ATTACHMENT 6 – SITE AUDIT REPORT

Planning Proposal – SP20018 – Croft Developments (November 2021)

SITE AUDIT REPORT

20 Hely Avenue, Turvey Park NSW
Remediation Action Plan

Prepared for: Croft Developments Pty Ltd

Date: July 2020

Project Number: E032

Audit Number: JE078A

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Site Audit Report

20 Hely Avenue, Turvey Park NSW Remediation Action Plan

Prepared for:

Croft Developments Pty Ltd

Prepared by:

Envirocene Pty Ltd Level 1, 29 Kiora Road Miranda NSW 2228	 Dr Julie Evans NSW EPA Accredited Site Auditor 1003

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Site Audit Statement

Abbreviations

ASC NEPM	National Environment Protection (Assessment of Site Contamination) Measure
B(a)P TEQ	Benzo(a)pyrene Toxicity Equivalent Quotient
bgs	below ground surface
BH	Borehole
BTEXN	Benzene, Toluene, Ethylbenzene, Xylenes and Naphthalene
C_6-<C_{10}	Hydrocarbon chain-length fraction
CLM Act	NSW Contaminated Land Management Act 1997
COPC	Chemical of potential concern
Council	Wagga Wagga City Council
CRC CARE	CRC for Contamination Assessment and Remediation of the Environment
DP	Deposited Plan
DSI	Detailed Site Investigation
EIL	Ecological investigation level
EPA	NSW Environment Protection Authority
ESL	Ecological screening level
HIL	Health-based Investigation Level
HSL	Health-based Screening Level
iENVI	iEnvironmental Australia
LEP	Local Environment Plan
LNAPL	Light Non-aqueous Phase Liquid
LOR	Limit of Reporting
µg/L	micrograms per litre
m	Metre
MES	McMahon Earth Sciences
mg/kg	milligrams per kilogram
MW	Monitoring Well
NATA	National Association of Testing Authorities
OCP	Organochlorine Pesticide
OPP	Organophosphorus Pesticide
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PID	Photoionisation Detector
PSI	Preliminary Site Investigation
QA/QC	Quality Assurance / Quality Control
RAP	Remediation Action Plan
RPD	Relative Percent Difference
SAQP	Sampling, Analysis and Quality Plan
SAR	Site Audit Report
SAS	Site Audit Statement

TRH	Total Recoverable Hydrocarbon
UST	Underground Storage Tank

1 Introduction

A site contamination audit has been conducted on behalf of the client, Croft Developments Pty Ltd (Croft) in relation to the site located at 20 Hely Avenue, Turvey Park NSW (Attachment 1), described as part Lot 2 DP 1183166 (Attachment 2). The audit has been undertaken to determine if the land can be made suitable for the proposed use, subject to implementation of a specified remediation action plan (RAP).

The site is approximately 11.32Ha and Croft propose to redevelop the site in two stages: (1) aged care facility with assisted living units and (2) retirement housing with associated community centre and public open space.

The site is subject to a site compatibility certificate (SCC) issued by the Department of Planning (DoP) on 23 July 2018 under clause 25(4) of State Environmental Planning Policy (Housing for Seniors or People with a Disability) 2004. It is understood that Croft have currently submitted two development applications to Wagga Wagga City Council: DA18/0175, for subdivision of the site (consent issued) and DA19/0001 for construction of Stage 1.

DA19/0001 is currently under assessment and council has advised that, prior to determination, site contamination matters must be addressed through submission of additional information as follows:

- *a DSI for the whole site (or additional DSI for Stage 1), and*
- *a NSW EPA accredited Site Auditor review the information and provide a Site Audit Statement stating the site will be suitable for the development when the recommended actions are carried out, and that the Auditor also review any RAP or EMP or similar site management plan required. Alternatively, this may comprise a condition of consent as a deferred commencement consent.*

Subsequently council confirmed, via Email to Croft, that a Part B5 Site Audit Statement, advising whether the site can be made suitable subject to the implementation of a remediation action plan (RAP), would need to be submitted to council to facilitate completion of the DA assessment.

This audit was undertaken to comply with the above request for additional information from council, prior to determination of a development proposal and is therefore a non-statutory audit.

1.1 Background to the Audit

The site was used for a short period as a RAAF hospital (1942-1946) before being used as a tertiary education facility (Wagga Wagga Teachers College, Riverina College of Advanced Education (RCAE) and more recently by Charles Sturt University (CSU) Figure 4). The site is currently vacant and most of the former hospital and college buildings have been demolished.

A preliminary site investigation (PSI) and detailed site investigation (DSI) have been undertaken by McMahon Earth Science (MES). No indicators of significant industrial uses on-site and surrounds that would have the potential to contaminate the site were reported, although uncertainties were identified with respect to hazardous materials clearance (asbestos) in previously demolished buildings. This was addressed by an additional Stage 1 & 2 DSI that included comprehensive asbestos quantification assessment and chemical assessment. The results of the Stage 1 & 2 DSI identified some areas of asbestos impact that require remediation before the site can be considered suitable for the proposed use. The asbestos impact was associated with areas of former buildings.

The auditor reviewed the PSI, DSI and Stage 1 & 2 DSI and prepared an interim audit advice letter (IAA) dated 16 January 2020. The auditor's review, as reported in the IAA, has been incorporated into this SAR.

After issue of the IAA, MES obtained additional site history documentation (in the form of detailed plans and interviews with a former site worker). Based on this additional information, MES identified some additional areas of environmental concern (AEC). These were addressed through an additional phase of targeted site investigation. The results were consistent with the previous investigation work and did not identify any further contamination issues.

A RAP has been prepared by iEnvironmental Australia Pty Ltd (iEnvi) documenting the preferred remediation methodology.

Council has advised that the site is affected by urban soil salinity. MES prepared a hydrogeological assessment report to address the urban salinity issues at the site, assess potential impacts, identify building mitigation measures and develop a groundwater management plan (for management of salinity). Consideration of the impacts of dryland salinity falls outside the scope of a contaminated site audit and has not been considered in determining whether the site can be made suitable (from a contamination

perspective). Impacts on buildings and structures will be controlled through requirements on the final design of the development imposed by the SCC and Wagga Wagga Development Control Plan (DCP 2010).

1.2 Details of the Audit

Name of Site Auditor	Dr Julie Evans
Auditor's Accreditation Number	1003
Auditor's Contact Details	Envirocene Pty Ltd Level 1, 29 Kiora Road, Miranda NSW 2225 Email: jevans@envirocene.com.au
Audit number	JE078A
Person requesting the Audit	Clinton Witnish on behalf of Croft Developments Pty Ltd
Purpose of the Audit	The audit was conducted to provide an independent review by an EPA Accredited Auditor to determine if the land can be made suitable for the proposed use if the site is remediated in accordance with a specified remediation action plan i.e. a "Site Audit" as defined in Section 4 "Definitions" of the NSW Contaminated Land Management Act 1997 (the CLM Act).
Type of Audit	The audit was completed to address a request for additional information from council prior to determination of a DA and is considered to be non-statutory.

1.3 Scope of the Audit

The scope of the Audit included:

- Review of the following reports:
  - 'Preliminary Site Investigation, Former CSU South Campus, 20 Hely Avenue, Turvey Park, NSW' July 2018, (Report 5340 Rev 05) McMahon Earth Science (*the PSI*).
  - 'Detailed Site Investigation, Former CSU South Campus, 20 Hely Avenue, Turvey Park, NSW 2650', June 2019, (Report 5901 Rev 01) McMahon Earth Science (*the DSI*).
  - 'Sampling Analysis and Quality Plan (24/10/19), 20 Hely Avenue, Wagga Wagga, NSW', 24 October 2019, McMahon Earth Science.
  - 'Detailed Site Investigation, Stages 1 & 2, Former CSU South Campus, 20 Hely Avenue Turvey Park NSW 2650', December 2019, (Report 6459 Rev 03) McMahon Earth Science (*the Stage 1 & 2 DSI*).
  - 'Sampling Analysis and Quality Plan (March 2020), Former CSU South Campus, 20 Hely Avenue, Turvey Park NSW 2650', 6 April 2020 (Report 6735 Rev 03), McMahon Earth Science.
  - 'Detailed Site Investigation, Former CSU South Campus, 20 Hely Avenue, Turvey Park NSW 2650', 11 May 2020 (Report 6735 Revision 02), McMahon Earth Science (*the Additional DSI*).
  - 'Remediation Action Plan, 20 Hely Avenue, Turvey Park NSW 2650', 3 July 2020 (Version 9.0 Final), iEnvironmental Australia Pty Ltd. (*the RAP*).
- Review of correspondence in Email format, unless specified these were prepared for the auditor:
  - Email Re: CSU South Campus: Additional Sampling. Sent 9 March 2020 by Zach Bradley on behalf of McMahon Earth Science. This included an attachment entitled "Additional History".
  - Letter Re: Summary of Findings – DM McMahon Pty Ltd DSI Report Ref: 6735. Dated 11 May 2020. Prepared by Michael Nicholls on behalf of iEnvironmental Australia Pty Ltd for Croft Developments Pty Ltd.
- A site visit by the Auditor on 16 September 2019.
- Discussions with Croft Developments, and with MES who undertook the investigation phase and iEnvi who prepared the RAP. The auditor also attended a meeting with Wagga Wagga City Council on 30 June 2020 to discuss the proposed remediation.

2 Site Description

Site location (Attachment 1) and identification details are as follows:

Street Address	20 Hely Avenue, Turvey Park NSW 2650
Identifier	Part Lot 2 DP 1183166 (Attachment 2)
Local Government Area	Wagga Wagga City Council
Owner	Signature Care Pty Ltd
Site Area	11.32Ha (excludes sub-division area)
Zoning	SP2 – Infrastructure (Wagga Wagga Local Environmental Plan 2010).

The site is located within an area of low density residential and light commercial. The surrounding site use includes:

- North: Commercial / recreational (Wagga Wagga Veterinary Hospital / Wagga Wagga Showground)
- East: General residential and primary education ('Henschke Primary School')
- South: General residential and vacant land / Wagga Wagga Ambulance Station
- West: Immediately to the west of the Stage 1 area is a newly constructed residential sub-division. Immediately to the west, within the central area of the site, is the Charles Sturt University (CSU) regional archives building and the Saint Mary Mackillop College (SMMC) "Conservatorium of Music". The area of land to the west is vacant and a school subdivision is proposed, although this lies outside the current audit area. Further to the west is the Juvenile Justice Centre, rail line and commercial properties.

The highest point of this site is about 211m AHD in the south-east corner at the intersection of Fernleigh Road and Hely Avenue. The site generally slopes to the north-west with lowest point being about 196m AHD in the north-western corner on Urana Street. The boundaries of the site are generally well defined by existing roads (Hely St, Charleville Road, College Avenue and Fernleigh Road). The exception is the boundary with the proposed school subdivision and Conservatorium of Music (Attachment 3).

MES conducted a search of council online mapping and reported "*…the subject lot is in a natural resource's sensitivity area for groundwater vulnerability with minimal, sparse and isolated areas of biodiversity; no areas classed as vulnerable lands or riparian lands/waterways were identified*."

The site forms part of the Murrumbidgee River catchment with overland flow in a generally north west direction following topography towards Flowerdale Lagoon and the Murrumbidgee River, located approximately 2 to 2.5km north of the site. There is limited run-on water to the site owing to the site stormwater system. Run off from the site would eventually end up in the Flowerdale Lagoon via the council stormwater network. Due to the incline and surface of the site, rainfall is likely to both run off and infiltrate the relatively permeable topsoil. MES reported that the site has no flood risk owing to the distance from and elevation above the flood plain. As noted in section 1.1, the site is potentially affected by urban soil salinity.

2.1 Site Inspections

During the initial investigation phase (PSI & DSI) conducted in 2018, MES conducted numerous site inspections and reported the following conditions:

- Three large U-shaped housing blocks (former student accommodation) identified as buildings 501, 525 and 526, a recreation hall (building 507) and building 510 (identified as 'ancillary') (Figure 4) were present on-site. The buildings were reportedly constructed of brick walls with corrugated iron roofing (based on visual inspection) and were all vacant. Building 514 (Archives and Conservatorium of Music), located outside the audit area was reportedly in use at the time of the inspection.
- Surface vegetation was predominantly grass in poor condition due to the below average rainfall in the preceding months. Trees (Eucalypts and other large native species) were located around the border of

the site and sparsely scattered throughout. Some introduced tree species were scattered throughout the site, usually around existing buildings and gardens.

- Two large carports are located on site, adjacent to carpark P61 and the above carpark P67. These were reportedly constructed of steel truss/brick walls and ceilings with corrugated iron roofing.
- Four sealed roads with associated drainage systems and an extensive network of above and below ground stormwater drainage (based on the underground services access pits visible across the site) were reported. Entry points for service access pits were reported to be sealed.
- Bonded ACM fragments were observed on the site surface in the vicinity of former building footprints 534/523 and 527. Fragments of ACM were also observed in the subfloor area of building 503.

In 2019, at the time of the Stage 1 & 2 DSI, MES reported that buildings 502 and 503 had been demolished.

This is consistent with a site inspection conducted by the auditor on 16 September 2019, during which the auditor observed minor fragments of ACM on the site surface in the vicinity of the former residences located along Hely Avenue, to the south of building 501 and to the north of former building 506.

3 Site History

The site history was initially reported by MES in the PSI, DSI and Stage 1 & 2 DSI, based on aerial photographs, LPI records, council records (DA applications), site photographs, NSW EPA records, Safework NSW, information provided by Charles Sturt University (CSU), hazardous material survey reports and Trove online library (newspaper articles).

In addition, a search of the CSU Riverina Regional Archives and interviews with Ms Cheryl Honey/Cole of the Riverina Archives (a long-time employee of CSU, who previously worked at the site) was undertaken. MES summarised the additional site history information in a document entitled "Additional History" (section 1.3).

In reviewing the site history, the auditor also considered an urban heritage study[1] and consulted Ms Sherry Morris, a local historian[2] who provided a copy of a newspaper extract[3]. This information was not formally reviewed as part of the audit but was referenced as an additional line of evidence.

A summary of the complete site history is provided below:

Table 3.1: Site History

Date	Activity	Surrounding Area
1889	MES referenced parish maps (1889-1937) which inferred that the site had been used for broadacre farming. Prior to 1943, the site was owned by the Murrumbidgee Pastoral and Agricultural Association (MPAA) and was used as a parking area for the showgrounds before being acquired by the Commonwealth for construction and use of the RAAF hospital (1944)[3].	Surrounding land was predominantly vacant with farming land to the south and west, light density residential areas observed to the north and east. The Wagga Showgrounds located to the north and the railway line sits to the northwest of the showgrounds.
1943	RAAF Hospital (150 beds and associated ancillary buildings incl incinerator and boiler room). Hospital was transferred from the nearby RAAF Base in Forrest Hill in 1946. A detailed plan of the hospital layout (dated 1943) was included in the MES reports. Aerial photographs from 1944 show the hospital layout. Low density residential houses are located along Hely Avenue to the east and south of the hospital.	Surrounding area predominantly vacant. Low density residential houses located to the east across College Avenue.
1946	Hospital closed and site buildings renovated (including demolition of two buildings) for re-use as the Wagga Wagga Teachers College (WWTC). The refurbishment was completed in 1948 and the WWTC was officially opened in 1949. Several detailed plans of the WWTC, dating from 1946 to 1967 are included in the MES reports. Low density residential housing along Hely Ave had been demolished by 1966 (aerial photograph).	Increase in the residential development to the east of the site across Hely St. Showgrounds still present to the north.
1970's	Extensive development of the site for Riverina Murray Institute of Higher Education – Riverina College of Advanced Education (RCAE) South Campus. Detailed historical plans of the college layout (dated 1973 & 1975) were included in the MES report. The plans identified specific uses for each individual building.	Extensive residential development to the north, east and south with vacant fields and paddocks to the west. A sporting field constructed in the southwest corner of the block.

[1] Wagga Wagga City Council Urban Heritage Study - Volume 3 : Database of Places Recommended for Heritage Listing. Peter Freeman Pty Ltd

[2] Sherry Morris (1999) 'Wagga Wagga: A History', The Council of the City of Wagga Wagga & Bobby Ingram Publishers

[3] Daily Advertiser (Wagga Wagga, NSW : 1911 - 1954), Friday 8 March 1946

Table 3.1: Site History		
Date	**Activity**	**Surrounding Area**
	The RCAE South Campus was gradually transferred to the main campus in Boorooma on the northern outskirts of Wagga Wagga. This occurred gradually between 1970-1990. Residential buildings along Hely street demolished.	
1989	RCAE transferred to Charles Sturt University (CSU) and the south campus became redundant.	-
2008	Veterinary hospital in the northeast section of the site subdivided (DA08/0606).	-
2011	Buildings became derelict and a DA (DA14/0041) was approved to demolish some buildings between 2014-2016. DA lists demolition of 12 redundant and deteriorated buildings. Later demolition of building 510 and 511 (derelict condition).	Surrounding land has undergone further development. The juvenile justice centre constructed to the west and significant road networks.
2014	Saint Mary Mackillop College took ownership of the western section of the former RCAE site and erected two demountable classrooms. Building 514 houses two entities, the CSU Regional Archives and The Riverina Conservatorium of Music, Wagga Wagga. The College is still currently in operation and falls outside the audit area.	
2018	Two Lot subdivision of RCAE site including the creation of a separate land parcel for the existing Saint Mark McKillop College (proposed Lot 21 (1.995ha). Proposed Lot 22 (11.32ha) was offered for sale by Charles Sturt University and was purchased by Signature Care.	Residential development constructed to the northwest. Wagga Wagga Ambulance Station constructed to the south (Fernleigh Road).
2019	Two of the larger student accommodation buildings (502 & 503) were destroyed by fire and were demolished.	-

The summary indicates that the site has been used primarily as an educational teaching campus (following a brief use as a RAAF hospital). Numerous buildings have been located across the site (with many already having been demolished). MES identified several of the former building uses as potential areas of environmental concern (AEC) as follows:

- RCAE boiler room (identified as building 533 on hazardous building material reports)
- RAAF boiler room and incinerator compound, waste disposal area and operating hut (identified on plan of RAAF hospital dated 1943)
- Printery/photography (identified on RCAE 1973 plan as 'printery' and on RCAE 1975 plan as photography building)
- Workshop buildings (referred to as east workshop & west workshop) (1973 RCAE plan)
- Screen printing (1975 RCAE plan)
- (Cliffs) garage (anecdotal information indicated that this was not a car repair garage but a single car garage used for parking of the principal's car). (1973 RCAE plan)
- Nursery (for plants) (undated WWTC plan)
- Workshop (1975 RCAE plan)
- Fuel store (based on anecdotal information from Cheryl Honey – previous worker on-site) this was inferred to have been located in a store to the east of the former screen-printing building.

Several buildings were also identified in recent hazardous building material reports as containing asbestos, SMF, lead paint and PCBs. The site was also noted to have an extensive underground service network which has the potential to contain asbestos.

A former student publications office was identified (to the west of the audit area) although MES reported that large scale printing of newspapers was not undertaken on-site as follows:

- The main student publication from the WWTC was called 'Talkabout' and it ran from 1947 to 1971. The paper from such was printed by The Daily Advertiser (not on the campus).
- The main student publication from the RCAE was called 'RACE' and it ran from 1972 to 1981. The paper was also printed by The Daily Advertiser (not on the campus).

This was confirmed by reference to various editions of 'Talkabout' and 'RACE' held by regional archives, copies of which are appended to the MES reports. On this basis, the former student publications office was not considered as a potential AEC.

3.1 Auditor's Opinion

The site history has been adequately documented using verified sources and is chronologically complete. The site history includes detailed information on the building layout and former building use by the RAAF hospital, WWTC, RCAE and CSU.

No indicators of significant industrial use were identified on-site and surrounds, however some of the former buildings have been used for teaching and ancillary/maintenance purposes that may have the potential to cause localised contamination issues. These locations were adequately identified by review of the detailed layout plans, supplemented by review of a chronological record of aerial photographs which were then cross referenced to generate GPS coordinates of the building footprints.

Uncertainties also exist with respect to hazardous materials clearance (primarily asbestos) in previously demolished buildings and sub-surface infrastructure.

4 Contaminants of Concern

MES provided a list of the contaminants of concern and for the identified AEC (Attachment 5). These have been tabulated in Table 4.1.

Table 4.1: Contaminants of Concern

Area	Activity	Potential Contaminants
AEC 1: Former RCAE boiler room.	Poor storage and disposal of chemicals and waste. Spills and leaks	Metals, PCBs, hydrocarbons (TRH, BTEX), PAHs, phenols, OCP/OPPs.
AEC 2: Former RAAF boiler room, incinerator compound, waste disposal area and operating hut.		
AEC 3: East and West Workshops (EW & WW)		Metals, hydrocarbons (TRH, BTEX, PAHs), phenols, OCP/OPPs, PCBs
AEC 4: Former workshop (WO)		
AEC 4: Former photography building (PH)		hydrocarbons (TRH, BTEX, PAH), volatile organic compounds (VOCs), perfluoroalkyl substances (PFAS).
AEC 4: Former screen printing building (SP)		
AEC 4: (Cliffs) garage (GN)		Metals, hydrocarbons (TRH, BTEX, PAH), VOCs.
AEC 4: Possible fuel store area (FS)		hydrocarbons (TRH, BTEX, naphthalene), lead
AEC 4: Nursery (for plants) (GN)	Use of herbicide/pesticides	Metals, OCPs/OPPs
Areas of previously demolished and existing buildings. The location of all former buildings from both the RAAF hospital and later WWTC/RCAE/CSU plans have been identified and are included in Attachment 5.	Degradation of hazardous building materials. Poor demolition practices. Pest control.	Asbestos, metals (including lead), OCPs/OPPs
General open areas.	Weed control	Phenoxy acid herbicides
Site wide drainage, sewage and fire hydrant system.	Service pits and pipes containing asbestos.	Bonded ACM

4.1 Auditor's Opinion

The identified AEC's and analyte list used by MES adequately reflects the site history and condition.

5 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

MES reported the stratigraphy of the site as follows: "*The geology and lithology of the site is slightly complex and variable as it runs across two different landscape profiles. Main rock types include undivided Ordovician metasedimentary rocks and colluvium including thinly interbedded siltstone, sandstone, shale, hornfels phyllites, minor schists (including quartz mica and graphite) and quartzite deposits. Lithology can vary over short distances with thick slope-washed and alluvial clayey sediments occurring on the lower slopes and drainage depressions. The catchment that is the focus of this report where the proposed development is located consists of Ordovician meta-sediments. Overlying the weather zone are colluvial clayey sediments, especially in the lower elevation areas of the catchment*."

The sub-surface profile of the site as encountered during the intrusive investigations is summarised in Table 5.1.

Table 5.1: Stratigraphy

Depth (mbgl)	Subsurface Profile
0.0 – 0.3	**Topsoil**: brown to yellow brown, firm, damp, low plasticity clay. Due to previous poor demolition practices, rubble and/or asbestos (as ACM) was also observed in some soils logged as natural.
	FILL was logged in the following locations with no description of the material: Area 2 (12, 15, 26, 27, 35, 40, 51, 53-56, 59, 60, 705*, 706*, 708*, 2005, 2006, 2013, 2023*). Area 3 (7-16, 18-21, 23, 28-31). Area 4 (8-11, 22-23, 27, 695*, 752*, 866*), Area 5 (2) and 2014 (outside identified areas). Fill was also logged in areas around specific building locations as follows: Area PH: FILL (sandy clay) PH01-04. Area WO: FILL (silty clay with black deposits/ash, gravel, brick, pipe and concrete) WO02-05. Area SP: FILL (clay sand, silty clay with brick) SP01, SP02, SP04-09.
0.2 – 3.0	Residual Silty CLAY (natural): brown grading to yellow-brown with depth, medium plasticity, stiff to very stiff.

mbgl – metres below ground level
*depth of fill not characterised

The depth of fill within some localised areas has not been characterised and this is further discussed in the context of the investigation results in section 8. In areas where observations of ACM have been made, in material logged as natural and/or topsoil, this is considered to be 're-worked' natural material.

Most observations of fill appear to be characterised by reworked natural soils with inclusions of brick, broken pipe work and concrete within areas of former building footprints. Some ash was observed associated with the location of a former boiler room/incinerator and a workshop.

5.2 Hydrogeology

In reviewing the hydrogeology, the auditor also considered the MES hydrogeological assessment[4] (prepared to address urban salinity issues), a CSIRO report[5] on regional groundwater recharge and discharge and the Wagga Wagga Urban Salinity Technical Report 2018/2019[6]. These reports relate to urban salinity issues and review of these reports falls outside the scope of this site contamination audit, although they have been referenced as an additional line of evidence with respect to groundwater occurrence in the region.

Groundwater beneath the site is described as mainly highly extensive, porous aquifers of moderate to high productivity (Geoscience Australia). Two registered groundwater bores are located on site and 23 registered groundwater bores are located within 500m of the site. The bores are all registered for monitoring purposes (associated with the Wagga Wagga urban salinity monitoring program) with the exception of two bores (located within the showground which are registered for recreational use).

The site is located within the western catchment of a drainage basin that drains to the north towards the Murrumbidgee River and the alluvial floodplain and groundwater flow is controlled by the soil landscapes and the underlying geology. The lower permeability colluvial and alluvial clays in the lower catchment and the lower hydraulic gradient in the northern part of the lower lying areas of the catchment restrict drainage and cause water tables to approach the land surface. Underlying this shallow water table aquifer is an intermediate to localised groundwater flow system associated with the Ordovician meta-sediments.

MES reported that the western boundary of the site is likely to be located over the colluvial material, while most of the site (located at higher elevation) would be underlain by Ordovician metamorphic sediments. This is critical to interpretation of groundwater conditions at the site with the lower lying areas potentially affected by high water table (associated with the colluvial deposits). This is consistent with council salinity monitoring bore data which have historically recorded high groundwater levels at monitoring locations immediately to the west of the site.

MES referenced geotechnical borehole data (in the hydrogeological assessment). Three boreholes were drilled to a depth of 6m, one of which encountered groundwater at a depth of 5.5mbgl. This was located outside the western boundary of the site, adjacent to the CSU archives building.

5.3 Auditor's Opinion

The reported stratigraphy and hydrogeology is acceptable for the purposes of the contaminated site audit. The need for groundwater characterisation is dependent on the potential for any contamination to migrate vertically as discussed in Section 8.1.1. As noted in section 1.1, consideration of the salinity impacts associated with the elevated groundwater levels fall outside the scope of this contaminated site audit and have not been considered.

[4] McMahon Earth Sciences (2020) Former CSU South Campus, 20 Hely Avenue, Turvey Park NSW, Hydrogeological Assessment. Report 6723.

[5] CSIRO (2001) Groundwater Recharge and Discharge in a Saline, Urban Catchment, Wagga Wagga NSW. CSIRO Land and Water Technical Report 39/01.

[6] https://wagga.nsw.gov.au/city-of-wagga-wagga/council/plans-and-reports/reporting-to-our-community/environmental-reports

6 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 Auditor's assessment follows in Tables 6.1 and 6.2.

Table 6.1: QA/QC – Sampling and Analysis Methodology Assessment

Sampling and Analysis Plan and Sampling Methodology	Auditor's Opinion
Data Quality Objectives (DQO): MES defined specific DQOs in accordance with the seven step process outlined in DEC (2006) *Guidelines for the NSW Site Auditor Scheme*.	These were considered appropriate for the investigations undertaken.
Sampling pattern, locations and density: *Soil (excluding asbestos quantification):* Sampling was judgmental based on potential areas of environmental concern (AEC) identified during the site history and tabulated in Table 4.1. Samples were analysed for the contaminants of concern using a "top-down" approach targeting surface and near surface soils (0-0.3m). In addition, sampling in the vicinity of the RCAE boiler room was undertaken to 3m. Some of the samples analysed for asbestos were not collected as outlined in NEPM (2013) (Schedule B1) and were used to detect presence/absence of asbestos. A separate asbestos quantification assessment was also undertaken and is discussed below.	Given the well documented site history and low potential for contamination, the judgmental sampling program is considered acceptable. The investigation locations adequately targeted the identified areas of concern and were spaced to gain coverage of the majority of the site. Sampling depths were appropriate in consideration of the site history. In a few areas the depth of fill was not delineated, although in consideration of the chemical results reported, this is not significant. Fill characterisation is further discussed with respect to the asbestos impact below.
Asbestos Quantification: Due to observations of ACM on the site surface an asbestos quantification assessment was undertaken. Asbestos quantification was undertaken in two phases: Visual inspection and removal 'emu pick' of ACM across the site surface following multi-directional raking or mechanical tilling (where vegetation inhibited raking). The inspection was managed by applying a 10m x 10m grid across the site. ACM was collected and weighed within each individual grid square to allow calculation of %w/w asbestos across the site surface (based on depth of raking and area of grid square). Based on the results of the surface inspection (i.e. detections of ACM in an individual grid square), MES identified areas to be investigated using testpits (for asbestos quantification) to assess if the ACM/FA&AF was present in the sub-surface. The	Use of the surface inspection to identify areas of concern for asbestos quantification using testpits is acceptable. The 'emu pick' also had the added benefit of reducing the ACM concentration across the site surface. The inspection was undertaken using a systematic grid-based methodology in accordance with the procedure outlined in section 4.1.1 of WA DOH (2009)[8] WA DOH and a 10m x 10m grid was applied in accordance with the requirements of the NEPM (2013).

[8] Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia.

