Detailed Site Investigation Report – Rosalind Street (WP12)

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Important note about your report

The purpose of this report is to present the findings of a detailed site investigation (DSI) carried out by the Sydney Program Alliance (SPA) contamination team associated with the Stage 1A Works at Rosalind Street, Cammeray NSW, as part of the Early Works Program (WP12) in preparation for the Warringah Freeway Upgrade (WP12).

All reports and conclusions that deal with sub-surface conditions are based on interpretation and judgement and as a result have uncertainty attached to them. You should be aware that this report contains interpretations and conclusions which are uncertain, due to the nature of the investigations. No study can investigate every risk, and even a rigorous assessment and/or sampling programme may not detect all problem areas within a site.

This report is based on assumptions that the site conditions as revealed through sampling and information provided by SPA are indicative of conditions throughout the site (i.e. the proposed construction support site associated with the Early Works Program). The findings are the result of standard assessment techniques used in accordance with normal practices and standards, and (to the best of the SPA contamination team's knowledge) they represent a reasonable interpretation of the current conditions within the investigation area an as limited by the scope of the assessment.

Sampling techniques, by definition, cannot determine the conditions between the sample points and so this report cannot be taken to be a full representation of the sub-surface conditions. This report only provides an indication of the likely sub surface conditions.

Conditions encountered when site work commences (i.e. Early Works Program) may be different from those inferred in this report, for the reasons explained in this limitation statement. If site conditions encountered during site works are different from those encountered during the SPA contamination team's site investigation, the SPA contamination team reserves the right to revise any of the findings, observations and conclusions expressed in this report.

The passage of time, manifestation of latent conditions or impacts of future events may require further examination of the project and subsequent data analysis, and re-evaluation of the data, findings, observations and conclusions expressed in this report.

In preparing this report, the SPA contamination team has relied upon, and presumed accurate, information provided by the SPA and from other sources. Except as otherwise stated in the report, the SPA contamination team has not attempted to verify the accuracy or completeness of any such information. The reliance on provided information is governed by the specific limitations as detailed in the respective information sources. If the information is subsequently determined to be false, inaccurate or incomplete then it is possible that our observations and conclusions as expressed in this report may change.

The SPA contamination team has prepared this report in accordance with the usual care and thoroughness of the consulting profession, for the sole purpose described above and by reference to applicable standards, guidelines, procedures and practices at the date of issue of this report. For the reasons outlined above, however, no other warranty or guarantee, whether expressed or implied, is made as to the data, observations and findings expressed in this report, to the extent permitted by law.

This report should be read in full and no excerpts are to be taken as representative of the findings. No responsibility is accepted by SPA for use of any part of this report in any other context.

This report has been prepared on behalf of, and for the exclusive use of, SPA, and is subject to, and issued in accordance with, the provisions of the contract between Jacobs (i.e. the SPA contamination

team) and SPA. SPA accepts no liability or responsibility whatsoever for, or in respect of, any use of, or reliance upon, this report by any third party.

Executive summary

This executive summary should be read with consideration of the 'Important note about your report' (provided above) and the scope and limitations of this investigation provided throughout this report and specifically in Sections 1 to 4.

Further to the above please note:

- This investigation was limited to the Stage 1A works associated with the Early Works Program within the larger Warringah Freeway Upgrade (WFU) project area. Hence, was not inclusive of the larger project area beyond the specific 'sub areas' nominated within this report.
- The investigation work described within this report was conducted in April 2021, prior to the commencement of any works on site related to the Early Works Program.
- Where required, the investigation provided advice on the contamination status of the investigation area and the need for further assessment/management in the context of the of the Stage 1A Works and the protection of construction workers undertaking the Early Works Program.
- The investigation evaluated compliance with Western Harbour Tunnel and Warringah Freeway Upgrade (SSI-8863) conditions of approval.
- This investigation was designed to be an independent assessment of 'known contamination' (i.e. PAH contamination and asbestos) and potential contamination (heavy metals) identified by the Environmental Impact Statement (EIS, January 2020). The assessment incorporates some of data previously collected by SMEC (as specified in Section 4 of this report), that was relevant to the assessment of heavy metal, PAH contamination and asbestos.
- Further, the conclusions of the SPA investigation are not intended to represent a 'suitability' assessment for the proposed use and occupation of the investigation areas during the Early Works Program.

