that the risks to human health and the environment are low.

13.0 Compliance with Regulatory Guidelines and Directions

The auditor has used guidelines currently approved by the EPA under Section 105 of the NSW Contaminated Land Management Act 1997 (Appendix C).

The investigation was generally conducted in accordance with SEPP (Resilience and Hazards) 2021 and reported in accordance with the NSW EPA (2020) Consultants Reporting on Contaminated Sites Contaminated Land Guidelines. The checklist included in that document has been referred to. The EPA's Checklist for Site Auditors using the EPA Guidelines for the NSW Site Auditor Scheme 2017 (October 2017) has also been referred to.

13.1 Notification

JKE indicated that the remediation works were classified 'Category 2' Remediation Works not requiring consent.

13.2 Development Approvals

Development consent (SSD-57064458, issued on 12 August 2024) was granted by the Minister for Planning and Public Spaces for the construction and operation of a new seven storey hospital, including landscaping, internal roads and access, at-grade and multi-level car parking, utility/service connections and supporting infrastructure. The consent was subject to a number of requirements of which condition (B43) relates to contamination and requires a site audit statement as follows:

> *"Prior to the commencement of construction, the Applicant must submit a Validation Report prepared by a suitability qualified remediation consultant and verified by an EPA-accredited Site Auditor, which confirms the site has been appropriately remediated and is suitable for the Health Service Facility use. The Validation Report is to be submitted along with an Environmental Management Plan (if required) to the Planning Secretary and the Certifier"*

The above condition has been interpreted to require a Site Audit Statement commenting on site suitability for health service facility use since the recommendations of the investigation report referenced relate to suitability for health service facility use. This Site Audit Report and accompanying Site Audit Statement has been completed in order to comply with this condition. Note that a long-term environmental management plan is not required for the site.

13.3 Waste Disposal

The auditor has assessed the overall waste management process by review of the information presented in the referenced reports, supplemented by field observations. An assessment of the waste classification process in consideration of Waste Classification Guidelines, Part 1: Classifying Waste (EPA 2014) was undertaken. JBS&G indicated wastes were classified and managed in accordance with the Waste Classification Guidelines, Part 1: Classifying Waste (EPA 2014). The key documents provided relating to waste include:

- In-situ waste classification assessments for the remediation area around the structures prepared by JBS&G on 11 September 2023. Soil sample results were based on analysis of the fill in JKE (2021b) (see Section 8).
- In-situ waste classification assessments for the unexpected finds prepared by JBS&G between 1 August and 11 September 2023.

- Ex-situ waste classification assessments for the stockpiles prepared by JBS&G between 9 and 14 June 2023. Soil sample results were based on analysis of the stockpiles in JKE (2021b) (see Section 8).
- Off-site disposal register including disposal date, time, material type, destination, weight (in tonnes) and weighbridge receipt number.
- Weighbridge receipt dockets.

Based on the information provided in the validation report the auditor is satisfied:

- With the classification of the waste.
- That overall, the material excavated for off-site disposal was moved off-site and taken to landfill.

The auditor has not been provided with the following information within the off-site disposal register:

- Documentation confirming the exact source or corresponding relevant waste classification for each disposal event i.e. truck ID and volume in m^3.

As the volume of material disposed of as general solid waste - special asbestos waste, was generally as expected based on the field observations, the auditor is overall satisfied that the waste was taken to lawful facilities.

13.4 VENM and Other Imported Materials

Based on the information in Section 10.0 and the site visit on 20 September 2024, the auditor is of the opinion that the material imported to the site is consistent with VENM.

13.5 Licenses

Excavation and removal of asbestos fibre contaminated soils were required to be conducted by a Class A licensed contractor. Excavation, onsite remediation and offsite removal of ACM contaminated soils were required to be conducted by at least a Class B licensed contractor.

JBS&G confirmed that during the remediation works all Class A and B asbestos removal work was completed by World Wide Demolitions (license number AD213387) and Cleary Brothers under the supervision of RARE Environmental (licence number AD213303). Copies of the appropriate licences were not provided to the auditor.

The auditor accessed the SafeWork register of licenced contractors and is satisfied that World Wide Demolitions and RARE Environmental hold the appropriate licence to undertake friable and non-friable asbestos removal work as at 18 September 2024.

Asbestos clearance inspections were undertaken following the remedial works with clearance certificates provided in Appendix E of the validation report. Clearances were undertaken by the following licensed assessors:

- Lillian Beevors – Asbestos Assessor Licence No. LAA001613.
- Leo Rothacker – Asbestos Assessor Licence No. LAA001578.
- Hamish Cowan – Asbestos Assessor Licence No. LAA001471.

The auditor checked the NSW Government register of licensed tradespeople on 18 September 2024 and confirmed that the LAA licences listed are current and active.

JBS&G state that NSW EPA WasteLocate was used to track the disposal of all asbestos waste from the site.