Table 6.1: QA/QC – Sampling and Analysis Methodology Assessment	
Sampling and Analysis Plan and Sampling Methodology	**Auditor's Opinion**
sampling density was based on the likelihood of contamination as recommended in WA DOH (2009) as follows: • Where ACM was encountered on the site surface, the likelihood of ACM was assigned as "known" and a double density CSMS[7] grid was applied to the area. • In areas where buildings were historically located, but no ACM detected during the site inspection, the likelihood of ACM was assigned as "suspect" and a single density CSMS grid was applied. Staff were reported to be experienced in the identification of asbestos. Sampling depth was 0-0.3m and was generally sufficient to delineate the extent of fill material with the exception of some locations within area 2, 3 4 & 5 (see section 3.1 for details). Delineation of identified fibrous asbestos within the footprint of building 503 was undertaken using testpit trenches.	A multiple lines of evidence approach was employed to identify areas requiring further quantification. This included results of the surface inspection and evidence of former buildings (from site history). Sampling density was undertaken at an appropriate density based on likelihood of ACM occurrence. Sampling depths were acceptable providing that the areas where fill has not been delineated are considered during the remediation planning phase.
Sample collection method: *Soil (chemical assessment):* Initial soil sampling (PSI & DSI) was undertaken using a drill rig equipped with solid flight augers. Soils were collected from the auger flights, with external material removed prior to collecting the sample. Later sampling during the Stage 1 & 2 DSI and additional DSI (for chemical assessment) was undertaken from testpits excavated by machine. Samples were collected by hand, either directly from the excavation or from the excavator bucket. Testpit trenching was used to assess the fuel storage area and delineation of the fibrous asbestos within the footprint of building 503. *Asbestos quantification:* A 10L sample was collected using a calibrated unit mass container for field screening of asbestos. A 500mL sample was also collected in from each testpit and transported to the laboratory for asbestos analysis.	Sample collection from the auger flights is not ideal as it can result in loss of volatiles and sample cross contamination, although cross contamination was minimised by removing external material. Given the key contaminants at the site are metals and ACM, this deficiency is not considered to be of great significance. Overall the sample collection method was found to be acceptable.
Decontamination procedures: Sampling equipment was cleaned with a brush and tap water between sampling events to prevent cross contamination. New gloves were reportedly used for each new sample.	Acceptable
Sample handling and containers: Samples for chemical analysis were placed into unpreserved glass jars 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.	Acceptable
Chain of Custody (COC): Completed chain of custody forms were provided in the report.	Acceptable
Detailed description of field screening protocols: Volatiles: Field screening for volatiles was undertaken using a PID. Soil sub-samples were placed in zip-lock plastic bags and the headspace measured for VOCs after allowing time for equilibration. *Asbestos Screening:* The 10L Samples were transported to the McMahon laboratory for weighing (using a calibrated scale) and manual screening through a 7mm mesh sieve. ACM retained on	Acceptable

[7] minimum sampling density listed in CSMS Development of Sampling and Analysis Programs (WA DEC, 2001) – Appendix C

Table 6.1: QA/QC – Sampling and Analysis Methodology Assessment	
Sampling and Analysis Plan and Sampling Methodology	**Auditor's Opinion**
the sieve was weighed and % soil asbestos calculated using the formula provided in WA DOH (2009).	
Calibration of field equipment; The reports indicated that calibration had been undertaken prior to use and checks were performed during use. Calibration certificates from the equipment supplier were provided.	Acceptable
Sampling logs: Soil logs are provided within the report, indicating sample depth and lithology. Observations of ACM were recorded although the size of the fragments was not estimated.	Acceptable noting that observations of ACM have been considered within a multiple lines of evidence approach.

Table 6.2: QA/QC – Field and Lab Quality Assurance and Quality Control	
Field and Lab QA/QC	**Auditor's Opinion**
Field quality control samples Field QC samples were collected as part of the DSI and included a trip blank and a field intra-laboratory duplicate (analysed for the contaminants of concern). During the later Stage 1 & 2 DSI, intra-laboratory duplicates were collected and analysed for both the chemical contaminants of concern and asbestos. Inter-laboratory duplicates were not collected or analysed, although the primary laboratory, ALS are NATA accredited to ISO17025 (Accreditation No 825) for the analyses undertaken and conditions of accreditation is participation in external proficiency testing (undertaken by NATA). Field QC samples were collected as part of the additional DSI and included rinsate samples and intra/inter-laboratory duplicate samples (analysed for the contaminants of concern).	In consideration of the complete dataset which has been considered using a multiple lines of evidence approach, the field QC is considered acceptable.
Field quality control results The results of field quality control samples were generally within appropriate limits with the following exceptions: RPDs for the intra-laboratory soil duplicate sample for four metals ranged from 33 to 78% and one dieldrin result of 78%. The results were close to the laboratory limit and RPD exceedances have been exaggerated. Nickel was detected (2ug/L) in the trip blank during the initial DSI. The laboratory results for nickel in soil samples were below the adopted criteria and the detection does not affect conclusions made from the data set.	Overall, in the context of the dataset reported, the elevated RPD results and detection in the trip blank are not considered significant and the field quality control results are acceptable.
NATA registered laboratory and NATA endorsed methods Laboratories used included: ALS and Envirolab. Laboratory certificates were NATA stamped.	Acceptable
Analytical methods Analytical methods were included in the laboratory test certificates. 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) were also included. Asbestos identification was conducted using polarised light microscopy with dispersion staining by method AS4964-2004	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*

Table 6.2: QA/QC – Field and Lab Quality Assurance and Quality Control	
Field and Lab QA/QC	**Auditor's Opinion**
Method for the Qualitative Identification of Asbestos Bulk Samples. A larger 500mL sample size was used to improve the likelihood of identifying material >2mm (consistent with the procedure recommended in the NEPM (2013). Results reported in accordance with the NEPM requirements were noted to be outside the scope of the NATA accreditation.	*developed and validated the AS4964-2004 is recommended for use"*.
Holding times Review of the COCs and laboratory certificates indicate that the holding times had been met with the exception of the following: – Trip blank analysed 58-73 days over holding time for TRH, BTEXN and mercury (results were reported as non-detect). MES also reported that holding times have been met.	The trip blank was analysed outside of holding time. This does not affect the usability of the data since no volatile compounds (including BTEX and TRH C_6-C_{10}) were detected in the soil samples analysed.
Practical Quantitation Limits (PQLs) PQLs were less than the threshold criteria for the contaminants of concern.	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.	Acceptable
Laboratory quality control results The results of laboratory quality control samples were generally within appropriate limits, with the following exceptions: Spike recoveries less than the lower quality data objective for Chromium VI were reported in two samples. RPDs for laboratory duplicates exceeded the control limits in two samples (one for manganese; one for phenanthrene and sum of PAH).	The identified laboratory QC non-conformances are minor and in consideration of the complete QC dataset do not affect the usability of the data.
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. MES concluded [in the Stage 1 & 2 DSI] that *"the QA/QC criteria and DQOs have been evaluated and the relevant sampling and analysis requirements have been met" and in the later additional DSI "In consideration of the adopted QAQC procedures and the results from their subsequent analysis, McMahon find the QAQC results are suitable for the investigation undertaken and reflect the analytical data is of a suitable quality to determine contamination risk with an appropriate level of confidence."*	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 are likely to be representative of the overall conditions at the site because appropriate media have been adequately investigated for the relevant contaminants of potential concern. Samples were collected, transported and analysed in an appropriate manner.

- The data set is considered to be complete because sufficient samples have been collected and analysed from the site in accordance with documented procedures. Laboratory analysis was NATA accredited and all documentation was correct.
- The data set is comparable because experienced staff collected the samples using appropriate sampling procedures and standard analytical methods.
- The data is likely to be accurate. The field QC was found to be acceptable and did not indicate any significant bias in the results. Standard methods were employed during sampling. The laboratories provided sufficient information to conclude that data is of sufficient precision.

7 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, aged care facility and retirement housing, the most conservative criteria for 'residential with garden/accessible soil' (HIL/HSL A) has been used. The HIL/HSL A exposure scenario also includes consideration of other sensitive site uses including childcare centres, preschools and primary schools. Less sensitive site uses included under the HIL/HSL B (residential with minimal opportunities for soil access), HIL C (public open space such as parks, playgrounds and playing fields, secondary schools and footpaths) and HIL/HSL D (commercial/industrial) will also be addressed by application of the most conservative HSL/HIL A exposure scenario. A summary of the screening criteria is provided below:

- Human Health Assessment
  - Health Based Investigation Levels (HIL A)
  - Soil Health Screening Levels (HSL A) for Vapour Intrusion. The most conservative criteria were adopted i.e. assumed depth to source < 1 m and sand.
  - Asbestos Health Screening Levels (HSL A).
  - Human Health Investigation Levels for soil (HIL A) from PFAS National Environmental Plan (NEMP) Version 2.0 (January 2020)
- Terrestrial Ecological Assessment
  - Ecological Screening Levels (ESL Urban Residential) assuming coarse/fine soil.
  - Ecological Investigation Levels (EIL Urban Residential). Site specific EILs have been derived using the Interactive (Excel) Calculation Spreadsheet provided in the ASC NEPM Toolbox assuming the contamination is "aged", no lead background concentrations, low traffic volume, 10% clay content and using site specific pH and cation exchange capacity (CEC) values.
  - Ecological Guideline Values for soil (direct and indirect exposure) from PFAS National Environmental Plan (NEMP) Version 2.0 (January 2020).
  - Management Limits (ML Residential/Open Space) assuming fine soil.
- Aesthetics
  - The Auditor has considered the need for remediation based on the 'aesthetic' contamination as outlined in the NEPM (2013).

8 Evaluation of Investigation Results

8.1 Analytical Results

The analytical results, excluding asbestos quantification (see section 8.2), have been assessed against the environmental quality criteria and are summarised in Table 8.1. Soil sampling locations are included in Appendix A. No observations of staining or odour were recorded and PID readings were reported to be low. Sampling locations were targeted to the identified AEC as follows:

PSI

- Grid based sampling of **AEC 1**: RCAE boiler room (Samples 1-4, Attachment 6).

DSI

- Grid based sampling of **AEC 2**: RAAF boiler room and incinerator compound (Samples 1-22, Attachment 7 and Samples P1-P10, Attachment 8).

Stage 1 & 2 DSI

- Metals (including lead) and OCPs within the building footprints (Attachment 9). Asbestos quantification results are discussed in section 8.2.
- Herbicide application in wider open areas (Samples 3001-3003, Attachment 9).

Additional DSI

- **AEC 3:** Grid based sampling across the former east and west workshops (EW01-EW08 & WW01-WW08) (Attachment 10). It is noted that west workshop was also sampled as AEC 1 during the PSI.
- **AEC 4**: Grid based sampling of the former photography (printery) building (Samples PH01-PH05), former screen printing building (SP01-SP10), former garage (Cliffs) and nursery (for plants) (GN01-GN08) and former workshop (WO01-WO05) Testpit trenches and grid based sampling across the possible fuel storage area (Samples FS01-FS09). (Attachment 11).

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

Analyte	n	Detections	Maximum	n > Screening Criteria	Comments
Asbestos (presence/absence)	66	NAD	NAD	-	-
BTEX	79	<PQL	<PQL	None	-
F1 (TRH C_6–C_{10} minus BTEX)	79	<PQL	<PQL	None	-
F2 (TRH >C_{10}–C_{16} minus naphthalene)	79	<PQL	<PQL	None	-
TRH >C_{16}-C_{34}	79	3	150	None	Detections in WW02, WW05 & WW06.
TRH >C_{34}-C_{40}	79	4	310	None	Detections in WW02, WW04, WW05 & WW06.
Naphthalene	91	<PQL	<PQL	None	-
Benzo(a)pyrene	82	15	3.4	12	B(a)P marginally exceeds the EIL (0.7mg/kg) in samples 8/1, 9/1, P1, P3, P5, P8, P9,P10, WO01-WO03 & WO05.

Table 8.1: Evaluation of Soil Analytical Results – Summary Table (mg/kg)					
Analyte	**n**	**Detections**	**Maximum**	**n > Screening Criteria**	**Comments**
Benzo(a)pyrene TEQ	82	15	4.6	3	The highest concentrations were detected in P3 (3.4mg/kg), P8 (4.5mg/kg) and WO03 (4.6mg/kg) marginally in excess of the HIL-A.
Total PAHs	82	19	43.7	None	Highest concentration detected in footprint of WO (samples WO01, WO03 and WO05).
Pentachlorophenol	47	<PQL	<PQL	None	-
Total Phenols	47	<PQL	<PQL	None	-
Arsenic	125	89	39	None	-
Cadmium	125	<PQL	<PQL	None	-
Chromium	125	123	66	None	-
Copper	125	122	45	None	-
Lead	136	136	133	None	Highest concentration recorded in GN08 (nursery area)
Mercury	70	2	0.4	None	-
Nickel	125	124	33	None	-
Zinc	125	125	736	1	Highest concentration recorded in GN08 (nursery area) – exceeds EIL.
PCB's	47	<PQL	<PQL	None	-
OCP/OPP (only compounds detected are listed remaining OCP/OPP <PQL)					
DDD + DDE + DDT	110	2	0.22	None	-
Aldrin + Dieldrin	110	5	4.56	None	
Total Chlordane	110	5	6.41	None	
Heptachlor	110	2	5.42	None	
Phenoxy Acid Herbicides	57	<PQL	<PQL	-	-
PFAS					
PFOA	15	1	0.0026	None	-
Sum of PFOS and PFHxS	15	6	0.0004	None	-
VOC's	23	<PQL	<PQL	None	-

n number of samples
<PQL Less than the practical quantitation limit

In reviewing the analytical results, the Auditor notes the following:

- Two sampling points (8/1 & 9/1) located within AEC 2 (RAAF boiler room and incinerator) in the vicinity of the former boiler room were noted to contain marginally elevated concentrations of B(a)P (0.8-1.1mg/kg) compared to the EIL (0.7mg/kg). This triggered further grid sampling across the area (P1-10) (Figure 8) which confirmed some localised low-level B(a)P impact with a maximum concentration of 4.5mg/kg. Similar concentrations were identified in the vicinity of the workshop (WO) located adjacent to the boiler room/incinerator. This is associated with ash from the former boiler/incinerator (which was identified in the borelogs) and is not considered to be bioavailable.
- A minor EIL exceedance was observed in the nursery area (736mg/kg). This was not typical of the general site area and in the context of the proposed development (which will require importation of growing medium in landscaped areas due to the general poor condition of the site soil) this is not considered to be significant.

The remaining results were below the screening criteria. However, some ACM was observed on the site surface (section 2.1) and asbestos quantification was undertaken as discussed in section 7 below.

8.1.1 Auditor's Opinion

The results of the chemical assessment (excluding asbestos) were generally below the screening criteria and, consistent with the site history, confirm the low potential for contamination. The exception being the marginally elevated B(a)P. Given the very limited extent, expected low bioavailability (confirmed by the presence of ash) and proposed development (of which a significant proportion is hard-standing and building), management of the B(a)P is not warranted.

On the basis of the soil investigation results reported, the potential for contamination to migrate vertically is low and groundwater characterisation is not required.

8.2 Asbestos Quantification

MES conducted asbestos quantification in two stages as follows:

Visual inspection and hand picking: Visual inspection and removal 'emu pick' of ACM across the site surface following multi-directional raking or mechanical tilling (where vegetation inhibited raking). The inspection was managed by applying a 10m x 10m grid across the site. ACM was collected and weighed within each individual grid square to allow calculation of %w/w asbestos across the site surface.

Bonded ACM fragments were found within 120 of the 1,138 grid squares inspected (Attachment 12). The results all reported concentrations of bonded ACM on the surface below 0.01%w/w. The ACM finds correlated well with areas of previous buildings. Based on the location of the surface ACM finds, MES identified specific areas for further investigation as discussed in section below.

Testpits: Based on the results of the surface inspection, MES identified areas to be investigated using testpits to assess if the ACM was present in the sub-surface. As discussed in section 6, Table 6.1, the sampling density was based on the likelihood of contamination. The asbestos quantification testpit locations are shown on Attachment 13. Additional ACM quantification during the additional DSI included grid based testpits across building footprints within AEC 2: east workshop (EW) & west workshop (WW) and AEC 4: former screen printing (SP), photography (PH), garage and nursery (GN) & fuel storage area (FS) (Attachments 10-11). A summary of the results is presented in Table 8.2 below.

In addition, inspection of services was undertaken using pits excavated in areas where underground services were located. This include the stormwater, fire hydrant system and telecommunications pits. The locations of the areas inspected is shown on Attachment 14.

Table 8.2: Summary of Asbestos Quantification Results

Asbestos Area	Surface Inspection	Testpit Results
1	ACM was observed and removed from 35 grid squares within this area. Concentrations calculated to be below the screening criteria. Surface detections correlated to former RCAE buildings 534, 523 and 521. A number of small sheds were also located	Of the 68 testpits excavated: Subsurface quantification included: 68 grid based testpits (1/1-1/68) plus an additional 16 testpits within the footprint of former buildings investigated during the additional DSI (identified as EW & WW).

Table 8.2: Summary of Asbestos Quantification Results		
Asbestos Area	**Surface Inspection**	**Testpit Results**
	in this area during use of the site by RAAF. Likelihood of asbestos considered as 'known'. Asbestos quantification of sub-surface using testpits at double density CSMS[9]	*Surface*: Minor bonded ACM fragments were reportedly observed in the surface soil of 4 testpits 1/7, 1/30, 1/36, 1/44. *Sub-surface*: – ACM was detected and quantified as being below the screening criteria in (10L) samples at 2 locations 1/11 (0.008%w/w) and 1/30 (0.002%w/w). – No FA & AF detected in the sub-surface (500mL) samples.
2	ACM was observed and removed from 39 grid squares within this area. Concentrations calculated to be below the screening criteria. The ACM finds correlate well with location of former RAAF buildings (boiler room and incinerator compound) and RCAE buildings located in the central area including the former photography, screen printing, garage, nursery and former fuel store. Also includes building 527 (demolished cottage) to the north and former residences along the eastern boundary. Likelihood of asbestos considered as 'known'. Asbestos quantification of sub-surface using testpits at double density CSMS.	Subsurface quantification included: 60 grid based testpits (2/1-2/60) plus an additional 28 testpits within the footprint of former buildings investigated during the additional DSI (identified as PH, GN, WO, SP & FS) *Surface*: Minor bonded ACM fragments were reportedly in the surface soil of 5 testpits: 2/2, 2/14, 2/25, 2/29, 2/41. *Sub-surface:* – No ACM was detected in the sub-surface (10L) samples during field screening, however, the laboratory reported ACM in sample 2/3 at a concentration of 0.17%w/w. – Asbestos fines (as FA & AF) were detected at the screening limit in the sub-surface (500mL) sample: 2/35 (0.001%w/w). Testpit log for 708 (chemical assessment – section 6.2) noted a bonded ACM pipe fragment on the testpit surface and "Asbestos FA" in the subsurface. Roadway: some ACM was observed in testpits 2039 & 2023 within the roadway but no asbestos quantification undertaken. The ACM reported in samples 2/2 and 2/3 occurs within an area of rubble logged in the footprint of building 527 (2031 and 2/2). Rubble/fill was also located within the central area (locations 705-708, 2/26, 2/27, 2/35 and 2/51) with asbestos fines reported in 2/35 (at the screening limit) and 708 (not quantified).
3	ACM was observed and removed from 19 grid squares within this area. Concentrations calculated to be below the screening criteria. The ACM finds correlate well with location of former RCAE building 503 which was destroyed by fire and demolished in 2018. Likelihood of asbestos considered as 'known'. Asbestos quantification of sub-surface using testpits at double density CSMS.	Of the 32 testpits excavated in this area: *Surface*: minor bonded ACM fragments were reportedly observed and removed from the surface soil of 1 testpit: 3/25. *Sub-surface:* – ACM was detected and quantified at or above the screening criteria in the sub-surface (10L) samples at 2 locations 3/11 (0.02%w/w) & 3/13 (0.01%w/w). – Asbestos fines (as FA & AF) were detected above the screening criteria in the sub-surface (500mL) sample: 3/4 (0.003%w/w) & 3/18 (0.002%w/w). – In addition, the testpit log for 247 (chemical assessment – section 6.2) reported "asbestos detected" in the surface and testpit 347 was abandoned due to "FA" – this was reported in the

[9] minimum sampling density listed in CSMS Development of Sampling and Analysis Programs (WA DEC, 2001) – Appendix C

Table 8.2: Summary of Asbestos Quantification Results		
Asbestos Area	**Surface Inspection**	**Testpit Results**
		text of the DSI as "pipe lagging" and analysis by the laboratory reported asbestos fines (AF & FA) at a concentration of 2.42%w/w. Fill noted across much of this area (3/7, 3/8, 3/9, 3/10, 3/12-3/16, 3/18-3/21, 3/23, 3/28-3/31) possibly due to the recent demolition of the fire damaged building.
4	ACM was observed and removed from 8 grid squares within this area. Concentrations calculated to be below the screening criteria. The ACM finds correlate well with location of former RCAE building 502 which was destroyed by fire and demolished in 2018. Area 4 also includes some ACM finds along the eastern boundary possibly associated with former houses demolished during construction of the RAAF hospital. Likelihood of asbestos considered as 'known'. Asbestos quantification of sub-surface using testpits at double density CSMS.	Of the 39 testpits excavated in this area: *Surface*: Large bonded ACM fragments (x5) were observed and removed from the surface of testpit 4/2. This was associated with building rubble. Minor ACM fragments were also observed and removed from the surface of 4/10 & 4/13. *Sub-surface:* – ACM was detected and quantified in the sub-surface (10L) below the screening criteria at 1 location: 4/8 (0.008%w/w). – No asbestos fines (as FA & AF) were detected in the sub-surface (500mL) sample, however the testpit log for 866 (chemical assessment – section 6.2) reported "large bonded ACM fragments" in the surface and "FA detected" in the subsurface. Fill logged across some of this area (4/2, 4/9, 4/10, 4/11, 4/13, 4/22, 4/23, 4/27).
5	ACM was observed and removed from 1 grid square within this area. The concentration was calculated to be below the screening criteria. The ACM find appears to be isolated and may be associated with a small residence historically located immediately to the east of area 5. Likelihood of asbestos considered as 'known'. Asbestos quantification of sub-surface using testpits at double density CSMS.	Of the 2 testpits excavated in this area: *Surface*: No ACM was observed on the surface of the testpit area. *Sub-surface:* – No ACM was detected in the sub-surface (10L) samples. – No asbestos fines (as FA & AF) were detected by the laboratory in the sub-surface (500mL) sample.
6	ACM was observed and removed from 16 grid squares within this area. The concentration was calculated to be below the screening criteria. The ACM find appears to be associated with associated with former houses located along the eastern boundary of the site. These were demolished during construction of the RAAF hospital. Likelihood of asbestos considered as 'known'. Asbestos quantification of sub-surface using testpits at double density CSMS.	Of the 23 testpits excavated in this area: *Surface*: Minor bonded ACM fragments were reportedly observed in the surface soil of 4 testpits: 6/5, 6/10, 6/12, 6/22. *Sub-surface*: – ACM was detected and quantified as below the screening criteria in the sub-surface (10L) samples at 1 location 6/4 (0.003%w/w). – No asbestos fines (as FA & AF) were detected by the laboratory in the sub-surface (500mL) sample.
7	ACM was not observed on the site surface; however, the aerial photos indicate that a small building was historically located in this area. Likelihood of asbestos considered as 'suspect'. Asbestos quantification of	Of the 3 testpits excavated in this area: *Surface*: No ACM was observed on the surface of the testpit area. *Sub-surface:* No ACM was detected in the sub-surface (10L) samples and no asbestos fines (as FA & AF) were detected in (500mL) sample.

Table 8.2: Summary of Asbestos Quantification Results		
Asbestos Area	**Surface Inspection**	**Testpit Results**
	sub-surface using testpits at single density CSMS.	
8	ACM was observed and removed from 1 grid square within this area. The concentration was calculated to be below the screening criteria. The ACM find appears to be isolated and may be associated with a small building that was historically located in this area (based on review of aerial photographs). Likelihood of asbestos considered as 'suspect'. Asbestos quantification of sub-surface using testpits at single density CSMS.	Of the 2 testpits excavated in this area: *Surface*: No ACM was observed on the surface of the testpit area. *Sub-surface:* – No ACM was detected in the sub-surface (10L) samples during the field screening, however the laboratory detected bonded ACM above the screening criteria in sample 8/2 (0.03%w/w). – No asbestos fines (as FA & AF) were detected by the laboratory in the sub-surface (500mL) sample.
9	ACM was not observed on the site surface; however, the aerial photos indicate that some small buildings were historically located in this area associated with former houses located along the eastern boundary of the site. These were demolished during construction of the RAAF hospital. Likelihood of asbestos considered as 'suspect'. Asbestos quantification of sub-surface using testpits at single density CSMS.	Of the 6 testpits excavated in this area: *Surface*: No ACM was observed on the surface of the testpit area. *Sub-surface:* – No ACM was detected in the sub-surface (10L) samples. – No asbestos fines (as FA & AF) were detected by the laboratory in the sub-surface (500mL) sample.
Services	N/A	Results of the sub-surface service inspections did not detect ACM in the stormwater or fire hydrant system (in the locations inspected), however some ACM was observed in a Telstra communications box located adjacent to building 502.

8.3 Auditor's Opinion

ACM was observed on the site surface during the site inspection ('emu pick') and during later excavation of testpits. Although ACM concentrations have been reduced by the 'emu pick' the screening criteria of "no visible asbestos for surface soil" has not been met.

A review of the results of the sub-surface asbestos quantification sampling (testpits), using a multiple lines of evidence approach, has identified some localised areas of asbestos impact as follows:

- ACM and asbestos fines (reported as pipe lagging) and fill associated with the footprint of former building 503 (recently fire damaged and demolished).
- ACM in the footprint of building 527. This appears to be associated with an area of rubble logged in the footprint of building.
- An area of rubble/fill within a cluster of former buildings 504-506. Asbestos fines were reported at the screening limit.
- ACM and asbestos fines and fill associated with former building 502 (recently fire damaged and demolished).
- ACM in the subsurface likely to be associated with a small building (Area 8) that was historically located in this area (based on review of aerial photographs).

The auditor agrees with the MES conclusion that remediation is required to render the site suitable for the proposed use (aged care facility and retirement housing with community centre). This is discussed in section 9.

9 Evaluation of Remediation Action Plan

9.1 Conceptual Site Model

MES developed a CSM which was revised iteratively throughout the site assessment to inform decisions around investigation and management requirements. The CSM was updated by IEnvi in the RAP, following completion of the investigation. Table 11.1 below provides a summary of the CSM and audit review.

Table 9.1: Review of the Conceptual Site Model

Element of CSM	Consultant	Auditor Opinion
Contaminant source and mechanism	Fibrous and bonded asbestos in surface soils due to poor building demolition. Communications pit containing ACM.	Acceptable
Affected media	Surface soils. Groundwater, sediment and surface water are considered to have limited exposure pathways a low potential for contamination.	Acceptable
Receptor identification	Human health - construction workers, site users/residents.	Acceptable
Exposure pathways	Inhalation of respirable fibres.	Acceptable
Presence of preferential pathways for contaminant movement	Fibrous asbestos identified within the footprint and immediate vicinity of building 503. Bonded ACM has been reported below the criteria (for sub-surface soils) however some building footprints were referred to as "*high asbestos potential building footprints*" with reference to multiple lines of evidence reported during the investigation phase. These were identified as former buildings 502, 504-506, 527 and small ancillary building in area 8. Underground services have the potential to be constructed of bonded ACM material.	Acceptable.

9.2 Proposed Remediation Methodology

The proposed remediation methodology was documented in the RAP as:

- Excavation and off-site disposal of fibrous asbestos impact within the footprint of former building 503.
- Excavation, stockpiling and validation of surface soils in the footprint of former buildings 502, 504-506, 527 and small ancillary building in area 8.
- Excavation and removal of the communications pit containing ACM.

In the remaining areas of the site, concentrations of asbestos (as ACM) were assessed to be below criteria (0.01%w/w) in the sub-surface with no evidence of fill/demolition rubble. Surface ACM was removed during the 'emu pick' completed by MES, although no documented clearance/validation of the site surface with reference to the screening criteria of "no visible asbestos for surface soil" was reported. For this reason, management of the proposed Stage 1 & 2 'cut and fill' earthwork program (required to achieve design levels) is proposed. This will involve excavation of the top 100 mm of remaining surface material (after completion of the remediation) to be stockpiled and inspected for the presence of asbestos (and sampled if required).

Redundant services are to be inspected for the presence of asbestos and (if required) removed and validated. An unexpected finds protocol is to be implemented across the site.

The proposed remediation validation methodology is summarised in Table 9.2.

Table 9.2: Preferred Remediation Options

Item	Extent	Proposed Management	Proposed Validation
Fibrous asbestos impacted soil.	Within the footprint and immediate vicinity of former building 503 (recently fire damaged and demolished). An area of fibrous asbestos (reported as pipe lagging) adjacent to Building 503 and fill within the former building footprint to a depth of 0.1m (Attachment 16). Source considered to be improper asbestos removal works undertaken prior to demolition.	Excavation of the identified fibrous asbestos, stockpiling for waste classification prior to off-site disposal to a licensed waste management facility.	Excavation Area: – Visual inspection and "emu pick" by a licensed asbestos assessor. – Collection of surface samples at a rate of 1 per 10m^2 across the excavation area. Analysis for AF/FA (500mL samples).
"*high asbestos potential building footprints*"	Building footprints 504-506, 527, 502 and small ancillary building in area 8. These areas were identified in the investigation phase using multiple lines of evidence, to have the potential to contain some localised asbestos impact. Surface soils in these areas to be excavated, stockpiled and validated.	Area of building footprints to be excavated (to a depth of 0.1m) and stockpiled for visual inspection and sampling. This material is referred to as "*Stockpiled Material from areas above assessment criteria Sample Protocol*" in Table 13 of the RAP. Materia exceeding criteria is to be disposed off-site to a licensed waste management facility.	Soil stockpiles: – Visually inspected. – Stockpile samples (500ml and 10L) collected and analysed for asbestos at a rate of 1 per 50m^3. Excavation: – Visual inspection and "emu pick" by the environmental consultant, occupational hygienist or licensed asbestos assessor. – Collection of soil samples at a rate of 1 per 10 square metres of excavation floor, and 1 per 5 linear metres of wall from excavation surface and analysis for asbestos.
Underground service pits containing ACM.	During the investigation, bonded asbestos was identified in a communications box located in the vicinity of building 503. This was identified as requiring removal and validation. Due to the underground service network being inaccessible, iEnvi also identified the potential for ACM to be present in other underground services.	Excavation and removal of the communications box constructed of ACM. A program of inspection and clearance for redundant underground services is included in the construction program.	Removal of asbestos containing services to be validated by: – Visual inspection and "emu pick" by environmental consultant, occupational hygienist or licensed asbestos assessor; – Collection and analysis of 500ml samples (asbestos) a rate of 1 per 5 linear metres of excavation wall and one sample per 10m^2 from the excavation base.

