

30 August 2019

Health Infrastructure  
c/- Sue Folliott  
TSA Management  
Via email: [sfolliott@tsamanagement.com.au](mailto:sfolliott@tsamanagement.com.au)

**Interim Audit Advice (0503-1914-002): 771 Cudgen Road, Cudgen NSW**

Dear Sue,

**1. Introduction**

Andrew Lau, of JBS&G Australia Pty Ltd (JBS&G), was engaged on 6 May 2019, by Health Infrastructure (HI) to conduct a site audit of the property located at 771 Cudgen Road, Cudgen, NSW ('the site').

The site is legally identified as Lot 11 in DP 1246853 and has an area of approximately 19.4 hectares. The site audit relates to the proposed development of the site as the Tweed Valley Hospital. It is understood that the development application pathway for the project consists of a staged Significant Development Application under Section 4.22 of the Environmental Planning and Assessment Act 1979 (EP&A Act).

Andrew Lau ('the Auditor') is a Site Auditor accredited by the NSW Environment Protection Authority (EPA) under the *Contaminated Land Management Act 1997* (CLM Act 1997) (Accreditation Number 0503). A Site Audit Statement (SAS) and Site Audit Report<sup>1</sup> (SAR) were previously issued for the site by Andrew Lau on 4 February 2019, certifying that the site could be made suitable for the proposed land use subject to remediation and management in accordance with the Remedial Action Plans (RAPs) prepared by OCTIEF (2019)<sup>2</sup> and Cavvanba (2019a<sup>3</sup> and 2019c<sup>4</sup>) and a number of conditions including the preparation of a Validation Sampling Analysis and Quality Plan (VSAQP) and Work Health and Safety Plan (WHSP) for subsequent review and endorsement by the Auditor prior to commencing the site works.

A Development Consent (SSD 9575) has since been granted by Minister for Planning and Public Spaces on 11 June 2019 for the proposed hospital development at the site. Conditions B10, B11, B15 and B16 within Schedule 3, Part B of the Development Consent require the preparation of a Soil and Groundwater Investigation Report, a RAP (for any additional contamination identified) and various management plans requiring review and endorsement by the Site Auditor prior to certification of site works. The required documents have subsequently been prepared by the consultants, Cavvanba

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<sup>1</sup> JBS&G Australia Pty Ltd (2019) *Site Audit Report 0503-1901, 771 Cudgen Road, Cudgen NSW*, 4 February 2019.

<sup>2</sup> OCTIEF Pty Ltd (2019) *Remediation Action Plan, Tweed Valley Hospital site, 771, Cudgen Road, Cudgen NSW*, 1 February 2019.

<sup>3</sup> Cavvanba Consulting Pty Ltd (2019a) *Remedial Action Plan Addendum – Farm Shed, 771 Cudgen Road, Cudgen NSW*, 24 January 2019.

<sup>4</sup> Cavvanba Consulting Pty Ltd (2019c) *Remedial Action Plan Addendum – Residential House, 771 Cudgen Road, Cudgen NSW*, 1 August 2019.

and others and provided to the Auditor for independent review to assist with the preparation of this interim audit advice (IAA).

## 2. Documents Reviewed

The documents reviewed as part of the preparation of this IAA include:

- B & P Survey Consulting Surveyors, *Remediation Area Plan*, ref: T16452, 9 August 2019;
- Cavvanba Consulting Pty Ltd (2019a) *Remedial Action Plan Addendum – Farm Shed, 771 Cudgen Road, Cudgen, NSW*, ref: 18084 R04 V2, 24 January 2019;
- Cavvanba Consulting Pty Ltd (2019b) *Soil Investigation Report – Residential House, 771 Cudgen Road, Cudgen NSW*, ref: 18084 R01 V3, 1 August 2019;
- Cavvanba Consulting Pty Ltd (2019c) *Remedial Action Plan Addendum – Residential House, 771 Cudgen Road, Cudgen NSW*, ref: 18084 R02 V4, 1 August 2019;
- Cavvanba Consulting Pty Ltd (2019d) *Groundwater and Soil Investigation, 771 Cudgen Road, Cudgen NSW*, Ref: 19038 R02 V2, dated 22 August 2019;
- Cavvanba Consulting Pty Ltd (2019e) *Remedial Action Plan Addendum – Farm Pit, 771 Cudgen Road, Cudgen NSW*, ref: 19038 R03 V2, 19 August 2019;
- Cavvanba Consulting Pty Ltd (2019f) *Validation Data Quality Objectives and Sampling, Analysis and Quality Plan, Proposed Tweed Valley Hospital, 771 Cudgen Road, Cudgen NSW*, ref: 19038 R04 V1, 23 August 2019;
- Delta Pty Ltd (2019) *Work Health and Safety Plan*, dated 28 August 2019;
- Lendlease Building Pty Ltd (2019a) *Tweed Valley Hospital, Management Plan – Hazardous Materials*, Rev7, 28 August 2019; and
- Lendlease Building Pty Ltd (2019b) *Tweed Valley Hospital, Works Plan*, Rev3, 26 August 2019.

It should be noted that the Soil Investigation Report (Cavvanba 2019b) and RAP (Cavvanba 2019c) prepared for the residential house and garage were reviewed and considered by the Auditor in the preparation of the previous Site Audit Report and Site Audit Statement. These reports have recently been amended to reflect an isolated aldrin and dieldrin impact identified within shallow soil beneath the garage slab. Based on the results of the soil investigation and statistical assessment, the Auditor concurs with the consultant (Cavvanba) that the reported soil impact beneath the garage slab is unlikely to realise any unacceptable health and ecological risks to the proposed development, hence soil remediation is not considered to be warranted in this area. These revised reports have been included in the list of the reviewed documents above for completeness.

## 3. Summary of Contamination Issues

Since the issuance of the previous Site Audit Statement and Audit Report, additional soil, groundwater and surface water investigative works have been conducted at the site. Key findings of these investigation works are summarised in the sections below.

### 3.1 Soil

A summary of the soil investigation results is provided as follows:

- A total of 31 soil boreholes/test pits were advanced at the site, targeting the existing residential house (now demolished), farm pit (concrete sump feature), farm shed, farm dam and farm dump to a maximum depth of 1.2 metre below ground surface (mbgs);

- Two (2) locations (SL21 and SL22) beneath the residential house reported elevated lead concentrations (up to 385 mg/kg) above the adopted NEPM health investigation level A (HIL A) at a depth of approximately 0.1 mbgs. Previous soil investigation also identified elevated lead concentrations (up to 1,600 mg/kg) within the shallow soil at the residential house which appear to be limited to the building footprint;
- One (1) location (SL11) adjacent to the concrete slab associated with the farm pit reported an elevated benzo(a)pyrene (BaP) TEQ concentration (7.1 mg/kg) above the adopted NEPM HIL A at a depth of approximately 0.1 mbgs. The reported BaP TEQ impact at this location has been vertically and laterally delineated;
- The shallow soil samples collected from select locations (SL01 and SL02) in the vicinity of the farm pit reported elevated TRH F2 or F3 concentrations above the adopted NEPM ecological screening levels (ESLs) for urban residential land use setting. The consultant (Cavvanba 2019d) has concluded that the reported TRH impacts at these locations are potentially attributed to overflow of the farm pit water during rainfall events or general poor housekeeping during historical farm operation;
- One (1) sample (CS\_02) retrieved from the concrete slab associated with the farm pit reported an elevated copper concentration (12,200 mg/kg) above the adopted NEPM HIL A. In addition, elevated concentrations of zinc (up to 1,590 mg/kg) and TRH F3 (up to 9,440 mg/kg) above the adopted NEPM ESLs for urban residential land use setting were also recorded in all the concrete samples. The consultant (Cavvanba 2019d) has concluded that the contaminant levels recorded in the concrete samples are reflective of the effect of chemical impregnation associated with the historical use of the farm pit;
- One (1) location (SL16) located to the western side of the farm shed reported detection of asbestos fibres at a depth of approximately 0.1 mbgs, however no asbestos was detected in the underlying sample at 0.5 mbgs, suggesting the asbestos impact was limited to shallow depth. Previous investigations conducted by OCTIEF (2018a)<sup>5</sup> and Cavvanba (2019a) also reported the presence of shallow asbestos contamination to the western and south-eastern sides of the farm shed. The nature of asbestos contamination is considered to be asbestos containing material (ACM) in disturbed soil rather than a friable asbestos source;
- One (1) location (SL23) was advanced in the vicinity of the farm dam. Soil samples collected from this location reported concentrations of all contaminants of potential concern (COPC) (where analysed) were either below the laboratory limit of reporting (LOR) or adopted ecological and human health criteria;
- Select shallow soil samples retrieved from the residential house, farm shed and farm pit reported concentrations of a combination of COPC including heavy metals (copper, nickel and zinc) and BaP above the adopted ecological criteria for urban residential land use setting;
- One (1) sediment sample (SS01) retrieved from the farm dam reported concentrations of all COPC (where analysed) were either below the laboratory LOR or ANZECC/ARMCANZ (2000) low sediment quality guidelines;
- Three (3) locations (SL26, SL28 and SL29) advanced within the farm dump reported zinc concentrations (up to 502 mg/kg) above the adopted ecological criterion for urban residential land use setting at depths between 0.1 and 0.5 mbgs. However, all soil samples