14.0 Conclusions and Recommendations

JBS&G considers that the site is “suitable for the proposed Shellharbour Hospital”. Based on the information presented in JBS&G, JKE and Cardno reports and observations made on site, and following the Decision-Making Process for Assessing Urban Redevelopment Sites in NSW EPA (2017) Guidelines for the NSW Site Auditor Scheme, the auditor concludes that the site is suitable for the purposes of the “construction and operation of a new seven storey hospital, including landscaping, internal roads and access, at-grade and multi-level car parking, utility/service connections and supporting infrastructure”.

15.0 Other Relevant Information

This audit was conducted on the behalf of Hutchinson Builders for the purpose of assessing whether the land is suitable for the proposed health service facility use i.e. a “Site Audit” as defined in Section 4 (definition of a ‘site audit’ (b)(iii)). The audit report has been prepared to satisfy a requirement for the development the site.

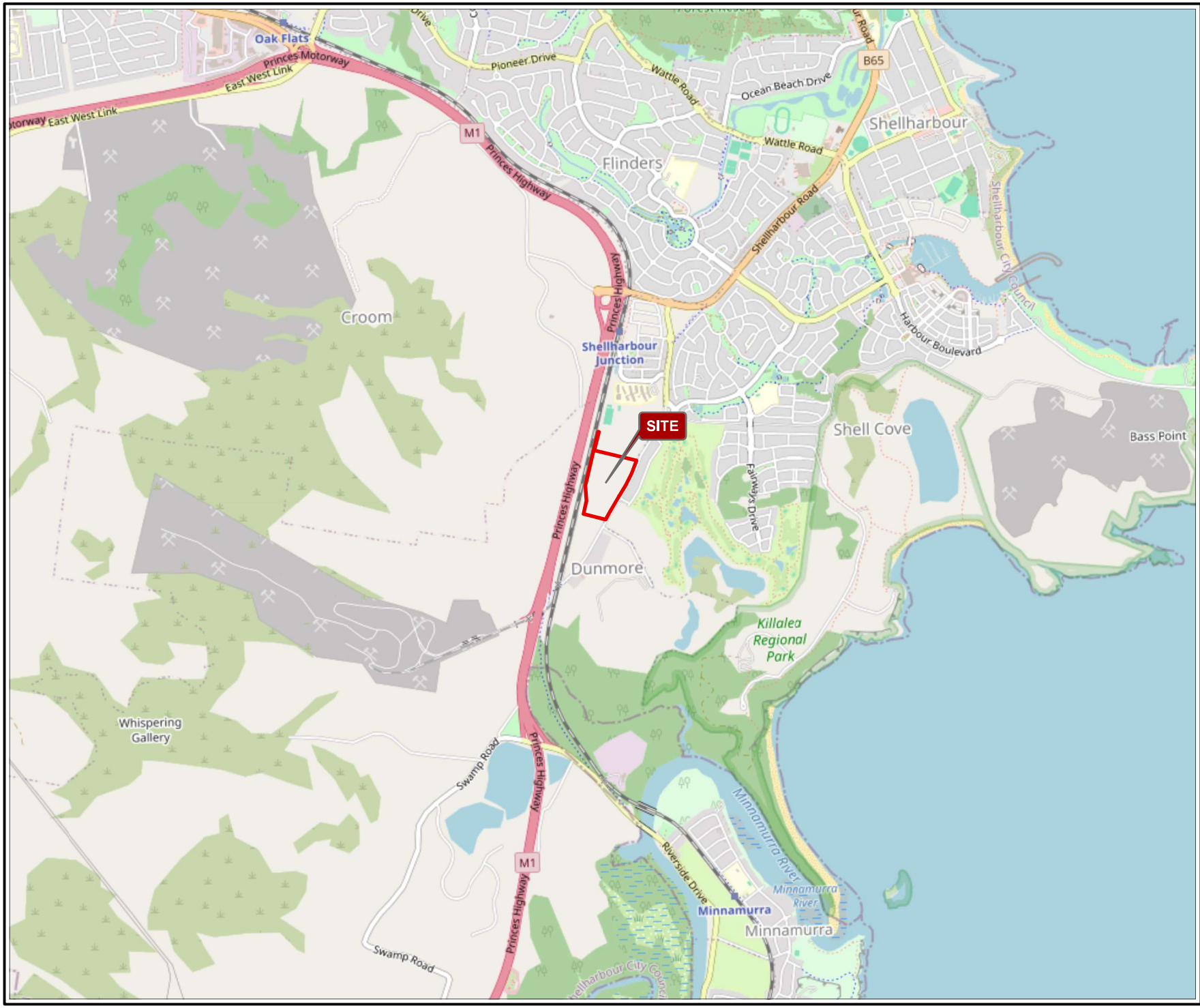
This summary report may not be suitable for other uses. Cardno, JKE and JBS&G included limitations in their report. The audit must also be subject to those limitations. The auditor has prepared this document in good faith, but is unable to provide certification outside of areas over which the auditor had some control or is reasonably able to check.