9.3 Remediation Action Plan

The Auditor has assessed the RAP by comparison with the checklist included in NSW EPA (2020) *Consultants Reporting on Contaminated Land* and this is summarised Table 9.3, below.

Table 9.3: Evaluation of Remedial Action Plan

Remedial Action Plan	Auditor Comments
Remedial Objective The overarching objective of the RAP is to remediate the site so that it is rendered safe for future low density residential (Health Investigation/Screening Level A) use with potential garden/accessible soil and the contamination is managed compliantly with NSW regulations. Remediation goal were stated as: - removal of unacceptable risks to human health and the environment from the identified asbestos contamination at the site, such that the site is suitable for the proposed land use as an aged care facility; - validate the remedial works in accordance with the relevant NSW EPA Guidelines and with reference to the adopted site criteria, or, install suitable control measures to manage future risks posed by residual asbestos contamination; and - document the validation and/or management process.	The proposed remediation strategy involves the use of material meeting less sensitive criteria (HIL/HSL D) to be used under roads within the proposed development. In addition, earth works associated with cut and fill to level the site in preparation of the aged care development form part of the proposed remediation strategy. For that reason, the remediation goal of rendering the site suitable for the proposed development (as opposed to low density residential) is appropriate.
Discussion of the extent of remediation required Remediation extent was discussed within the RAP and was based on the CSM (see Table 9.2 above).	Appropriate
Remedial Options A range of remedial options for remediation of the asbestos contaminated material was assessed. Based on the nature and extent, technically viable options were identified as excavation and: - Consolidation and isolation/containment on site within a properly designed barrier or cell; - off-site disposal; - Use of material (below HSL D criteria) below roads and hard-standing was also selected as a management option for excavated stockpiled surface soils identified to exceed HSL A criteria but not the less conservative HSL D criteria.	Appropriate.
Rationale for Selection of Preferred Remediation Option On-site containment of asbestos contaminated soil was selected as the preferred remediation option for the identified friable asbestos contaminated material (excavated from the footprint of building 503). iEnvi stated that this was consistent with the preferred hierarchy of site remediation documented in NEPM (2013) and CRC Care National Remediation Framework. However, discussions with council[10] indicate that ongoing management requirements for a containment cell on a sensitive site use such as the proposed aged care facility are unlikely to be supported by council.	With reference to s.6(16) Assessment of Site Contamination Policy Framework of Schedules A and B of the NEPM (2013), the on-site (or off-site) treatment of the friable asbestos impacted soil is not a viable (technically feasible) option. Therefore on-site containment or off-site disposal are acceptable remediation options with respect to NSW EPA policy.

[10] Meeting with Wagga Wagga City Council 30 June 2020.

Table 9.3: Evaluation of Remedial Action Plan	
Remedial Action Plan	**Auditor Comments**
On this basis, the next preferred strategy of off-site disposal of asbestos impacted soil to licensed waste management facility was selected.	The NEPM (2013) states that assessment of the social, economic and environmental sustainability of the preferred remediation option depends on local factors and this "*…is a matter for the responsible participating jurisdiction."* As council have indicated that long term management of a containment cell on the aged care facility is unlikely to be supported, the proposed off-site disposal option is considered appropriate.
Proposed Validation Criteria Health Screening Levels for asbestos contamination in soil NEPM (2013): - Bonded asbestos: Health Screening Level (HSL A) – Residential 0.01%w/w - Friable asbestos (AF/FA) HSL (all exposure scenarios) – 0.001%w/w. - No visible asbestos for surface soils.	Appropriate
Proposed Validation Testing Proposed validation of the remediation areas is discussed in Table 9.2 above. Visual inspections will consist of a grid-based walkover using a rake (7mm spaced tines to a depth of 0.1m) on transects of 1m with a minimum 3 passes. Where visible asbestos is observed, this will be removed ("emu pick") and additional clearance passes undertaken. Soil sampling will consist of both 500mL samples for laboratory analysis and 10L samples for ACM gravimetric analysis. Imported Material: will be VENM, ENM or be classified under a Resource Recovery Exemption. Documentation to be reviewed and approved by environmental consultant. This is to include an assessment of suitability for use on site. Material to be inspected upon importation. Sampling of imported material is required where "*material imported to the site may present a risk*." At a frequency of not less than 1 sample per truckload. Off-site disposal: Waste will be classified in accordance with NSW EPA Waste Classification Guidelines. Sampling of stockpiles of surface soils excavated from outside remediation areas: Samples will be collected at a ratio of 1 sample per 200m^3 and analysis for AF/FA (500mL sample) and 10L sample for gravimetric analysis to confirm low risk condition of the material. Contingencies and procedures are provided where asbestos is identified. Top 100mm of site surface (NSW EPA policy requires "*no visible asbestos for surface soil*"): Following completion of remediation and earthworks program the site surface will be validated as free of visible asbestos through:	Appropriate

Table 9.3: Evaluation of Remedial Action Plan	
Remedial Action Plan	**Auditor Comments**
– Confirmation of imported material (i.e. for landscaping or construction of building slab), or – A program of surface clearance in accordance with WA DOH (2009).	
Interim Site Management Plan (before remediation) No interim site management is proposed.	The site is currently vacant and fenced and interim site management is not warranted.
Unexpected Finds An unexpected finds (UXF) protocol is provided in the RAP. UXF are identified as conditions detectable through visual or olfactory means such as: hydrocarbon impact, asbestos, construction/demolition waste, waste material, or ash/slag. Upon detecting unexpected contamination, the work is to stop and area controlled until investigation and clearance by an environmental consultant.	The procedure for handling unexpected finds, which includes stopping work and identification of issue by an environmental consultant is appropriate and practical. This can reasonably be expected to be managed during earthwork program.
Site Management Plan (operation phase) A site-specific construction environmental management plan (CEMP) is to be prepared in accordance with the Guideline for the Preparation of Environmental Management Plans (DIPNR, 2004) and Consultants Reporting on Contaminated Land (NSW EPA, 2020). The RAP states that "*…the CEMP will provide details regarding the Principal Contractor responsibilities for RAP implementation during the earthworks by reference to the appropriate sections of the RAP.*"	Appropriate
Contingency Plan if Selected Remedial Strategy Fails The remedial strategy has a low risk of failure. However, contingency for dealing with additional volumes of asbestos contaminated material is to be managed by; validation to a less sensitive criteria (for use under roads) or disposal off-site to as licensed facility.	Appropriate
Remediation Schedule Indicative remediation duration was given as 5 months followed by completion of building work within 12months.	Appropriate
Material Handling and Tracking Plan A material tracking plan is to be implemented and will include tracking excavated material from source to destination and imported material.	Appropriate
Licence and Approvals The following regulatory requirements and approvals were identified in the RAP: Category 2 remediation work. Notify council of Category 2 remediation work 30 days prior. Class A licensed contractor for fibrous excavation/containment work. Class B for rest of site (bonded asbestos conditions). Notify Safework NSW 5 days prior. Asbestos Removal Control Plan. Air monitoring during fibrous work. Transport of any asbestos waste off-site to be tracked using WasteLocate. Waste to be transported off-site will be subject to waste classification in accordance with NSW EPA Waste Classification Guidelines and will be transported to a licensed facility. This has been identified as	The required licences and approvals have been appropriately identified. It is understood that remediation will be ancillary to the proposed development and is to be considered by council during assessment of the current development application.

Table 9.3: Evaluation of Remedial Action Plan	
Remedial Action Plan	**Auditor Comments**
Gregadoo Waste Management Centre, located at 132 Ashfords Road, Lake Albert NSW 2650, approximately 14 km by road to the south.	
Contacts/Community Relations Direct community consultation is not proposed.	As remediation will be ancillary to the proposed development, this can be addressed through the development consent process.
Staged Progress Reporting Given the proposed remediation schedule, staged progress reporting is not proposed.	Appropriate

9.4 Contamination Migration Potential

As discussed in section 8, the investigation results did not identify any significant contamination issues[11] other than asbestos and the risk of migration of contamination vertically to groundwater is considered to be low and acceptable.

With respect to the identified asbestos impacts, there is no evidence of significant off-site migration (via dust or mechanical transport) under current conditions. Remediation of the site as documented in the RAP will address potential contamination migration potential.

9.5 Assessment of Risk

There is a risk of unexpected contamination to be encountered during the remediation. Any unexpected finds or additional contamination during remediation and redevelopment can be managed by the RAP, which includes an unexpected finds protocol.

9.6 Auditors Opinion

The proposed remediation strategy documented in the RAP provides a practical and achievable basis to successfully remediate the site for the proposed use.

[11] As discussed in section 1 contamination does not include consideration of salinity issues.

10 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.

The RAP was reported in accordance with the NSW EPA (2020) Consultants Reporting on Contaminated Land. The checklist included in that document has been referred to. The investigation was prepared prior to revision of the NSW EPA current reporting guidelines and this was considered with reference to OEH (2011) *Guidelines for Consultants Reporting on Contaminated Sites*. The reports generally met the requirements exceptions and departures have been addressed by the auditor in this SAR.

11 Conclusions and Recommendations

Based on the information presented in the reports listed in Section 1.3 of this SAR, and with reference to the *NSW EPA (2020) Consultants Reporting on Contaminated Land*, the site can be made suitable for the proposed use (as described in the SCC) if remediated in accordance with the following remedial action plan:

- 'Remediation Action Plan, 20 Hely Avenue, Turvey Park NSW 2650', 3 July 2020 (version 9.0 Final), iEnvironmental Australia Pty Ltd.

Subject to compliance with the following conditions:

- Preparation of a Site Audit Statement certifying suitability for the proposed use, at the completion of the remediation and validation.

The site is potentially affected by urban soil salinity. Review of the impacts of urban soil salinity falls outside the scope of a contaminated site audit and consideration of the impacts of salinity have not been considered in determining whether the site can be made suitable (from a contamination perspective). Impacts on buildings and structures will be controlled through requirements on the final design of the development imposed by the SCC and Wagga Wagga Development Control Plan (DCP 2010). Notwithstanding this, it is noted that the RAP recommends that "*The saline nature of the groundwater should be considered during future construction and landscaping with regard to aggressivity to concrete and salt stress to vegetation.*"

12 Other Relevant Information

This Audit was conducted on the behalf of Croft Developments for the purpose of the suitability and appropriateness of a remedial action plan (RAP), i.e. a "Site Audit" as defined in Section 4 (definition of a 'site audit' (b)(v)) of the CLM Act.

This summary report may not be suitable for other uses. MES and iEnvi included limitations in their reports. 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.

The Auditor has relied on the documents referenced in Section 1 of the Site Audit Report in preparing the Auditors' opinion. 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.

APPENDIX A

Attachments

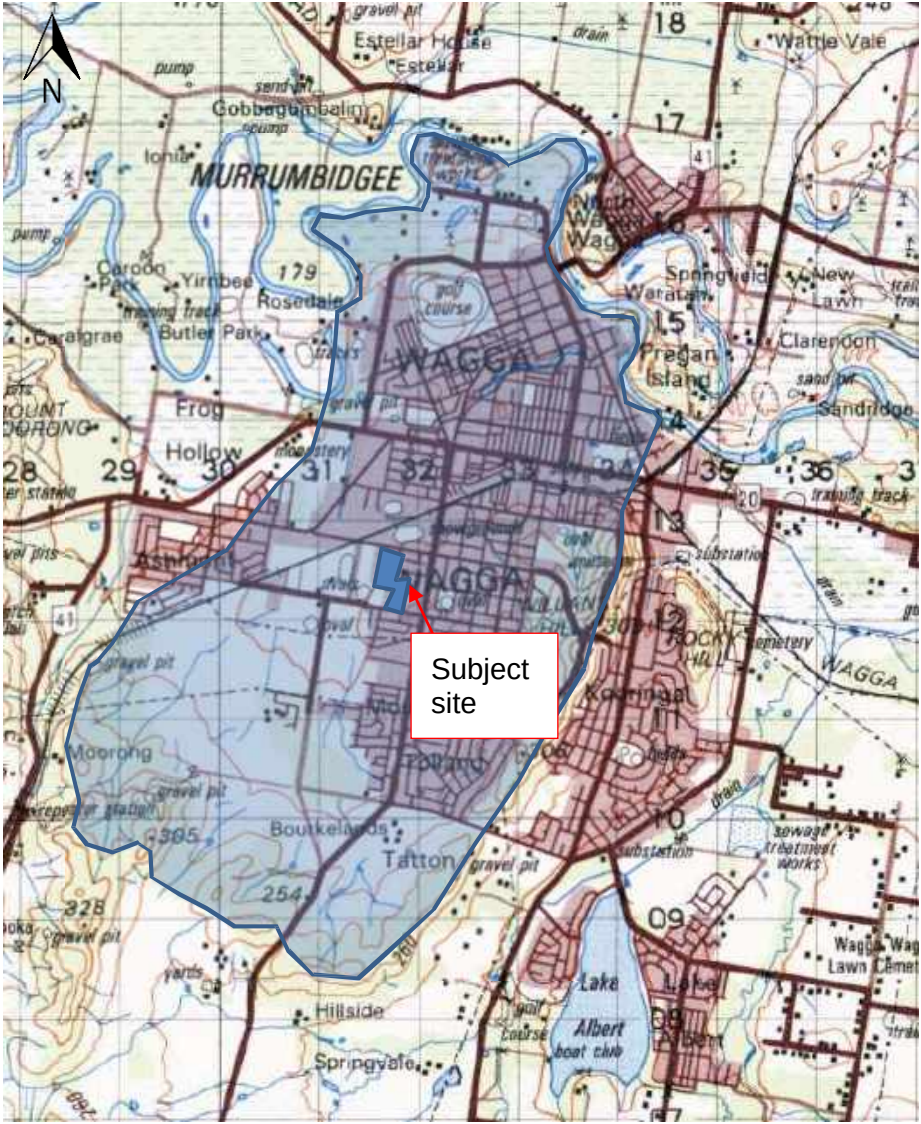
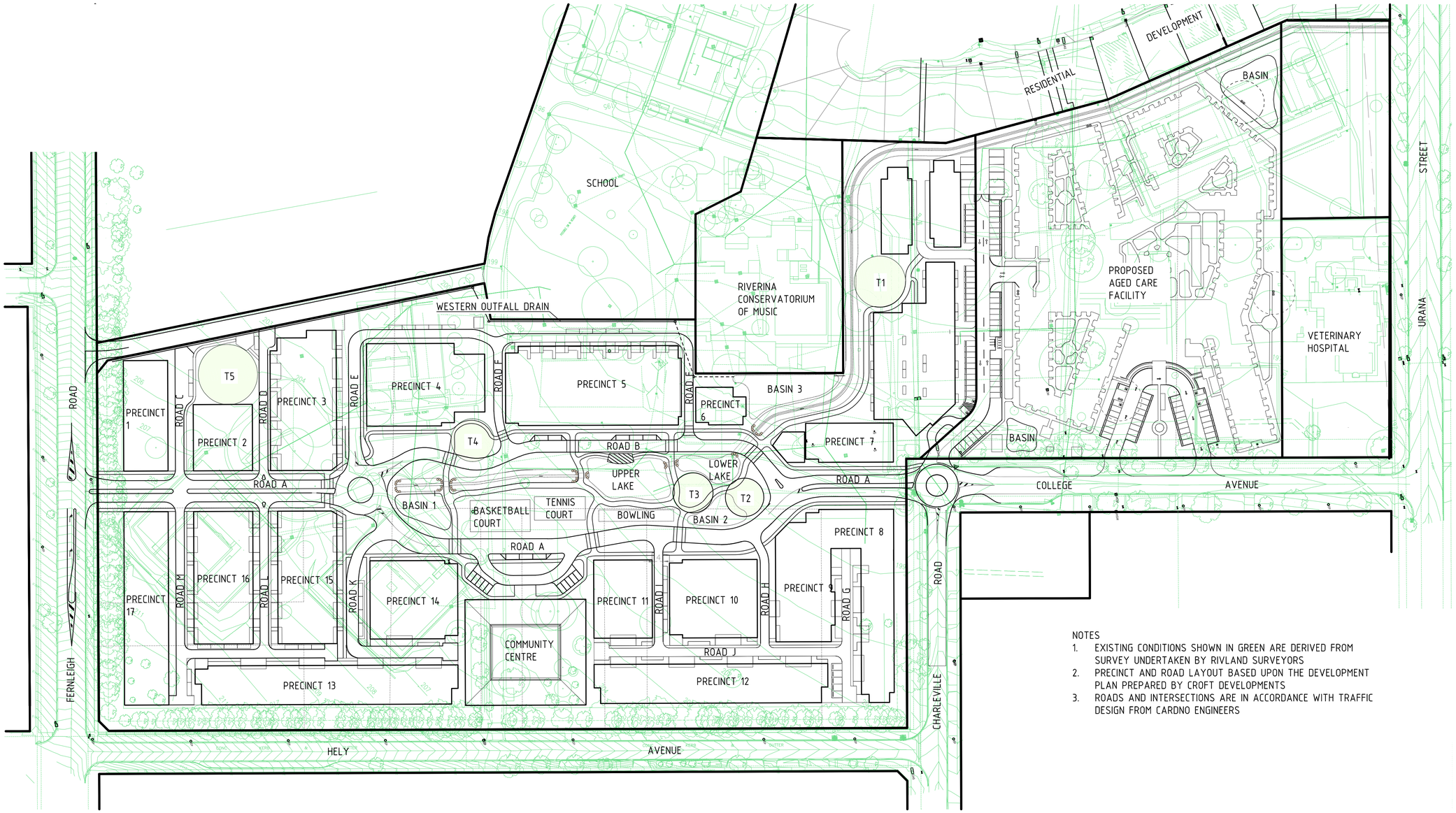


Figure 1: Site Location Plan Showing *Western catchment of Wagga Wagga*



NOTES
1. EXISTING CONDITIONS SHOWN IN GREEN ARE DERIVED FROM SURVEY UNDERTAKEN BY RIVLAND SURVEYORS
2. PRECINCT AND ROAD LAYOUT BASED UPON THE DEVELOPMENT PLAN PREPARED BY CROFT DEVELOPMENTS
3. ROADS AND INTERSECTIONS ARE IN ACCORDANCE WITH TRAFFIC DESIGN FROM CARDNO ENGINEERS

MELBOURNE (03) 9285 2800 SYDNEY (02) 8036 8370
www.cjarms.com info@cjarms.com

PROJECT NUMBER CJA 14330

REVISIONS	No	DATE	AMENDMENTS	AUT.
	P1	02/11/18	ISSUED FOR INFORMATION	BM

0 30 60 Meters

CLIENT CROFT DEVELOPMENTS PTY LTD

CONSULTANT CJ ARMS & ASSOCIATES
www.cjarms.com

PROJECT WAGGA WAGGA DEVELOPMENT
COLLEGE AVENUE, TURVEY PARK
NSW, 2650
CTY OF WAGGA WAGGA

DRAWING MASTER PLANNING OVERALL LAYOUT PLAN

DRAWING STATUS PRELIMINARY
PROJECT STATUS PRELIMINARY

SCALE A3 1:2000 | A1 1:1000
DESIGN PP
DRAWN BM
DATE 02/11/18
DRAWING & REV. MP-01 P1

J:\14330 Croft Wagga Wagga\04 Civil\Drawings\PDF\300 Drawings\20181031 Updated Subdivision Precinct\14330 UPDATED RETIREMENT VILLAGE MASTER PLAN.dwg

Figure 3: *Site map and topographic features*

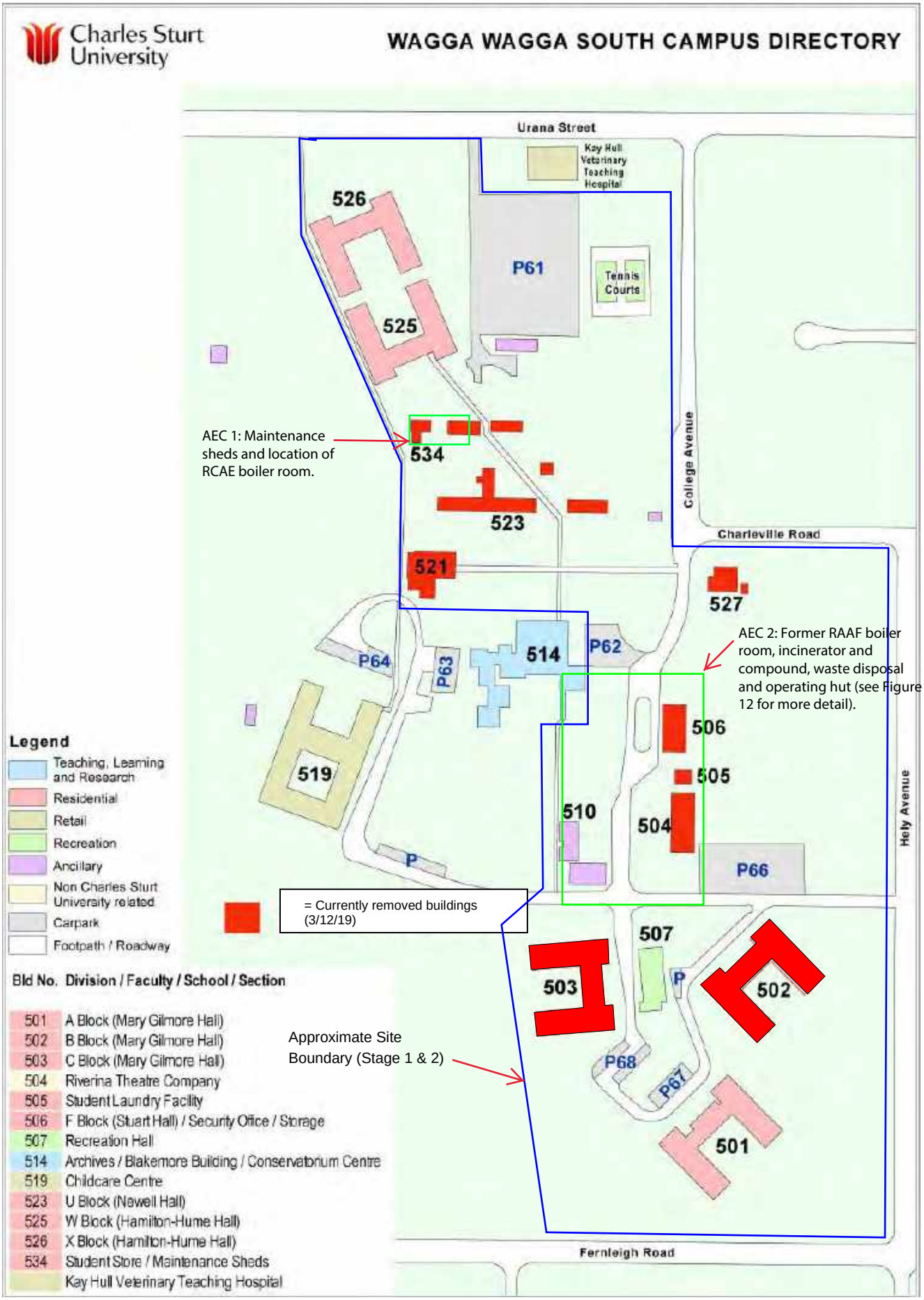


Figure 4: *CSU South Campus demolition plan*

Figure 5 Previous Structures South Campus Contamination Investigation November 2019

Legend

Demolished building footprints
Boundary

Definitions & Specifications

Demolished building footprints digitised from all available historical aerial imagery from the following years: 1944, 1966, 1971, 1980, 1990, 1998, 2004, 2007, 2009, 2014, 2016, 2018 & 2019.
Other sources of information pertaining to the location of demolished buildings include:
- CSU South Campus Directory 2013
- Plan of No.1 RAAF Hospital 1943

