

14 June 2019

Landream Pyrmont Pty Ltd
c/- Mr Harrison Tanke
Project Manager
Property Development Solutions (Aust) Pty Ltd
Level 1, 63 York Street
Sydney NSW 2000

Via email: harrison.tanke@pdsgroup.com.au
cc: ddenaro@jbsg.com.au

Dear Harrison,

Re: Interim Advice 4 (IA4) –Endorsement of Remedial Action Plan (RAP) for 14-26 Wattle Street, Ultimo NSW 2007

1 Introduction

Property Development Solutions (Aust) Pty Ltd (PDS), on behalf of Landream Pyrmont Pty Ltd has appointed Rebeka Hall of Zoic Environmental Pty Ltd (Zoic), a NSW EPA Auditor accredited (No. 0802) under the Contaminated Land Management (CLM) Act 1997, to conduct an Audit of the property located at 14-26 Wattle Street, Ultimo, NSW ("the site").

The overall aim of the engagement is to enable a site audit statement (SAS) and associated site audit report (SAR) to be prepared that confirms the suitability for the proposed mixed use redevelopment which includes high density residential apartments, commercial office space, retail, childcare centre, basketball court, recreational and garden areas and basement car parking. A development application for the proposed development is due for lodgement with City of Sydney Council for assessment.

The current aim of the Audit is to endorse a remedial action plan for the site. The Audit is being conducted in accordance with the requirements outlined in NSW EPA (2017) Contaminated Land Management Guidelines for the NSW Site Auditor Scheme (3rd edition).

2 Scope of Audit and Nature of Interim Advice

NSW EPA (2017) Contaminated Land Management Guidelines for the NSW Site Auditor Scheme (3rd Edition), describes the site assessment and audit process as:

1. The contaminated land consultant, or other relevant party, designs and implements the site assessment and, where required, all remediation and validation activities achieve the stated objectives; and



2. The site auditor independently reviews the works undertaken to ensure that they comply with current regulations, standards and guidelines, and that the site has been assessed, remediated and validated to a standard appropriate to the proposed land use.

Therefore, the contaminated land consultant and other relevant parties should be satisfied that the work to be conducted conforms to all appropriate regulations, standards and guidelines and is suitable based on the site history and the proposed mixed landuse development.

3 Current Interim Advice

The purpose of the current Interim Advice No. 4 (IA4) is to provide the Auditor's opinion on whether the site can be made suitable for the proposed development based on the remedial strategy presented in the current Remedial Action Plan prepared by the appointed environmental consultant JBS&G:

- JBS&G (13 June 2019a) Remedial Action Plan 14-26 Wattle Street Ultimo, New South Wales (Ref: 55900-122315 (Rev 0)).

During the course of the Audit, the Auditor has reviewed the following additional reports:

- JBS&G (13 June 2019b) Proposed Multi-Use Development, Human Health Risk Assessment, 14-26 Wattle Street Ultimo, New South Wales (Ref: 55900/122485 (Rev 0)).
- JBS&G (5 June 2019) Proposed Multi-Use Development, Additional Environmental Assessment, 14-26 Wattle Street, Ultimo, New South Wales (Ref: 55900/121,644 Rev A).
- JBS&G (9 July 2018) Data Gap Investigation Former City of Sydney Works Depot 14-26 Wattle Street Ultimo New South Wales (Ref: 52087/106367 (Rev 0)).
- JBS&G (7 August 2015) Environmental Management Plan Wattle Street Depot 14-26 Wattle Street Pyrmont, NSW (Ref: 50982-101376 (Rev A)).
- JBS&G (5 August 2015) Off-Site Groundwater Assessment, July 2015 - City of Sydney Wattle Street Depot, 14-26 Wattle Street, Pyrmont, NSW (Ref: 50982-101342 L001 CoS Wattle St Depot - Offsite GW assessment July 2015 Rev 0.docx).
- DP (2014) Report on Contamination Investigation Proposed School 14-16 Wattle Street, Ultimo (Ref: 73753.01, August 2014).
- SKM (2005) Site Audit Report, Site Audit 103 by Dr Ian Swane, Review of a Remediation Action Plan for Wattle Street Depot, Ultimo NSW 2007 (Ref: SAS 103, 28 July 2005). It should be noted that this audit was for non-statutory purposes and was based on a different landuse (commercial) and development layout.
- DP (December 2004) Report on Additional Environmental Assessment Works Wattle Street Depot Ultimo (Ref: 37334).
- DP (February 2004) Report on Supplementary Groundwater Monitoring (Round 4) (Ref: 30284C, February 2004).
- Douglas Partners (DP) (2002) Groundwater Monitoring Wattle Street Depot Ultimo (Ref: 30284, 7 May 2002).
- Coffey (1998) Wattle Street Depot Groundwater Monitoring and Well Installation (Ref: E2035/6-AF, 15 July 1998).
- Coffey (1997) Wattle Street Depot Ultimo Supplementary Environmental Site Assessment (Ref: E2035/2-AF, July 1997).
- Coffey (August 1996) Wattle Street Depot Ultimo Environmental Site Assessment (Ref: E2035/1-AF, 15 August 1996).



- EIS (1994) Report to Sydney City Council on Environmental Investigation for Proposed Redevelopment of Council Depot at Wattle Street, Pyrmont, NSW (Ref: E10242S/a).

4 Summary of Environmental Investigations and Proposed Remedial Strategy

Numerous investigations have been conducted across the site since 1994 with the following contamination identified across various impacted media:

4.1 Soil Conditions

- Heavy metals (specifically arsenic) in soil were detected above ecological criteria;
- Total recoverable hydrocarbons (TRH) F1, F2, F3 and F4, benzene, naphthalene were detected above human health and ecological criteria (HSL, ESL and/or management limits) generally across the site.
- Naphthalene and BaP were detected above ecological screening levels (ESL) in a number of locations and BaP TEQ was detected above HIL B generally across the site.
- Some VOCs (dichloromethane, 2-chlorotoluene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, 4-isopropyl toluene, Isopropylbenzene, n-butylbenzene, styrene, acetone) were detected above the level of reporting (LOR) in some samples.
- An asbestos fragment was detected in 1 sample, noting that only qualitative asbestos analysis has been conducted to date.
- JBS&G concluded that remediation/management of soil impact is required to render the site suitable for the proposed landuse.

4.2 Groundwater Conditions

- Elevated total recoverable hydrocarbons (TRH), benzene, xylenes, naphthalene, benzo-a-pyrene (BaP) were detected in one or more samples, noting that the results could not be compared with NEPM (2013) Health Screening Levels (HSL) for vapour intrusion as the proposed basement level is below groundwater level.
- Some volatile organic compounds (VOC) were detected above the LOR, similar to soil.
- The extent of contaminant plumes and groundwater contours have not been provided. Previous investigations conclude that groundwater flow is to the west, however some tidal influence has been recorded in the past.
- Separate phase has not been measured, however oily sheen was previously identified by DP in BH119. Additionally, free tarry residues were observed at BH33. Diesel and petroleum products were observed at the water table in Areas 3, 4, 5, 6 of the area of underground storage tanks (UST) (DP, December 2004).

4.3 Soil vapour:

- Benzene and naphthalene exceeded human health criteria (HSL A/B (for sand)) at sample point SVJ09 with TRH F1 and F2 detected above HSL A/B criteria in a number of other vapour wells.
- Some VOC were detected above the level of reporting (LOR), similarly detected in soil and groundwater samples.



4.4 Hazardous ground gas monitoring

Three rounds of sampling were conducted by JBS&G (in April 2019) with results indicating a low risk of hazardous ground gas the site.