This specific report refers to the sub portions (i.e. proposed support areas) at Rosalind Street, Cammeray, located within the WFU project area. **This executive summary should be read with consideration of the discussion provided in Section 1 of this report.**

Purpose/objective

Provide advice on the contamination status of the area(s) and the need for further assessment/management in the context of the Stage 1A Works and the protection of construction workers undertaking the Early Works Program.

The following conclusions and recommendations were made based on the scope/limitations of the assessment:

Conclusions

1) **Condition E117(i)** requires a Detailed Site Investigation report that concludes "*whether the land is suitable (for the intended final land use) or can be made suitable through remediation*."

Based on the available information presented within this report, SPA conclude that the **investigation area is not likely to be suitable for all potential unrestricted final land use(s) at this time.** This conclusion is based on (but not limited to) the following reasons:

- This initial Detailed Site Investigation (DSI) is only for the early works. In the next stages of the Warringah Freeway Upgrade (WFU) project, there is likely to be a range of construction activities that will involve bulk excavation of material, remediation of contaminated soil (if present), reforming the land, construction of paved surfaces, basements and placement of clean spoil on the respective construction areas. This work is expected to significantly reform the soil profile and therefore change potential exposure scenarios under a potential unrestricted final land use.
- The next stages of construction activities present a risk of potential contamination (e.g. hydrocarbon/fuel spills by the contractor that may increase the level of contamination within the soil).
- There is currently no detailed design available for the final land use arrangements and there are many unknown design parameters that makes it impossible to accurately determine whether the site is or is not suitable for its intended land use until Final Design is achieved by the Main Works Contractor in 2022.

The investigation areas could be made suitable through remediation/management; however, any such suitability determination is likely to require confirmation of the following (as a minimum).

- The proposed final land use(s).
- Clear designation of the land area requiring a suitability statement. Typically, this would either be a Title boundary or a survey area.
- The final design/layout of the freeway (post construction). This would need to include areas proposed to be excavated/filled, final design levels and proposed finished paving materials.
- Soil contamination data representative of the soils where such future soils will be exposed to future occupants. With respect to this point we note that many areas of the proposed alignment will be excavated, reshaped and/or filled. With the final soil quality of these areas unknown at this time.
- Assessment of groundwater quality and potential groundwater future extraction and use(s).
- Assessment of soil vapour quality and the potential for soil vapour to affect any future structure built on-site (including basements).
- Evaluation of potential off-site sources of contamination and the potential for any off-site source of contamination to affect the potential future on-site land uses.
- Where residual contamination remains on-site (post freeway construction), documentation and management of residual contamination.

2) **Condition E118** – "*Should remediation be required to make land suitable for the final intended land use, a Remediation Action Plan must be prepared or reviewed and approved…"*

Remediation is not required to make the investigation area 'suitable' for the Early Works Program, as potential interaction with soil contamination and/or asbestos will be managed by the Construction Environmental Management Plan (CEMP) for the works.

Determination of the need for remediation (and Remediation Action Plan) to make the site/s suitable for a future use can only be assessed once additional information is provided (i.e. the

proposed land use, final development design, etc.) and further assessment is conducted (i.e. soil, groundwater conditions) over the whole WFU project area.

This conclusion also addresses **Conditions E119 and E120**.

3) Although soil contamination and/or asbestos containing materials was not identified by this assessment, there is the potential for undiscovered soil contamination and/or asbestos containing materials to be present within the subsurface. Undiscovered contamination during the Stage 1A works will be managed in accordance with the Construction Environmental Management Plan (including an unexpected finds procedure).