Drawn by DM 08/12/2019
Aerial photo - 2018

50 0 50 Meters

Figure 6: *Soil sampling plan 31 July 2018 to 3m depth*

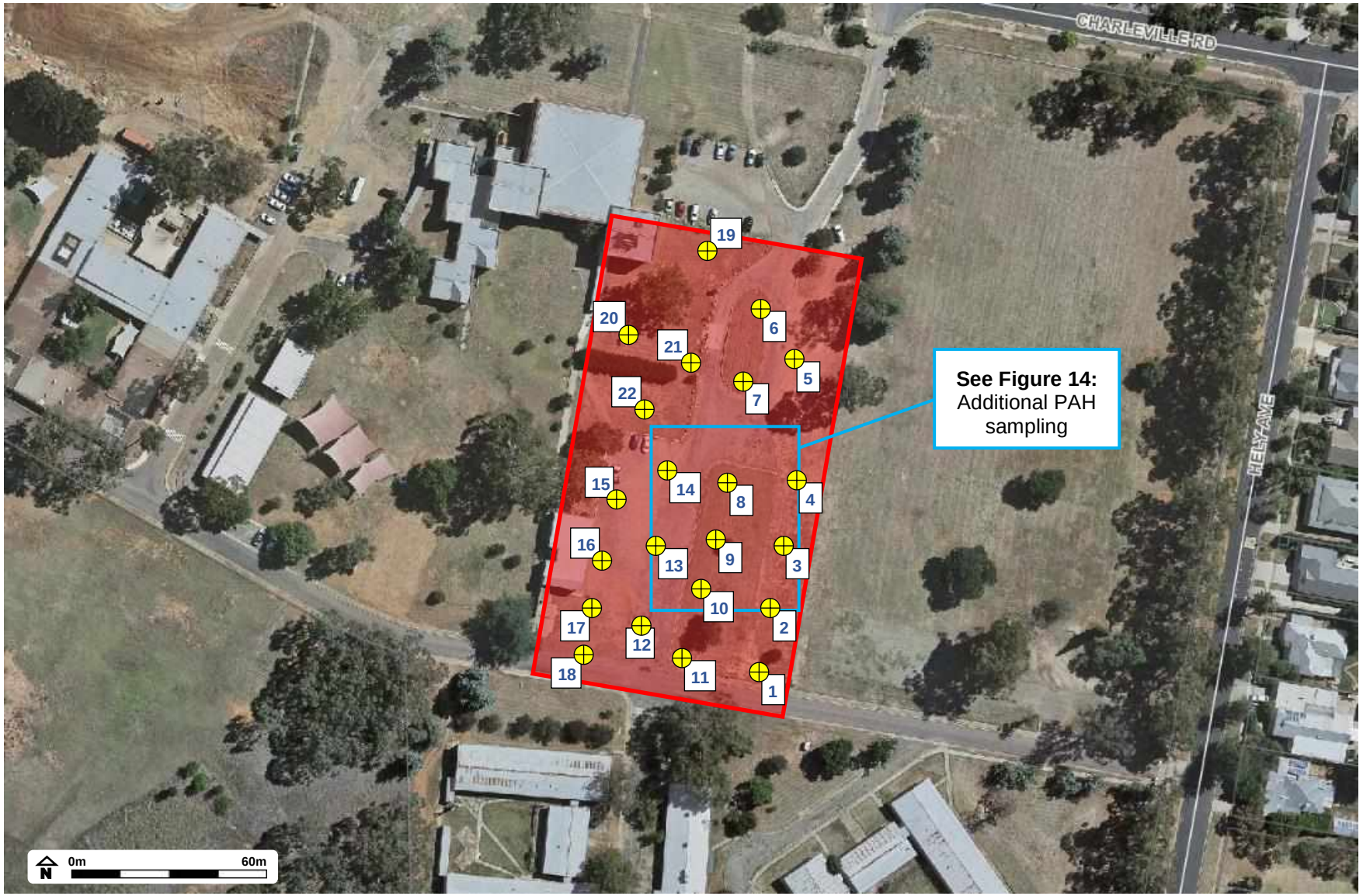


Figure 7: *Initial soil sampling locations*

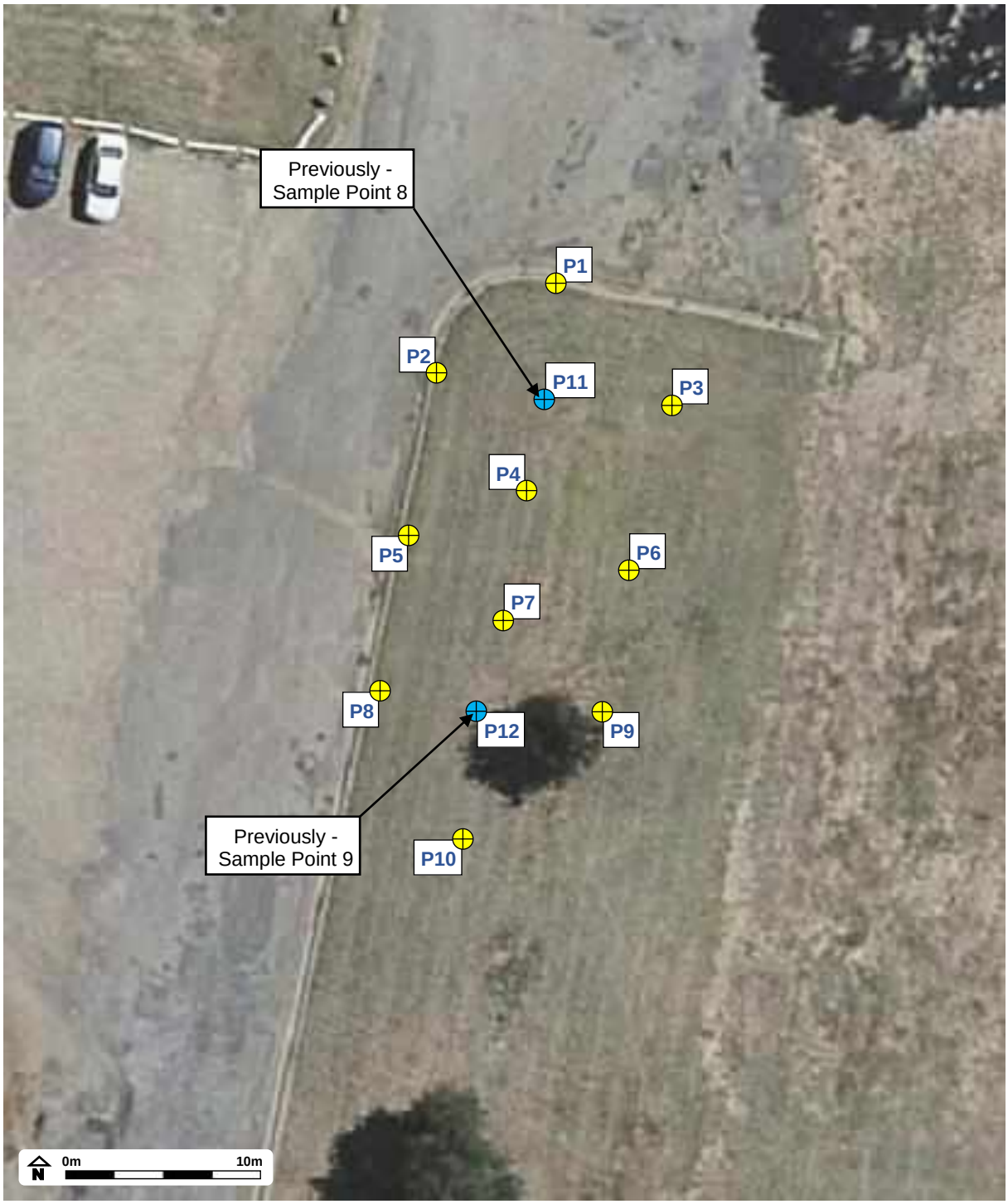


Figure 8: *Additional PAH sampling*

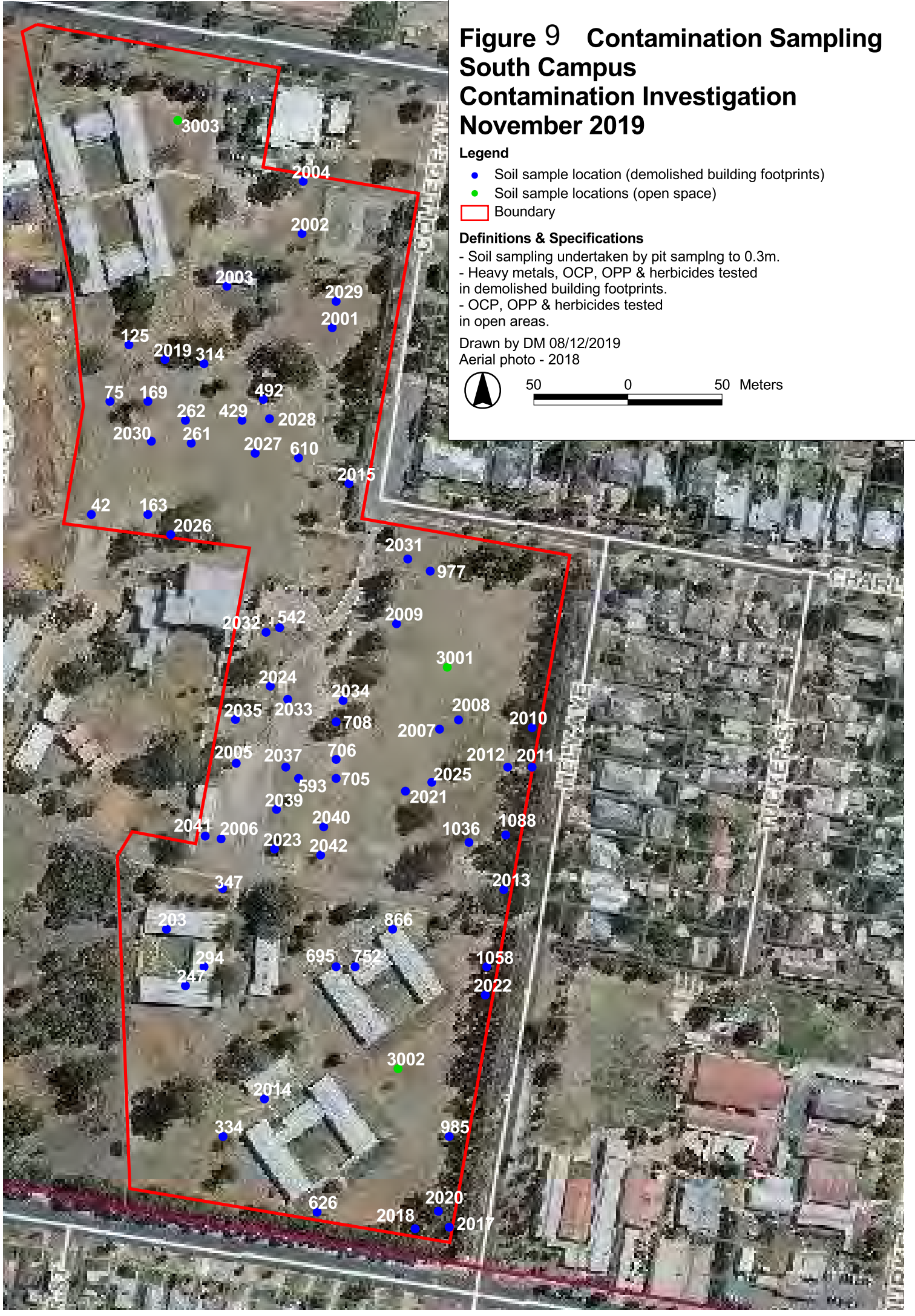


Figure 9 Contamination Sampling South Campus Contamination Investigation November 2019

Legend

- Soil sample location (demolished building footprints)
- Soil sample locations (open space)
- Boundary

Definitions & Specifications

- Soil sampling undertaken by pit samplng to 0.3m.
- Heavy metals, OCP, OPP & herbicides tested in demolished building footprints.
- OCP, OPP & herbicides tested in open areas.

Drawn by DM 08/12/2019
Aerial photo - 2018

50 0 50 Meters

Figure 10 Bonded ACM Finds South Campus Asbestos Investigation October 2019

Legend

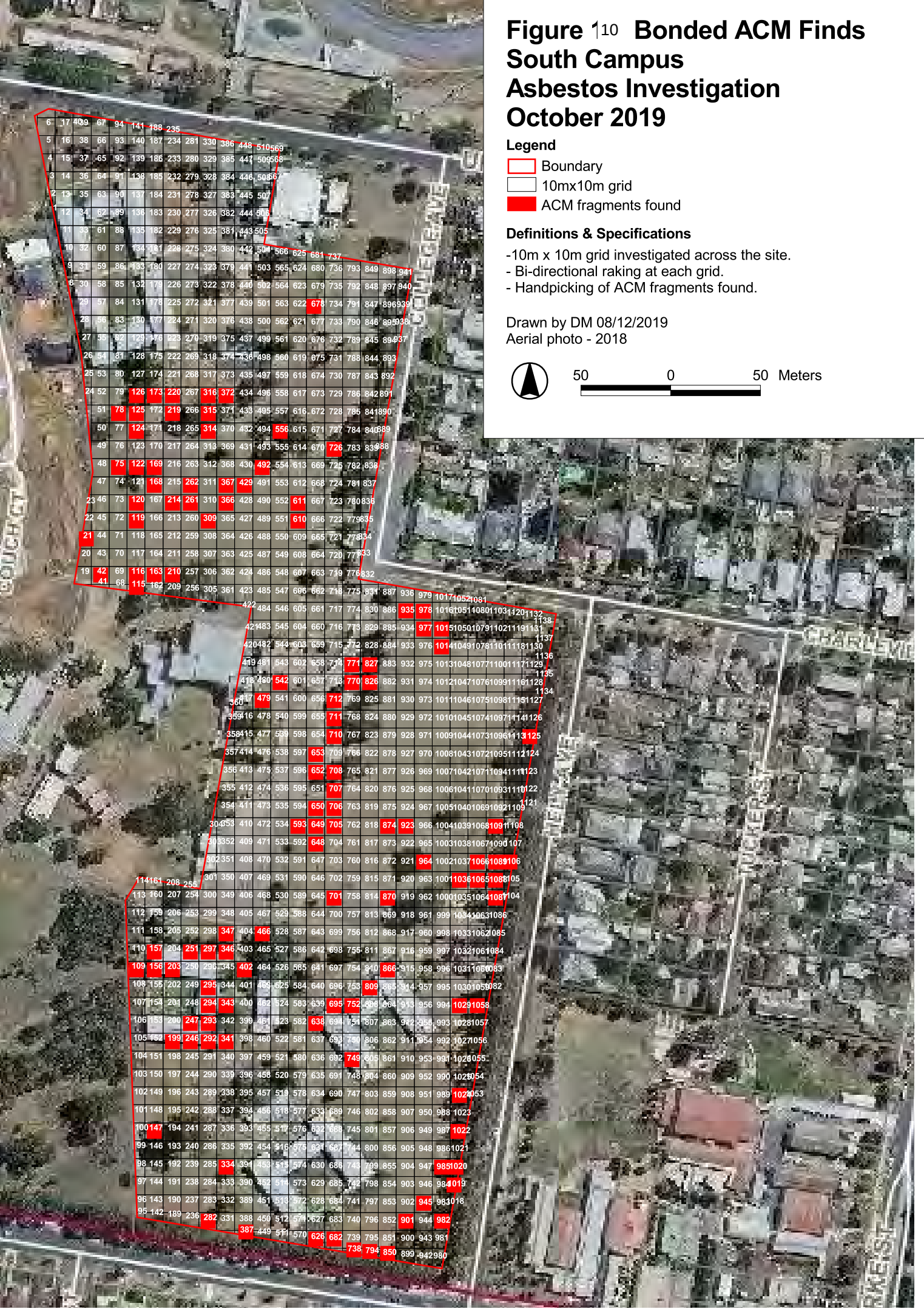
- Boundary
- 10mx10m grid
- ACM fragments found

Definitions & Specifications

-10m x 10m grid investigated across the site.
- Bi-directional raking at each grid.
- Handpicking of ACM fragments found.

Drawn by DM 08/12/2019
Aerial photo - 2018

50 0 50 Meters



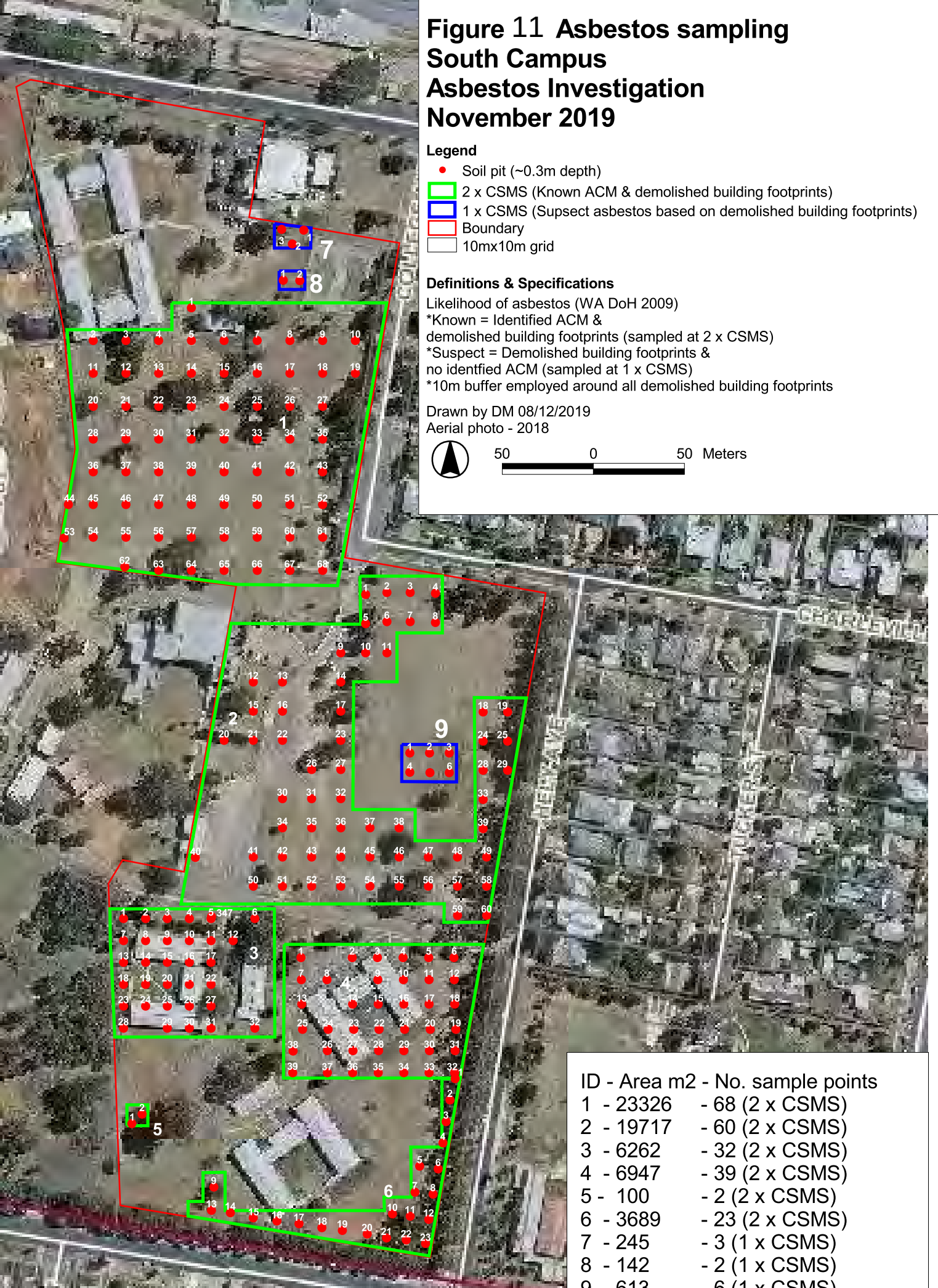


Figure 11 Asbestos sampling South Campus Asbestos Investigation November 2019

Legend

- Soil pit (~0.3m depth)
- 2 x CSMS (Known ACM & demolished building footprints)
- 1 x CSMS (Supsect asbestos based on demolished building footprints)
- Boundary
- 10mx10m grid

Definitions & Specifications

Likelihood of asbestos (WA DoH 2009)
*Known = Identified ACM &
demolished building footprints (sampled at 2 x CSMS)
*Suspect = Demolished building footprints &
no identfied ACM (sampled at 1 x CSMS)
*10m buffer employed around all demolished building footprints

Drawn by DM 08/12/2019
Aerial photo - 2018

50 0 50 Meters

ID - Area m2 - No. sample points	
1 - 23326	- 68 (2 x CSMS)
2 - 19717	- 60 (2 x CSMS)
3 - 6262	- 32 (2 x CSMS)
4 - 6947	- 39 (2 x CSMS)
5 - 100	- 2 (2 x CSMS)
6 - 3689	- 23 (2 x CSMS)
7 - 245	- 3 (1 x CSMS)
8 - 142	- 2 (1 x CSMS)
9 - 613	- 6 (1 x CSMS)

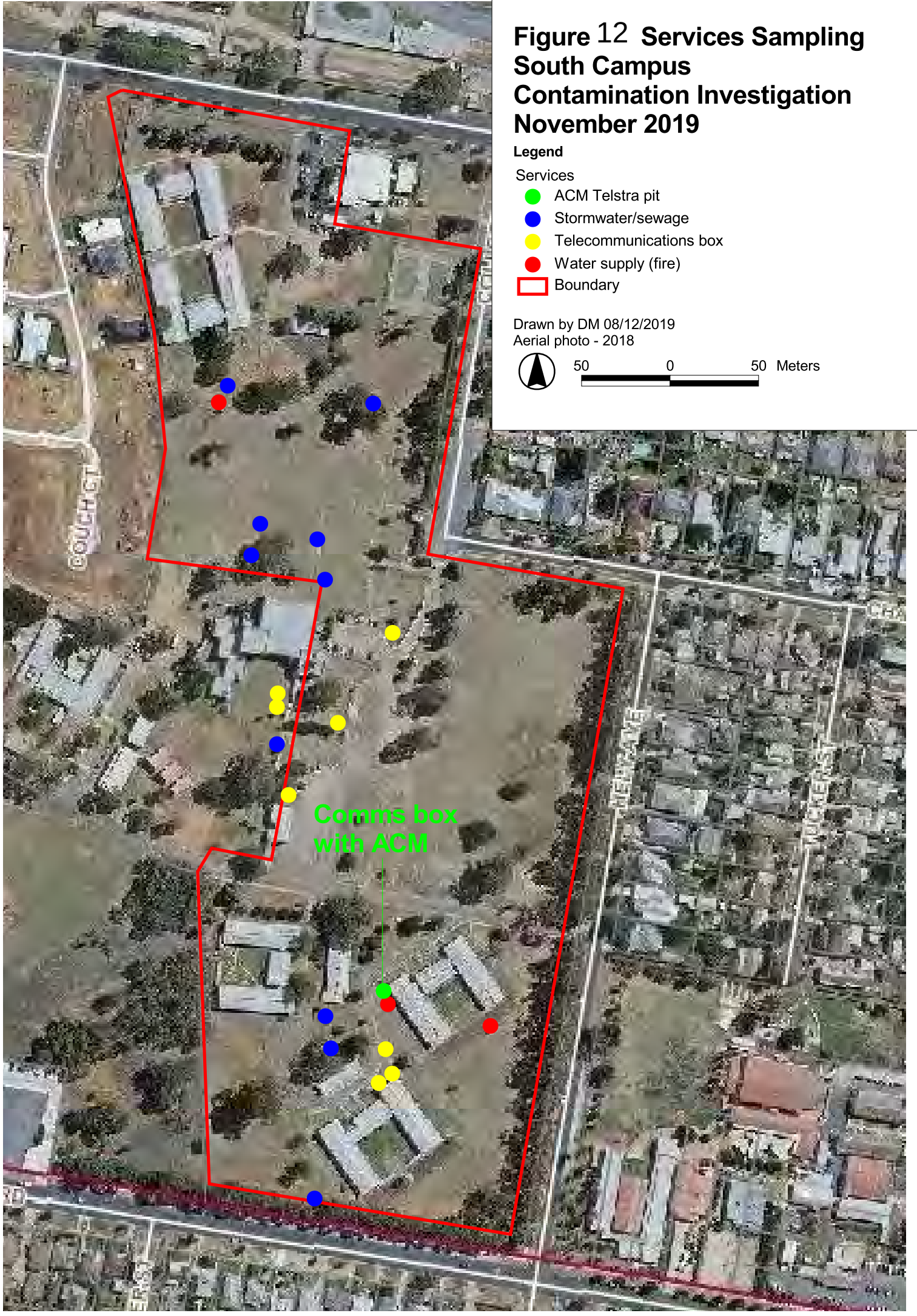


Figure 12 Services Sampling South Campus Contamination Investigation November 2019
Legend
Services
ACM Telstra pit
Stormwater/sewage
Telecommunications box
Water supply (fire)
Boundary
Drawn by DM 08/12/2019
Aerial photo - 2018
50 0 50 Meters
Comms box with ACM

Figure 13 Fibrous Asbestos Finds South Campus Asbestos Investigation November 2019

Legend

Boundary

Fibrous asbestos detected to 0.3m depth

Drawn by DM 08/12/2019

Aerial photo - 2018

50 0 50 Meters

APPENDIX B

Site Audit Statement

NSW Site Auditor Scheme

Site Audit Statement

A site audit statement summarises the findings of a site audit. For full details of the site auditor's findings, evaluations and conclusions, refer to the associated site audit report.

This form was approved under the *Contaminated Land Management Act 1997* on 12 October 2017.

For information about completing this form, go to Part IV.

Part I: Site audit identification

Site audit statement no. JE78A

This site audit is a:

☐ ~~statutory audit~~

☑ non-statutory audit

within the meaning of the *Contaminated Land Management Act 1997*.

Site auditor details

(As accredited under the *Contaminated Land Management Act 1997*)

Name: Julie Evans

Company: Envirocene Pty Ltd

Address: Level 1, 29 Kiora Road, Miranda NSW

Postcode: 2228

Phone: 0402 142050

Email: jevans@envirocene.com.au

Site details

Address: 20 Hely Avenue, Turvey Park NSW

Postcode: 2650

Property description

(Attach a separate list if several properties are included in the site audit.)

Part Lot 2 DP 1183166 (Refer to attachment at end of Part I)

Local government area: Wagga Wagga City Council

Area of site (include units, e.g. hectares): 11.32Ha

Current zoning: SP2 – Infrastructure (Wagga Wagga Local Environmental Plan 2010)

Regulation and notification

To the best of my knowledge:

☐ **the site is** the subject of a declaration, order, agreement, proposal or notice under the *Contaminated Land Management Act 1997* or the *Environmentally Hazardous Chemicals Act 1985*, as follows: (provide the no. if applicable)

- ☐ Declaration no.
- ☐ Order no.
- ☐ Proposal no.
- ☐ Notice no.

☑ **the site is not** the subject of a declaration, order, proposal or notice under the *Contaminated Land Management Act 1997* or the *Environmentally Hazardous Chemicals Act 1985*.

To the best of my knowledge:

☐ the site **has** been notified to the EPA under section 60 of the *Contaminated Land Management Act 1997*

☑ the site **has not** been notified to the EPA under section 60 of the *Contaminated Land Management Act 1997*.

Site audit commissioned by

Name: Clinton Witnish

Company: Croft Developments Pty Ltd

Address: 59 Wangara Road, Cheltenham VIC

Postcode: 3192

Phone: 0400 345944

Email: Clinton.Witnish@croft.com.au

Contact details for contact person (if different from above)

Name: N/A

Phone: N/A

Email: N/A

Nature of statutory requirements (not applicable for non-statutory audits)

☐ ~~Requirements under the *Contaminated Land Management Act* 1997 (e.g. management order; please specify, including date of issue)~~

N/A

☐ ~~Requirements imposed by an environmental planning instrument (please specify, including date of issue)~~

N/A

☐ ~~Development consent requirements under the *Environmental Planning and Assessment Act 1979* (please specify consent authority and date of issue)~~

N/A

☐ ~~Requirements under other legislation (please specify, including date of issue)~~

N/A

Purpose of site audit

☐ **A1** To determine land use suitability

Intended uses of the land:

☐ **A2** To determine land use suitability subject to compliance with either an active or passive environmental management plan

Intended uses of the land:

OR

(Tick all that apply)

☑ **B1** To determine the nature and extent of contamination

☑ **B2** To determine the appropriateness of:

☐ an investigation plan

☑ a remediation plan

☐ a management plan

☐ **B3** To determine the appropriateness of a **site testing plan** to determine if groundwater is safe and suitable for its intended use as required by the *Temporary Water Restrictions Order for the Botany Sands Groundwater Resource 2017*

☐ **B4** To determine the compliance with an approved:

☐ **voluntary management proposal** or

☐ **management order** under the *Contaminated Land Management Act 1997*

☑ **B5** To determine if the land can be made suitable for a particular use (or uses) if the site is remediated or managed in accordance with a specified plan.

Intended uses of the land: aged care facility and retirement housing incorporating a community centre and public open space

Information sources for site audit

Consultancies which conducted the site investigations and/or remediation:

McMahon Earth Science

iEnvironmental Australia Pty Ltd

Titles of reports reviewed:

‘Preliminary Site Investigation, Former CSU South Campus, 20 Hely Avenue, Turvey Park, NSW’ July 2018, (Report 5340 Rev 05) McMahon Earth Science.

‘Detailed Site Investigation, Former CSU South Campus, 20 Hely Avenue, Turvey Park, NSW 2650’, June 2019, (Report 5901 Rev 01) McMahon Earth Science.

‘Sampling Analysis and Quality Plan (24/10/19), 20 Hely Avenue, Wagga Wagga, NSW’, 24 October 2019, McMahon Earth Science.

‘Detailed Site Investigation, Stages 1 & 2, Former CSU South Campus, 20 Hely Avenue Turvey Park NSW 2650’, December 2019, (Report 6459 Rev 03) McMahon Earth Science.

‘Sampling Analysis and Quality Plan (March 2020), Former CSU South Campus, 20 Hely Avenue, Turvey Park NSW 2650’, 6 April 2020 (Report 6735 Rev 03) McMahon Earth Science.

‘Detailed Site Investigation, Former CSU South Campus, 20 Hely Avenue, Turvey Park NSW 2650’, 11 May 2020 (Report 6735 Revision 02) McMahon Earth Science.

‘Remediation Action Plan, 20 Hely Avenue, Turvey Park NSW 2650’, 3 July 2020 (Version 9.0 Final) iEnvironmental Australia Pty Ltd.

Other information reviewed, including previous site audit reports and statements relating to the site:

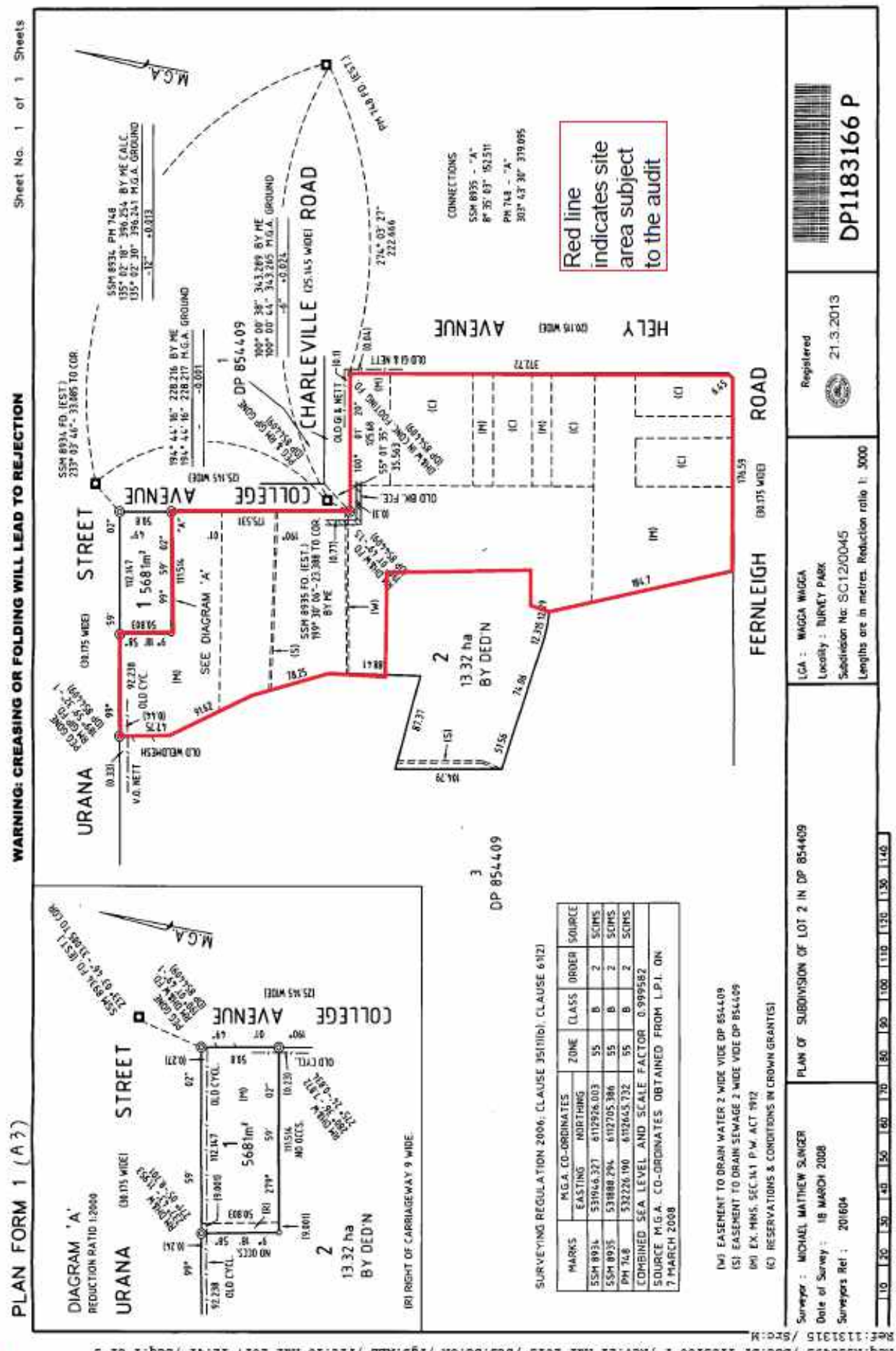
Email Re: CSU South Campus: Additional Sampling. Sent 9 March 2020 by Zach Bradley on behalf of McMahon Earth Science. This included an attachment entitled “Additional History”.

Letter Re: Summary of Findings – DM McMahon Pty Ltd DSI Report Ref: 6735. Dated 11 May 2020. Prepared by Michael Nicholls on behalf of iEnvironmental Australia Pty Ltd for Croft Developments Pty Ltd.

Site audit report details

Title: Site Audit Report, 20 Hely Avenue, Turvey Park NSW Remediation Action Plan

Report no. E032 Date: 8 July 2020



Part II: Auditor's findings

Please complete either Section A1, Section A2 or Section B, not more than one section. (Strike out the irrelevant sections.)