4.5 Human Health Risk Assessment (2019)

The JBS&G (13 June 2019b) HHRA provides a human health risk assessment for applicable onsite receptors based on the current development plans. The outcomes of the HHRA were as follows

- Exceedances above risk and hazard criteria were identified for all of the receptors assessed, including:
 - Resident
 - Recreation centre
 - Commercial/retail worker
 - Childcare centre (commercial worker)
 - Childcare centre (child)
 - Lift/basement maintenance worker
 - Subsurface/excavation worker
- The exceedances were as a consequence of:
 - Potential inhalation of the maximum concentrations of benzene, naphthalene, trimethylbenzenes, or TRH and
 - Potential direct contact to the maximum concentration of BaP TEQ and TRH for soil.

4.6 Overview of the proposed Remedial Strategy

Based on the outcome of the investigations and the HHRA findings, JBS&G conclude that remediation of the site is required to render the suitable for the proposed development. The remedial strategy outlined in the JBS&G (13 June 2019a) RAP can be summarised as follows:

- Excavation and offsite disposal for the identified hotspots, petroleum infrastructure, tar impacted and malodorous soil;
- Capping and containment of any residual contamination;
- Onsite treatment (via controlled landfarming) as a contingency strategy for hydrocarbon impacted soil; and
- Preparation of a long term Environmental Management Plan (LT EMP) detailing ongoing management/maintenance/ monitoring for residual contamination and to ensure the integrity of the proposed cap is maintained.

5 RAP Endorsement

The RAP prepared by JBS&G (13 June 2019a) has been reviewed with respect to its application and robustness in addressing contamination currently identified at the site. The RAP presents contingencies and required actions should contamination be greater than anticipated,



unexpected finds or if the proposed remedial approach does not achieve the remedial goal of rendering the site suitable for the proposed mixed use.

Although the Auditor has determined that the site is capable of being made suitable subject to the successful implementation of the JBS&G RAP (13 June 2019), it must be recognised that additional works are required to determine the full lateral and vertical extent of the remediation to achieve site suitability.

The Auditor considers that the remedial strategy as presented in JBS&G (13 June 2019a) is conceptually appropriate for the known contamination and the site is capable of being made suitable if implemented, subject to the following conditions:

1. Technical queries raised in IA3 (Attachment A) on the current versions of the HHRA and RAP must be addressed and reports updated as appropriate. Specific requirements include the:
 - a. Completion of further site characterisation comprising:
 - i. Assessment of site conditions beneath current structures.
 - ii. Completion of asbestos assessment in accordance with NEPM (2013).
 - iii. Further assessment into PFAS in soils and groundwater and if conditions pose an unacceptable risk to sensitive receptors.
 - iv. Additional groundwater and soil vapour sampling. The soil vapour sampling should be as close to the depth of groundwater as possible using soil vapour wells. Future soil vapour sampling should also include carbon disulphide analysis.
 - v. Confirm the extent of the groundwater and soil vapour plumes particularly in the south-western portion of the site.
 - vi. Assess the potential for soil vapour intrusion through the sandstone cutting and the quality of water seepage along the eastern boundary (Jones Street).
 - vii. Assess the leaching potential of any contaminated material to remain onsite to ensure that the material does not continue to be a source of contamination to the groundwater.
 - b. Confirmation of site-specific soil remediation clean up criteria for BaP TEQ noting the queries raised in IA3 and the assumptions behind its derivation.
 - c. Based on the findings of the above, confirm the nature and extent of remediation required, and amend the RAP accordingly.
2. Any updated HHRA and RAP should be provided to the Site Auditor for review and endorsement. This includes the design of any cap and containment and/or engineering controls incorporated into the development.
3. Once the final development plans are confirmed, the Auditor will require confirmation that the finalised HHRA and RAP remain valid to ensure appropriate remediation occurs to render the site suitable for the indented landuses, or amended as appropriate.
4. Prior to commencement of any remediation works, a detailed WHS Plan and CEMP must be prepared and implemented by the appointed remediation contractor to ensure that potential risks to human health (on and off site) and the environment are appropriately managed during the works.
5. Any unexpected finds or deviations from the RAP must be discussed with the Site Auditor at the earliest possible opportunity. The WHS Plan and CEMP should include a protocol for responding to any unexpected finds.



6. The Auditor will require involvement during the course of remediation and validation activities, and requests regular reporting on progress of remedial works.
7. At the completion of remediation, a validation report and long term EMP are to be provided to the Site Auditor for review and endorsement, to enable the preparation of a Site Audit Statement and Report to confirm the suitability of the site for the approved development.

This interim advice does not constitute a SAS or a SAR, but rather is provided to assist the Client in the assessment and management of contamination issues at the site. The information provided herein should not be considered pre-emptive of the final Audit conclusions. It represents the Auditor's opinion based on the review of currently available information.

Should you have any queries or wish to discuss any points, please do not hesitate to contact the undersigned.

Yours sincerely,

Rebeka Hall
Site Auditor
Zoic Environmental Pty Ltd

Cheryl Halim
Senior Environmental Engineer
Zoic Environmental Pty Ltd

Attachment: Attachment A – Interim Advice 3



Attachment A – Interim Advice 3

14 June 2019

Landream Pymont Pty Ltd
c/- Mr Harrison Tanke
Project Manager
Property Development Solutions (Aust) Pty Ltd
Level 1, 63 York Street
Sydney NSW 2000

Via email: harrison.tanke@pdsgroup.com.au
cc: ddenaro@jbsg.com.au

Dear Harrison,

Re: Interim Advice 3 (IA3) – Review of Revised Human Health Risk Assessment (HHRA) and Remedial Action Plan (RAP), 14-26 Wattle Street, Ultimo NSW 2007

1 Introduction

Property Development Solutions (Aust) Pty Ltd (PDS) on behalf of Landream Pymont Pty Ltd, has appointed Rebeka Hall of Zoic Environmental Pty Ltd (Zoic), a NSW EPA Auditor accredited (No. 0802) under the Contaminated Land Management (CLM) Act 1997, to conduct an Audit of the property located at 14-26 Wattle Street, Ultimo, NSW ("the site").

The overall aim of the engagement is to enable a site audit statement (SAS) and associated site audit report (SAR) to be prepared that confirms the suitability for the proposed multi use redevelopment which includes high density residential apartments, commercial office space, retail, childcare centre, basketball court, recreational and garden areas and basement car parking. A development application for the proposed development is due for lodgement with City of Sydney Council for assessment.

The current aim of the Audit is to endorse a remedial action plan for the site. The Audit is being conducted in accordance with the requirements outlined in NSW EPA (2017) Contaminated Land Management Guidelines for the NSW Site Auditor Scheme (3rd edition).

2 Current Interim Advice

The purpose of the current IA is to document Auditor findings following the review of the revised human health risk assessment (HHRA) prepared for the site for the contaminants and receptors identified. This advice outlines any data gaps identified in revised report which should be addressed by the appointed environmental consultant, JBS&G, in refining their HHRA with due consideration of any modification or changes in the development layout as part of the DA assessment process. In addition this advice provides Auditor comments on the review of the current remedial action plan (RAP).



In preparing this interim audit advice, the Auditor has reviewed the following reports:

- JBS&G (13 June 2019) Proposed Multi-Use Development, Human Health Risk Assessment, 14-26 Wattle Street Ultimo, New South Wales (Ref: 55900/122485 (Rev 0)).
- JBS&G (13 June 2019) Remedial Action Plan 14-26 Wattle Street Ultimo, New South Wales (Ref: 55900-122315 (Rev 0)).

3 Review of the Human Health Risk Assessment (HHRA)

The Auditor has reviewed the revised JBS&G (13 June 2019) HHRA against the checklist provided in Appendix E of the NSW EPA (2017) Guidelines for the NSW Auditor Scheme (3rd edition). The Auditor had previously reviewed earlier versions of the HHRA with comments provided in IA2 (issued 29 May 2019). Responses to these earlier comments have also been considered in evaluating the current HHRA.