4) Reported concentrations for all contaminant compounds in soil were below the adopted guideline values (for all individual sample results).

5) Asbestos was not identified by the laboratory in any of the samples submitted for asbestos identification and asbestos containing materials were not observed by the SPA contamination team (Jacobs) while collecting the soil samples.

6) The SMEC analysis (for TRH, BTEX, pesticides and PCBs) did not indicate contamination that would present a risk to the proposed occupation and use of the site associated with the Early Works Program and therefore further evaluation of these contaminants was considered not to be warranted.

7) As noted in Section 2.3 (vii), this assessment was not designed to provide in-situ classification of soils for off-site disposal. In the event that off-site disposal of soils is required, EPA guidelines with respect to off-site soil classification/disposal will need to be considered.

Recommendations for the Construction Environmental Management Plan (CEMP)

A CEMP has been prepared and is being implemented for the Stage 1A works at the Rosalind Street site. The CEMP includes management protocols for soil and water and unexpected contamination finds. This CEMP has been communicated to all on-site staff during induction and tool- box meetings. Compliance with the CEMP and specialist protocols is managed through regular site environmental inspections by the Independent Environmental Representative and the SPA environmental management team. Transport for NSW have also appointed an experienced erosion and sediment control specialist to review soil and water plans and inspect the works as they progress to ensure the risk of migration of any contaminated soil off site is minimised to acceptable levels. The unexpected contamination finds protocol triggers a 'stop work' and assessment (with consultation of a suitably qualified/experience environmental professional). This assessment will evaluate the potential for contamination associated with the 'unexpected find' and the need for implementation of additional management controls to eliminated/reduce any exposure to the identified contamination/material.

These measures have been incorporated into the CEMP (including the use of PPE) to ensure that all fill/soils encountered are treated as potentially contaminated and managed accordingly. These controls should be sufficiently robust to minimise/eliminate any on-site exposure to site workers and/or offsite migration of potentially contaminated materials by various pathways including air and water. The following recommendations are made specifically for consideration within the CEMP.

During construction works at the site, the following is recommended:

a) The potential for undiscovered soil contamination and/or asbestos containing materials to be present within the subsurface should be noted within the CEMP (including an unexpected finds procedure).

b) The CEMP should also ensure that any disturbance of the site surface is managed appropriately (this includes scrapping of the surface and vehicle movements). For example, minimise dust

generation, surface water/sediment runoff from the site, etc.). In the event that off-site disposal of soils is required, EPA guidelines with respect to off-site soil appropriate classification/disposal will need to be considered.

Recommendations relevant to Planning Approval Conditions

c) **Approval Condition E115** - As noted in Section 1 of this report, it is recommended that further consideration be given to the definition of 'disturbance' in relation to the Early Works Program and subsequent Main Works contract.

d) **Approval Condition E117(i)** - "whether the land is suitable (for the intended final land use) or can be made suitable through remediation." As noted in Conclusion (1) of this report, any such suitability statement is likely to require additional assessment/information.

Further, it is not practical to provide a suitability statement prior to the completion of the freeway construction works as there is the potential for further excavation and removal of soil as well as re-profiling the land and the construction of permanent hard stand surfaces.

In order to make this assessment, detailed final design plans are required. It is also possible that further contamination may be caused at the site during the main works construction phase (e.g. fuel and oil spills) which may affect the contamination levels within the existing work areas.

e) **Approval Condition E121 and E122** – Provision of Audit Reports/Statements regarding the suitability of the site(s) for a future use.

Considering the staged and dynamic nature of planned construction activities, SPA recommends that further DSI's are undertaken for all forthcoming stages with the final assessment of suitability made at the completion the final stage of the project and when full detailed design for the Rosalind Street site is known.

Our recommendation is that compliance with this condition is applied at the completion of the construction program (i.e. post demobilisation of construction equipment/structures) to ensure that surplus land is suitable for use by future occupants.