- Use **Section A1** where site investigation and/or remediation has been completed and a conclusion can be drawn on the suitability of land uses **without the implementation** of an environmental management plan.
- Use **Section A2** where site investigation and/or remediation has been completed and a conclusion can be drawn on the suitability of land uses **with the implementation** of an active or passive environmental management plan.
- Use **Section B** where the audit is to determine:
  - (B1) the nature and extent of contamination, and/or
  - (B2) the appropriateness of an investigation, remediation or management plan[1], and/or
  - (B3) the appropriateness of a site testing plan in accordance with the *Temporary Water Restrictions Order for the Botany Sands Groundwater Source 2017*, and/or
  - (B4) whether the terms of the approved voluntary management proposal or management order have been complied with, and/or
  - (B5) whether the site can be made suitable for a specified land use (or uses) if the site is remediated or managed in accordance with the implementation of a specified plan.

[1] For simplicity, this statement uses the term 'plan' to refer to both plans and reports.

Section A1

I certify that, in my opinion:

The **site is suitable** for the following uses:

(Tick all appropriate uses and strike out those not applicable.)

☐ Residential, including substantial vegetable garden and poultry

☐ Residential, including substantial vegetable garden, excluding poultry

☐ Residential with accessible soil, including garden (minimal home-grown produce contributing less than 10% fruit and vegetable intake), excluding poultry

☐ Day care centre, preschool, primary school

☐ Residential with minimal opportunity for soil access, including units

☐ Secondary school

☐ Park, recreational open space, playing field

☐ Commercial/industrial

☐ Other (please specify):

_____

OR

☐ I certify that, in my opinion, the **site is not suitable** for any use due to the risk of harm from contamination.

Overall comments:

_____

_____

_____

_____

_____

_____

Section A2

I certify that, in my opinion:

Subject to compliance with the **attached** environmental management plan[2] (EMP), the site is suitable for the following uses:

(Tick all appropriate uses and strike out those not applicable.)

☐ Residential, including substantial vegetable garden and poultry

☐ Residential, including substantial vegetable garden, excluding poultry

☐ Residential with accessible soil, including garden (minimal home-grown produce contributing less than 10% fruit and vegetable intake), excluding poultry

☐ Day care centre, preschool, primary school

☐ Residential with minimal opportunity for soil access, including units

☐ Secondary school

☐ Park, recreational open space, playing field

☐ Commercial/industrial

☐ Other (please specify):

EMP details

Title:

Author:

Date: No. of pages:

EMP summary

This EMP (attached) is required to be implemented to address residual contamination on the site.

The EMP: (Tick appropriate box and strike out the other option.)

☐ requires operation and/or maintenance of **active** control systems[3]

☐ requires maintenance of **passive** control systems only[3].

[2] Refer to Part IV for an explanation of an environmental management plan.
[3] Refer to Part IV for definitions of active and passive control systems.

~~Purpose of the EMP:~~

~~Description of the nature of the residual contamination:~~

~~Summary of the actions required by the EMP:~~

~~How the EMP can reasonably be made to be legally enforceable:~~

~~How there will be appropriate public notification:~~

~~Overall comments:~~

Section B

Purpose of the plan[4] which is the subject of this audit is to demonstrate that "*the site can be made suitable for the proposed land use as an aged care facility".*

I certify that, in my opinion:

(B1)

☑ The nature and extent of the contamination **has** been appropriately determined

☐ ~~The nature and extent of the contamination **has not** been appropriately determined~~

AND/OR (B2)

☑ The investigation, remediation or management plan **is** appropriate for the purpose stated above

☐ ~~The investigation, remediation or management plan **is not** appropriate for the purpose stated above~~

~~AND/OR (B3)~~

☐ ~~The site testing plan:~~

- ☐ ~~**is** appropriate to determine~~
- ☐ ~~**is not** appropriate to determine~~

~~if groundwater is safe and suitable for its intended use as required by the *Temporary Water Restrictions Order for the Botany Sands Groundwater Resource 2017*~~

~~AND/OR (B4)~~

☐ ~~The terms of the approved voluntary management proposal* or management order** (strike out as appropriate):~~

- ☐ ~~**have** been complied with~~
- ☐ ~~**have not** been complied with.~~

~~*voluntary management proposal no.~~

~~**management order no.~~

AND/OR (B5)

☑ The site **can be made suitable** for the following uses:

(Tick all appropriate uses and strike out those not applicable.)

- ☐ ~~Residential, including substantial vegetable garden and poultry~~
- ☐ ~~Residential, including substantial vegetable garden, excluding poultry~~
- ☐ ~~Residential with accessible soil, including garden (minimal home-grown produce contributing less than 10% fruit and vegetable intake), excluding poultry~~
- ☐ ~~Day care centre, preschool, primary school~~

[4] For simplicity, this statement uses the term 'plan' to refer to both plans and reports.

~~☐ Residential with minimal opportunity for soil access, including units~~

~~☐ Secondary school~~

~~☐ Park, recreational open space, playing field~~

~~☐ Commercial/industrial~~

☑ Other (please specify):

aged care facility and retirement housing incorporating a community centre and public open space as described in the Certificate of Site Compatibility (issued by Department of Planning on 23 July 2018)

IF the site is remediated/~~managed~~* in accordance with the following plan (**attached**):

*Strike out as appropriate

Plan title: Remediation Action Plan, 20 Hely Avenue, Turvey Park NSW 2650

Plan author: iEnvironmental Australia Pty Ltd

Plan date: 3 July 2020 No. of pages: 72

SUBJECT to compliance with the following condition(s):

Preparation of a Site Audit Statement certifying suitability for the proposed use, at the completion of the remediation and validation.

Overall comments:

The site is potentially affected by urban soil salinity. Review of the impacts of urban soil salinity fall outside the scope of a contaminated site audit and consideration of the impacts of salinity have not been considered in determining whether the site can be made suitable (from a contamination perspective). Impacts on buildings and structures will be controlled through requirements on the final design of the development imposed by the Certificate of Site Compatibility (issued by the NSW Department of Planning 23 July 2018) and Wagga Wagga Development Control Plan (DCP 2010). Notwithstanding this, it is noted that the RAP recommends that "*The saline nature of the groundwater should be considered during future construction and landscaping with regard to aggressivity to concrete and salt stress to vegetation."*

The proposed remediation will be validated to the most conservative low density residential criteria and also includes childcare centres, preschools and primary schools. Remediation to this level would also address less sensitive site use associated with residential with minimal opportunities for soil access, public open space such as parks, playgrounds and playing fields, secondary schools and footpaths and commercial/industrial exposure scenarios. Notwithstanding this, the proposed remediation strategy has been developed in consideration of the earthworks program and final use of the site as described in the Certificate of Site Compatibility (issued by the NSW Department of Planning 23 July 2018). For that reason, the remediation action plan has been considered only in the context of the proposed aged care development.

Part III: Auditor's declaration

I am accredited as a site auditor by the NSW Environment Protection Authority (EPA) under the *Contaminated Land Management Act 1997.*

Accreditation no. 1003

I certify that:

- I have completed the site audit free of any conflicts of interest as defined in the *Contaminated Land Management Act 1997,* and
- with due regard to relevant laws and guidelines, I have examined and am familiar with the reports and information referred to in Part I of this site audit, and
- on the basis of inquiries I have made of those individuals immediately responsible for making those reports and obtaining the information referred to in this statement, those reports and that information are, to the best of my knowledge, true, accurate and complete, and
- this statement is, to the best of my knowledge, true, accurate and complete.

I am aware that there are penalties under the *Contaminated Land Management Act 1997* for wilfully making false or misleading statements.

Signed: 

Date: 8 July 2020

Part IV: Explanatory notes

To be complete, a site audit statement form must be issued with all four parts.

How to complete this form

Part I

Part I identifies the auditor, the site, the purpose of the audit and the information used by the auditor in making the site audit findings.

Part II

Part II contains the auditor's opinion of the suitability of the site for specified uses or of the appropriateness of an investigation, or remediation plan or management plan which may enable a particular use. It sets out succinct and definitive information to assist decision-making about the use or uses of the site or a plan or proposal to manage or remediate the site.

The auditor is to complete either Section A1 or Section A2 or Section B of Part II, **not** more than one section.

Section A1

In Section A1 the auditor may conclude that the land is *suitable* for a specified use or uses OR *not suitable* for any beneficial use due to the risk of harm from contamination.

By certifying that the site is *suitable*, an auditor declares that, at the time of completion of the site audit, no further investigation or remediation or management of the site was needed to render the site fit for the specified use(s). **Conditions must not be** imposed on a Section A1 site audit statement. Auditors may include **comments** which are key observations in light of the audit which are not directly related to the suitability of the site for the use(s). These observations may cover aspects relating to the broader environmental context to aid decision-making in relation to the site.

Section A2

In Section A2 the auditor may conclude that the land is *suitable* for a specified use(s) subject to a condition for implementation of an environmental management plan (EMP).

Environmental management plan

Within the context of contaminated sites management, an EMP (sometimes also called a 'site management plan') means a plan which addresses the integration of environmental mitigation and monitoring measures for soil, groundwater and/or hazardous ground gases throughout an existing or proposed land use. An EMP succinctly describes the nature and location of contamination remaining on site and states what the objectives of the plan are, how contaminants will be managed, who will be responsible for the plan's implementation and over what time frame actions specified in the plan will take place.

By certifying that the site is suitable subject to implementation of an EMP, an auditor declares that, at the time of completion of the site audit, there was sufficient information satisfying guidelines made or approved under the *Contaminated Land Management Act 1997*

(CLM Act) to determine that implementation of the EMP was feasible and would enable the specified use(s) of the site and no further investigation or remediation of the site was needed to render the site fit for the specified use(s).

Implementation of an EMP is required to ensure the site remains suitable for the specified use(s). The plan should be legally enforceable: for example, a requirement of a notice under the CLM Act or a development consent condition issued by a planning authority. There should also be appropriate public notification of the plan, e.g. on a certificate issued under s.149 of *the Environmental Planning and Assessment Act 1979*.

Active or passive control systems

Auditors must specify whether the EMP requires operation and/or maintenance of active control systems or requires maintenance of passive control systems only. Active management systems usually incorporate mechanical components and/or require monitoring and, because of this, regular maintenance and inspection are necessary. Most active management systems are applied at sites where if the systems are not implemented an unacceptable risk may occur. Passive management systems usually require minimal management and maintenance and do not usually incorporate mechanical components.

Auditor's comments

Auditors may also include **comments** which are key observations in light of the audit which are not directly related to the suitability of the site for the use(s). These observations may cover aspects relating to the broader environmental context to aid decision-making in relation to the site.

Section B

In Section B the auditor draws conclusions on the nature and extent of contamination, and/or suitability of plans relating to the investigation, remediation or management of the land, and/or the appropriateness of a site testing plan in accordance with the *Temporary Water Restrictions Order for the Botany Sands Groundwater Source 2017*, and/or whether the terms of an approved voluntary management proposal or management order made under the CLM Act have been complied with, and/or whether the site can be made suitable for a specified land use or uses if the site is remediated or managed in accordance with the implementation of a specified plan.

By certifying that a site *can be made suitable* for a use or uses if remediated or managed in accordance with a specified plan, the auditor declares that, at the time the audit was completed, there was sufficient information satisfying guidelines made or approved under the CLM Act to determine that implementation of the plan was feasible and would enable the specified use(s) of the site in the future.

For a site that *can be made suitable*, any **conditions** specified by the auditor in Section B should be limited to minor modifications or additions to the specified plan. However, if the auditor considers that further audits of the site (e.g. to validate remediation) are required, the auditor must note this as a condition in the site audit statement. The condition must not specify an individual auditor, only that further audits are required.

Auditors may also include **comments** which are observations in light of the audit which provide a more complete understanding of the environmental context to aid decision-making in relation to the site.

Part III

In **Part III** the auditor certifies their standing as an accredited auditor under the CLM Act and makes other relevant declarations.

Where to send completed forms

In addition to furnishing a copy of the audit statement to the person(s) who commissioned the site audit, statutory site audit statements must be sent to

- the **NSW Environment Protection Authority**:
  nswauditors@epa.nsw.gov.au or as specified by the EPA

  AND
- the **local council** for the land which is the subject of the audit.

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Remediation Action Plan

03 July 2020

20 Hely Avenue, Turvey Park NSW 2650

Prepared for Croft Development Pty Ltd

Version: 9.0 FINAL
Reference: 20191001

PHONE: 13000 43684 (13000 iEnvi)

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Site Size:	13.32 (total), 3.46 ha (Stage 1), 7.86 ha (Stage 2), 2.00 (subdivision)
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Prepared by iEnvironmental Australia Pty Ltd ABN: 65 625 493 478

A short informal video summary of this report will be provided upon approval of the RAP by the auditor.

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Abbreviations

Term	Description
AEP	Annual Exceedance Probability
AHD	Australian Height Datum (metres above mean sea level)
ADWG	Australian Drinking Water Guidelines
ANZECC	Australian and New Zealand Environment and Conservation Council
ANZG	Australian and New Zealand Guidelines
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
AS	Australian Standard
DBYD	Dial Before You Dig
DP	Deposited Plan
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EPA	Environmental Protection Authority
EPL	Environmental Protection License
IBC	intermediate Bulk Container
LPG	Liquefied Petroleum Gas
mAHD	Elevation in metres with respect to the Australian Height Datum
NEPC	National Environment Protection Council
NHMRC	National Health and Medical Research Council
NRMMC	Natural Resource Management Ministerial Council
OEMP	Operational Environmental Management Plan
PPE	Personal Protective Equipment
PVC	Polyvinyl Chloride
TWA	Trade Waste Agreement

Emergency Contacts

Company/Organisation	Number
Construction Project Manager	TBC
Council Site Supervisor	TBC
EPA NSW Griffith Office	02 6640 2500
iEnvironmental Australia (Environmental Consultants)	1300 043 684
Local Police	(02) 4632 4499
Ambulance	000
Wagga Wagga Base Hospital	(02) 5943 1000
Wagga Wagga City Council	1300 292 442 or (02) 6926 9100
WorkCover NSW	13 10 50
Wildlife Information, Rescue and Education Service (WIRES)	1300 094 737

1 Executive Summary

iEnvironmental Australia Pty Ltd (iEnvi) was engaged by Croft Development Pty Ltd (Croft) to prepare a Remediation Action Plan (RAP) to meet the requirements of a non-Statutory Site Audit and development consent conditions for the proposed Stage 1 and Stage 2 redevelopment at 20 Hely Avenue, Turvey Park NSW 2650 (the site). The Site location is illustrated in Figure 1.

Through historical demolition of structures at the site, bonded asbestos debris has been left in surficial soils across the majority of the site. A detailed site investigation (DSI) completed by McMahon Earth Science indicated a portion of fibrous asbestos within the former building 503 footprint. Asbestos within recent buildings at the site had been removed, with asbestos clearance reports provided. These buildings were subsequently demolished due to fire damage occurring after the asbestos removal works, however there is uncertainty regarding the potential presence of asbestos within the building footprints

The surface and near surface inspection identified bonded ACM fragments in 120 of the 1,138 10 m x 10 m grids investigated. Bonded ACM fragments were identified in six and fibrous asbestos was detected in three of the 235 asbestos quantification test pits sampled. Subsequent strip trenching delineated the potential area of fibrous material at the site. The water and stormwater pipes inspected contained no asbestos, however one decommissioned telecommunication box did contain asbestos. Due to the presence of widespread underground services at the site, confirmation and validation of services for potential asbestos is required. Locations of asbestos containing materials, and subsequently the remediation area and construction management area, are provided in Figure 4.

The overarching objective of the RAP is to remediate the site so that it is rendered safe for future low density residential (Health Screening Level A) use with potential garden/accessible soil and the contamination is managed compliantly with NSW regulations.

The objective of the remediation and validation is to render the site soils currently impacted by asbestos, suitable for ongoing residential use in accordance with SEPP 55 and the NEPM (ASC).

The initial remediation of asbestos impacted soil identified in previous investigations will be completed prior to the main construction works, including:

1. an approximate 3,800 m^2 area of fibrous asbestos impacted soil in and around the former building 503 footprint (fill to be removed);
2. stripping and separate stockpiling of the high asbestos-potential building footprints (502, 504, 505, 506, 527 and the area 8 ancillary building) for sampling after demolition of the buildings; and
3. validation of soil in these locations after excavation.

After the works above are completed, construction will continue with defined validation sampling, validation asbestos clearance inspections and certificates, management of an unexpected finds protocol, and underground services and pit removal processes focussed on detecting asbestos containing material and asbestos impacted soils as defined in this RAP.

In summary, iEnvi have selected the following remediation method and validation strategy in relation to asbestos impacted soil discovered at the site during previous investigations:

1. implementation of an accepted Construction Environmental Management Plan (CEMP) during remediation works;
2. begin close out of data gaps through sampling beneath existing structures and underground services;
3. stripping of the area of identified fibrous asbestos impacted soil in and around former building footprint 503, and classification and disposal of soil material offsite;
4. stripping and stockpiling of the high asbestos potential building footprints (502, 504, 505, 506, 527 and the area 8 ancillary building);
5. construction management through supervision by person appropriately trained in asbestos identification of stripping of surface material of bonded asbestos areas within the Stage 1 area (as shown on Figure 4), transport to the Stage 2 area and stockpiling;
6. visual inspection of the residual Stage 1 soils;
7. construction management through supervision by person appropriately trained in asbestos identification of stripping of surface material of bonded asbestos areas within the Stage 2 area (as shown on Figure 4) and stockpiling;
8. sampling of stockpiled soils by the environmental consultant to determine suitability for reuse and subsequent assignment of a material tracking ID;
9. visual inspection of all areas identified as containing asbestos;
10. based on material suitability for reuse, replacement of soils following excavation;
11. after remediation is completed, site-wide (Stage 1 and 2) validation will be required in 10 m x 10 m areas as per Section 11 and the Validation report prepared for the site.

Based on the validation results of remediation, the validation should include a statement of whether the site is considered to be remediated and suitable for the planned use as a retirement housing and community centre.

Roles and responsibilities for the execution of the RAP include:

Table 1: RAP Roles and Responsibilities

Role	Responsibility
Environmental Project Manager	Ensure field personnel are suitably familiar with the requirements of the OH&S Plan before commencing works on site. Ensure subcontractors are suitably qualified and safe work method statements have been supplied and approved prior to commencing works on site. Responsible for the day to day implementation of the health and safety plan in all phases of work. Ensure that any required modifications to the OH&S Plan are noted, communicated to all project staff and are implemented.
Environmental/Civil Contractor Manager	Inductions for remediation personnel and contractors in accordance with the site-specific Induction requirements. Ensure communication and notification of the remediation works to the site owners, leaseholders, Council and operators. Provision of copy of the RWP to site owners, leaseholders and operators. Maintain material tracking records
Environmental Field Manager	Induction of sub-contractors and/or other Field Personnel in accordance with the requirements of this OH&S Plan and the site-specific Induction. Ensure they are personally familiar with the requirements of the OH&S Plan before commencing works on site. Ensure that they appropriately induct sub-contractors and visitors to the site and that all persons inducted sign the acknowledgement form of this OH&S Plan (Appendix A). Ensure the on-site activities and deliverables conform to the OH&S Plan. Ensure that appropriate Personal Protective Equipment (PPE) is worn. Report any incidents or accidents as soon as possible.
Appropriately Trained person / person appropriately trained in asbestos identification	Person who has undergone asbestos identification training from an accredited training body. Oversees all excavation works onsite. Segregates stockpiles based on visual observations for sampling to be undertaken by the environmental consultant.
Environmental consultant	Review and approval of imported material documentation. Sampling and inspection of stockpiles. Sampling and inspection for validation. Preparation of validation reports and material suitability checklists.
Contractors	Site-specific Induction and OH&S Plan before commencing works on site and have signed acknowledgement form of OH&S Plan. Responsible for abiding by the OH&S Plan. Provide H&S P's and/ or SWMS's for work to be undertaken. Ensure they are suitably qualified and trained to complete the tasks required including operation of equipment. Ensure the on-site activities and deliverables conform to the OH&S Plan. Ensure that appropriate PPE is worn. Report any incidents or accidents to the Field Manager as soon as possible. Contractors should demonstrate appropriate OHS knowledge and performance, be able to identify risks associated with the work they are doing and provide suitable work methods to minimize the risks to themselves and others.

2 Introduction

iEnvironmental Australia Pty Ltd (iEnvi) was engaged by Croft Development Pty Ltd (Croft) to prepare a Remediation Action Plan (RAP) to meet the requirements of a non-Statutory Site Audit and development consent conditions for the proposed Stage 1 and Stage 2 redevelopment at 20 Hely Avenue, Turvey Park NSW 2650 (the site). The site location is illustrated in Figure 1.

The Detailed Site Investigation (DSI) report by McMahon Earth Science (McMahon 2019a and 2019b) described the site as currently comprising vacant buildings, car parking and unsealed land that is covered in grass and gravel patches. The vegetation in the area is described as primarily annual and perennial grasses with sparsely scattered Eucalyptus trees that appeared to be in good health. The site plan and development stages are illustrated in Figure 2.

iEnvi understands the client intends to remediate the site to make it suitable for the proposed redevelopment, with asbestos materials observed in Stage 1 and Stage 2 development areas.

Historical demolition of structures and potential minor quantities of imported fill caused asbestos impact to surface soil, and ACM was identified in a small telecommunications pit at the site. Both Fibrous and bonded asbestos is subsequently the primary contaminant of concern for this RAP.

This RAP has been prepared based on a review of historical environmental reports and investigations undertaken at the site, including:

- McMahon Earth Science (2019a), Detailed Site Investigation Report 5901; and
- McMahon Earth Science (2019b), Detailed Site Investigation Report 6459; and
- McMahon Earth Science (2019c), Sampling Analysis Quality Plan.

2.1 Project Personnel

The personnel involved for this project are shown in the table below.

Table 2: Project Personnel Details

Personnel	Company	Position	Project Responsibility
Michael Nicholls - 20 years experience, B Env Sc, MEIANZ, CEnvP (CS Specialist)	iEnvi	Principle Environmental Scientist	Project Director Report review and authorisation
Steven Drysdale, B L&W Sci (Hons), CEnvP	iEnvi	NSW Operations Manager, Senior Environmental Scientist	Report preparation

2.2 Site Information

The site comprises the proposed Stage 1 and Stage 2 development areas located off 20 Hely Avenue, Turvey Park NSW, within the Wagga Wagga City Council local government area.

The site location is presented in Figure 1, with site features presented in Figure 2. The site has recently been predominantly vacant with the exception of buildings on the western boundary which have been used for educational purposes by Charles Sturt University (CSU).

Table 3: Site Identification Details

Site Address:	20 Hely Avenue, Turvey Park NSW 2650
Site Size:	13.32 (total), 3.46 ha (Stage 1), 7.86 ha (Stage 2), 2.00 (subdivision)
Site Owner:	Charles Sturt University
Site Use:	Predominantly disused with some operational education facilities
Site Use Type:	infrastructure
Lot and DP Number:	Lot 2 DP 1183166
Local Government Area:	Wagga Wagga City Council
Current Zoning:	SP2 - Infrastructure
Distance from CBD:	1.5 km south-west of the Wagga Wagga Central Business District
Geographical Coordinates (MGA56 H):	-35.128300, 147.350980

3 Background Information

Based on client supplied information the recent site history is summarised below:

- the site was used for broadacre farming prior to the development of the No. 1 RAAF hospital in 1944;
- the hospital closed in 1946 and reopened as the Wagga Wagga Teachers College, with works including renovations and building demolition;
- the site was further developed in the early 1970's to form the Riverina Murray Institute of Higher Education - Riverina College of Advanced Education (RCAE);
- the RCAE transferred to CSU, with the campus gradually becoming redundant until 2011, when a development application was approved to demolish site structures. Demolition works were undertaken between 2014 and 2016; and
- Saint Mary Mackillop College constructed two demountable classrooms in 2014 which remain operational in the western portion of the site. The college is excluded from the scope of the DSI and this RAP however. Building 514 in the central portion of the site remains operational for the CSU Regional Archives and The Riverina Conservatorium of Music.

The property is proposed to be redeveloped to a retirement housing and community centre facility with the development to be undertaken predominantly within two stages. Stage 1 involves 3.46 ha of land being developed into an retirement housing and community centre facility and assisted living units, with the adjacent 2.0 ha of land occupied by the Riverina Conservatorium of Music, Charles Sturt University (CSU) Regional Archives and Saint Mary McKillop College being subdivided off and outside the footprint of the DSI and this RAP. Stage 2 (7.86 ha) will consist of retirement housing with a community centre on the eastern boundary. The development works are to be carried out under development applications DA18/0175 and DA19/0001. The development applications identified the primary issues consist of tree removal, staging conditions, access and waste management, however state the proposed development is permissible with consent.

Subsequently a Statement of Environmental Effects (SEE) was prepared by Salvestro Planning (SEE 2019). The SEE reviewed the background data for the site with regard to the proposed development, design plans, site history, infrastructure networks and services, relevant planning guidelines and environmental considerations. The SEE reported the potential for asbestos containing material and lead paint at the site associated with hazardous construction materials and building demolition works, however determined the risk to be low under current conditions. The SEE concluded the site is considered suitable for the proposed age car facility based upon the reviewed information.

Asbestos removal works of former buildings at the site identified as containing asbestos were undertaken by Kane's Construction and Riverina Asbestos Removal, with subsequent asbestos clearance reports provided by All Clear Inspections. Asbestos removal works were undertaken at the following buildings including the removed non friable ACM sheeting areas:

- Building C (Building 503), initial 2400 m^2, non friable;
- Buildings A (Building 501) and B (Building 502), 2400 m^2, non friable; and
- Building 503, subsequent 342 m^2, non friable.

All provided asbestos clearance reports reported asbestos had been removed to an appropriate standard. It should be noted, reported for damage to the buildings occurred following removal of asbestos containing materials, and as such non friable removal works were undertaken.

3.1 Previous Investigations

Previous site investigations were undertaken by McMahon and consisted of a Preliminary Site Investigation (PSI), the Stage 1 Detailed Site Investigation (DSI) and subsequent Sampling and Analysis Quality Plan (SAQP) to guide additional sampling requirements and provision of the DSI incorporating Stages 1 and 2.

The previous investigations comprised the following combined scope of work:

- Preliminary Site Investigation (McMahon 2018):
  - review of historical aerial photographs, titles and available NSW public registers regarding the site.
- Stage 1 Detailed Site Investigation (McMahon 2019a):
  - advancement of 22 boreholes to 1 metre below ground level (mBGL) adjacent to the locations of the demolished boiler rooms, operating hut, offices, incinerator and compound and waste disposal area;
  - collection of soil samples and submission for analysis of contaminants of potential concern, including metals, hydrocarbons, pesticides and polychlorinated biphenyls; and
  - advancement of a subsequent 12 boreholes to 1.5 mBGL around two locations of slightly elevated benzo(a)pyrene concentrations.
- Stage 1 and 2 Detailed Site Investigation (McMahon 2019b):
  - inspection of surface and near surface soils on a 10 metre by 10 metre gird for presence of asbestos, comprising a total of 1,138 grids;
  - subsequent sampling for bonded and friable asbestos to a depth of 0.3 mBGL based upon results from the previous inspection, comprising 235 quantification pits;
  - inspection of site services including water/ stormwater infrastructure and telecommunications boxes for the presence of asbestos;

- sampling for heavy metals in areas where structures were identified during the PSI and site inspections;
- sampling for pesticides and phenoxy herbicides in areas of former structures and open grassland;
- advancement of five strip trenches to delineate fibrous asbestos within the former building and demolition footprint of Building 503.

The inspection and laboratory results from the entirety of the investigation program indicated:

- surface soil contained bonded ACM fragments in 120 of the 1,138 10 m x 10 m grid squares investigated across the Stage 1 and Stage 2 areas;
- bonded ACM fragments were found in six of the test pits sampled;
- fibrous asbestos was detected in three of the 235 asbestos quantification pits sampled;·
- water and stormwater pipes inspected contained no ACM; and
- one decommissioned telecommunication box uncovered during sample pit excavation contained ACM.

All 72 previous structures and open space sites sampled for heavy metals, OCP/OPP and phenoxy herbicide analysis returned results below Method Detection Limits (MDLs) and/or the Health Investigation Level (HIL) criteria for Residential 'A' land use.

3.2 Objectives of This RAP

The overarching objective of the RAP is to remediate the site so that it is rendered safe for future low density residential (Health Screening Level A) use with potential garden/accessible soil and the contamination is managed compliantly with NSW regulations.

The objective of the remediation and validation is to render the site soils currently impacted by asbestos, suitable for ongoing residential use in accordance with SEPP 55 and the NEPM (ASC).

The principal elements of this RAP include outlining the following:

- complete/ Lodge & Gain SafeWork NSW Approval to remove asbestos;
- PPE and health and safety requirements for site work;
- waste classification requirements for materials to be disposed off site;
- remediation criteria;
- remediation process including delineation and supervision by a licenced asbestos assessor and asbestos removal contractor; and
- validation requirements.