A summary of the Auditor's evaluation of the most current version of HHRA (13 June 2019) is provided in Table 1.

Table 1: Review of JBS&G (13 June 2019) HHRA

Requirement	Consultant Consideration	Auditor Comment
Hazard Identification		
Have all appropriate sources of information regarding chemicals of potential concern been identified and assessed?	<p>Soil</p> <p>Section 4.1 JBS&G (13 June 2019) states that soil results from EIS (1994), Coffey (August 1996), DP (2014), JBS&G (9 July 2018) and JBS&G (15 May 2019a) were considered and compared with Tier 1 criteria, noting that for organic compounds only DP (2014), JBS&G (9 July 2018) and JBS&G (15 May 2019a) data were considered given potential natural attenuation.</p> <p>Groundwater</p> <p>Section 4.2 JBS&G (13 June 2019) states that only the most recent data (2015, 2016, 2018, 2019) has been considered as well as DP (2002), DP (December 2004), DP (2014).</p> <p>Soil vapour</p> <p>Section 4.3 JBS&G (13 June 2019) states that soil vapour results from DP (2014), JBS&G (9 July 2018) and JBS&G (15 May 2019a) were considered.</p>	<p>The Auditor considers:</p> <ul style="list-style-type: none"> • The Auditor requires more robust justification for the omission of TRH and PAH results prior to 2014, given the potential source of TRH and PAH were product and/or coal tar. • Some compounds in groundwater (such as BTEX) do not appear to have been considered from the older data. Please justify and make it consistent with the approach adopted for other COPCs (e.g. TRH considered older data). • The Auditor notes the HHRA did not include assessment of hazardous ground gas, which is assessed separately. • JBS&G's response to ESA comments confirmed that additional round (s) of soil vapour assessment is required for the site. The Auditor strongly agrees, and this should be included in the current RAP.
Has justification been given for the selection of the chemicals of potential concern?	<p>Section 4.1 JBS&G (13 June 2019) provides justification for COPCs selected, based on Tier 1 criteria (health-based criteria):</p> <ul style="list-style-type: none"> • Soil: <ul style="list-style-type: none"> - Heavy metals (arsenic, chromium, lead). JBS&G omitted chromium as Cr is considered likely to be present as Cr (III). Lead was not selected as COPCs as NEPM (2013) criteria will be adopted in the RAP. - TRH 	<p>The Auditor considers the selection of the COPCs to be generally acceptable, noting the following:</p> <p>Soil</p> <ul style="list-style-type: none"> • The RAP shall make provision for confirmation that chromium occurs as Cr (III). • The RAP shall provide mercury and nickel statistics.



Requirement	Consultant Consideration	Auditor Comment
	<ul style="list-style-type: none"> - Benzene - Xylenes - PAHs (naphthalene and BaP TEQ) Why not phenanthrene? - Why not 4-isotoluene? - Asbestos was not assessed. Exposures during construction will be managed as per CEMP and WHS plan. • Groundwater: <ul style="list-style-type: none"> - Arsenic - Manganese (its omission requires justification) - Benzene - Xylenes (its omission requires justification) - BaP - Naphthalene - TRH C6-C40 - PFOS + PFHxS. JBS&G has omitted PFOS and PFHxS given the exceedance was marginal and groundwater at the site is not likely to be used as drinking water. - 4-isopropyltoluene (its omission requires justification). • Soil vapour: <ul style="list-style-type: none"> - Chlorobenzene - Carbon disulfide - Chloroform - Benzene - Naphthalene - Trimethylbenzenes - 1,3-dichlorobenzene. This is omitted by JBS&G because its concentration is below 1,2-dichlorobenzene and 1,4-dichlorobenzene. - Heptane and isopropylbenzene. These are omitted by JBS&G because heptane concentration is only slightly exceeding the criterion and is likely below what would potentially pose a risk once attenuation between sub-surface and building space is considered. - 4-isopropyltoluene, sec-butylbenzene, 1-ethyl-4-methyl benzene and 4-isopropyltoluene. These are omitted by JBS&G because there are no criteria and are considered when assessing petroleum hydrocarbons.. 	<ul style="list-style-type: none"> • JBS&G did not consider 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene and 2-chlorotoluene. The Auditor has compared these against USEPA RSL and consider that their concentrations were unlikely to present an unacceptable risk. • Ecological assessment shall be conducted in the area of proposed landscaping. • The RAP provides further assessment for asbestos impact as per NEPM (2013) in the area where site fill will be retained. <p>Groundwater</p> <ul style="list-style-type: none"> • It needs to be demonstrated that PFOS + PFHxS are not sourced from the site and will not impact on the nearest waterbody receptor. • Please justify the omission of manganese, xylenes, PFOS + PFHxS, 4-isopropyl toluene for the users of the surface waterbody. <p>Soil vapour:</p> <ul style="list-style-type: none"> • The Auditor accepts the omission for 1,3-dichlorobenzene, heptane and isopropylbenzene, noting that JBS&G has adopted ambient air USEPA RSL without multiplication of attenuation factor, which is conservative and accepts that 4-isopropyltoluene, sec-butylbenzene, 1-ethyl-4-methyl benzene and 4-isopropyltoluene are assessed with the assessment of TRH.
Toxicological Assessment		
<p>Have all critical toxic effects been identified?</p> <p>Have the effects on each body system (for example renal, hepatic, cardiovascular and developmental) and the types of effects (for example genotoxic and</p>	<p>Section 5.4.1 provides toxic effects and effects on each body system.</p>	<p>The Auditor considers that adequate information has been provided.</p> <p>Review any additional ones for soil and groundwater that may be identified.</p>



Requirement	Consultant Consideration	Auditor Comment
carcinogenic) been summarised?		
Has the dose-response relationship for chemicals of potential concern been discussed?	Section 5.4.1 provides dose response relationships.	The Auditor considers that adequate information has been provided. However, other COPCs may need to be added, given the above comments.
Have all relevant toxicological data been considered and checked for accuracy?	Section 5 of JBS&G (15 May 2019b) provides relevant toxicological data, which were reviewed for accuracy. Section 5.5 also provides odour thresholds.	Please justify the RfC and RfD for chlorobenzene. Other COPCs may need to be added, based on the above comments.
Have relevant primary toxicological resources been considered? Has the adequacy of available toxicological database been commented on? Have different toxicity data from different resources been assessed and discussed?	JBS&G considered various toxicological data from Australian and international sources, including NHMRC, NEPC, SA Health, Therapeutic Goods Administration, WHO, enHealth, NEHF, IARC, WHO/FAO JMPR, NICNAS PEC, ATSDR, NTP, OECD SIDS SIAR, USEPA.	Acceptable, subject to review of additional COPCs flagged above.
Have the selected toxicity data been adequately justified?	Section 5 of JBS&G (15 May 2019b) provides justification for toxicity data.	The Auditor has checked the adopted toxicity data and considers that these are generally appropriate, subject to review of additional COPCs and justification for RfC and RfD for chlorobenzene as flagged above.
Exposure Assessment		
Has a comprehensive and appropriate conceptual site model been presented that indicates all potential pathways and receptors?	Section 3 JBS&G provides the CSM.	Acceptable, subject to groundwater and soil vapour plumes being provided.
Have all potential receptors been identified?	Section 6.1 outlines the receptors considered in the HHRA: <ul style="list-style-type: none">• Residential occupants in dwelling overlying basement• Residential occupants in outdoor recreational open space areas• Recreational users of Recreation Centre within deep excavation at the central portion of site• Commercial and retail workers on ground floor overlying basement and/or within slab-on-grade building, including gardeners/landscapers on the open space areas.• Commercial workers and children within child care constructed partially overlying the Recreation Centre and partially as slab -on-grade building.• Future construction workers• Subsurface maintenance workers	The Auditor notes: <ul style="list-style-type: none">• The selection of exposure pathways has assumed that there will be no direct contact exposure pathway to impacted soil by future site users (with the exception of construction workers) through placement of validated growing medium. This needs to be validated in the future as part of remedial works.• See additional comments in Section 4.