In drawing conclusions, the auditor used reasonable care to avoid reliance upon data and information that may be inaccurate, however a degree of uncertainty is inherent in all subsurface investigations and there remains the possibility that variations may occur between sample locations. The audit and this report are limited by and rely upon the scope of the review, and the information provided by the Client and their consultants and representatives through documents provided to the auditor. The audit is based on a review of the subsurface condition of the site at the time of assessment, as described in the assessment reports attached to the audit report and site inspections conducted by the auditor and their representatives. The auditor’s conclusions presented in this report are therefore based on the information made available to them and arising from their own observations conducted during the audit. If the auditor is unable to rely on any of those documents, the conclusions of the audit could change.

It is not possible in a Site Audit Report to present all data which could be of interest to all readers of this report. Readers are referred to the referenced reports for further data. Users of this document should satisfy themselves concerning its application to, and where necessary seek expert advice in respect to, their situation.

In reaching their conclusions about the site, the Client and NSW EPA may use this audit report and site audit statement. The scope of work performed as part of the audit process may not be appropriate to satisfy the needs of any other person. Any other person’s use of, or reliance on, the audit document and report, or the findings, conclusions, recommendations or any other material presented or made available to them, is at that person’s sole risk.

Appendix A: Attachments



Legend

Approximate Site Boundary

JBS&G

Job No: 65163

Client: Hutchinson Builders

Version: R01 Rev 0	Date 2/02/2024
Drawn By: IA/AB	Checked By: LR

Scale 1:35,000

0 330 660

metres

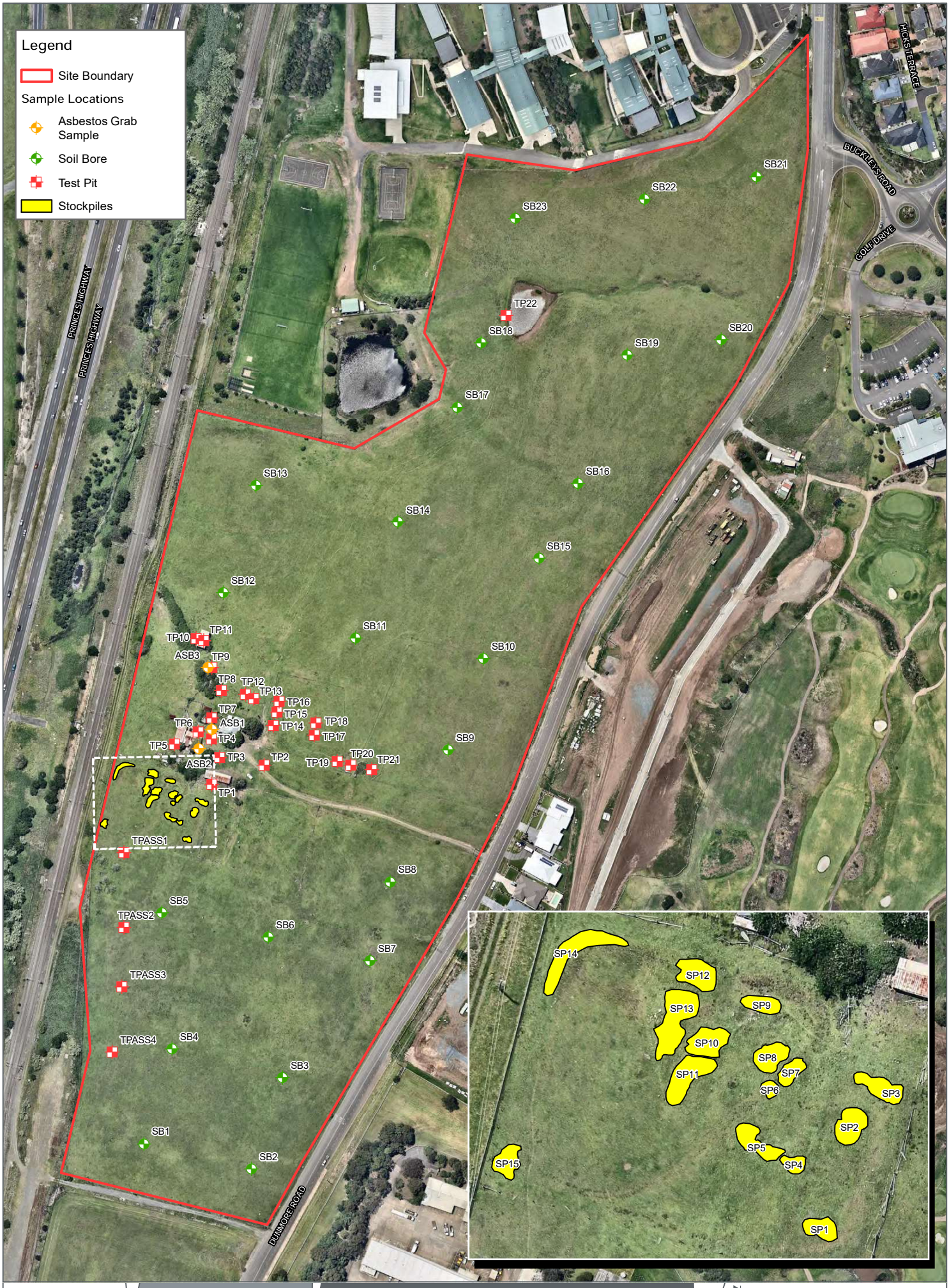
Coord. Sys. GDA 1994 MGA Zone 56

86 Dunmore Road
Dunmore,NSW

SITE LOCATION

FIGURE 1

File Name: 65163_ShellharbourHospital_R01



SHELL HEIGHTS

FIGURE 3

1:2,500 Scale at A3

m

0 25 50 75 100

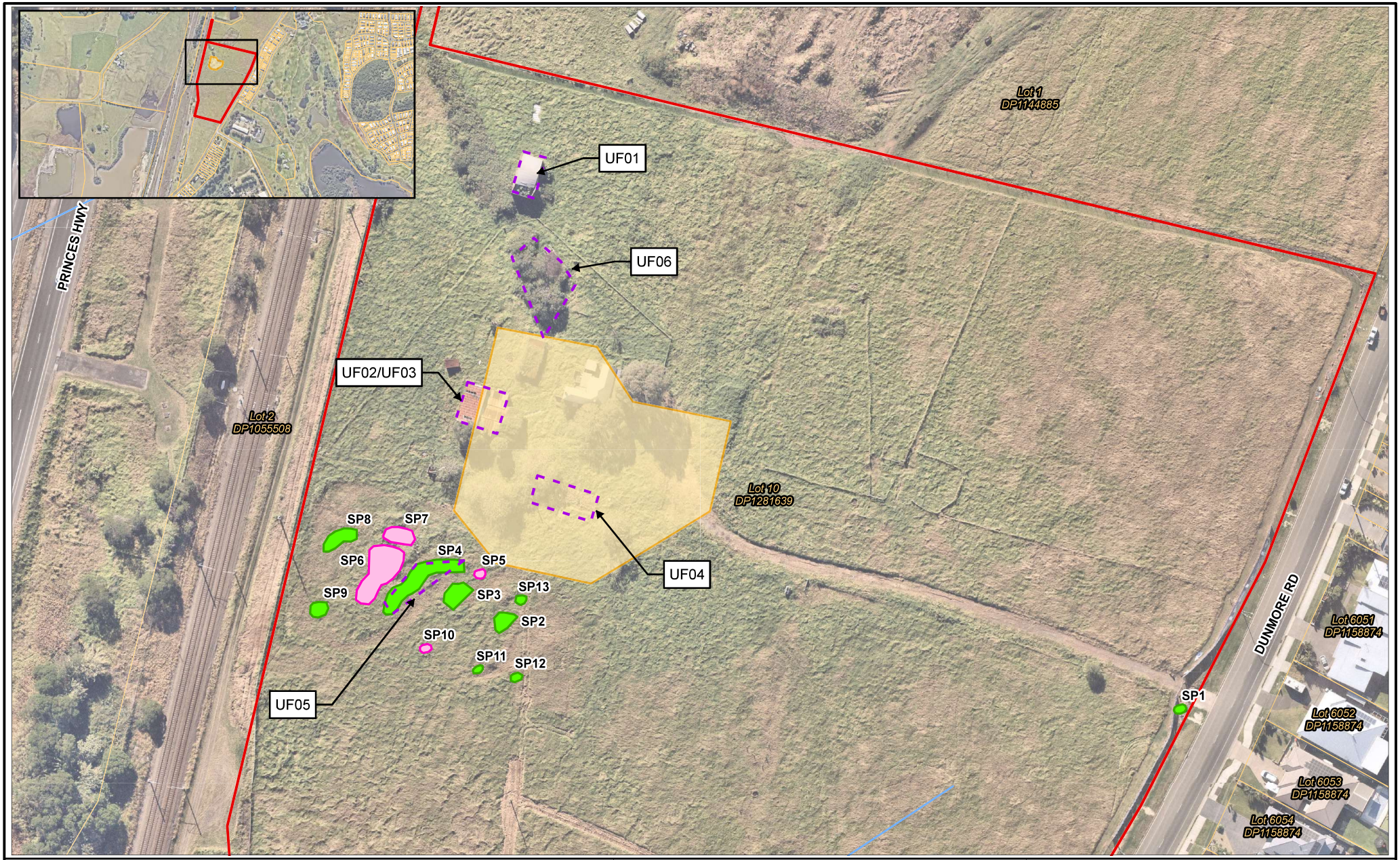
Sample Location Plan

SHELL HEIGHTS SOUTH

N

Cardno

Map Produced by Cardno NSW/ACT Pty Ltd (WOL)
Date: 2018-03-13 | Project: 82013011
Coordinate System: GDA 1994 MGA Zone 56
Map: 82013011-23-GS-003-SampleLocationPlan.mxd 02
Aerial imagery supplied by nearmap (December, 2017)