3.3 Guidelines and Legislative Framework

The RAP incorporates guidance from the following:

- ANZECC (1999). Guidelines for the Assessment of On-Site Containment of Contaminated Soil, September 1999;
- 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;
- ASTM (2000) Standard Practice D2488 90 Description and Identification of Soils (Visual-Manual Procedure). American Society for Testing and Materials;
- EnHealth (2012) Environmental Health Risk Assessment: Guidelines for assessing human health risks from environmental hazards, Department of Health and Ageing and EnHealth Council, Commonwealth of Australia (2012);
- National Environmental Protection Council (NEPC) (2013). National Environment Protection(Assessment of Site Contamination) Measure 1999 (as amended April 2013);
- NHMRC & NRMMC (2011). Australian Drinking Water Guidelines (ADWG) - National Health and Medical Research Council & Natural Resource Management Ministerial Council;
- National Environmental Protection Council (NEPC) (2013). National Environment Protection(Assessment of Site Contamination) Measure 1999 (as amended April 2013);
- NHMRC & NRMMC (2011). Australian Drinking Water Guidelines (ADWG) - National Health and Medical Research Council & Natural Resource Management Ministerial Council;
- NSW Department of Urban Affairs and Planning (1998) Managing Land Contamination: Planning Guidelines: SEPP 55 Remediation of Land, August (1998);
- NSW EPA (1995). Sampling Design Guidelines (1995);
- NSW EPA (1996). Protection of the Environment Operations (Waste) Regulation (1996);
- NSW EPA (2014). Technical Note: Investigation of Service Station Sites, NSW EPA, April (2014);
- NSW EPA (2014). Waste Classification Guidelines (November 2014);
- NSW EPA (2015). Guidelines on the Duty to Report Contamination under the Contaminated and Management Act 1997 (July 2015);
- NSW EPA (2017) Guidelines for the NSW Site Auditor Scheme (3rd Ed.) (2017);

- NSW EPA (2019) Consultants reporting on contaminated land. Contaminated land guidelines (Draft).
- NSW OEH (2011). Guidelines for Consultants Reporting on Contaminated Sites (2011). NSW Office of Environment and Heritage;
- NSW Workcover (2014) Managing asbestos in or on soil. March (2014);
- Safe Work Australia (2016) Code of Practice, How to Safely Remove Asbestos. April (2016);
- Standards Australia (1993) AS1726-1993. Geotechnical site investigations Australian Standard;
- Standards Australia (2005). Guide to the investigation and sampling of sites with potentially contaminated soil. Part 1: Non-volatile and semi-volatile compounds AS4482.1 (2005) and Part 2: Volatile substances, AS4482.2 (2005);
- USEPA (2000). Guidance for the Data Quality Objectives Process, EPAC QA/G-4 DEC/600/r- 96/055, United States Environmental Protection Agency Office of Environmental Information, Washington DC;
- Western Australia Department of Health (2009). Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia.

4 Site Conditions and Local Environment

4.1 Site Description and Current Use

Details of the site are outlined in Table 2 – Site identification. Figure 2 presents an approximate site layout and refer to Figure 3 and 4 the locations of identified asbestos at the site.

The site is predominantly disused and vacant with the exception of the Regional Archives and Conservatorium of Music which remain operational. The St Mary Mackillop College will continue operating, and is outside of the scope of the proposed development, and subsequently the DSI and this RAP.

4.2 Surrounding Land Use and Water Bodies

The site is an industrial use and zoned as SP2 - Infrastructure The surrounding land uses are described in Table 3.

Table 4: Surrounding Land Use

Direction	Land Use or Activity
North	Wagga Wagga Veterinary hospital and low density residential developments.
East	Low density residential developments, the Henschke Primary School and churches.
South	The Wagga Wagga NSW Ambulance station beyond which is Fernleigh Road.
West	Open land, beyond which is the Juvenile Justice Centre, a rail line and commercial and light industrial premises including scrap metals, an animal shelter and construction material suppliers
Nearest Surface Water Bodies	Flowerdale Lagoon and the Murrumbidgee River are located approximately 2 to 2.5 km north of the site..

4.3 Topography, Drainage and Groundwater

The site surface elevation is approximately 190 to 220 metres with respect to the Australian Height Datum (mAHD). Slope on the site was reported as relatively consistent with the site generally sloping to the north west. Site surface waters are limited, with overland flows expected to be directed via the onsite and Council stormwater systems, prior to discharge to Flowerdale Lagoon and subsequently the Murrumbidgee River. Rainfall is expected to follow the natural inclines of the site, as well as infiltrate through the relatively permeable site topsoils.

4.4 Regional Geology and Hydrogeology

4.4.1 Site Geology

The site is reported as being underlain by two geological landscapes. The underlying geologies were reported by the DSI (2019b) as undivided Ordovician metasedimentary rocks and colluvium with interbedded siltstone, sandstone, shale, hornfels phyllites, minor schists and quartzite deposits. Ordovician metasediments are considered to be the primary underlying geology beneath the development location, with colluvial clayey sediments overlying the weather zone in the lower elevation areas.

Surface soils at the site were reported as brown silty clays and sandy clays.

4.4.2 Hydrogeology

The Geoscience Australia hydrogeology dataset describes the groundwater beneath the site as highly extensive, porous aquifers of moderate to high productivity. Groundwater is considered likely to be saline based on the regional Wagga Wagga urban salinity. Two registered bores are reported on site, and 23 registered bores are located within 500 metres of the site. Based upon review of the bore data presented in the DSI (2019), a shallow groundwater table between 4 metres and 10 mBGL, underlain by a deeper aquifer at depths exceeding 60 mBGL. Boreholes advanced during the initial McMahon Stage 1 DSI (2019a) reported groundwater at 4.5 mBGL. Anecdotal evidence provided by Wagga Wagga Council through their groundwater monitoring programs reported groundwater at 0.09 mBGL in the lower surface elevation northwest of the site, however this was not identified through site investigations and test pitting works. The saline nature of the groundwater should be considered during future construction and landscaping with regard to aggressivity to concrete and salt stress to vegetation.

4.5 Areas of Environmental Concern

The review of site history and the previous investigations undertaken by McMahon Earth Sciences identified asbestos containing materials on the site surface and within test pits. Asbestos observed during the McMahon investigations was removed at the time of sampling, however subsequent inspection identified asbestos remaining within five locations at the site. These locations include the footprint of building 527 and the central area of rubble/fill within Area 2, asbestos fines within the footprint of former building 503 in Area 3, asbestos fines and fill adjacent to former building 502 in Area 4 and asbestos containing material within the footprint of a historically demolished building in Area 8. Based on the above, the identified impacted areas include:

Table 5: Areas of Environmental Concern

AECs	Observations	Sampling results	Impacted soil depth (mbgl)	Impacted area	Volume (m^3)
Area 1	Current CSU Buildings 525 & 526. Former RAAF buildings. Former CSU Buildings 521, 523 & 534 as well as 5 ancillary buildings. Clearance reports for Buildings 525 & 526. See McMahon PSI (2018).	Surface and near surface ACM noted below HIL A assessment criteria within shallow fill.	<0.1	Former building footprints and potential current building footprints within Area 1. Extent forms part of area of bonded asbestos presented in Figure 4.	n/a
Area 2	No current CSU buildings. Former RAAF buildings. Former CSU Buildings 504, 505, 506, 510 & 527. Clearance reports for Buildings 504, 505, 506 & 527. See McMahon PSI (2018).	Surface and near surface ACM noted. Potential fibrous asbestos in building 504-506 footprint, however quantification not undertaken. Footprint of building 527 contained 1 sample exceeding asbestos criteria.	<0.1	Former building footprints and potential current building footprints within Area 2. Extent forms part of area of bonded asbestos presented in Figure 4.	n/a
Area 3	Current CSU Building 507. No former RAAF buildings. Former CSU Building 503. No clearance reports for buildings. See McMahon PSI (2018).	a. Surface and near surface ACM noted below HIL A assessment criteria. b. Fibrous asbestos detected in pits 4,18 & 347 above assessment criteria.	a. <0.1 b. <0.2 within northern verge, 0.1 within building footprint	a. Former building footprint areas within Area 3. Extent forms part of area of bonded asbestos presented in Figure 4. b. 800m^2 within northern verge (topsoil), 3,000m^2, within building 503 footprint (Fill) 600 m3 (ex situ) to be excavated and disposed offsite.	a. n/a b. 600m^3 based on 1.3 x bulking factor

Area 4	No current CSU buildings. No former RAAF buildings. Former CSU Building 502 (burnt down in 2019). No clearance report for building. See McMahon PSI (2018).	Surface and near surface ACM noted below HIL A assessment criteria, however has not been quantified in the area associated with building 502.	<0.1	Former building footprint areas within Area 4. Extent forms part of area of bonded asbestos presented in Figure 4.	n/a
Area 5	No current CSU buildings. No former RAAF buildings. No former residences. See McMahon PSI (2018).	Surface and near surface ACM noted below HIL A assessment criteria.	<0.1	Former building footprint areas within Area 5. Extent forms part of area of bonded asbestos presented in Figure 4.	n/a
Area 6	No current CSU buildings. No former RAAF buildings. Former residences and sheds. No clearance reports for buildings. See McMahon PSI (2018).	Surface and near surface ACM noted below HIL A assessment criteria.	<0.1	Former building footprint areas within Area 6. Extent forms part of area of bonded asbestos presented in Figure 4.	n/a
Area 7	No current CSU buildings. No former RAAF buildings. Former CSU ancillary building. No clearance report for CSU ancillary building. See McMahon PSI (2018).	Surface and near surface ACM noted below HIL A assessment criteria.	<0.1	Former building footprint areas within Area 7. Extent forms part of area of bonded asbestos presented in Figure 4.	n/a
Area 8	No current CSU buildings. No former RAAF buildings. Former CSU ancillary building. No clearance report for CSU ancillary building. See McMahon PSI (2018).	Surface and near surface ACM noted below HIL A assessment criteria, with the exception of one sample obtained from former ancillary building footprint which contained bonded ACM.	<0.1	Former building footprint areas within Area 8. Extent forms part of area of bonded asbestos presented in Figure 4.	n/a

Area 9	No current CSU buildings. Former RAAF buildings. No clearance report for CSU ancillary building. See McMahon PSI (2018).	Surface and near surface ACM noted below HIL A assessment criteria.	<0.1	Former building footprint areas within Area 9. Extent forms part of area of bonded asbestos presented in Figure 4.	n/a

4.6 Conceptual Site Model Summary

The conceptual site model for the remediation works has been prepared below based on the findings of the DSI. The environmental risk assessment is based on a contaminant (source) - exposure pathway - receptor methodology. This relationship allows an assessment of potential environmental risk to be determined, in accordance with the current national guidelines.

Central to the requirements for the assessment of risk is the development of an initial conceptual site model (CSM), identifying each contaminant source and the associated receptor exposures.

Table 6: CSM Summary

Source Location	Contamination Category	Potential and Confirmed Sources	Potential and Confirmed Pathways	Potential and Confirmed Receptors	Summary
Onsite	Hazardous Materials	**Potential**: Fibrous asbestos surficially in soil materials. **Confirmed**: Yes, in 3 test pits within and adjacent to the former building 503 footprint. Strip trenching and site observations delineated the area to topsoil adjacent to Building 503 and fill within the former building footprint. Source considered to be improper asbestos removal works.	**Potential**: Inhalation. **Confirmed**: Yes.	**Potential**: Current and future site users. Maintenance and construction workers. **Confirmed**: Yes, potential exposure to current grounds staff and construction workers involved in the site redevelopment. Potential transport to unimpacted areas through the construction process and impact to future site users.	Asbestos has been delineated via the initial soil sampling, and the subsequent strip trenching and observations of soil strata. Remediation of the material is required as the risk to current and future users is considered unacceptable.
		Potential: Bonded asbestos surficially in soil materials. **Confirmed**: Yes, throughout the soil surface below assessment criteria. Based on site observations and location of historical buildings, bonded asbestos considered to be due to improper demolition of	**Potential**: Inhalation. **Confirmed**: No, concentrations are below what would be considered a potential risk to human health.	**Potential**: Current and future site users. Maintenance and construction workers. **Confirmed**: Potentially, potential exposure to current grounds staff and construction workers involved in the site redevelopment through disturbance. Potential transport to unimpacted areas through the construction	Bonded asbestos has been identified throughout the development area, however at concentrations below the assessment criteria and are therefore not considered a risk to human health

		structures and confined to areas of former buildings.		process and impact to future site users.	
		Potential: Bonded asbestos in services. **Confirmed**: Partial. Bonded asbestos identified in one communications box at the site. Due to the underground service network being inaccessible, the presence of bonded asbestos is unknown in services.	**Potential**: Inhalation. **Confirmed**: No, the known asbestos containing communications box is in good condition and does not pose a risk in its current state. Additional investigation required to determine potential risk posed by underground services.	**Potential**: Current and future site users. Maintenance and construction workers. **Confirmed**: Potentially, potential exposure to current grounds staff and construction workers involved in the site redevelopment through damage. Potential transport to unimpacted areas through the construction process and impact to future site users.	Identified bonded asbestos within the communications box is in good condition and not considered to pose a risk. Additional investigation is required to close out the current data gap associated with the underground services and determine risk, if any.

Based on the above, there is considered to be a risk to current and future human receptors posed by fibrous asbestos at the site. Due to the low concentrations of bonded asbestos when compared to the assessment criteria, there is not considered a risk to current or future human receptors, however consideration of management of bonded asbestos containing material through the construction process will be required.

4.7 Extent of Required Remediation

Fibrous asbestos was reported in three quantification pits adjacent to former building 503 within the Stage 2 development area. The fibrous asbestos was subsequently delineated through the advancement of strip trenches, and inspection and sampling of soils encountered. An approximate area of remediation based on the sampling undertaken during the DSI is presented in Figure 4.

Remediation of bonded asbestos at the site is not required due to concentrations being below the assessment criteria, and therefore posing minimal risk. As the materials are to be excavated however, soil will need to be managed during the construction process to ensure concentrations remain suitable for the proposed land use, and asbestos is not spread to unimpacted areas. The area requiring management consists of surficial soils within the Stage 1 and Stage 2 development areas, as shown on Figure 4.

Based on the above, remediation works and subsequent validation are required for the identified fibrous asbestos within the development area. Both Stage 1 and Stage 2 development areas require construction stage management of the identified bonded asbestos in areas of former

buildings, which does not pose a current risk to receptors due to concentrations being below the adopted assessment criteria, and therefore does not require remediation.

All buildings have been removed at site with the exception of buildings 501, 507, 510 and 514, which will be removed prior to earthworks commencement. Following removal of existing buildings, the building footprints will require assessment as to remediation requirements, if any. Due to the presence of underground services at the site which have not been assessed, there is the potential for these to contain asbestos, and subsequently require consideration.

4.7.1 Demolished Building Areas

Multiple buildings have been demolished at the site, with some uncertainty to the exact former locations and asbestos/hazardous material removal work quality reported during the DSI. These include buildings 201, 504, 505, 506, 511, 512, 514, 519, 521, 523, 524, 527, 528, 529, 533, 534, 535, 536 and 537. Recently utilised buildings, Blocks A (Building 501), B (Building 502) and Block C (Building 503), were identified as containing non-friable asbestos in building materials, including walls, eaves and flooring. These buildings have subsequently had asbestos removal works undertaken, with clearance reports issued, with the exception of the sub-flooring in building 501 which is scheduled for removal. Following asbestos removal works, buildings 502 and 503 were demolished.

During the McMahon DSI, fibrous asbestos was reported within three quantification pits adjacent to former Building 503. As such, these locations require further delineation and remediation.

The pending asbestos removal works within Building 501 are the outstanding remediation works with regard to structures at the site.

4.7.1.1 Delineation Completed in DSI

During the McMahon DSI, the site, including former building footprints, was divided into 1,138 grid squares for visual inspection of asbestos. Based on this, a further 235 test pits to 0.3m depth were advanced within, and adjacent to the former building footprints, among other potential areas of concern. Following identification of fibrous asbestos in 3 test pits within and adjacent to the former Building 503 footprint, five strip trenches were advanced, soil stratigraphy logged and samples analysed to delineate the impacted area.

4.7.1.2 Delineation Uncertainty

As building 501 is yet to undergo asbestos removal and subsequent demolition, there is uncertainty as to the potential for impacted soil material within the building footprint.

4.7.2 Residual (Not Demolished) Building Areas

In addition to Building 501 which is pending removal, Buildings 507, 510, 525 and 526 remain onsite. The buildings are reported to be constructed of brick walls with corrugated iron roofing.

Carports P61 and P67 also remain onsite, and are constructed of steel truss/brick walls and ceilings with corrugated iron roofing.

Based on the above, with the exception of Building 501, the remaining site structures are not considered to require asbestos removal works.

4.7.2.1 Delineation Completed in DSI

During the McMahon DSI, the site, including adjacent to existing structures, was divided into 1,138 grid squares for visual inspection of asbestos. Based on the observations made during the grid square inspections, quantification pits to 0.3m below ground were advanced in areas of potential concern adjacent to structures.

4.7.2.2 Delineation Uncertainty

Areas beneath existing structures have not been inspected or sampled during the DSI. As such, following demolition of the structures, the soil surface should be inspected and sampled as per the below.

4.7.3 Buried Pipelines and Structures

The site is reported as containing an extensive underground service and drainage network. Where possible, services were inspected during the DSI, however the majority of service pits were found to be sealed, and therefore inaccessible. As a result, there is the potential that this network contains asbestos.

4.7.3.1 Delineation Completed in DSI

Service pits were inspected during the DSI, however underground services were unable to be inspected or sampled, and therefore have the potential to contain asbestos.

4.7.3.2 Delineation Uncertainty

There is uncertainty regarding the underground services and drainage systems at the site, with them considered to have the potential to contain asbestos.

4.7.4 General Surface Areas (Stage 1 - Northern Area)

Surficial asbestos fragments at concentrations below the adopted assessment criteria were identified within grid squares and subsequent sampling in the Stage 1 - Northern area during the DSI. Prior to site validation this area should be included in the site wide inspection and clearance validation requirements.

4.7.4.1 Delineation Completed in DSI

General surface areas within Stage 1 were included in the site wide grid square inspections. These works included tilling to 0.1m below ground surface, and the advancement of soil quantification pits to 0.3m depth.

4.7.4.2 Delineation Uncertainty

While surficial asbestos materials observed during the DSI were removed at the time of sampling, uncertainty regarding the quality of the removal exists, with no documented clearance or validation for the Stage 1 area undertaken. Based on the locations of identified asbestos, and comparison to the former building footprints, it is considered that surficial bonded asbestos is present to some extent within all areas of building footprints.

4.7.5 General Surface Areas (Stage 2 - Southern Area)

Surficial asbestos fragments were identified within grid squares and subsequent sampling in the Stage 2 - Southern area during the DSI. Asbestos was removed at the time of inspection during these works. An asbestos containing communications pit was observed adjacent to Building 502, and will require removal prior to site validation. Based on the locations of identified asbestos, and comparison to the former building footprints, it is considered that surficial bonded asbestos is present to some extent within all areas of building footprints.

Following removal of the asbestos containing communications pit, and prior to site validation general surface areas should be included in the site wide inspection and clearance validation requirements.

4.7.5.1 Delineation Completed in DSI

General surface areas within Stage 2 were included in the site wide grid square inspections. These works included tilling to 0.1m below ground surface , and the advancement of soil quantification pits to 0.3m depth.

4.7.5.2 Delineation Uncertainty

While surficial asbestos materials observed during the DSI were removed at the time of sampling, uncertainty regarding the quality of the removal exists, with no documented clearance or validation for the Stage 2 area undertaken.

5 Remediation Options

Remediation options are based on the identified asbestos contamination at the site as reported by the DSI (2019b). The remediation options are founded on the site's proposed land use as retirement housing and a community centre.

For the purposes of this RAP, remediation is proposed to be undertaken on areas where asbestos has been identified in previous investigations. During remediation, delineation of the identified asbestos shall be undertaken followed by removal works. Additional asbestos clearance and soil sampling works are to be completed to validate residual soils after remediation.

5.1 Remediation Goals

The remediation goals are outlined as follows:

- removal of unacceptable risks to human health and the environment from the identified asbestos contamination at the site, such that the site is suitable for the proposed land use as an aged care facility;
- validate the remedial works in accordance with the relevant NSW EPA Guidelines and with reference to the adopted site criteria, or, install suitable control measures to manage future risks posed by residual asbestos contamination; and
- document the validation and/or management process.

5.2 Consideration of Remediation Options

Remediation options have been considered in accordance with the Guidelines for the NSW Site Auditor Scheme (NSW EPA 2017) with the preferred hierarchy of options for soil remediation and management as follows:

1. delineation and on-site treatment of the soil so that the contaminant is either destroyed or the associated risk is reduced to an acceptable level; and
2. delineation and off-site treatment of excavated soil so that the contaminant is either destroyed or the associated hazard is reduced to an acceptable level, after which the soil is returned to the site; or

If the above options are not practicable:

3. consolidation and isolation of the soil on the site by containment with a properly designed barrier or cell;

4. delineation and offsite disposal of contaminated material to an approved facility or site; and
5. do nothing.

Consideration of the above remediation options is based on aspects of sustainability, including economic, environmental and social, of which an appropriate balance between potential benefits and impacts is considered.

Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia (WA DoH 2009) were adopted to provide guidance when assessing the acceptability of any remediation, considering the minimisation of the following:

- risk to human health;
- disturbance of contaminated material; and
- contaminated material moved to landfill.

The potential remediation options are assessed in Table 5 below. The preferred remediation option(s) is highlighted in **bold**.

Table 7: Remediation Options Matrix

Remediation option	Discussion	Conclusion
Option 1: Delineation and on-site treatment of the soil so that the contaminant is either destroyed or the associated risk is reduced to an acceptable level	On-site treatment options for fibrous asbestos materials are not available which reduce the risk to receptors.	Not a viable option
Option 2: Delineation and off-site treatment of excavated soil so that the contaminant is either destroyed or the associated hazard is reduced to an acceptable level, after which the soil is returned to the site	Off-site treatment options for fibrous asbestos materials are not available which reduce the risk to receptors.	Not a viable option
Option 3: Consolidation and isolation of the soil on the site by containment with a properly designed barrier or cell	**As the Stage 2 works area involve bulk earthworks, over-excavation and disposal of clean material would be required to contain impacted materials. Encapsulation on site is commercially viable when compared to high volume off site disposal costs, however does leave onsite liability and may decrease potential land values. Encapsulation beneath roads and easements, or subdivision as a separate lot and encapsulation under a Section 88b Planning Instrument minimises ongoing liability, Requires consideration to material suitability for future land uses, development of a long term Environmental Management Plan including responsibilities and management requirements, cell locations to be surveyed and clearly delineated and documented, with the cell area included on the council PCLR.**	**Viable option**
Option 4: Delineation and removal of contaminated	**A suitably licensed facility is present in the Wagga Wagga Shire Council area to accept asbestos wastes. Offsite disposal of**	**Viable option**

material to an approved facility or site	**asbestos materials removes the risk to human health and can be incorporated into the development works with regard to required plant and machinery.**	
Option 5: Do nothing	Does not mitigate the risk to human health.	Not a viable option

5.2.1 Preferred Remediation Strategy

Of the possible remediation options presented in Table 4, the preferred remediation strategy for the site is consolidation and isolation of the soil offsite through subdivision of a commercial lot through a Section 88B instrument and subsequent containment with a properly designed barrier or cell.

However a preference of Council as a primary stakeholder and owner of land after development is to not have an onsite containment cell due to ongoing management requirements. Therefore, the next preferred strategy of removal of asbestos impacted soil to an offsite licensed landfill facility has been selected after waste classification in accordance with the NSW EPA (2014) Waste Classification Guidelines.

This remediation method would be undertaken as follows:

1. the stripping of an approximate 3,800 m^2 area of fibrous asbestos containing topsoil and fill materials in the former building 503 area, as presented in Figure 4, followed by stockpiling within the lot boundary and near to the excavation area;
2. classification of the stockpiled fibrous asbestos containing material in accordance with the NSW EPA (2014) Waste Classification Guidelines;
3. disposal of fibrous asbestos containing materials to a landfill licensed to accept fibrous asbestos waste under waste tracking protocols;
4. stripping and separate stockpiling of the high asbestos-potential building footprints (502, 504, 505, 506, 527 and the area 8 ancillary building) for sampling after demolition of the buildings;
5. management of Stage 1 & 2 cut and fill through stripping of the top 100 mm of surface material within the bonded area to be stockpiled and managed, and validation, including identification of services, and reuse (if suitable); and
6. sample and validation of areas previously potentially containing asbestos as shown in Figure 4.

In its current condition, the asbestos conditions may pose a long-term risk to human health at the site, as well as a risk to construction workers involved in the development works. Offsite disposal is considered a viable method to remove the potential risk to human receptors.

5.2.2 Justification for Preferred Remediation Strategy

Of the possible remediation options, offsite disposal is a viable method to meet the project goal of making the site suitable and preferred by key stakeholders to avoid ongoing management requirements.

5.2.2.1 Social Considerations

In specific reference to the remediation of site contamination, social considerations will include community and sustainability and achieving an acceptable balance between the impacts of undertaking remediation activities and the benefits those activities will deliver in terms of the environmental, economic and social indicators relevant to the site.

The overarching social consideration will be the ultimate development of a community aged care facility. The remedial option selected will remove the current risk posed by fibrous asbestos at the site.

6 Waste Classification

If impacted soil is required to be disposed offsite it will require waste classification to facilitate disposal at an appropriately licensed landfill. Soil material should be sampled at a ratio of 1 sample/25 m^3 for waste classification prior to disposal to a licensed facility. Based on the previous sampling data which did not include leachate sampling, the soil would currently be classified as Restricted Solid Waste mixed with Special Waste (asbestos), however this is expected to be reduced to General Solid Waste mixed with Special Waste (asbestos) upon Toxicity Characteristic Leaching Procedure (TCLP) analysis.

7 Remediation Criteria

Based on the DSI (2019a and 2019b), the only contaminant requiring remediation identified at the site is asbestos. Therefore, after remediation, the following soil remediation criteria apply.

7.1 National Environment Protection (Assessment of Site Contamination) Measure 2013 (NEPM)

The NEPM (2013) was updated to include a more scientific, site-specific risk-based assessment. The updated NEPM helps determine the human health and ecological risk more specifically in order to more effectively address site-specific pathways and receptors. The NEPM is legislated in New South Wales under the Environment Protection Act 1970 and contains relevant soil criteria

that have been adopted for residential, public open space and commercial and industrial sites. The relevant criteria for the proposed future land use, and subsequently for the site to be considered suitable following the remediation works is as follows:

- **Asbestos in Soil Health Screening Level (HSL) – A - Residential** (NEPM Schedule B1, Table 7). Health screening levels for asbestos in soil, which are based on scenario-specific likely exposure levels, are adopted from the Guidelines for the Assessment, Remediation and Management of Asbestos- Contaminated Sites in Western Australia (WA DoH 2009) guidelines. Health screening levels for asbestos contamination in soil have been adopted.

Based on the above, Table 6 below presents the Remediation Criteria for the proposed works.

Table 8: Asbestos Remediation Criteria

Form of Asbestos	HSL A (w/w)
Bonded ACM	0.01%
Fibrous Asbestos and Asbestos Fines (friable asbestos)	0.001%
All forms of asbestos	No visible asbestos for soil surface

7.2 Waste Disposal

Following waste classification of material required to be disposed offsite, it should be transported under waste tracking conditions to a facility licensed to accept the class of waste. The nearest facility which accepts asbestos waste is the Gregadoo Waste Management Centre, located at 132 Ashfords Road, Lake Albert NSW 2650, approximately 14 km by road to the south.

Waste disposal dockets should be retained for all materials disposed offsite, and matched with the corresponding waste classification for inclusion in the site validation.

8 Remediation & Construction Program

The proposed remediation strategy incorporates the following elements:

1. implementation of an accepted Construction Environmental Management Plan (CEMP) during remediation works;
2. begin close out of data gaps through sampling beneath existing structures and underground services;
3. stripping of the area of identified fibrous asbestos impacted soil in and around the former building 503 footprint, and stockpiling within the lot boundary near to the excavation area;
4. classification of stockpiled fibrous asbestos containing soil materials in accordance with the NSW EPA (2014) Waste Classification Guidelines and disposal offsite at an appropriately licensed landfill;
5. stripping and stockpiling of the high asbestos potential building footprints (502, 504, 505, 506, 527 and the area 8 ancillary building);
6. construction management through supervision by person appropriately trained in asbestos identification of stripping of surface material of bonded asbestos areas within the Stage 1 area (as shown on Figure 4), transport to the Stage 2 area and stockpiling;
7. visual inspection of the residual Stage 1 soils;
8. construction management through supervision by person appropriately trained in asbestos identification of stripping of surface material of bonded asbestos areas within the Stage 2 area (as shown on Figure 4) and stockpiling;
9. sampling of stockpiled soils by the environmental consultant to determine suitability for reuse and subsequent assignment of a material tracking ID;
10. visual inspection of all areas identified as containing asbestos;
11. based on material suitability for reuse, replacement of soils following excavation;
12. after remediation is completed, site-wide (Stage 1 and 2) validation will be required in 10 m x 10 m areas as per Section 11 and the Validation report prepared for the site.

8.1 Data Gap Close Out

To adequately close out existing data gaps for areas beneath existing structures and underground services the following sample designs are to be applied.

8.1.1 Beneath Existing Structures

1. Undertake a site walkover of the former building footprint by a person appropriately trained in asbestos identification (environmental consultant, licensed asbestos assessor or hygienist);

2. Advancement of five test pits within the former building footprint and inspection for potentially asbestos impacted fill;
3. In the event potential asbestos impacted fill is encountered, continue test pits to base of fill and collect one soil sample per test pit for analysis of asbestos as per NEPM 2013 (including AS4964). Samples of potential asbestos containing material should also be collected and analysed for the presence of asbestos; and
4. Where fill is found to contain asbestos, the remedial and construction management process outlined in Section 8.2 onwards should be implemented for the entirety of the building footprint based upon concentrations identified in soil.

8.1.2 Buried Pipelines and Structures

1. Services should be located prior to excavation and confirmed to be redundant;
2. Excavation should be undertaken with due care so as not to damage the structure, with the final 100mm exposed via hand tools to ensure services are not damaged. If the services are likely to be damaged they should be wetted during excavation;
3. Once exposed, services should be inspected by an appropriately trained person. Services which are visually identified as being either of fibre cement construction, or containing a fibrous lagging, shall be sampled and analysed for the presence of asbestos;
4. HOLD POINT - Services shall not be removed until analytical results are received;
5. Services which are found to not contain asbestos are to be removed as per standard practice. Services containing asbestos shall be removed as per SafeWork guidelines;
6. The identified asbestos containing communications box shall be removed during the service removal process in accordance with SafeWork guidelines; and
7. Inspection reports should be retained for all services. Services containing asbestos shall be validated as per Section 11.