Requirement

Consultant Consideration

Auditor Comment

Requirement	Consultant Consideration	Auditor Comment
	<ul style="list-style-type: none">• Users of roadway <p>Table 8.1 provides risk assessment for the following receptors – and the Auditor has tied this with the scenarios assessed based on the tables provided in the appendices</p> <ul style="list-style-type: none">• Resident (adult & child) – oral and dermal from seepage water, inhalation from soil vapour seepage water in basement and in apartment.• Recreation centre (adult + child) - oral and dermal from seepage water, inhalation from soil vapour seepage water in basement.• Commercial/retail workers (including workers at recreation centre) and building above - oral and dermal from seepage water, inhalation from soil vapour seepage water in basement and in building.• Childcare worker - oral and dermal from seepage water, inhalation from soil vapour seepage water in basement and in building.• Childcare children - oral and dermal from seepage water, inhalation from soil vapour seepage water in basement and in building.• Lift & basement maintenance worker oral and dermal from seepage water, inhalation from soil vapour seepage water in basement• Subsurface maintenance workers - oral and dermal from seepage water into excavation and from soil, inhalation (JBS&G adopted maximum between soil vapour, seepage water and underlying groundwater). See comment: why not the sum of the maximum between soil vapour and groundwater AND the seepage water?	
Have the estimates or measured exposure concentrations for each exposure route and chemical of potential concern been identified?	<p>Section 6.6.2 provides the adopted concentrations for soil, groundwater and soil vapour. The Auditor notes that JBS&G has adopted the maximum concentrations for soil and soil vapour for all investigations, but only considered more recent data for groundwater (question on validity).</p> <p>JBS&G also notes:</p> <ul style="list-style-type: none">• Soil data is only considered for oral and dermal exposures for potential direct contact (for subsurface maintenance workers) and is not used to estimate soil vapours.• Groundwater data is used to estimate vapour levels in basements by volatilization from wet walls/pooled seepage water, for estimating vapour levels in excavation from pooled seepage water, for estimating vapour levels in slab on grade buildings by vapour intrusion, and for estimating incidental oral and dermal exposures within basements and excavation.• Soil vapour is used to estimate vapour intrusion to basements, to slab on grade buildings, and for site excavations. <p>Section 6.7 and Appendix B present exposure concentrations for each of the scenario considered.</p>	<p>Comment on validity of adopting more recent data only for groundwater in the absence of the same information for some wells.</p> <p>The Auditor has comments regarding the size of rooms, saturated wall heights for the basement carpark and recreation centre, exposure time and duration for lift/basement maintenance workers and subsurface maintenance workers, which will affect the outcome.</p>

Risk Characterisation



Requirement	Consultant Consideration	Auditor Comment
Has the acceptable risk level been identified and justified?	Section 8 provides a summary of risk and hazard for each receptor, which indicate that exceedances were recorded for risk and/or hazard for all receptors.	Not applicable given unacceptable risk is identified.
Have all potential receptors and pathways been considered?	Section 8 provides a summary of risk and hazard for each receptor, which indicate that exceedances were recorded for risk and/or hazard for all receptors.	The Auditor considers that JBS&G has considered relevant receptors and pathways.
Has the relative significance of each exposure pathway, based on the risk analysis been discussed?	<p>JBS&G states that the exceedances occurred mainly due to:</p> <ul style="list-style-type: none"> • Potential inhalation of benzene, naphthalene, trimethylbenzenes from soil vapour. • Potential direct contact to BaP and TRH C>16. 	<p>The Auditor generally agrees, noting: Potential inhalation of TRH C6-C16 is also main risk driver.</p> <p>Direct contact to arsenic, naphthalene, and TRH C6-C16 also contribute to direct contact impact.</p>
Has a detailed sensitivity/uncertainty analysis been presented?	<p>Section 9. presents a detailed discussion of sensitivity analysis, and provides discussion on:</p> <ul style="list-style-type: none"> • Sampling program • Toxicological parameters • Landuse • Exposure parameters • Building parameters • Modelling equations <p>JBS&G also states that the following conservative assumptions were used:</p> <ul style="list-style-type: none"> • Maximum historical levels were adopted. • Omission of degradation of petroleum vapours. • Use of conservative modelling package. • Use of most conservative of the available methods to estimate advective flow. • Use of reasonable maximum exposed based exposure parameters • Assumption of all potential pathways. 	<p>The Auditor notes a degree of conservatism:</p> <ul style="list-style-type: none"> • Vapour intrusion is assumed to be through the entire basement carpark. However, given the basement is likely to be submerged, vapour intrusion is likely through walls only above groundwater level, which has a significantly less area than the entire basement area). • Depth of soil vapour source was assumed to be 0.1m. For the walls of the basement and sandstone wall, the depth to source varies based on the height of the wall. <p>The Auditor has also assessed these assumptions:</p> <ul style="list-style-type: none"> • Vapour concentration from the lift through the remainder of the building was considered to be negligible by JBS&G. This is generally considered appropriate, subject to other comments being addressed (i.e. air exchange rate, concentrations of groundwater COPCs). • For slab-on-grade structure, the maximum between indoor air concentration based on soil vapour and groundwater concentrations were adopted. This is considered appropriate. <p>The Auditor requires all other comments to be addressed to be able to assess the sensitivity of the parameters.</p>
Equations		
Have all equations used in the risk assessment been presented in the report, dimensionally correct, with	<p>Section 6.2 provides estimated exposure intake equation.</p> <p>Section 6.4 provides exposure concentration equation.</p>	Please provide equations for Ac building and water inflow in Appendix B.



Requirement	Consultant Consideration	Auditor Comment
correct units and consistent? Have all parameters in each equation been clearly defined with unit conversion factors, where applicable, been included?	Estimation of indoor air concentration was provided by using RISC V.5.03. Section 7.1.1 provides carcinogenic risk equation. Section 7.1.2 provides non-carcinogenic hazard quotient equation. Appendix B provides seepage water equations.	
Has all pertinent information been provided to enable calculations to be checked through in a stepwise process?	Information provided	The Auditor was able to check calculations on the information provided.
Data Evaluation		
What were the data collection objectives and are they consistent with the requirements of the risk assessment?	The HHRA has considered soil, groundwater and soil vapour data as reported in investigations across the project area and reported in the various investigation reports. Environmental data from these investigations has formed the basis of the risk assessment.	The Auditor considers that the objectives are generally consistent with the requirements of the risk assessment and current audit purpose of endorsing a remedial strategy, noting the HHRA has considered the most up to date development plans which may change during the DA assessment process.
Were the laboratory analyses NATA accredited, and QA/QC reported and analysed, field QA/QC reported and analysed, statements of accuracy made in the risk assessment?	Assessment of QA/QC was discussed in the various reports and has generally confirmed that the laboratory results are reliable for the purposes of the HHRA.	The Auditor considers that the overall QA/QC in the previous investigations to be acceptable.
Assessment and Report Preparation		
Has information been presented coherently and in an appropriate sequence to enable efficient appraisal of the report?	Information has been generally presented coherently to enable review.	The Auditor considers this requirement to have been met.
Have the objectives and scope been clearly stated?	Section 1.1 provides the following objectives: <ul style="list-style-type: none"> to determine whether environmental impact present on the site poses a potential risk to potential future on-site human receptors with the proposed development of the site. Where a potentially unacceptable level of health risk is identified, a secondary objective of the risk assessment is to identify measures to mitigate the risk. Section 1.1 states that the risk assessment is required to assess whether levels of environmental constituents as measured in soil, groundwater and/or soil vapour by recent sampling and analysis works will potentially pose a health risk to future human users of a residential development of the site. The HHRA does not assess potential ecological or offsite risk.	The objectives and scope of work are appropriate for the purposes of the current audit phase, noting that human risks were assessed for future use of the project area as mixed residential land, recreational and commercial, based on the latest development plans. Once the final development layout has been approved, the HHRA should be re-evaluated to confirm assumptions/scenario/conditions remain applicable. This will be a condition of RAP endorsement. The Auditor notes that the potential offsite and ecological risk should be provided as part of the audit. This will be a condition of RAP endorsement.