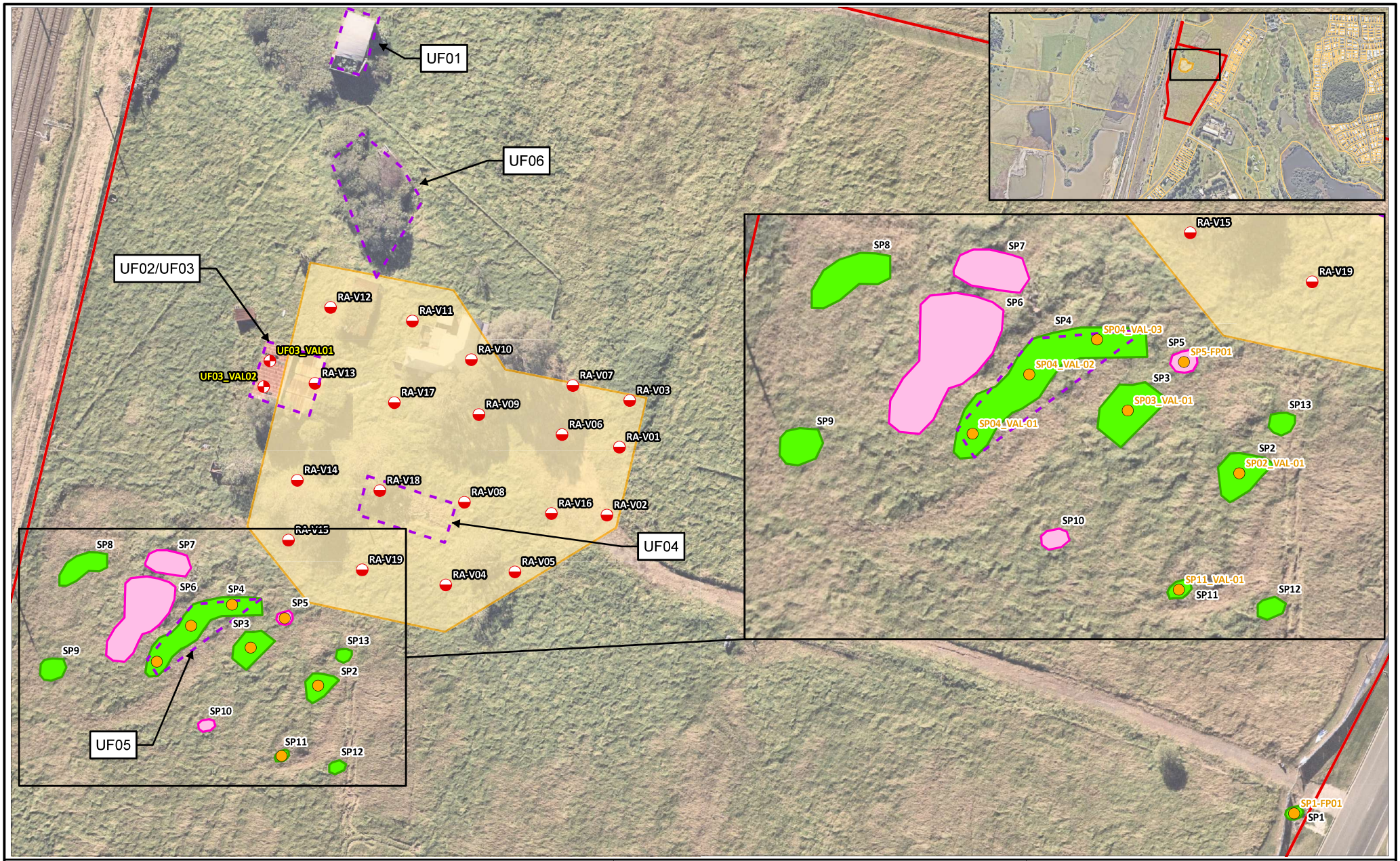


Legend

- Approximate Site Boundary
- NSW Cadastre
- Remediation Area
- Unexpected Finds
- ACM stockpile
- Stockpile

Scale 1:1,550 (0, 10, 20 metres)		86 Dunmore Road, Dunmore, NSW
Coord. Sys. GDA2020 MGA Zone 56		SITE LAYOUT
Job No: 65163		
Client: Hutchinson Builders		FIGURE 2
Version: R01 Rev 0	Date 2/02/2024	JBS&G
Drawn By: IA/AB	Checked By: LR	

File Name: 65163_ShellharbourHospital_R01
Reference: Nearmap - www.nearmap.com (Capture Date: 15/06/2023)



Legend

- Approximate Site Boundary
- Remediation Area
- Unexpected Finds
- ACM stockpile
- Stockpile
- Validation Samples
- Unexpected Finds Validation Samples
- Stockpile Validation Locations

Scale 1:1,075 (0, 9, 18 metres)		86 Dunmore Road, Dunmore, NSW
Coord. Sys. GDA2020 MGA Zone 56		SITE LAYOUT
Job No: 65163		
Client: Hutchinson Builders		FIGURE 3
Version: R01 Rev 0	Date 2/02/2024	JBS&G
Drawn By: IA/AB	Checked By: LR	