1 Introduction

The Sydney Program Alliance (SPA) contamination team undertook an assessment of potential contamination with respect to the construction support site for Early Works Program of the Western Harbour Tunnel and Warringah Freeway Upgrade project.

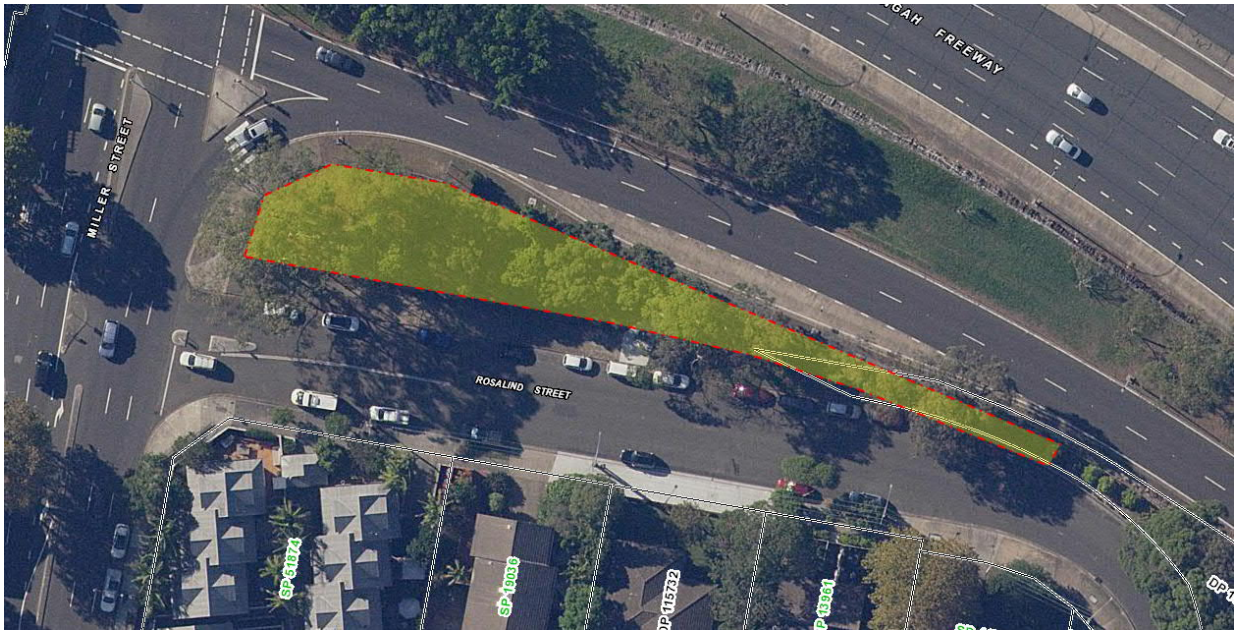
Key points for this assessment are noted below:

- The investigation work described within this report was conducted in April 2021, prior to the commencement of any works on site related to the Early Works Program.
- This assessment was limited to the proposed temporary construction support areas (associated with the Early Works Program) within the larger Warringah Freeway Upgrade (WFU) project area (subject to the Main Works Program). Hence, was not inclusive of the larger WFU project area beyond the specific 'sub areas' nominated within this report.
- The proposed extent of the construction support area is presented on **Figure 1-1**.
- This assessment was designed to be an independent assessment of 'known contamination' (i.e. PAH contamination and asbestos) and potential contamination (heavy metals) identified in Appendix M of the Environmental Impact Statement, January 2020 (EIS).
- The SPA assessment was not intended to be a comprehensive assessment of the larger WFU project area (inclusive of the specified investigation areas), for a broad range of potential contaminants and media, with the goal of providing a suitability statement (or similar) for any future land use.
- Further, the conclusions of the SPA assessment are not intended to represent a 'suitability' assessment for the proposed use and occupation of the investigation areas during the Early Works Program.
- The assessment incorporates a limited amount of data previously collected by SMEC (as specified in Section 4.2 of this report).