Requirement	Consultant Consideration	Auditor Comment
Has the analysis been based on up-to-date literature?	The Auditor has reviewed the toxicological data used, which were based on up-to-date literature.	This requirement has been met.
Have all assumptions and default data been identified and justified?	The Auditor has reviewed the assumptions and default data and provided comments.	See various comments within this IA.
Have all tables and figures been referred to correctly in the text of the report?	Tables and figures have been generally referred to correctly.	This requirement has been met.
Has adequate data been presented to support the conclusions?	Section 8 states that: <ul style="list-style-type: none"> • Only the impact around SVJ09 needs to be remediated. • Highest groundwater impact at MW21 is associated with tar. • A site-specific remediation target level of 400mg/kg was developed for BaP TEQ. 	<p>The Auditor notes that potential inhalation of TRH C6-C16 impact also provides significant contribution to the hazard exceedances.</p> <p>The Auditor does not agree that only SVJ09 remediation is required. The Auditor considers that the risk in the south-western portion of the site has not been fully understood.</p> <p>The Auditor requires:</p> <ul style="list-style-type: none"> • Reassessment of site specific remediation target for BaP TEQ. • Consideration of remediation of TRH. • Further groundwater and soil vapour assessment in the south-western portion.

4 Review of current Remedial Action Plan (RAP)

The remedial action plan (RAP) has been audited in accordance with the requirements outlined in EPA (2017) Contaminated Land Management Guidelines for the NSW Site Auditor Scheme (3rd edition), OEH (2011) Guidelines for Consultants Reporting on Contaminated Sites and with consideration of the amended NEPC (1999) National Environment Protection (Assessment of Site Contamination) Measure, Schedule A and Schedules B(1)-B(9) by National Environment Protection Council, Adelaide (April 2013). A summary of the document review is presented in the following table.

Table 2: Summary of JBS&G (13 June 2019) RAP

Requirement	Consultant Consideration	Auditor Comment
Remediation Goal:	Section 3.1 states that the remediation goals are to: <ul style="list-style-type: none"> • Remove unacceptable risks to human populations living at/working on/visiting the proposed multi-use development site by fill materials/soil, soil vapour and groundwater contamination; • Remove or manage unacceptable ecological risks to flora/fauna posed by fill/soil and groundwater contamination; and • Undertake remedial works, and associated site development works (i.e. bulk excavation, waste disposal etc) in a manner that best 	Acceptable, noting the proposed development will also include a childcare and storage areas potentially for use by residents (not commercial).



Requirement	Consultant Consideration	Auditor Comment
	complies with the principles of ecologically sustainable development (ESD).	
Extent of remediation required as outlined in RAP:	<p>Section 3.2 states that the extent of remediation includes:</p> <ul style="list-style-type: none">• Areas of underground petroleum storage system (UPSS) and any associated adjoining hydrocarbon impacted surrounding soil.• Elevated levels of petroleum hydrocarbons and naphthalene in the proximity of SVJ09.• Soil affected by BaP exceeding 200mg/kg and located at Coffey TP16 (3.8m), DP 124 (0.2m), BHJ24 0.8-1 (0.9-1m) and BHJ30 (2.5-2.6m).• Soils that are found to be affected by gross levels of asbestos containing material (ACM) or asbestos fines/free asbestos fibres.• Tar impacted material, at least in the vicinity of BHJ06 and potentially in the proximity of MW21. <p>Section 3.2 also states that soil onsite is considered unsuitable for potential direct contact for potentially sensitive human users of the site and/or ecological receptors.</p>	<p>The extent of remediation is considered to be acceptable subject to complete review of revised HHRA given comments in Table 1 and noting:</p> <ul style="list-style-type: none">• The site-specific remediation criterion for BaP is to be reassessed following an update of the HHRA (given the current assumptions which will change the site specific criteria). This criterion is not applicable for soil retained or reused within the development for landscaping as this level may not be protective of ecological receptors.• The extent of remediation requires further supporting evidence in addressing data gaps/uncertainties identified in this advice and the requirement for additional rounds of monitoring, and with due consideration of offsite migration/impact.
Discussion of possible remediation options:	<p>Section 3.4 provides discussion of remediation options for each COPC, including:</p> <ul style="list-style-type: none">• On-site treatment• Off-site treatment• Excavation and offsite removal of impacted material• On-site insitu management of soil and ongoing management	The Auditor considers this requirement has been met.
Selected remediation option:	<p>Section 3.4 provides the following preferred remedial approach:</p> <ul style="list-style-type: none">• Excavation and off-site disposal of highly impacted areas (as shown on Figure 7);<ul style="list-style-type: none">- UPSS and affected soils / backfill in proximity;- Petroleum hydrocarbon affected soils in proximity of soil vapour probe location SVJ09 at the south of the site;- Tar affected materials as identified on the site and at least anticipated to include hot-spots at the northern and southern extents of the site;- Carbon disulfide affected soils at the eastern portion of the site;- Soils affected with gross levels of benzo(a)pyrene and PAHs as identified at four discrete hot-spots on the site;- Areas of gross levels of asbestos / ACM impact; and	<p>The selected remediation options are considered to be appropriate based on currently available data, however the extent of remediation in the RAP should be reassessed, as per comments outlined in this IA, the requirement for further site data gap assessment/monitoring and with consideration of the final approved development layout/construction methods (once confirmed).</p>



Requirement	Consultant Consideration	Auditor Comment
	<ul style="list-style-type: none"> Retention of impacted soils across the remainder of the site with appropriate controls to preclude access of normal site users and/or direct contact of potential ecological receptors. 	
Rationale for selected remedial option:	Rationale for selection of remediation options is provided in Table 3.1.	The rationale is considered to be appropriate.
Remediation methodology:	<p>Section 3.6 provides remediation methodology, which includes:</p> <ul style="list-style-type: none"> Site establishment Site demolition and pavement removal Removal of UPSS infrastructure Excavation of hydrocarbon impacted soils/tar pits/malodorous soils Asbestos management Carbon dioxide monitoring In situ/ongoing soils management Importation and offsite disposal of fill material Landfarming of hydrocarbon impacted soil Movement of material 	Generally acceptable, with comments outlined below
Basis for selected remediation criteria:	<p>Validation criteria are provided in Section 4.5:</p> <ul style="list-style-type: none"> Accessible soils/exposed natural soils (with no ongoing management): <ul style="list-style-type: none"> For remedial excavation: <ul style="list-style-type: none"> HIL D HSL A/B Interim soil vapour HIL for Residential A Management Limits for coarse grained soil for residential landuse Site acceptance criterion for BaP of 200mg/kg. HSL D for asbestos For material above marker layer: <ul style="list-style-type: none"> EIL ESL for coarse-grained soil HIL C/HSL C for public open space HIL A/HSL C for residential gardens No residual material containing >1% w/w tar in addition to laboratory results Consideration to be given to high malodorous or discoloured soils caused by contamination. Material for offsite disposal – as per NSW EPA (2014) Waste Classification Guidelines, with consideration to NSW EPA general immobilization approvals for ash and slag. Imported material: Material shall meet definition of: <ul style="list-style-type: none"> VENM ENM 	<p>The Auditor considers:</p> <ul style="list-style-type: none"> HIL D and HSL D (for asbestos) is not considered appropriate for the proposed residential development with childcare for the accessible soils/exposed natural soils “with no ongoing management”. Site acceptance criterion for BaP should be reassessed following revision of HHRA.