File Name: 65163_ShellharbourHospital_R01
Reference: Nearmap - www.nearmap.com (Capture Date: 15/06/2023)

LEGEND

	APPROXIMATE ZONE BOUNDARIES
	APPROXIMATE WIDER PROPERTY BOUNDARY
	ABORIGINAL AREAS (EMM REPORT)
BH/MW(Fill Depth)	BOREHOLE AND GROUNDWATER MONITORING WELL LOCATION, NUMBER AND DEPTH OF FILL (m)
TP(Fill Depth)	TEST PIT LOCATION, NUMBER AND DEPTH OF FILL (m)

AERIAL IMAGE SOURCE: MAPS.AU,NEARMAP.COM

0 20 40 60 80 100

SCALE 1:2000 @A3 METRES

This plan should be read in conjunction with the Environmental report.

Title: **SAMPLE LOCATION PLAN ZONE B**

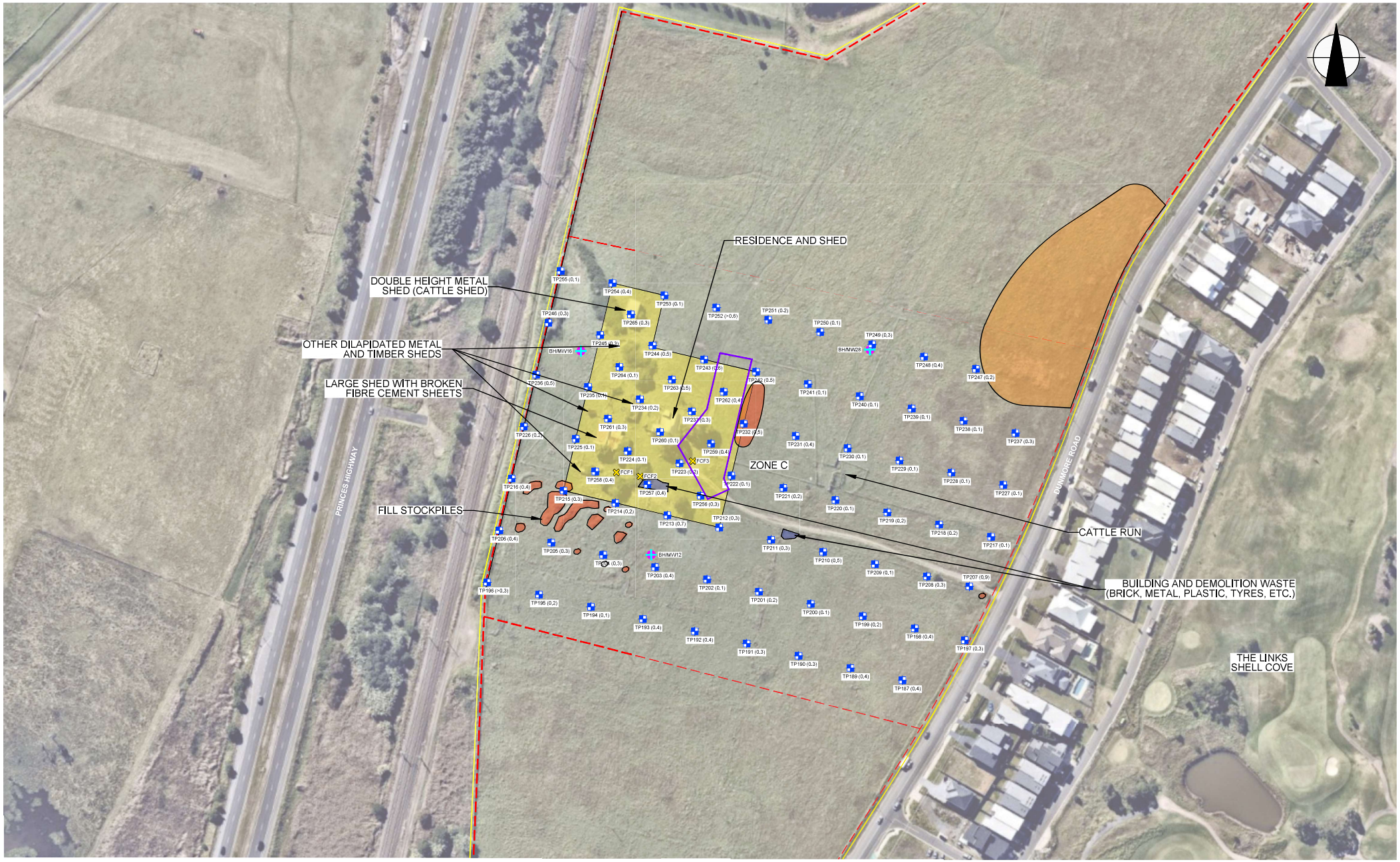
Location: 86 DUNMORE ROAD, SHELLHARBOUR, NSW

Project No: E34300PTrpt2

Figure No: 2b

JKEnvironments

PLOT DATE: 21/10/2021 10:46:08 AM DWG FILE: S:\5 EIS\5c EIS JOBS\34000'S\E34300PT DUNMORE\CAD\E34300PTRPT2.DWG



LEGEND

- APPROXIMATE ZONE BOUNDARIES
- APPROXIMATE WIDER PROPERTY BOUNDARY
- ABORIGINAL AREAS (EMM REPORT)
- BH/MW(Fill Depth) BOREHOLE AND GROUNDWATER MONITORING WELL LOCATION, NUMBER AND DEPTH OF FILL (m)
- TP(Fill Depth) TEST PIT LOCATION, NUMBER AND DEPTH OF FILL (m)

AERIAL IMAGE SOURCE: MAPS.AU.NEARMAP.COM

0 20 40 60 80 100

SCALE 1:2000 @A3 METRES

This plan should be read in conjunction with the Environmental report.