<sup>5</sup> OCTIEF Pty Ltd (2018) *Preliminary and Detailed Site Investigation – 771 Cudgen Road, Cudgen, NSW 2487*, 17 October 2018.

reported concentrations of all COPC (where analysed) were below the adopted human health criteria; and

- The consultant (Cavvanba 2019d) has recommended excavation and validation of the identified soil impacts at the residential house, farm shed and farm pit. The farm dump is proposed to be removed from the site due to the presence of aesthetically unsuitable materials including corrugated iron, cement sheeting (non-asbestos), plastic hosing, star pickets and bricks.

The soil and sediment investigation locations are depicted in the attached **Figures 1 – 5**.

### **3.2 Groundwater**

A summary of the groundwater investigation results is provided as follows:

- Four (4) groundwater monitoring wells (MW01 – MW04) were installed in the vicinity of farm shed and farm pit using a combination of solid flight auger and air hammer to a maximum depth of 17 mbgs. These wells were screened within the underlying basalt aquifer;
- Two (2) additional groundwater monitoring wells (MW05 and MW06) were installed in the vicinity of the farm dump and farm dam using a hand auger to a maximum depth of 1.5 mbgs. These wells were screened within silty clay which is likely to be underlain by the basalt aquifer;
- Standing water levels in the wells ranged from 0.37 to 14.53 metre Australian Height Datum (mAHD). Based on the groundwater elevations, groundwater flow direction was inferred to be predominantly northerly towards an unnamed canal located approximately 250 m to the north of the site (at its nearest point). The canal is likely to drain into the Tweed River and potentially Cudgen Creek located approximately 2.9 km to the north-west and 0.8 km to the east of the site respectively;
- Elevated concentrations of zinc and mercury above the adopted freshwater criteria were reported in most of the groundwater wells. The consultant (Cavvanba 2019d) has concluded that these metals are representative of background groundwater conditions;
- Appreciable concentrations of TRH F3 (albeit below the adopted groundwater criteria) were reported in wells MW02 and MW03. It is not clear whether the reported TRH impact at these locations is of anthropogenic nature; and
- The consultant (Cavvanba 2019d) has recommended (the Auditor agrees) an additional round of groundwater monitoring be undertaken to confirm the initial groundwater results. Cavvanba has also recommended TRH silica gel clean up, major ions and trace level OCP analysis be included in the analytical schedule for the next groundwater monitoring.

The groundwater investigation locations are depicted in attached **Figures 6 and 7**.