Requirement	Consultant Consideration	Auditor Comment
	<ul style="list-style-type: none"> - Recycle material as per EPA exemption • Validation of capping: Levels of the site prior to and after placement of capping. • Additionally Section 4.2.1 provides requirement for basement tanking. 	
Proposed testing to validate the site after remediation:	<p>Proposed validation is provided in Section 4.2.6, which includes:</p> <ul style="list-style-type: none"> • Validation of UPSS removal and associated backfill sands: <ul style="list-style-type: none"> - 1 per 5m per excavation wall (minimum 1) - 1 per 25m² excavation base (minimum 1) - Discrete sample locations under other petroleum infrastructure (remote fill points, fuel dispensers). If significant impact requiring excavation is encountered, then sample as per UST excavation above. - Sample locations at a linear spacing of 5m underlying pipelines. - Samples will be analysed for TRH, PAHs, lead, VOCs. • Validation of remedial excavations (TRH, BTEXN, VOCs, PAHs, odours, tar): <ul style="list-style-type: none"> - 1 sample per 10m excavation wall and 1 per vertical 1m (minimum 1 per wall) - 1 sample per 100m² base (minimum 1 per excavation) - Observations of staining, odours, PID are also taken into account. - Free associated with carbon disulphide for the excavation targeting carbon disulphide impact. • Validation of remedial excavations (asbestos): <ul style="list-style-type: none"> - 1 sample per 10m excavation wall and 1 per vertical 1m (minimum 1 per wall) - 1 per 100m² excavation base (minimum 1 per excavation) • Growing media – 1 per 100m³ (minimum 3 samples) – TRH, PAGHs, OCPs, PCBs, asbestos, soil pH • VENM – 1 per 1000m³ (minimum 5) • ENM – as per exemption • Recycled products – Sampling density and analysis will be agreed with the Auditor, with 1 sample per 70m³ allowed for. • Waste classification – as per NEPM (2013) • Confirmation of treated hydrocarbon soil – 1 per 70m³ for TRH, lead and VOC. 	Generally acceptable, with comments outlined below
Contingency plan for remediation:	<p>Section 5 provides contingency plan, which includes:</p> <ul style="list-style-type: none"> • Unexpected finds protocol • Change in development plans 	Generally acceptable, noting that volume of impacted material encountered may to that identified with the current investigation data.



Requirement	Consultant Consideration	Auditor Comment
	<ul style="list-style-type: none"> • Identification of additional underground storage tank • Identification of oily or tarry materials • Identification of chlorinated hydrocarbon impact • Material storage breach • Emissions complaints 	
Interim site management plan prior to implementation of remediation (health, safety & environment):	Not provided	Please provide if this required. It is noted that the site is currently being used.
Site management plan for remediation works (environment)	Requirements of remediation environmental management plan are provided in Section 6.1, which need to be prepared by the Principal Contractors Remediation Contractor.	Conceptual only, noting that the RAP requires this to be prepared by the Principal's appointed Remediation Contractor.
Site management plan for remediation works (health & safety)	Section 6.2 provides health and safety requirement, which requires a work health and safety management plan to be prepared by the remediation contractor.	Acceptable. As above.
Remediation schedule	Not provided, noting that Section 6.1.4 states that the remediation contractor will need to include a proposed schedule within the remediation environmental management plan.	Acceptable for current purpose, noting that it will depend on any staging of works and DA consent requirements.
Hours of operation	Section 6.1.4 states the remediation hours shall meet the requirement of development consent.	Acceptable
Contingency plans for incidents:	Table 6.1 states that the remediation environmental management plan needs to include emergency response.	Acceptable
Licenses and approvals:	<p>Section 3.5 provides regulatory and planning requirements, including:</p> <ul style="list-style-type: none"> • SEPP55 – The remediation is classified as Category 1 Remediation Works, and JBS&G considers that inclusion of the remediation in the development application works is appropriate. • Environmental Planning and Assessment Regulation 2000 – The works do not constitute designated development. However, should soil requires to be pre-treated prior to offsite disposal, an assessment of potential triggers will need to be completed. • PoEO 1997 – Licensing is not required given the proposed remediation is less than 3ha and does not propose in handling 30,000m³ of contaminated fill. • Water Management Act 2000 – Should dewatering be required, a dewatering and re-injection approval will be required. • PoEO (Waste) Regulation 2014 • NSW EPA Waste Classification Guidelines 	<p>The Auditor considers this requirement has been met, noting:</p> <ul style="list-style-type: none"> • The proposed remediation works will constitute designated development should on-site treatment of soil be proposed (refer to Schedule 3 Part 1 Clause 15). • At this stage the Auditor does not agree that there is no ongoing obligation regarding Duty to Report (under CLM Act) or ongoing discussion with EPA. Current data shows that there is offsite impact for various contaminants/media. Further evaluation is required during the course of remediation and validation activities.



Requirement	Consultant Consideration	Auditor Comment
	<ul style="list-style-type: none">• NSW Office of Water NSW Aquifer Interference Policy• City of Sydney (2004) Contaminated Land Development Control Plan• Guidelines the Duty to Report Contamination under the Contaminated Land Management Act 1997• Work Health and Safety Act 2011 and Work Health and Safety Regulation 2011	
Contact persons	Table 6.1 states that the remediation environmental management plan needs to include contact details for remediation.	Acceptable
Community relations (where applicable)	Table 6.1 states that the remediation environmental management plan needs to include community relations plan.	Acceptable
Staged progress reporting (where applicable)	Not provided	To be confirmed once development, remediation and construction program are known.
Long term site management plan	Requirement for environmental management plan is provided in Section 4.7.	Acceptable. The Auditor notes that part(s) of the site will be an ongoing concern for CoS (recreational centre/daycare), and various other parties as per future strata plans. Any long term EMP will need to clearly outline roles, responsibilities and obligations for any future management/maintenance/monitoring of residual contamination and any engineering controls adopted as part of remedial works. Acceptance and acknowledgement will be required from relevant entities. Any LTEMP will need to be made legally enforceable and publically notifiable.

5 Auditor Comments

As outlined in tables above, the Auditor provides further comments on the current reports to be addressed by JBS&G:

HHRA (13 June 2019)

1. Section 3: This section only considers the potential onsite receptors but no offsite receptors. Please include offsite receptors.
2. Table 4.1:
 - a. Maximum arsenic is 614mg/kg, which is below the adopted value (conservative).
 - b. Maximum iron is 84,000mg/kg (EIS, 1994). The Auditor considers iron is unlikely to present unacceptable risk given all other concentrations are below screening criterion.