Title: **SAMPLE LOCATION PLAN ZONE C**

Location: 86 DUNMORE ROAD, SHELLHARBOUR, NSW

Project No: E34300PTrpt2

Figure No: 2c

JKEnvironments

PLOT DATE: 22/10/2021 12:35:35 PM DWG FILE: S:\5 EIS\5C EIS JOBS\34000'S\E34300PT DUNMORE\CAD\E34300PTRPT2.DWG

Appendix B: EPA Guidelines

Guidelines made or approved by the EPA under section 105 of the *Contaminated Land Management Act 1997*

(as of: 12 August 2022)

Section 105 of the CLM Act allows the EPA to make or approve guidelines for purposes connected with the objects of the Act. The EPA must consider these guidelines whenever they are relevant. Other people must also consider the guidelines, namely, accredited site auditors when conducting a site audit; contaminated land consultants when investigating, remediating, validating and reporting on contaminated sites; and those responsible for land contamination with a duty to notify the EPA.

A current list of guidelines made or approved by the EPA under the CLM Act appears below.

Guidelines made by the EPA

- Assessment and management of hazardous ground gases: Contaminated land guidelines (PDF 4MB)
- Guidelines for the vertical mixing of soil on former broad-acre agricultural land (PDF 148KB)
- Contaminated land sampling design guidelines part 1 – application (PDF 3.3MB)
- Contaminated land sampling design guidelines part 2 – interpretation (PDF 1MB)
- Guidelines for assessing banana plantation sites (PDF 586KB)
- Consultants reporting on contaminated land: Contaminated land guidelines (PDF 1MB)
- Guidelines for assessing former orchards and market gardens (PDF 172KB)
- Guidelines for the NSW Site Auditor Scheme, 3rd edition (PDF 999KB)
- Guidelines for the assessment and management of groundwater contamination (PDF 604KB)
- Guidelines on the duty to report contamination under the Contaminated Land Management Act 1997 (PDF 412KB)

Guidelines that refer to the:

- Australian Water Quality Guidelines for Fresh and Marine Waters (ANZECC, October 2000), are replaced as of 29 August 2018 by the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG, August 2018), with the exception of the water quality for primary industries component, which still refer to the ANZECC & ARMCANZ (2000) guidelines
- National Environment Protection (Assessment of Site Contamination) Measure 1999 are replaced as of 16 May 2013 by the National Environment Protection (Assessment of Site Contamination) Measure 1999 (April 2013).

Guidelines approved by the EPA

- Australian and New Zealand Guidelines for Fresh and Marine Water Quality, ANZG (August 2018)
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Volume 3, Primary Industries - Rationale and Background Information (ANZECC & ARMCANZ (October 2000)
- Composite sampling, Lock, W. H., National Environmental Health Forum Monographs, Soil Series No.3, 1996, SA Health Commission, Adelaide. Email enHealth.Secretariat@health.gov.au for a copy of this publication.
- Environmental health risk assessment: Guidelines for assessing human health risks from environmental hazards, Department of Health and Ageing and EnHealth Council, Commonwealth of Australia (June 2012)
- National Environment Protection (Assessment of Site Contamination) Measure 1999 (April 2013)* (ASC NEPM)
- Guidelines for the Assessment and Clean Up of Cattle Tick Dip Sites for Residential Purposes, NSW Agriculture and CMPS&F Environmental (February 1996)
- Australian Drinking Water Guidelines, NHMRC and Natural Resource Management Ministerial Council of Australia and New Zealand (2011)

*The ASC NEPM was amended on 16 May 2013.

Appendix C: Interim Audit Advice

Senversa Pty Ltd
Level 24, 1 Market St, Sydney 2000
ABN 89 132 231 380 www.senversa.com.au

23 September 2024

Max Elmes
Project Manager
Hutchinson Builders
23 Dunning Avenue
Rosebury NSW 2018

Dear Max,

Re: Interim Audit Advice #1: 50 & 86 Dunmore Road, Dunmore NSW

Review of Validation Report

1.0 Introduction and Background

Melissa Porter (the Site Auditor) of Senversa Pty Ltd (Senversa) has been engaged by Hutchinson Builders on behalf of Health Infrastructure as a NSW Environment Protection Authority (EPA) Accredited Contaminated Sites Auditor for the proposed development of 50 & 86 Dunmore Road, Dunmore NSW (hereafter referred to as 'the site').