### **3.3 Surface Water**

A summary of the surface investigation results is provided as follows:

- One (1) surface water sample (SW\_DAM) was collected from the existing dam on-site using an unpreserved bottle attached to an extendable pole. The sampler was gently submerged into the water body to minimise disturbance to the underlying sediment;
- The dam water sample reported an elevated zinc concentration above the freshwater criterion, which is consistent with the underlying groundwater. The consultant (Cavvanba

2019d) has concluded that the dam is potentially recharged by the underlying groundwater hence the elevated zinc is likely representative of background groundwater condition;

- One (1) water sample (SW-DIP) was collected from the water within the farm pit feature. The results indicated concentrations of select metals (cadmium, chromium, copper, lead and zinc), TRH and PAHs exceeded the adopted freshwater and/or drinking water criteria. The consultant (Cavvanba 2019d) has concluded the impacted pit water is likely associated with the historical use of fuels, oils, grease and solvents within this area; and
- The consultant (Cavvanba 2019d) has recommended removal of the farm pit water as part of the remediation works proposed for the farm pit.

The surface water investigation locations are depicted in attached **Figures 6 and 7**.

#### 4. Remediation and Validation Strategy

A remediation feasibility assessment has been conducted and included in the relevant RAPs (2019a, 2019c and 2019e) to assist with the identification of the most feasible remediation methodology for the identified contamination issues at the residential house, farm shed and farm pit. A VSAQP has also been prepared by the consultant (Cavvanba 2019f) outlining the validation and sampling procedures and requirements for each area of concern. The relevant RAPs and VSAQP have been reviewed and endorsed by the Auditor.

A summary of the proposed remedial and validation strategy for each area of concern is provided in the table below.

Area of Concern	Identified Contamination Issue	Proposed Remediation Strategy	Proposed Validation Strategy
Residential house	<ul style="list-style-type: none"> <li>• Shallow lead impact above NEPM HIL A has been reported at select locations beneath the residential house; and</li> <li>• Approximately 132 m<sup>3</sup> of lead impacted soil requires management.</li> </ul>	<ul style="list-style-type: none"> <li>• Excavation of the lead impacted area to a maximum depth of 0.7 mbgs; and</li> <li>• Disposal of the excavated material to an EPA licensed facility.</li> </ul>	<ul style="list-style-type: none"> <li>• Five (5) soil samples are proposed to be collected from the surface of the excavation and analysed for lead; and</li> <li>• Further excavation/validation sampling may be conducted should the initial validation results report any NEPM HIL exceedances.</li> </ul> <p>The extent of lead impacted area and the proposed sampling locations are depicted in <b>Figure 10</b>.</p>
Farm pit	<ul style="list-style-type: none"> <li>• Shallow BaP TEQ impact above NEPM HIL A has been reported at SL11 around the farm pit; and</li> <li>• Approximately 5 m<sup>3</sup> of BaP TEQ impacted soil requires management.</li> </ul>	<ul style="list-style-type: none"> <li>• Excavation of the BaP TEQ impacted area to a maximum depth of 0.3 mbgs; and</li> <li>• Disposal of the excavated material to an EPA licensed facility.</li> </ul>	<ul style="list-style-type: none"> <li>• One (1) soil sample is proposed to be collected from the base of the excavation where SL11 is located;</li> <li>• One (1) soil sample is proposed to be collected from the western wall of the excavation at a target depth of 0.1 m;</li> <li>• All soil samples are proposed to be analysed for PAHs (including BaP TEQ); and</li> <li>• Further excavation/validation sampling may be conducted should the initial validation results report any NEPM HIL exceedances.</li> </ul> <p>The extent of BaP TEQ impacted area and the proposed sampling locations are depicted in <b>Figure 8</b>.</p>