- c. The Auditor requires a more robust justification for omission of results prior to 2014, given that the source of soil impact is potentially from LNAPL and/or coal tar. The Auditor also notes that this is not consistent with the approach for groundwater, where all results have been considered. Alternatively, further validation testing can be included in the RAP to confirm conditions are conducive for attenuation.
 - d. From the table, maximum TRH F1 from 2014 onwards is 250mg/kg (DP, 2014). However, in some samples the LOR is <2,000mg/kg. This needs to be the concentration modelled. However, the Auditor requires justification for omission of results prior to 2014.
 - e. Maximum TRH F4 concentration from 2014 is 5,500mg/kg, which is below the adopted value (conservative). However, the Auditor requires justification for omission of results prior to 2014.
 - f. The Auditor does not agree that results prior to 2014 can be ignored for PAHs, BaP TEQ BaP, naphthalene and the other PAHs. For example, the highest PAHs were at Coffey TP16 (3.8m) at 42,000mg/kg. No sample was analysed at DP BH116, and no sample was collected from the same depth at TP02. Given the contaminant chemical properties, it most likely remains at those concentrations.
3. Section 4.1:
- a. Why have phenanthrene and 4-isopropyltoluene (no criteria) been omitted?
 - b. While we generally agree that chromium most likely occurs as Cr (III), this should be confirmed (noting NEPM (2013) does not have Cr (III) criterion, but USEPA provides Cr III) RSL of 120,000mg/kg for resident soil). The RAP shall confirm the form of chromium.
4. Section 4.2:
- a. Coffey result provides much higher manganese (up to 1130µg/L). The Auditor considers that the source of manganese is not fully understood and the potential risk should be assessed. Alternatively, further monitoring shall be conducted to assess manganese concentration in groundwater, targeting previous high concentrations and downgradient locations.
 - b. Highest benzene is 16µg/L at MW4. Please justify omission of this result.
 - c. Highest ethylbenzene and toluene are 200µg/L and 37µg/L, respectively, both are below the screening criteria.
 - d. Highest xylenes are 660mg/L (MW21), which are above criteria. Please justify omission, noting no further sample was collected at this location.
 - e. A more robust justification must be provided for the omission of PFOS and PFHxS. Additionally, it should to be demonstrated that PFOS + PFHxS are not sourced from the site and will not impact on the closest waterbody.
 - f. Please justify the omission of 4-isopropyl toluene (no criterion).
5. Section 4.4:
- a. Naphthalene should be applicable to groundwater as well.
 - b. Omission of xylenes in groundwater to be justified.
 - c. Please address previous comments regarding omission of COPCs:
 - i. Soil: phenanthrene, 4-isopropyltoluene
 - ii. Groundwater: manganese, xylenes, 4-isopropyltoluene, and a more robust discussion on PFOS + PFHxS



6. Table 5.12: Please justify for not using the more conservative USEPA RfC ($5E-02\text{mg}/\text{m}^3$ and RfD ($2E-2\text{ mg}/\text{kg}/\text{day}$) for chlorobenzene.
7. Table 5.13: It is noted that the most conservative odour threshold for naphthalene been not been adopted ($0.2\text{mg}/\text{m}^3$). Please justify.
8. Section 5.6: What are the 'background' contributions for BaP TEQ, naphthalene and other VOCs (chloroform, chlorobenzene, carbon disulfide)?
9. Section 6.1 lists users of road as a potential receptor but this receptor is not further addressed. Please discuss omission.
10. Table 6.4 and Table 6.6 are duplicates. Please provide exposure assumptions for recreational users of Recreation Centre.
11. Table 6.7:
 - a. Exposure duration of 10 years is not considered conservative. Please consider revising to 30 years.
12. Table 6.8:
 - a. Exposure frequency (5 days/year) is not considered conservative for basement maintenance workers.
13. Table 6.15:
 - a. Please provide exposure assumptions for recreational user (rec centre).
 - b. Is there a typographical error for childcare centre (basement) cancer risk – the Auditor calculated this to be $EC = 1.1E-03 \times CA$.
14. Table 6.17:
 - a. For soil, please justify the assumptions for 50% aliphatic and 50% aromatic components for TRH C10-C16 and TRH C>16.
 - b. For soil vapour: please justify the assumptions for 50% aliphatic and 50% aromatic components for TRH C10-C16.
15. Table 6.18:
 - a. Groundwater was present historically at a depth of 3.6mAHD (MW19) and basement 2 carpark will be at RL+1m (which means basement 2 carpark is likely to be submerged, basement 1 carpark may be partially submerged). Please also confirm these RLs as they do not appear to be consistent with the drawings. If these are correct, than the saturated wall height (1m) is not sufficiently conservative.
 - b. Ventilation/air exchange: Is this according to BCA?
 - c. Please justify the building area and volume, noting that there are 'small rooms' (e.g. plant rooms) within the basement carpark.
16. Table 6.19:
 - a. Groundwater was present historically at a shallowest depth of 3.6mAHD (MW19) and the recreational centre carpark is present at RL-3.85 (just the basketball court) and -0.7m (offices, lobby, change room, etc). This means the basketball court saturated wall height should be at least 7.45m and the offices, change room etc. should be at least 4.3m. Please confirm. If these are correct, then saturated wall height (4m) is not sufficiently conservative.
 - b. It appears that for the recreational users and the commercial workers for the recreational centre, JBS&G has assumed the entire building area and volume (based on



the entire size of the recreational centre) and does not consider smaller rooms (e.g. change room, offices). Please justify.

17. Section 6.7.4:

- a. It is assumed that water seepage is only from the base of the trench and not from walls. Please justify conservatism given groundwater depth was encountered as shallow as 0.75m below ground level (bgl) onsite or include at least a portion of the wall in the area of groundwater seepage.

18. Sandstone wall:

- a. Based on the Auditor's observation, water seepage was encountered on the sandstone cutting on the eastern portion (adjoining Jones Street). The groundwater quality from the sandstone cutting should be confirmed to assess (or somehow discounted) as a potential risk.
- b. Based on the current site plan, some parts of the proposed building (e.g. childcare, storage for residential purposes) will be against the sandstone cutting on the eastern part (Jones Street). Based on discussion with client onsite, the proposed development plan has not been confirmed and there is potential that residential apartment will also be against this sandstone cutting. The Auditor considers there is potential vapour intrusion of any impact from beneath the site (or adjacent site) via the sandstone wall/cutting. The Auditor requires this to be modelled using available soil vapour data and/or further site data collected to discount this as a source of soil vapour risk.

19. Section 8:

- a. The Auditor also notes that exceedances also occurred as a result of inhalation of TRH C6-C16.
- b. The Auditor does not agree that only impact around SVJ09 should be removed, given that:
 - i. The inhalation risk is contributed by both seepage water and soil vapour (not only soil vapour). Soil vapour concentration provides most of the daily intake for most COPCs, except for naphthalene and TRH C10-C16, where groundwater seepage also has significant contribution (and therefore should be taken into account). The maximum groundwater concentration for TRH and naphthalene was identified at an offsite well MW21 to the south-west corner of the site. It would appear that there is a plume in the south-western corner, which is not yet delineated, and may pose a risk to the building.
 - ii. Additionally, no soil vapour point is present in the vicinity of MW21.
 - iii. It would be prudent to conduct additional groundwater and/or soil vapour assessment in the south-western corner (in the area of current building) to assess the extent of impact. This could be considered as part of preliminary remedial works to firm up the remedial strategy/specifications and any engineering controls required for the future development.
 - iv. What about the exceedances at SVJ10? TRH C6-C10 and TRH C10-C16 were detected at this location at 50% and 20% the SVJ09 concentrations, which would have failed for at least childcare (children). The Auditor notes that SVJ10 is a sub-slab vapour point only and is not representative of ongoing concentration at depth (i.e. is not directly comparable to SVJ09).
- c. JBS&G states that the groundwater impact at MW21 is likely to be associated with tar. As per above comment this needs to be appropriately remediated. Could this also be from



the USTs in the south-western portion of the site? Is impact at SVJ09 likely from the same source?