It is understood that development plans for the site, which is currently vacant, include the construction of a construction and operation of a new seven storey hospital, including landscaping, internal roads and access, at-grade and multi-level car parking, utility/service connections and supporting infrastructure. JBS&G Australia (JBS&G), engaged as the environmental consultant to assess the remediation of the site, produced the following report, which was forwarded to the Site Auditor for review:

- 'New Shellharbour Hospital Early Works, Validation Report, 50 & 86 Dunmore Road, Dunmore NSW' dated 5 February 2024 by JBS&G Australia Pty Ltd (JBS&G).

This interim audit advice details the review of the Validation Report in relation to the contamination status of the site. Additional specialist advice should be obtained for the geotechnical and heritage issues referred to in the reports.

2.0 Review Comments

The Site Auditor has undertaken a review of the Validation Report against the requirements specified in the *Guidelines for the NSW Site Auditor Scheme (3rd edition)* (NSW EPA, 2017) and the *Guidelines for Consultants Reporting on Contaminated Sites* (NSW EPA, 2020). Review comments are detailed herein.

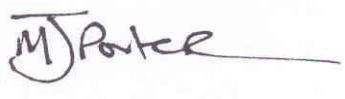
- Section 2.1.
  - Please include site owner.

  - The site address for Lot 10 DP 1281639 is 86 Dunmore Road Dunmore in SIXMaps, please confirm address.
- Section 2.2. Please include date for site inspection post remediation.
- Section 2.3.
  - Describe stockpiled material to the north of the site.
  - The JBS&G due diligence (2020) reports that the tributary to which the ephemeral creek drains is connected to the water body associated with the Boral-Dunmore quarry rather than to Rocklow Creek as stated in the validation report, please confirm surface water flow.
- Section 6.1.
  - Please confirm all stockpiles removed from site. State if inspection of all stockpile footprints was undertaken by JBS&G.
  - Logs from JKE DSI (2021) show fill across the site. Please confirm if fill remains at the site. Also confirm location of fill and discuss suitability to remain onsite.
  - Include in a figure the location of remaining fill and areas excavated to natural soil across the whole site.
- Section 6.2.
  - State if remediation area was excavated to natural i.e. what does ‘clean surface’ mean.
  - Confirm if excavation of the walls was continued until natural as well.
  - Confirm if validation samples were also collected from the walls of the excavation.
- Section 6.3 and 6.4. State if footprints of stockpiles were excavated to natural soil.
- Section 6.5. Describe validation sampling of these UFs following removal.
- Section 6.6. Please provide waste volumes in m^3.
- Section 6.8.
  - Please include all imported material volumes in m^3.
  - Confirm materials inspected upon importation.
  - Confirm photographs of all imported materials have been included in Appendix A and are clearly labelled.
  - Please provide any further information on the source of the 30,000m^3 of VENM that was stockpiled at the site.
- Summary Tables. Imported material should be assessed against ecological criteria as well, please update.
- Appendix B.
  - L01 and L02 – please include sample method.
  - Please check that sample locations are shown in all the waste classification assessment figures.
- Appendix D. Importation Materials Documentation:
  - L04 - Please include sample collection methodology, e.g. by hand.
  - Attach L13 (Material Importation Assessment, Cleary Bros, Gerroa Sand and Dapto Sands and Supersoils, Grey Fill Sand) Rev 0, dated 27 November 2023.
- Appendix G.
  - Please add material ID (i.e. stockpile or remediation area or UF), corresponding waste classification for each disposal even, truck ID and volume in m^3.
  - Provide a summary table of this information in Section 6.6.
  - Confirm if NSW EPAs WasteLocate or Integrated Waste Tracking System was used to track the disposal of asbestos waste.

3.0 Close

We look forward to receiving a response to the comments above and trust this meets your current requirements. Should you have any queries or require further information, please do not hesitate to contact the undersigned.

Yours sincerely,
On behalf of **Senversa Pty Ltd**



Melissa Porter
NSW EPA Accredited Site Auditor (0803)

ES/MP

Technical Limitations and Uncertainty – *This Interim Advice is not a Site Audit Report or a Site Audit Statement, as defined in the Contaminated Land Management Act 1997, but forms part of the Site Audit process*. It is intended that a Site Audit Statement and report will be issued at the completion of the site audit.
Consistent with NSW EPA requirements for staged "sign-off" of sites that are the subject of progressive assessment, remediation and validation, the Auditor is required to advise that:

- *This site audit advice does not constitute a site audit report or statement.*
- *This letter is considered by the Auditor to be consistent with NSW EPA guidelines and policies.*
- *This letter will be documented in the final Site Audit Statement and associated documentation.*
- *At the completion of the site audit, a Site Audit Statement will be prepared, for the consent agency to include the Site's property information, held by the local council.*

Senversa Pty Ltd

ABN 89 132 231 380
www.senversa.com.au
enquiries@senversa.com.au
LinkedIn: Senversa
Facebook: Senversa