Area of Concern	Identified Contamination Issue	Proposed Remediation Strategy	Proposed Validation Strategy
	<ul style="list-style-type: none"> <li>Farm pit sump feature remains at the site.</li> </ul>	<ul style="list-style-type: none"> <li>Excavation and off-site disposal of the farm pit sump feature.</li> </ul>	<ul style="list-style-type: none"> <li>One (1) soil sample is proposed to be collected from the base of the farm pit sump at approximately 1.1 mbgs;</li> <li>One (1) soil sample is proposed to be collected from the southern wall at a target depth of 0.5 mbgs; and</li> <li>All soil samples are proposed to be analysed for a broad suite of COPC including TRH, BTEXN, PAHs, OCPs, PCBs and heavy metals; and</li> <li>Further excavation/validation sampling may be conducted should the initial validation results report any NEPM HIL exceedances.</li> </ul> <p>The farm pit sump and the proposed sampling locations are depicted in <b>Figure 8</b>.</p>
	<ul style="list-style-type: none"> <li>Approximately 5 m<sup>3</sup> of concrete material is present at the farm pit area with elevated levels of TRHs and heavy metals.</li> </ul>	<ul style="list-style-type: none"> <li>Excavation and off-site disposal of the concrete material to an EPA licensed facility.</li> </ul>	<ul style="list-style-type: none"> <li>Not required.</li> </ul>
	<ul style="list-style-type: none"> <li>Approximately 1,000 L of water with elevated levels of TRHs, heavy metals and naphthalene are present within the farm pit.</li> </ul>	<ul style="list-style-type: none"> <li>Vacuum removal of the pit water by a licensed waste removal contractor and off-site disposal to an EPA licensed facility.</li> </ul>	<ul style="list-style-type: none"> <li>Not required.</li> </ul>
Farm shed	<ul style="list-style-type: none"> <li>ACM has been reported adjacent in shallow soil to the western side and south-eastern side of the shed; and</li> <li>Approximately 200 m<sup>3</sup> of asbestos impacted soil requires management.</li> </ul>	<ul style="list-style-type: none"> <li>Excavation of asbestos impacted area to a maximum depth of 0.3 mbgs; and</li> <li>Disposal of the excavated material to an EPA licensed facility.</li> </ul>	<ul style="list-style-type: none"> <li>A total of 45 soil samples are proposed to be collected from the surface and walls of the excavation and submitted for asbestos analysis;</li> <li>The proposed soil sampling density at the base of the excavation meets that provided in WA DoH (2009) guidelines, i.e. twice the minimum density listed in the NSW EPA <i>Sampling Design Guidelines</i> (1995) for the asbestos likelihood "known";</li> <li>At least one (1) sample from each wall per 5 m length of strata of interest (or per 1 m depth) is proposed for validation of excavation walls. Additional discretionary samples will be collected if necessary;</li> <li>Further excavation/validation sampling may be conducted should the initial validation results report any detection of asbestos fibres or ACM in soils; and</li> <li>Asbestos airborne fibre monitoring will be set up at four (4) locations of the work area during excavation works.</li> </ul>

Area of Concern	Identified Contamination Issue	Proposed Remediation Strategy	Proposed Validation Strategy
			The asbestos impacted area and the proposed sampling locations are depicted in <b>Figure 9</b> .
Farm dump	<ul style="list-style-type: none"> <li>• Presence of aesthetically unsuitable material in the farm dump; and</li> <li>• Approximately 500 m<sup>3</sup> of farm dump requires management.</li> </ul>	<ul style="list-style-type: none"> <li>• Off-site disposal of the farm dump to a nominated tipping facility.</li> </ul>	<ul style="list-style-type: none"> <li>• Not required.</li> </ul>

## 5. Auditor Opinions

The soil and groundwater investigation report (Cavvanba 2019d) was reviewed by the Auditor and was found to have sufficiently characterised soil, groundwater, sediment and surface water at the site. The assessment results were also considered sufficient to define the extent of remediation of the shallow soil impacts identified at the residential house, farm shed and farm pit. Subject to the limitations in **Attachment 1**, the following opinions are presented:

- The site assessment activities undertaken are considered to have met the requirements of the *Contaminated Land Management: Guidelines for the NSW Site Auditor Scheme (3rd Edition)* (EPA 2017).
- Elevated levels of metals (zinc and/or mercury) in site groundwater and dam water exceeded the adopted freshwater criteria. The Auditor concurs with the consultant (Cavvanba 2019d) that these metals are likely representative of background groundwater conditions and so do not require any further assessment or management as per the requirements of ANZECC/ARMCANZ 2000.
- Shallow soil impacts have been identified at the residential house, farm shed and farm pit which require management. However, the Auditor is satisfied that the remediation and validation processes documented in the relevant RAPs and VSAQP are sufficient to address the extent of remediation required.
- Ecological exceedances of heavy metals (copper, nickel and zinc), TRH F2, TRH F3 and BaP were reported in shallow soil at select locations across the site. Due to the absence of any ecological impacts identified as part of the site investigations, the exceedances of the EILs are considered by the Auditor to not warrant any further assessment or management.
- The remediation strategy documented in the relevant RAPs was reviewed by the Auditor and found to be technically feasible; environmentally justifiable given the nature and extent of the identified contamination; and consistent with relevant laws, policies and guidelines.
- The Auditor notes that the remediation and validation procedures outlined in the relevant RAPs and VSAQP are appropriate to render the site suitable for the proposed land use, subject to the following considerations:
  - Implementation of the Hazardous Materials Management Plan (Lendlease 2019a), Works Plan (Lendlease 2019b) and Work Health and Safety Plan (Delta 2019) which have been prepared for the site.
  - Undertaking an additional round of groundwater monitoring at the site which includes analysis of TRH silica gel clean up, major ions and trace level OCP.
  - Preparation of a validation report detailing the remediation and validation of the residential house, farm shed and farm pit in accordance with relevant guidelines.



- Completion of a Site Audit Statement supported by a Site Audit Report, certifying suitability for the proposed use, following the successful completion of the remediation and validation activities at the site.

Please note that this interim advice does not constitute a Site Audit Statement or a Site Audit Report, but is provided to assist in the assessment and management of contamination issues at the site in regard to requirements of the site audit. The information provided herein should not be considered pre-emptive of the final audit conclusions, but rather represent the findings of the audit based on a preliminary review of available site information. Furthermore, the interim advice should not be regarded as approval of any proposed investigations or remedial activities, as any such approval is beyond the scope of an independent auditor.

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Should you require clarification, please contact the undersigned on 02 8245 0300 or by email [alau@jbsg.com.au](mailto:alau@jbsg.com.au).

Yours sincerely:



Andrew Lau  
NSW EPA Accredited Site Auditor  
**JBS&G Australia Pty Ltd**

Attachments      (1) Limitations  
                         (2) Figures



## **Attachment 1 – Limitations**

This audit was conducted with a reasonable level of scrutiny, care and diligence on behalf of the client for the purposes outlined in the *Contaminated Land Management Act 1997*. The data used to support the conclusions reached in this audit were obtained by other consultants and the limitations which apply to the consultant's report(s) apply equally to this audit report.

Every reasonable effort has been made to identify and obtain all relevant data, reports and other information that provide evidence about the condition of the site, and those that were held by the client and the client's consultants, or that were readily available. No liability can be accepted for unreported omissions, alterations or errors in the data collected and presented by other consultants. Accordingly, the data and information presented by others are taken and interpreted in good faith.

Sampling and chemical analysis of environmental media is based on appropriate guidance documents made and approved by the relevant regulatory authorities. Conclusions arising from the review and assessment of environmental data are based on the sampling and analysis considered appropriate based on the regulatory requirements. Limited sampling and laboratory analyses were undertaken as part of the investigations reviewed, as described herein. Ground conditions between sampling locations and media may vary, and this should be considered when extrapolating between sampling points. Chemical analytes are based on the information detailed in the site history. Further chemicals or categories of chemicals may exist at the site, which were not identified in the site history and which may not be expected at the site.

Changes to the subsurface conditions may occur subsequent to the investigations described herein, through natural processes or through the intentional or accidental addition of contaminants. The conclusions and recommendations reached in this audit are based on the information obtained at the time of the investigations.

## **Attachment 2 – Figures**