- d. Given the comment on exposure duration for sub-surface maintenance workers and other comments, the risk-based level for BaP TEQ should be reassessed. The site-specific remediation criterion for BaP is to be reassessed following an update of the HHRA. This criterion is not applicable for soil retained or reused within the development for landscaping as this level may not be protective of ecological receptors.
- e. Exceedances occurred for both TRH and BaP TEQ for direct contact. Why is remediation only required for BaP TEQ and not for TRH impact? The Auditor notes that whilst only TRH C>16 has hazard exceedance, arsenic (soil only), naphthalene (mainly soil) and TRH C6-C16 (groundwater and to a lesser degree soil) also contribute to direct contact impact and shall be taken into account in the remediation requirement.

20. Section 8.1:

- a. While the Auditor accepts that only the carbon disulphide concentration at SV114 exceeds odour thresholds in the basement air, the Auditor notes that the concentrations at SV104 is close to odour thresholds and that only limited samples were analysed for carbon disulphide. What was the source of carbon disulphide and could there be carbon disulphide that may require remediation at other locations? The Auditor requires that future soil vapour sampling considers carbon disulphide.

21. Section 10: Update as per the recommendations for the previous sections.

22. Please provide data gap analysis, which should include (but not limited to):

- a. Area beneath current structures
- b. Asbestos assessment across the site in accordance with NEPM (2013) requirement.

23. Table B1:

- a. As per previous comment: wet wall height of 1m is not considered conservative.
- b. The spreadsheet assumes basement height of 6m, which is not considered conservative (as this means basement 1 and 2 are combined). It would be preferable to use lower basement height only.
- c. Room size: As per previous comment, the model has considered entire basement volume and does not consider small rooms. It is preferable that a small room is modelled.

24. Table B2:

- a. As per previous comment: wet wall height of 1m is not considered conservative.
- b. Room size: As per previous comment, the model has considered entire basement volume and does not consider small rooms (which has smaller area and smaller height). It is preferable that a small room is modelled separately.

25. Appendix B – Vapour Emissions from Pooled Water in Excavation: Please provide equations for Ac building and water inflow for completion (note that the Auditor obtained this from the spreadsheet).

26. Summary spreadsheet (page 277 and 287):

- a. Recreation Centre: Shouldn't naphthalene and TRH C>10-C16 (aromatic) be the sum of seepage and soil vapour (i.e. 2.5E-02 and 5E-02), respectively, noting for other chemicals the seepage component is negligible?
- b. Sub-surface maintenance workers: It would appear that JBS&G has adopted the maximum between the soil vapour, infiltrating seepage water, and underlying



groundwater source. Shouldn't the vapour levels be the sum of at least the maximum between the soil vapour or the groundwater source AND the seepage water?

- c. Based on comments regarding potential vapour intrusion and groundwater seepage through sandstone cuttings, the residential and childcare scenarios may be underestimated.
- d. The oral and dermal daily intakes for sub-surface maintenance workers for soil and groundwater do not match with the RISC output.

RAP (13 June 2019)

27. Section 3.2

- a. Please define "gross levels" for ACM and asbestos fines. The Auditor requires that asbestos should be assessed and remediation in accordance with NEPM (2013).
- b. The site-specific remediation criterion for BaP should be reassessed to address comments for HHRA. This criterion is not applicable for soil retained or reused within the development for landscaping as this level may not be protective of ecological receptors. Leaching potential must also be considered.

28. Section 3.5: The EPA notification was conducted a number of years ago prior to DP and JBS&G assessment work. **At this stage the Auditor does not agree that there is no ongoing obligation regarding Duty to Report (under CLM Act) or ongoing discussion with EPA. Current data shows that there is offsite impact for various contaminants/media.** This is to be addressed again by JBS&G following the completion of additional monitoring and based on the outcome on the success of remedial/validation effort.

29. Section 3.6.7: What is the proposed capping extent? Will this be the entire area outside the building footprint?

30. Section 4.2.1:

- a. This section needs to be updated based on the updated HHRA and other comments in this IA.
- b. It would be preferable that the requirement of tanked basement is provided in 4.5 as a form of validation requirement.

31. Section 4.2.3: The vertical extent of remediation should include groundwater depth.

32. Section 4.2.4:

- a. This section needs to be updated based on the updated HHRA and other comments in this IA.
- b. How will Decision 3 and 5 be validated? Will this be only by visual/olfactory validation?

33. What is proposed to investigate PFAS in soil noting exceedences for PFAS exceedances in groundwater and the environmental setting for the site?

34. Section 4.2.6.1: The proposed criterion here is HIL/HSL A, which is not consistent with Section 4.5.1.

35. Section 4.2.6.3: It is preferable to weigh the 10L samples and have the weight recorded, instead of using an assumed 10L volume which is converted to weight by assumed density.

36. Section 4.2.6.6: VOC analysis should also include naphthalene and BTEX.

37. Section 4.5.1:

- a. Since this section refers to area "with no ongoing management", HIL D and HSL D for asbestos are not considered appropriate for the proposed residential development



including childcare. If this section is meant to be in the capped area, then the phrase in bracket "(with no ongoing management)" should be removed. It is noted that HIL D and HSL D are not consistent with Section 4.2.6.1.

- b. Site acceptance criterion for BaP should be reassessed following revision of HHRA.
Additionally the BaP site-specific acceptance criterion may only apply for capped areas.

38. Section 4.5.1.1: What is the basis of 1% tar criterion and how will this be quantified? It is the Auditor's understanding that this guidance applies to waste classification/offsite disposal to licensed facilities and not for site suitability. This may not be acceptable for all landuse scenarios, and/or for the purposes of reusing material across the development. Leachable potential also needs to be considered given the environmental setting of the site.

39. Section 4.5.4: A survey of the mAHD levels will be required prior to and after placement of capping.

40. Section 4.6: As a guide, we would require (at minimum) the following information for material tracking to be included in the validation report:

For waste classification:

- Waste classification document
- Material source and description
- Sampling density, pattern, COPCs
- Result summary, including appropriate table with comparison to acceptance criteria
- Waste classification

For offsite disposal works:

- Source location
- Estimated volume (based on excavation size)
- Actual volume of disposal
- Waste classification
- Transporter
- Final destination, PoEO licence
- Reconciliation of waste dockets with actual disposal volume
- Reconciliation of actual disposal volume and the estimated volume of disposal (based on excavation size)

41. Section 6.2.2: Please provide personal protective equipment (PPE) requirement for the contaminants at the site, noting the potential direct contact risk.

42. Section 6.2.3: Asbestos removal work shall be conducted in accordance with SafeWork NSW (2016) Code of Practice How to Safely Remove Asbestos and SafeWork NSW (2016) How to Manage and Control Asbestos in the Workplace, which includes (but not limited to):

- Air monitoring requirements
- Preparation of asbestos management plan
- SafeWork NSW notification
- Decontamination

43. Long term EMP - The Auditor notes that part(s) of the site will be an ongoing concern for CoS (recreational centre/childcare), and various other parties as per future strata plans. Any long term EMP will need to clearly outline roles, responsibilities and obligations for any



future management/maintenance/ monitoring of residual contamination and any engineering controls adopted as part of remedial works. Acceptance and acknowledgement will be required from relevant entities. Any LTEMP will need to be made legally enforceable and publically notifiable.

The above comments are to be addressed by JSB&G, together with an amended copy of the reports, as and when appropriate following the completion of additional investigations and/or monitoring and on confirmation of final development plan layout and futures uses.

This interim advice does not constitute a SAS or a SAR, but rather is provided to assist the Client in the assessment and management of contamination issues at the site. The information provided herein should not be considered pre-emptive of the final Audit conclusions. It represents the Auditor's opinion based on the review of currently available information.

Should you have any queries or wish to discuss any points, please do not hesitate to contact the undersigned.

Yours sincerely,

Rebeka Hall
Site Auditor
Zoic Environmental Pty Ltd

Cheryl Halim
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