8.2 Pre-Remedial Works and Site Establishment

Initial activities at the site shall involve the establishment of all plant and equipment necessary for the remediation works. Prior to the commencement of any earthmoving activities, it will be necessary to prepare an asbestos removal control plan, provide notification to regulators, and install environmental protection safeguards, as well as site security measures. These measures include:

- Notification to Council in accordance with SEPP 55 - Remediation of Land;
- Development of an asbestos removal control plan to identify the specific control measures the asbestos removal licence holder will use to ensure workers and other persons are not at risk when asbestos removal work is being conducted;

- Notification to the regulator in writing at least five days prior to the proposed remediation works commencing in accordance with the Safe Work Australia Code of Practice (2016);
- Undertaking service clearance to ensure no services will be damaged by the remediation works; and
- Designating stockpile areas, haul routes and decontamination areas for plant and machinery to be used during the works;
- Installation of barricades to limit access and asbestos signage in accordance with the Safe Work Australia Code of Practice (2016).

Pre-remedial and site establishment requirements are detailed in the following subsections.

8.2.1 Pre-Remedial Works

Prior to remedial works commencing notification to regulators will be required.

The proposed remediation works are considered Category 2 remediation works, based on the following assessment of clause 9 of SEPP 55:

- The work is not considered designated development.
- The work is not on land identified as critical habitat.
- The work is not likely to have a significant effect on threatened species, populations, ecological communities or their habitats.
- Is carried out or to be carried out in an area or zone to which any classifications to the following effect apply under an environmental planning instrument:
    - coastal protection;
    - conservation or heritage conservation;
    - habitat area, habitat protection area, habitat or wildlife corridor,
    - environment protection;
    - escarpment, escarpment protection or escarpment preservation;
    - floodway;
    - littoral rainforest;
    - nature reserve;
    - scenic area or scenic protection; and
    - wetland.

- Is not carried out or to be carried out on any land in a manner that does not comply with a policy made under the contaminated land planning guidelines by the council for any local government area in which the land is situated.

Category 2 remediation works require that notice is given to the Wagga Wagga City Council at least 30 days prior to the commencement of the works. A notice complying with the requirements of Clause 16(3) of SEPP 55 should be prepared. Notice of completion of remediation works must also be provided within 30 days after completion of the work, consistent with Clauses 17(2&3) and 18. Furthermore, State Environmental Planning Policy (Housing for Seniors or People with a Disability) 2004, part 1, Clause 16 states development consent is required for the wider development, and development approval is required for the change of use of the site, and therefore the planning control and approval process for the remediation component of this development will be covered under the current project DA. As such an additional DA for the remediation works is not considered necessary. The Wagga Wagga Local Environmental Plan (LEP) (2010) additionally states that development consent is not required if the work is ancillary to other development for which development consent has been given.

An appropriately experienced and licensed Class A asbestos remediation Contractor (the remediation contractor) is required to undertake the works, under the supervision of an appropriately qualified SafeWork NSW (or equivalent) Licensed Asbestos Assessor for areas of fibrous asbestos. For remaining areas, works can be undertaken under the supervision of a Class B asbestos remediation contractor. The licensed contractor must submit a site-specific licence application, including asbestos removal control plan, to SafeWork NSW to undertake friable asbestos works at the site. This licence application must be made at least five working days before any asbestos works are commenced. Remediation works shall not commence until all required approvals, licences and notifications have been granted and/or received.

Furthermore, all required environmental and health and safety documentation must be completed prior to the commencement of remedial works including a health and environmental safety plan and CEMP. The CEMP shall be site specific, prepared in accordance with Guideline for the Preparation of Environmental Management Plans (DIPNR, 2004) and the Consultants Reporting on Contaminated Land (NSW EPA, 2020) and provide details regarding the Principal Contractor responsibilities for RAP implementation during the earthworks. This shall include, but not be limited to, excavation and inspection of surface soils, material tracking, stockpile segregation, unexpected finds protocol, service inspection and validation protocols through reference to the appropriate sections of the RAP.

8.2.2 Site Establishment

Based on the delineation works, the proposed remediation areas shall be established at the site with temporary fencing, or a similarly suitable physical barrier, installed surrounding the asbestos remediation area and proposed isolation area. A summary of the requirements for the

establishment of the asbestos remediation areas prior to asbestos removal works commencing is as follows:

- The asbestos remediation area/s shall be marked out and temporary fencing, or other easily recognisable barriers may be used to demarcate the proposed asbestos removal area;
- Installation of asbestos warning signs to asbestos removal works boundaries for the duration of the asbestos removal works and until final validation and clearance has been provided;
- The remediation contractor shall be responsible for undertaking a pre-start 'toolbox' talk with all personnel involved. No unauthorised/non-inducted personnel may enter any asbestos removal area; and
- Prior to remediation works commencing, undertake a waste classification of material to be disposed off site in accordance with the NSW Waste Classification Guidelines (2014). Appropriate asbestos controls and PPE shall be utilised by workers undertaking the waste classification works;

8.2.3 General Excavation and Plant Movement

Due to the presence of asbestos materials at the site, strict controls for excavation and plant movement are required to ensure asbestos is not tracked from areas containing asbestos to areas where asbestos has not been identified, or has previously been excavated. Furthermore, due to the footprints for Buildings 502, 504, 505, 506, 527 and Area 8 having elevated concentrations of asbestos, management early in the construction program will minimise the risk for improper management through the construction program. These include:

- rumble grids for the removal of soils from tracks and tyres should be installed at the boundaries of excavation zones;
- all plant which have operated in, or travelled through potential asbestos areas will require decontamination prior to exiting the area. Asbestos areas shall have clear entry and exit points;
- in the event movement from staging areas through asbestos impacted areas is required, this shall be via designated haul roads to remove plant contact with potential impacted soils. Haul roads shall be constructed of imported DGB or similar engineered fill. Material should be compacted and of at least 100 mm thickness;
- excavation of surficial soils in areas not under remediation shall be supervised through overseeing/watching the excavation by a person trained in the identification of asbestos. Where asbestos is identified, the area shall be placed under asbestos controls and the material segregated

- if materials are encountered during excavation that contain visual indicators of potential increased risk of asbestos (building rubble, brick, piping), these should be stockpiled separately, the environmental consultant notified and sampled at a higher density if required; and
- areas identified as containing a higher asbestos risk, such as the footprints to buildings 502, 504, 505, 506, 527 and the area 8 ancillary building should be separately stripped and individually stockpiled prior to stripping of the remaining areas of the site, with the exception of Building 503.

8.3 Remediation Works

A general summary of the requirements for the remediation works is as follows:

- the remediation contractor shall have total control of the fibrous asbestos remediation area for the duration of the asbestos remediation works and shall undertake all works in accordance with the requirements of their licence;
- all personnel entering the fibrous asbestos remediation area shall do so with the required personal protective equipment (PPE) at all times, including:
    - Disposable coveralls must be worn (Type 5, Category 3 or better);
    - Disposable gloves – non-disposable gloves must be cleaned within the decontamination unit in accordance with SWA (2016b);
    - P2 class respirator or higher – non-disposable respirators must be cleaned in the decontamination area in accordance with SWA (2016b);
    - Steel capped rubber soled work shoes or gumboots; and
    - PPE in accordance with the development site construction requirements.
- installation of static asbestos air monitors at locations surrounding all fibrous asbestos remediation works, including the proposed isolation area. Air monitoring shall be conducted for the duration of remediation and shall be completed in accordance with the National Occupational Health and Safety Commission's Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres – 2nd Edition [NOHSC: 3003 (2005)];
- the proposed asbestos remediation areas shall be kept damp by water spraying at all times during disturbance to reduce the possibility of dust generation;
- soils shall be excavated in a suitable manner to the required depth as detailed below. Plant operators undertaking intrusive works must close cabin doors and windows and set

air conditioning to recirculate when operating within the asbestos work zone or wear PPE as listed above;

- the asbestos containing communications box shall be removed under bonded asbestos conditions as described in the Safe Work Australia Code of Practice (2016);
- buildings which contain asbestos will have the hazardous material survey (HMS) reviewed prior to being demolished as per the Safe Work Australia Code of Practice (2016), following which the HMS will be updated and clearance certificate issued;
- excavated fibrous asbestos impacted soils and asbestos containing materials shall be stockpiled within the lot boundary, near to the excavation area. Stockpiling shall be on geofabric, wet down and appropriately covered to ensure airborne fibres are not produced and in accordance with Section 8.4.3 and the Landcom (2004) Managing Urban Stormwater: Soils and Construction. Trucks and mobile plant transporting asbestos containing materials will be decontaminated prior to leaving the remediation area, ensuring all soil materials are removed from tyres. Asbestos loads will be covered while underway;
- stockpiled soil materials shall be classified in accordance with the NSW EPA (2014) Waste Classification Guidelines through sampling at a rate of 1 sample per 25 cubic metres, and subsequent preparation of a Waste Classification Report in accordance with NSW EPA requirements; and
- offsite disposal of fibrous asbestos containing materials will be undertaken at a suitably licensed waste facility in accordance with the NSW EPA waste classification guidelines (NSW EPA 2014) and landfill requirements. Asbestos materials shall be tracked and reported to the NSW EPA using WasteLocate. Waste dockets shall be provided by the Class A contractor to the Licensed Asbestos Assessor and environmental consultant to form part of the ground surface clearance report.

8.3.1 Building 503 Fibrous Excavation and Clearance

The following remediation areas within the former Building 503 area are known to require remediation as shown on Figure 4 and detailed below:

1. Northern verge adjacent to building footprint containing DSI Pits 347 and 4 (combined 800 m^2) - excavation to 0.1 m depth based on strip trenching.
2. Former Building 503 footprint containing Pit 18 (3,000 m^2) - excavation to 0.2 m depth based on strip trenching.

The above areas shall have the asbestos impacted surface soils stripped (topsoil within area 1 and compacted fill within area 2 above) under asbestos conditions, with material then covered and transported to an area within the lot boundary and near to the excavation for stockpiling. The area will then be visually cleared, including raking to a depth of 0.1 mbgl to ensure all fill and

topsoil materials have been removed by a licensed asbestos assessor and residual asbestos fragments removed. Based on the above measurements, an in situ volume of approximately 380 m^3 will require containment. Based on a bulking factor of 1.3:1, approximately 500 m^3 of material is expected to require classification.

Following visual inspection, undertake soil validation works in accordance with WA DoH 2009, with 500 ml samples collected for analysis at a rate of one sample per 10 square meters from the excavation floor for the area of fibrous asbestos by the environmental consultant.

8.4 Construction Phase Material Management

8.4.1 Stage 1 & 2 Bonded Asbestos Excavation and Clearance

The following management steps will be undertaken within the Stage 1 and 2 bonded asbestos areas (refer to Figure 4):

- excavation of the surficial 0.1 m of bonded asbestos impacted soil under Class B asbestos conditions;
- transport of excavated material to a designated stockpile area by covered truck, under asbestos conditions;
- Stockpiling of material in accordance with 'blue book' guidance, with stockpiles not to be greater than 500 cubic metres in size;
- subsequent inspection, turning over of stockpiles of stockpiles while test pitting using an excavator to adequately characterise stockpile materials and sampling of soil materials at a rate of 1 500 ml sample per 200 cubic metres and analysis for asbestos. A rate of 1 per 200 cubic metres has been selected based on the site being adequately characterised by the data provided by the DSI and additional resampling of soil to be undertaken during the works;
- upon receipt of analytical results, comparison to the assessment criteria detailed in Section 7 to confirm the material suitability. Stockpiles which are suitable for reuse shall be labelled accordingly and covered to ensure additional soil materials are not added; and
- following the removal of asbestos impacted soils, the environmental consultant shall undertake a visual assessment of the resultant soils to ensure no visible asbestos is present, prior to commencement of further earthworks into natural soils.

8.4.2 Material Tracking

Material tracking is required for soil materials generated during the construction process, with records maintained for the duration of works. Specifically:

- a material tracking register is to be prepared and maintained for the duration of works;
- at a minimum, the following material types are to be tracked during the construction process:
    - asbestos impacted soil materials to be stockpiled for suitability assessment;
    - soils assessed as being suitable for reuse within HIL/HSL A - residential areas;
    - soils assessed as being unsuitable for reuse within residential areas, but suitable for reuse beneath roads;
    - asbestos impacted soil materials to be disposed offsite;
    - unimpacted soil materials (including natural materials encountered following surficial stripping, and those assessed as cleared through validation) recovered and re-used as engineered fill;
    - movement of soil to and from temporary storage/ stockpiled areas;
    - soil materials classified and disposed to landfill;
- material should be separated based on each type above, with impacted materials (asbestos or otherwise) delineated and segregated using a physical barrier (barrier tape, temporary fencing or geofabric) and clearly signposted as to the material type. A colour system should be employed for easy on site identification of stockpiles, with soils suitable for reuse being green, suitable for reuse under roads being orange, and requiring offsite disposall being red;
- for each material, all aspects of the transport operation are to be recorded within the tracking register (Appendix B), including:
    - initial material location;
    - process which disturbed the material;
    - volume of material;
    - name of contractor involved in the material removal;
    - name of transporter, including company name, licensed operator name and license number;
    - placement location;
- for waste material to be disposed of to landfill, a specific material ID shall be designated for each stockpile / in-situ area for waste classification purposes. The material ID shall be entered into the tracking register as well as the waste classification report reference. Prior to disposal, the landfill Environmental Protection Licence shall be reviewed to ensure the

landfill is licensed to accept the specific class of waste. Following disposal, the waste disposal dockets will be retained and entered into the material tracking register;

- upon completion of works, the material tracking register, and supporting waste disposal dockets, will be provided to the environmental consultant for inclusion in the Validation report; and
- material imported to site, inclusive of topsoils, DGB, recycled concrete etc., should be accompanied by a certificate verifying it as subject to an exemption, or ENM/VENM. All imported material documentation will be reviewed by the environmental consultant prior to acceptance of the material. In the event adequate documentation is not provided for material proposed to be imported, it shall not be accepted until appropriate testing has been completed.

A suggested material tracking sheet is provided in Appendix B.

8.4.3 Temporary Stockpiling of Soil

Soil excavated from areas of asbestos impact shall be segregated and stockpiled within a designated stockpile area. In the event material is required to be transported for stockpiling, the plant shall be decontaminated prior to leaving asbestos impacted zones to ensure asbestos is not spread to un-impacted areas. The following steps should be undertaken when temporarily storing potentially contaminated soils:

- segregate potentially contaminated soil from clean materials;
- place stockpile on a plastic liner, or geofabric for potential asbestos impacted stockpiles;
- keep soil moist through periodic wetting once stockpiled, and during excavation; and
- soil to be stored in excess of 30 minutes should be covered by plastic sheeting or geofabric, and securely weighted to minimise wind and weather exposure and signposted as containing asbestos and the material use as per Section 8.3.4.

8.4.4 Decontamination Procedures

The decontamination procedures specified below will be followed whenever personnel, plant or equipment leave the works area.

- wash plant and equipment thoroughly while in the appropriate PPE. Particular attention should be given to areas in contact with soil, such as tyres, tracks and excavator buckets;
- wash boots in clean water;
- remove outer gloves and store for reuse;
- remove overalls and place in the designated asbestos waste bin for disposal to a licensed facility;

- remove respirator and goggles (if used) and store clean for reuse or decontamination, as appropriate; and
- thoroughly wash hands and face.

9 Remediation Works Contingency Plan

The purpose of the Remediation Works Contingency Plan (RWCP) is to outline procedures for the identification and management of unexpected issues or events that may occur during the remediation works
They key risks that have the potential to arise during the remediation works include:

- unexpected finds;
- excavation works fail to achieve the remediation criteria and goals; and to a lesser extent; and
- heritage items.

The contingency measures that will be implemented to ensure that the remediation criteria are met are discussed below.

9.1 Unexpected Finds Protocol

The RAP is developed through a review of the previous investigations and historical activities that have been undertaken at the Site to determine the potential contaminants of concern. However, the possibility remains for unanticipated contamination (i.e. contaminated soil, water or debris) and/or potential source structures such as underground fuel storage tanks to be encountered.

The nature of residual material and the associated hazards are generally detectable through visual or olfactory means such as:

- hydrocarbon impacted materials through staining and odours;
- asbestos containing material (ACM) through visual observation outside of currently known areas of asbestos, or identification of fibrous asbestos in areas outside of the fibrous asbestos works zone;
- construction /demolition waste through visual observation;
- waste material associated with illegal dumping through visual observation; and
- ash or slag contaminated soils through visual observation.

In the event that one or more of the above mentioned substances are encountered, the following steps should be undertaken:

STEP 1: Immediately cease work and contact the Environmental Contractor or Project Manager.

STEP 2: Environmental Contractor personnel to form an exclusion zone through the use of barricading or similar to prevent access and exposure by workers.

STEP 3: Environmental Contractor to contact Environmental Consultant (if not already on Site) to arrange for inspection of encountered material.

STEP 4: Environmental Consultant to undertake detailed inspection and sampling and analysis of unexpected material. The sampling density requirements will be determined on-Site in accordance with the requirements of the NSW EPA (1995) *Sampling Design Guidelines*

STEP 5: Environmental Consultant to assess analytical results against remediation criteria.

STEP 6: Where results exceed the remediation criteria assess the appropriateness of the remediation approach with respect to the unexpected material encountered.

STEP 7: Where the unexpected material is considered suitable for adopted remediation approach, the material should be removed in accordance with the remediation methodology outlined in this RAP.

STEP 8: Undertake an assessment of potential remediation options and develop a separate RAP to address the requirements of remediation for material or classification in accordance with the NSW EPA (2014) Waste Classification Guidelines and disposal offsite to a facility licensed to accept the specific class of waste.

STEP 9: Environmental Consultant to supervise remediation and undertake validation in accordance with the RAP.

STEP 10: Environmental Contractor to remove barricades for exclusion zone.

STEP 11: Environmental Consultant to submit Validation Report to Environmental Contractor.

9.2 Excavation Works Fail to Achieve Remediation Criteria

Where the excavation works result in the validation criteria not being met, the following contingency measures should be implemented:

- review the results of the validation works;
- determine the lateral and vertical extent of contamination which remains on-Site and requires further remediation;
- mark out the spatial boundaries on-Site and communicate the depth boundaries to Environmental Contractor/Civil Contractor for further remediation within the required areas through additional excavations;
- upon completion of the additional remediation works, undertake validation works in accordance with this RAP; and

- where the validation works returns successful results, remediation is considered to have been completed.

9.3 Stockpile Assessment Fail to Achieve Residential Remediation Criteria

Where suitability assessment of material excavated from non-friable areas is found to exceed the HSL A assessment criteria, thereby making it unsuitable for reuse within the aged care development area, the following contingency process should be undertaken:

1. comparison of results to the NEPM (2013) HSL D - Commercial industrial assessment criteria to determine suitability for the material to be placed beneath roads;
2. i.e. due to time or space constraints, classification of the material in accordance with the NSW Waste Classification Guidelines (2014) and disposal off site to a licensed facility.

9.4 Heritage Items

Cultural heritage sites are easily damaged or destroyed by natural processes such as erosion, as well as disturbance. While it is not possible to prevent the slow destruction of cultural heritage sites, it is possible to prevent unnecessary damage by the implementation of careful work practices.

Due to the location and nature of the Site within an industrial and residential area, it is considered unlikely that heritage items will be encountered during the remediation works. However, given the nature of the disturbing activities that will be undertaken during the remediation works, should potential heritage items be encountered unexpectedly, the following contingency measures should be implemented:

STEP 1: Immediately cease all activities that could in any way interfere with or disturb the encountered site and/or object(s).

STEP 2: Promptly report the discovery to the Environmental Contractor where available who will in turn notify the Environmental Consultant, Council and/or the relevant regulatory authorities. Until further instructions are received:

- DO NOT disturb the Site;
- DO NOT collect any artefacts as this may alter the scientific value;
- DO NOT touch or interfere with painted art as this may cause the pigmentation to deteriorate, and similarly; and
- DO NOT touch up painted art or enhance engravings for the purposes of photographs.

STEP 3: Details of the find should be documented including:

- location of find in relation to the project site;
- person(s) whom encountered the find;
- time and date of find;
- description of find including number of objects, shape, colour etc.;
- actions taken; and
- without touching or interfering with the site and/or objects, obtain photographs for record of find.

10 Roles and Responsibilities

Roles and responsibilities during the remediation works are described in Table 7 below.

Table 9: Roles and Responsibilities

Role	Responsibility
Environmental Project Manager	Ensure field personnel are suitably familiar with the requirements of the OH&S Plan before commencing works on site. Ensure subcontractors are suitably qualified and safe work method statements have been supplied and approved prior to commencing works on site. Responsible for the day to day implementation of the health and safety plan in all phases of work. Ensure that any required modifications to the OH&S Plan are noted, communicated to all project staff and are implemented.
Environmental/Civil Contractor Manager	Inductions for remediation personnel and contractors in accordance with the site-specific Induction requirements. Ensure communication and notification of the remediation works to the site owners, leaseholders, Council and operators. Provision of copy of the RWP to site owners, leaseholders and operators. Maintain material tracking records
Environmental Field Manager	Induction of sub-contractors and/or other Field Personnel in accordance with the requirements of this OH&S Plan and the site-specific Induction. Ensure they are personally familiar with the requirements of the OH&S Plan before commencing works on site. Ensure that they appropriately induct sub-contractors and visitors to the site and that all persons inducted sign the acknowledgement form of this OH&S Plan (Appendix A). Ensure the on-site activities and deliverables conform to the OH&S Plan. Ensure that appropriate Personal Protective Equipment (PPE) is worn. Report any incidents or accidents as soon as possible.
Appropriately Trained person / person appropriately trained in asbestos identification	Person who has undergone asbestos identification training from an accredited training body. Oversees all excavation works onsite. Segregates stockpiles based on visual observations for sampling to be undertaken by the environmental consultant.
Environmental consultant	Review and approval of imported material documentation. Sampling and inspection of stockpiles. Sampling and inspection for validation. Classification of materials for offsite disposal. Preparation of validation reports and material suitability checklists.
Contractors	Site-specific Induction and OH&S Plan before commencing works on site and have signed acknowledgement form of OH&S Plan. Responsible for abiding by the OH&S Plan. Provide H&S P's and/ or SWMS's for work to be undertaken. Ensure they are suitably qualified and trained to complete the tasks required including operation of equipment. Ensure the on-site activities and deliverables conform to the OH&S Plan. Ensure that appropriate PPE is worn. Report any incidents or accidents to the Field Manager as soon as possible. Contractors should demonstrate appropriate OHS knowledge and performance, be able to identify risks associated with the work they are doing and provide suitable work methods to minimize the risks to themselves and others.

11 Validation

A validation plan is required to ensure the effectiveness of the remediation works and confirm the final site condition as being suitable for the proposed future use. Validation procedures to be undertaken following remediation works are described in the following subsections.

11.1 Validation Description

Given the widespread nature of asbestos impact at the site, a combination of capping, visual and analytical validation methods are required. Proposed validation methods are presented below:

Table 10: Validation Methods

Method	Item Requiring Validation	Validation Process
1	Service Removal	1. Identify redundant services and locate; 2. Excavate and expose service; 3. Inspection by a person appropriately trained in asbestos identification and completion of an inspection record, including photographs and report; 4. Sampling of services visually suspected of containing asbestos by an environmental consultant, occupational hygienist or licensed asbestos assessor and completion of asbestos inspection report; 5. Following receipt of sample results, removal of service under asbestos conditions if identified as containing asbestos; 6. Visual inspection of the area of removed services involving a grid based walkover of 1 m width and raking of the top 0.1 m using a rake with teeth no greater than 7mm apart to ensure no visible asbestos is present followed by validation sampling by the environmental consultant, occupational hygienist or licensed asbestos assessor in accordance with Table 13. In the event asbestos is identified by the raking, additional passes will be undertaken until clear; 7. Review of disposal documentation to ensure appropriate material disposal; and 8. Inclusion in the site validation report.
2	Stockpiled materials generated onsite	1. Inspection of the stockpiled material through 'flipping' with an excavator; 2. Sampling at a rate of 1 sample per 200 cubic metres as per Section 11.2; 3. If asbestos is present, further quantification using gravimetric analysis; 4. Confirmation of material suitability for use or requirement to be disposed offsite; 5. Assignment of a material tracking ID in accordance with Section 8.4 based on assessment results; 6. Track and document end location of material use; 7. Inclusion of tracking and sample results in the site validation report.
3	Building footprints identified as containing asbestos above assessment criteria (507, 510, 525, 526, 501)	1. Visual inspection of the former building footprint area following removal of surficial material by walking the entire removal footprint in a systematic grid pattern of 1 m width to ensure all residual soils are inspected. During the walkover, a rake with teeth spacing no greater than 7mm shall be used to inspect the top 0.1 m of soil The area should be walked three times at minimum and undertaken by the environmental consultant, occupational hygienist or licensed

		asbestos assessor. In the event asbestos is identified by the raking, additional passes will be undertaken until clear; 2. Collection of soil samples at a rate of 1 per 10 square metres of excavation floor, and 1 per 5 linear metres of wall as per Table 12; 3. Confirmation of appropriate removal of impacted material and review of tracking/disposal documentation; and 4. Inclusion of inspection and sampling results in the site validation report.
4	Fibrous asbestos area (building 503)	1. Visual inspection of the former building footprint following removal of impacted material by walking the entire removal footprint in a systematic grid pattern to ensure all surficial soils are inspected. During the walkover, a rake with teeth spacing no greater than 7mm shall be used to inspect the top 0.1 m of soil. The area should be walked three times at minimum and undertaken by a licensed asbestos assessor. In the event asbestos is identified by the raking, additional passes will be undertaken until clear; 2. Collection of 500 ml soil samples at a rate of 1 per 10 square metres of excavation floor, and 1 per 5 linear metres of wall as per Table 12; 3. Confirmation of appropriate removal of impacted material and review of tracking documentation; 4. Preparation of an interim validation report including the inspection report and sample results by the environmental consultant; 5. Review of tracking and disposal documentation; and 6. Inclusion of inspection and sampling results and disposal documentation in the site validation report.
5	Excavation following removal of 100mm of surficial soil	1. Visual inspection of the excavation area following removal of surficial material by walking the entire removal footprint in a systematic grid pattern to ensure all residual soils are inspected. During the walkover, a rake with teeth spacing no greater than 7mm shall be used to inspect the top 0.1 m of soil. The area should be walked three times at minimum and undertaken the environmental consultant. In the event asbestos is identified by the raking, additional passes will be undertaken until clear; 2. Preparation of an asbestos clearance report for inclusion in the site validation.
6	Imported material	1. Review of documentation for all material proposed to be imported to site to determine suitability for the site use and lawfulness to accept. For documentation to be considered adequate it must include: a. a description of the material source and history; b. material volume; c. description of the material characteristics including colour, material type and photographs to allow onsite comparison to the material once imported; d. adequate chemical testing to satisfy the material is suitable for the site, as well as lawfully acceptable; e. QAQC requirements have been met where appropriate, with appropriate QAQC measures implemented (duplicate/triplicate, laboratory methods etc.); f. a clear statement of the material type. 2. In the event material does not have adequate documentation, or the materials suitability can not be verified from provided documentation, refusal of material or testing in accordance with the relevant guideline for the material type, or material specific density reviewed by the auditor prior to sampling; and

		3. Inclusion of imported material details in the site validation report
7	100 mm of surface soils	1. Undertake a review of site survey plans, imported material tracking documentation and stockpile reuse documentation to determine areas which have not been surficially cleared; 2. Undertake a site walkover of identified areas and advancement of test pits as per item 9 to ensure no visible asbestos is present in surface soils. This shall be undertaken through importation of material proven to be suitable for the site, construction of buildings and hardstand, or by validation of the site surface in accordance with WA DOH (2009).
8	Areas not investigated or excavated during construction	1. Following completion of site earthworks, advancement of 1 test pit per area without previous investigation or earthworks; 2. Visual inspection for the presence of fill or asbestos; 3. Collection of 1 soil sample per test pit in accordance with Table 12 for analysis of asbestos and gravimetric analysis; and 4. Inclusion of findings in the site validation report.

11.2 Validation Sampling, Analytical and Quality Plan

The objective of the SAQP is to describe the sampling, analytical and quality program (if any) undertaken during the validation of the site. This SAQP was developed prior to fieldwork.

11.2.1 Objectives

The objectives of the validation is to assess whether the remediation criteria and objectives have been met, and whether the site is suitable for the proposed use.

11.2.1.1 SAQP Objectives

The objective of this SAQP is to outline the data collection activities to be undertaken to assess remediated soil at the site.

Specifically, this SAQP:

- describes the rationale and data quality objectives for the proposed sampling program;
- specifies the proposed human health, risk and infrastructure criteria;
- outlines the field methodologies for sample collection;
- specifies key analytical considerations;
- specifies the quality assurance and quality control (QA/QC) program; and
- identifies assessment criteria and data quality objectives and indicators that help assess the reliability of the data collected.

11.2.2 Data Quality Objectives

The data quality objectives adopted for the validation are detailed in Table 8. A comprehensive assessment of the data quality indicators relating to both field and laboratory procedures will be undertaken and detailed in this validation report, including aspects detailed in Table 11.

Table 11: Data Quality Objectives – 7 Step Process

	Step	Information
1	State the problem	The client wishes to validate soils within the remediation areas to minimise the identified asbestos risk to human health, potential liability associated with the asbestos and make the site suitable for the proposed use.
2	Identify the decision/ goal of the study	Does any onsite asbestos pose a risk to human health for onsite workers, future construction workers or users of the site once the residential development is complete? Has the asbestos materials been remediated so as to make the site a suitable level of contamination risk to human health? Are additional management measures required during site development? Is the site suitable for ongoing use, or other potential future uses?
3	Identify the information inputs	Previous investigations undertaken by MES. Site observations and discussion with Council, current construction workers or other authorised parties who may provide anecdotal information relating to the history of the site. Site layout plans. Soil sampling across the site and near potential contamination sources at the site.
4	Define the boundaries of the study	The validation boundary is the whole of site. Offsite sources and receptors in the surrounding area will also be considered. The depth boundary will be depth of remediation (between 0.1 and 0.5 m depth) as described in Section 8. There are no constraints for the proposed validation sampling, assuming Section 8.1 - Data Gap Close Out is undertaken.
5	Develop the analytical approach	A data quality review of the soil sample data will be completed to assess the validity of reported analytical results.
6	Specify performance or acceptance criteria	A range of QA/QC procedures and results will be used to evaluate whether the DQOs have been achieved. These procedures assess the usability of the data, particularly with regards to data accuracy and reliability for forming conclusions and are undertaken in accordance with guidance provided within Australian Standards, the NEPM, and by the United States Environmental Protection Agency (USEPA). The potential for significant decision errors is to be minimised by: • completing a robust QA/QC assessment of the field and laboratory data and application of the probability that 95% of data satisfies the DQIs, therefore a limit on the decision error is 5% that a conclusive statement may be incorrect; • assessing whether appropriate sampling and analytical density for the purposes of the assessment has been applied; • ensuring that the criteria set for the assessment works are appropriate for the proposed use of the site; and • a data validation checklist with specific acceptance criteria and discussion of results will be completed and provided within this investigation report.;
7	Develop the plan for obtaining data	The soil will be sampled by hand trowel and excavator bucket

11.2.3 Data Quality Indicators

An assessment of the Data Quality Indicators (DQIs) relating to both field and laboratory procedures has been undertaken with appropriate documentation provided for each

environmental element or media assessed. The DQIs adopted for the SAQP are summarised in Table 9.

Table 12: Data Quality Indicators

DQI	Information
QA Documentation	Provision of appropriate work plans, SAQP and DQO defined for the site and all QA/QC aspects documented.
Bias	Measure of the potential distortion in an analysis which can result in errors in one direction (e.g. one laboratory consistently higher results).
Representativeness	A qualitative measure of the confidence that data is representative of each medium present on the site. Use of appropriate and documented sampling methods, sampling handling, preservation and transport and holding times. Sampling and analytical procedures should be justified as to their appropriateness and effectiveness;
Precision	A quantitative measure of data variability or reproducibility. Precision in DQIs is considered an important assessment in an environmental study. Due to asbestos being inherently heterogeneous and its discrete occurence in soils, quality and reproducibility through duplicate and triplicate samples can be challenging and is therefore not proposed for asbestos validation. However, based onSection 4.5 of the *Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia (WA DOH, 2009),* it can be measured as follows: • use of similar analytical methods and instruments (e.g. for inter-laboratory assessment); • the environmental consultant should have adequate asbestos experience to ensure the quality of recommended visual detection and quantitation methodologies;and • laboratories will be NATA accredited with the Australian Standard Method for the Qualitative Identification of asbestos used all in bulk samples (AS4964-2004).
Accuracy	A quantitative measure of the closeness of data to a 'true value', measured by comparison of laboratory results to field observations and sampling guidances (including NEPC, 2013 and the WA CSMS).
Comparability	A qualitative measure of the confidence that data may be considered to be equivalent for each sampling and analytical event. By use of standard procedures, comparable methods, qualified personnel and review of sample integrity.
Completeness	A measure of the amount of usable data (expressed as a percentage - %) from a data collection activity, based on completeness of test program, overall QA/QC completeness and validity of dataset.

11.2.4 Sample Strategy and Methodology

The scope and method of the work is summarised in Sections 8 through 11. Sample locations will be selected based on a grid and targeted pattern across the remediation areas as described in Section 8 and 11.

Table 13: Soil Investigation Activity Summary

Activity	Information
Areas of fibrous material and building footprints identified as exceeding assessment criteria sample protocol	Following visual inspection, undertake soil validation works in accordance with WA DoH 2009, with surficial 500ml samples collected for analysis at a rate of 1 sample per 5 linear metres of excavation wall and one sample per 10 square meters from the excavation floor for the area of fibrous asbestos. Upon completion of the visual inspection and sampling, undertake clearance air monitoring through the installation of static asbestos air monitors at locations within the fibrous asbestos remediation work area. Air monitoring shall be conducted in accordance with the National Occupational Health and Safety Commission's Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres – 2nd Edition [NOHSC: 3003 (2005)].

Stockpiled Material from areas below assessment criteria sample protocol	Soil stockpiles will be visually screened through turning over of the stockpile by use of an excavator prior to sampling. Stockpiles to be validated as suitable for use on site will be sampled at a rate of 1 500 ml sample per 200 cubic metres of soil and analysed for asbestos. In the event significant, unexpected concentrations of asbestos is identified by the 500ml sample or environmental consultant visually, 10 L gravimetric analysis should be undertaken on the samples collected. An excavator shall be used to advance test pits, with samples obtained directly from the excavator bucket. Soil samples will be stored in zip-lock bags provided by the laboratory. All samples were labelled with an indelible marker pen directly on the bag.
Stockpiled Material from areas above assessment criteria (including high asbestos potential buildings 504-506, 527, 502 and area 8 ancillary footprints) sample protocol	Soil stockpiles will be visually screened through turning over of the stockpile by use of an excavator prior to sampling. Stockpiles to be validated will be sampled at a rate of one 500 ml sample and one gravimetric bulk sample per 50 cubic metres of soil and analysed for asbestos. An excavator shall be used to advance test pits, with samples obtained directly from the excavator bucket. Soil samples will be stored in zip-lock bags provided by the laboratory. All samples were labelled with an indelible marker pen directly on the bag.
Previously Uninvestigated / Unexcavated Areas	A test pit to 0.5 m depth shall be completed within the open space area of each planned subdivided lot in the event previous investigation or excavation and sampling has not occurred. One 500ml asbestos sample shall be collected from each test pit and analysed for asbestos. An excavator shall be used to advance test pits, with samples obtained directly from the excavator bucket. Soil samples will be stored in zip-lock bags provided by the laboratory. All samples were labelled with an indelible marker pen directly on the bag.
Underground services containing asbestos	Following visual inspection, undertake soil validation works in accordance with WA DoH 2009, with surficial 500ml samples collected for analysis at a rate of 1 sample per 5 linear metres of excavation wall and one sample per 10 square meters from the excavation floor for the area of removed asbestos containing services.
Imported Material	The environmental consultant must review documentation relating to the classification and testing of material prior to it coming to site, and also inspect material as it comes to the site as matching the documented quality and description. To ensure that material imported to site is suitable for use on the site a sampling protocol should be implemented to sample the material at a sampling density of not less than 1 sample per truckload unless otherwise determined by the environmental consultant, for analytes/contaminants of concern to be determined by the environmental consultant, and, potentially at the discretion of the environmental consultant, to review the source site and excavation/loading. QAQC samples should be collected at a rate of 1 duplicate and 1 triplicate per 20 primary samples and analysed for contaminants relevant to the material being imported. A rationale for the sampling density, analytes and validation of material should be documented in the validation report.
Decontamination Procedure	Sampling equipment will be decontaminated between each sample location. Fresh sampling disposable gloves will be used for each sample. Asbestos controls will remain in place until the validation results are received, with decontamination occurring prior to removal of controls.
Sample Preservation and Transport	Sample will be stored in a sealed esky (at ambient temperature) while on-site and in transit to the laboratory under Chain of Custody documentation.

11.3 Laboratory Analysis

Soil samples will be submitted to a NATA-accredited laboratory for analysis of asbestos. The selected analyses for each sample is detailed in Table 14 below.

Table 14: Laboratory Testing Program

Location	Primary Sample Nomenclature	Analyses
All Validation Areas	Val01, Val02, ValXX	Asbestos - Quantitation per AS4964 and NEPM 2013 Guidelines
Waste Classification Samples	SP*ID*/01_*depth*, SP*ID*/02_*depth*, SP*ID*/XX_*depth*	TRH, BTEX, PAH, metals 8, asbestos per AS4964, pH, pHfox

The quality control/ quality assurance (QA/QC) of the soil sampling program is discussed below.

11.4 Quality Analysis / Quality Assurance

A critical aspect of a soil investigation is the demonstration of the quality of the data used as the basis for the assessment. This is achieved through a Data Validation process which includes a review of the following aspects of the data collection process:

- project quality objectives and plans;
- data representativeness;
- data precision & accuracy;
- laboratory performance;
- data comparability; and
- data set completeness.

A detailed review of these aspects was undertaken, the results are presented in Section 11.2.4.

11.5 Validation Report

At the completion of remediation works, validation sampling and construction works, a Validation Report shall be completed. The Validation Report should be written in compliance with all relevant guidelines endorsed by the NSW EPA and follow the format set out in *Guidelines for Consultants Reporting on Contaminated Sites (NSW OEH 2011)*. In addition to the matters outlined in NSW OEH 2011, the Validation Report must contain information including, but not limited, to the following:

- details of the remediation works;
- information demonstrating that the objectives of the remediation and validation works have been achieved, in particular the validation results and assessment of the results against both the data quality objectives and the remediation acceptance (validation) criteria;
- information demonstrating compliance with appropriate regulations and guidelines;
- any variations to the strategy undertaken during the implementation of the remedial works and justification for the variation to the strategy;
- results of environmental monitoring undertaken during the course of the remedial works;
- all clearance certificates issued should be included as attachments;
- description of the remediation works undertaken at the remediation site, with drawings showing the locations of all significant works;
- a survey plan showing the locations of:

- the cadastral boundaries of the Remediation site;
- all fences and gates at the remediation site;
- vehicle access tracks to and within the remediation site; and
- the extent remediation completed and any residual contamination.

- descriptions, supported by relevant drawings, cross-sections and as-builts:
- description of the residual impacts requiring management, if any, including the nature and extent of impacted solid waste materials within the site;
- details of any environmental incidents occurring during the course of the remedial works and the actions undertaken in response to these incidents;
- details on waste classification, tracking and off-site disposal, including receipts from a licensed landfill of all materials disposed off-site;
- details on materials imported to the site (if any);
- a clear statement of the suitability of the site for the proposed use and any requirements for a Long Term Environmental Management Plan;
- if an LTEMP is required, it should include at a minimum in compliance with the NSW EPA Consultants reporting on Contaminated Land (NSW EPA 2020) guidelines Section 1.7, including the location and specifications of any waste cells, considerations in relation to other site investigations and proposed uses, who is responsible for ensuring the EMP is implemented in perpetuity (which may include inspections and maintenance of surfaces and capping material, any limitations to intrusion or subterranean services, mechanisms to ensure the areas are protected from unintentional or uncontrolled disturbance that could breach the integrity of any Containment Cell);
- assessment of the reliability of the field and laboratory programs, as appropriate, is required to be addressed in accordance with in accordance with Section 4.1.1 of the NSW EPA Guidelines for the NSW Site Auditor Scheme (3rd Edition), 2017 and Section 18.2 of Schedule B2 of the NEPM (NEPC 2013); and
- the overall suitability of the site is required to be assessed in compliance with the decision-making process for assessing urban development sites as set out in Appendix A of the NSW EPA Guidelines for the NSW Site Auditor Scheme (3rd Edition), 2017.

12 Proposed Remediation Schedule

Based on the remediation works the following schedule is proposed.

Table 15: Remediation Schedule

Construction Staging	Remediation Item	Section of RAP	Timing
Demolition of buildings and known asbestos impact remediation works	1. Site establishment; 2. Stripping of delineated former Building 503 area of fibrous asbestos stockpiling and waste classification;; 3. HOLD POINT - Inspection, sampling and validation of former building 503 footprint; 4. WITNESS POINT - Review of interim area validation; 5. Upon confirmation of validation, removal of asbestos controls for former building 503 remediation area; 6. Stripping of surficial soils in high risk building footprint areas (504-506, 527, 502 and building in area 8); 7. HOLD POINT - Inspection, sampling and validation of former building footprints; 8. WITNESS POINT - Review of interim building footprint validation by site auditor.	8.2 8.3 11.1	1 month
Main Earthworks Stage	1. Designate stockpile area for material to be assessed; 2. Undertake material tracking for all disturbed soils; 3. Commence surficial stripping of Stage 1 and 2 and relocate soils for assessment to stockpile area under the supervision and watch of a person trained in the identification of asbestos; 4. Undertake assessment of stockpiled soils for reuse; 5. HOLD POINT - Provision of asbestos clearance report and visual inspection by environmental consultant prior to commencement of earthworks in unimpacted soils; 6. Over excavation of Stage 2 area and placement of soils deemed suitable for reuse prior to importation of fill layer.	8.4 11.1	4 months
Completion of building works	NIL		12 months
Finalise Civil works, landscaping etc	1. HOLD POINT - Undertake a	11.1	1 month

	site wide validation of the top 100 mm, including review of survey plans, and provision of a Validation Report; 2. WITNESS POINT - Auditor Review and approval of the Validation Report; 3. HOLD POINT - Preparation of Long Term Environmental Management Plan (LTEMP) for the site; 4. WITNESS POINT - Review and approval of LTEMP by the auditor.		
Commissioning of building and provision of Occupancy Permit by Council.	NIL		1 month

13 Conclusions

iEnvi have selected the following remediation method in relation to asbestos impacted materials at the site as reported by the previous investigations undertaken by McMahon Earth Science:

1. implementation of an accepted Construction Environmental Management Plan (CEMP) during remediation works;
2. begin close out of data gaps through sampling beneath existing structures and underground services;
3. stripping of the area of identified fibrous asbestos impacted soil in and around former building footprint 503, and classification and disposal of soil material offsite;
4. stripping and stockpiling of the high asbestos potential building footprints (502, 504, 505, 506, 527 and the area 8 ancillary building);
5. construction management through supervision by person appropriately trained in asbestos identification of stripping of surface material of bonded asbestos areas within the Stage 1 area (as shown on Figure 4), transport to the Stage 2 area and stockpiling;
6. visual inspection of the residual Stage 1 soils;
7. construction management through supervision by person appropriately trained in asbestos identification of stripping of surface material of bonded asbestos areas within the Stage 2 area (as shown on Figure 4) and stockpiling;
8. sampling of stockpiled soils by the environmental consultant to determine suitability for reuse and subsequent assignment of a material tracking ID;
9. visual inspection of all areas identified as containing asbestos;
10. based on material suitability for reuse, replacement of soils following excavation;
11. after remediation is completed, site-wide (Stage 1 and 2) validation will be required in 10 m x 10 m areas as per Section 11 and the Validation report prepared for the site.

The above remediation program is considered to meet the objectives of the RAP by remediating the asbestos impacted site soils which are above assessment criteria through offsite disposal so they do not pose a risk to human health of future site users. Following implementation of the remediation works, fibrous asbestos materials will be removed, with pathways between asbestos materials and site users removed. As such, the site will be considered to have been made suitable with regard to the future residential land use.

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15 Limitations

The conclusions presented in this report are relevant to the conditions of the site and the state of legislation currently enacted as at the date of this report. iEnvironmental Australia Pty Ltd (iEnvi) does not make any representations or warranties of the suitability and applicability of the conclusions in this report in the future, since potential changes in the condition of the site, applicable legislation and/or other future factors may affect the conclusions contained in this report. iEnvi has based this report on data supplied by others, and as such does not warrant the quality of the previous investigations or data provided. In the event the previous data is found to contain errors or omissions, this may alter the conclusions of this report.

iEnvi has used a degree of skill and care ordinarily exercised by reputable members of the industry practising in the same or similar locality. Conclusions are based on representative samples and/or locations at the site, the frequency of those samples being in accordance with the usual levels of testing carried out for this type of investigation. Due to the inherent variability soils and groundwater and the general environment, iEnvi cannot warrant that the overall condition of the site is identical or substantially like the representative samples.

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16 Attachments

FIGURES

Figure 1. Regional and Vicinity Map
Figure 2. Site Layout Map
Figure 3. Historical Building and Sample Locations
Figure 4. Areas Containing Asbestos

APPENDICES

Appendix A. Photo Log
Appendix B. Materials Tracking Sheet

FIGURES

Figure 1 Regional and Vicinity Map
Figure 2 Site Layout Map
Figure 3 Historical Building and Sample Locations
Figure 4 Areas Requiring Remediation

COUNTRY

REGION

SITE LOCATION

VER	DATE	AMENDMENTS	DRW	CKD
02	07/05/2020	Boundary Details Updated	SDA	SD
01	17/04/2020	Initial Draft	SDA	SD

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FIGURE 1
SITE LOCATION MAP

Project Ref:	20191001
Project:	Remediation Action Plan - Former Charles Sturt University
Location:	20 Hely Avenue, Turvey Park, NSW, 2650
Client:	Croft Development Pty Ltd

Easting:531810.00	Northing: 6112610.00	Datum mAHD; UTM MGA 55 H	PRINT: A3 (L)

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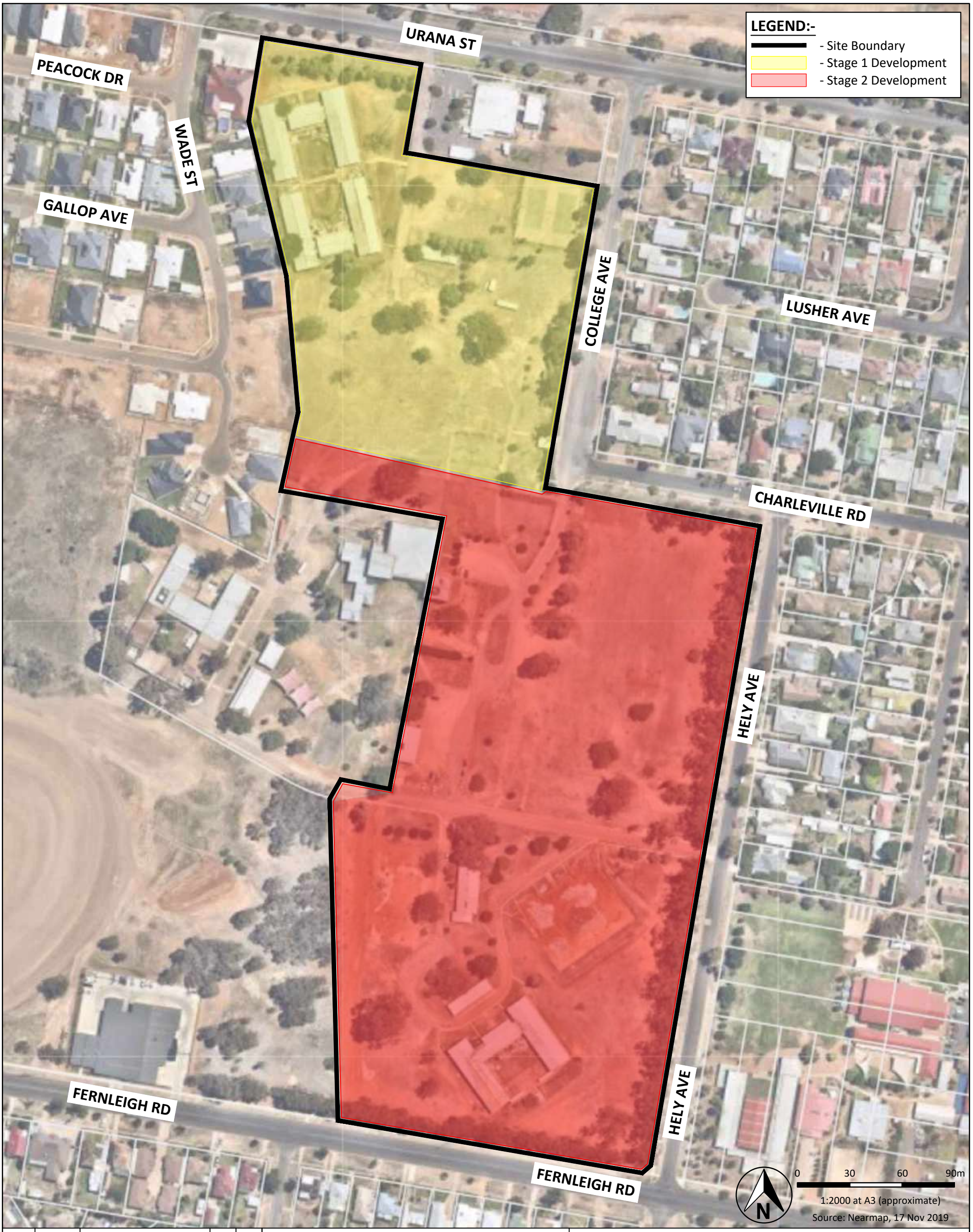

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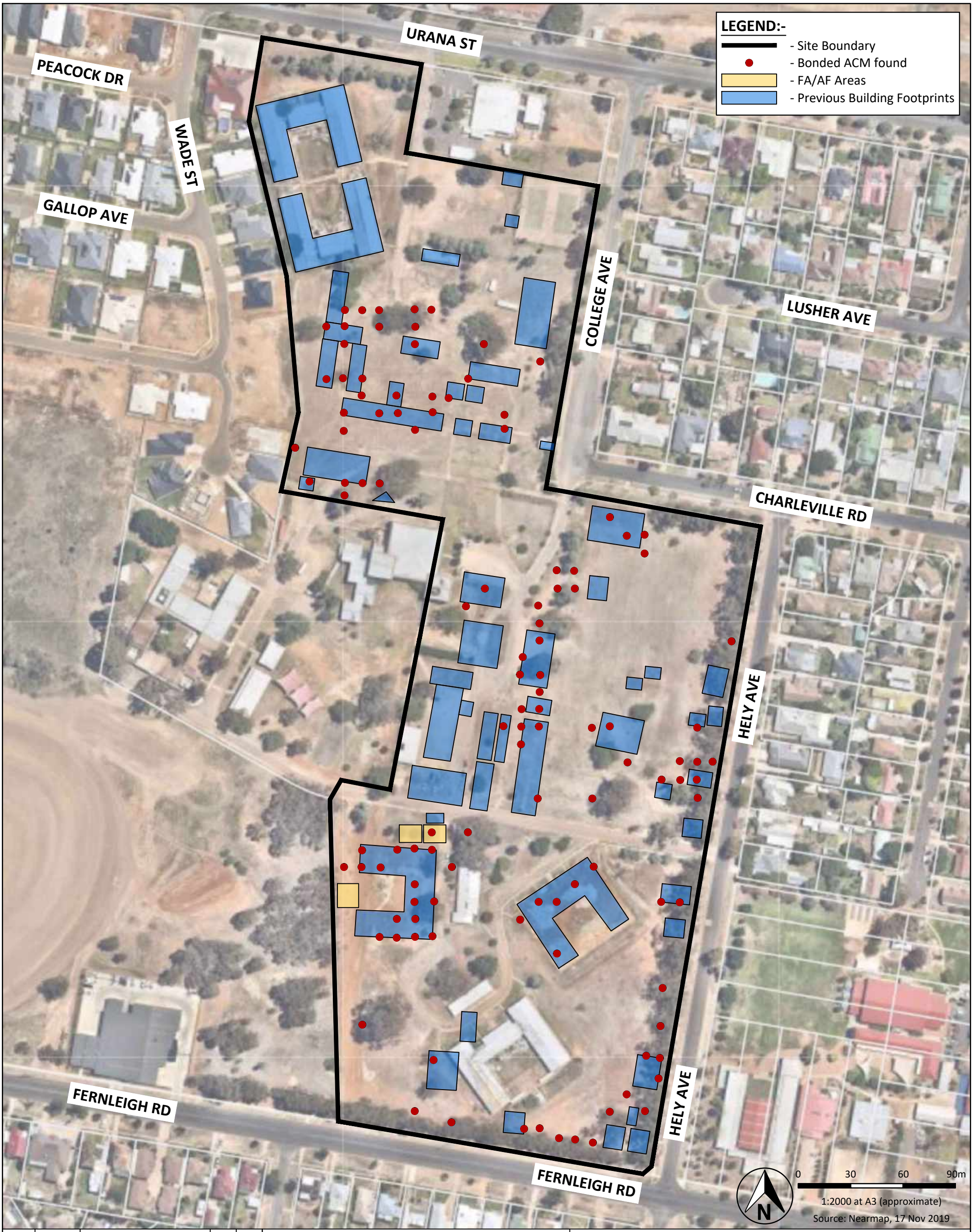
FIGURE 2
SITE LAYOUT

Project Ref:	20191001	
Project:	Remediation Action Plan - Former Charles Sturt University	
Location:	20 Hely Avenue, Turvey Park, NSW, 2650	
Client:	Croft Development Pty Ltd	
Easting: 531810.00	Northing: 6112610.00	Datum mAHD; UTM MGA 55 H

1013-iENVI-20-0002_V2.dwg



VER	DATE	AMENDMENTS	DRW	CKD
02	07/05/20	Boundary Details Updated	SDA	SD
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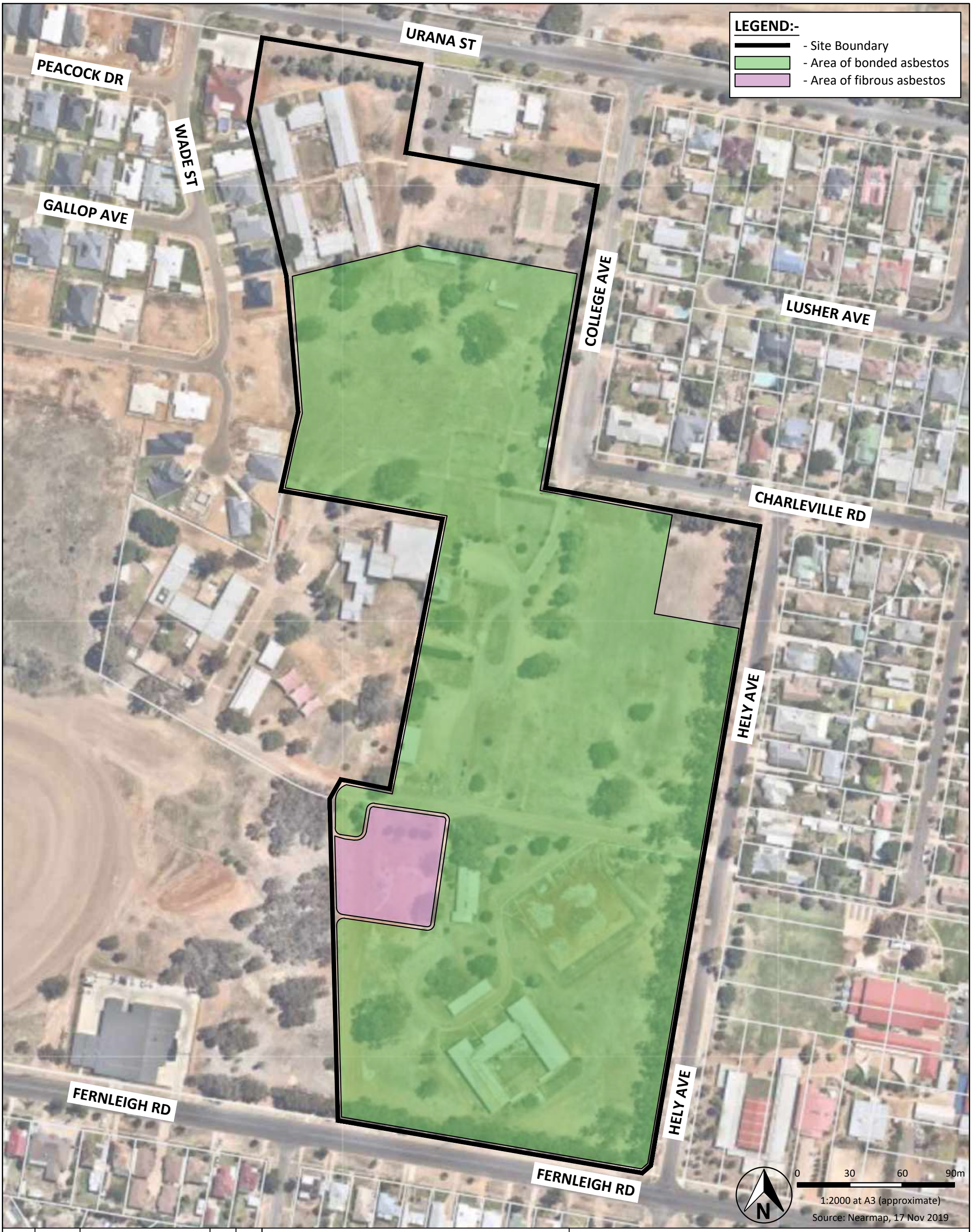
FIGURE 3
HISTORICAL BUILDING AND SAMPLE LOCATIONS

Project Ref:	20191001		
Project:	Remediation Action Plan - Former Charles Sturt University		
Location:	20 Hely Avenue, Turvey Park, NSW, 2650		
Client:	Croft Development Pty Ltd		
Easting: 531810.00	Northing: 6112610.00	Datum mAHD; UTM MGA 55 H	

1013-iENVI-20-0002_V2.dwg



VER	DATE	AMENDMENTS	DRW	CKD
02	07/05/20	Boundary Details Updated	SDA	SD
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FIGURE 4
AREAS REQUIRING REMEDIATION

Project Ref:	20191001		
Project:	Remediation Action Plan - Former Charles Sturt University		
Location:	20 Hely Avenue, Turvey Park, NSW, 2650		
Client:	Croft Development Pty Ltd		
Easting: 531810.00	Northing: 6112610.00	Datum mAHD; UTM MGA 55 H	

1013-iENVI-20-0002_V2.dwg

APPENDICES
Appendix A Photo Log

Photo 1. Fibrous lagging within Pit 347

Photo 2. Typical surficial bonded asbestos material observed at the site.

Photo 3. Pit 347, facing west-south-west.

Appendix B Materials Tracking Sheet

Date	Load Time	Your Initials	Source Location	Destination Location	Estimated Volume (m3)	Describe Material and Contamination