This assessment was designed so that appropriate soil management measures could be adopted during the Early Works Program to manage identified and potential contamination associated with the Early Works Program only (also refer to Section 2 for background, assumptions, and limitations).

The investigations undertaken by SPA at the site have been undertaken in general accordance with guidelines endorsed under Section 105 of the Contaminated Land Management Act 1997 and other relevant guidelines and provided to DPIE to meet the requirements of the Early Program scope of works (refer to Section 2.1 below).

Figure 1-1: Proposed construction support site extent



2 Background

This assessment report was prepared in relation to the Western Harbour Tunnel and Warringah Freeway Upgrade project. Key considerations relevant to the development of this report are noted below:

- Environmental Impact Statement (EIS, January 2020) – Predominantly a 'desktop' assessment of potential contamination. The EIS attributed a 'risk ranking' to sub areas of the alignment.

  The evaluation criteria used to determine the 'risk ranking' as detailed in the EIS was based on the potential for contamination to be present and the likelihood of excavation occurring (with such areas where both of these events area likely to occur, given a medium to high risk ranking).

  Importantly, the 'risk ranking' in the EIS does not appear to be based on the likelihood of a human health or environmental risk. The "risk ranking" detailed in the EIS was used to identify construction limitations/constraints and management options within the project area with respect to contamination.

  Therefore, the inference that areas classified as medium/high risk also represent a medium/high risk to human health and the environment is potentially misleading.

- The planning approval for the project *Western Harbour Tunnel and Warringah Freeway Upgrade (SSI-8863)* includes several conditions related to contamination (namely E115 to E124).

  With respect to these conditions the following comments are noted:

  1) **Appraisal of 'risk'** - Several conditions infer that high levels of contamination are present within the alignment that present a potential a risk to human health and that extensive assessment and potential remediation is required to assess and ameliorate the risk to human health.

     This interpretation of 'risk' does not appear to be aligned with the definition of 'risk' adopted by the EIS.

     Also, there does not appear to be provision of an intermediary step(s) where further site-specific assessment and consideration of likely human health risks to construction workers can be undertaken and that the outcomes of such an assessment could results in a revision to the classification of a 'moderate/high risk rating' to a lower risk ranking.

  2) **Type/Timing of construction works** - Condition 115(a) states *"Prior to the commencement of any work that would result in the disturbance of moderate to high risk contaminated sites as identified in the documented listed in Condition A1, a Detailed Site Investigations must be undertaken".*

     - ''Disturbance" is not defined in the condition (e.g. soil sampling, bulk excavations) and it is uncertain as to how this relates to the Stage 1A work.
     - **Recommendation (f):** the definition of 'disturbance' be clarified with Transport for NSW (TfNSW) and the Department of Planning, Industry and Environment (DPIE).
     - The exclusion of 'low' risk contaminated sites implies that a DSI is not required for 'low risk' contaminated sites. Therefore, further augmenting the need to clarify the definition of 'risk' and revision of the risk ranking (as discussed above).

  3) **Scope/timing of contamination assessment** - Condition E117(i) requires a Detailed Site Investigation report that conclude "*whether the land is suitable (for the intended final land use) or can be made suitable through remediation*."

     Any such conclusion regarding 'suitability' would likely require conformation of the following:

a) The proposed final land use(s).

b) Clear designation of the land area requiring a suitability statement. Typically, this would either be a Title boundary or a survey area.

c) The final design/layout of the freeway (post construction). This would need to include areas proposed to be excavated/filled, final design levels and proposed finished paving materials.

d) Soil contamination data representative of the soils where such future soils will be exposed to future occupants. With respect to this point we note that many areas of the proposed alignment will be excavated, reshaped and/or filled. With the final soil quality of these areas unknown at this time.

e) Assessment of groundwater quality and potential groundwater future use(s).

f) Assessment of soil vapour quality and the potential for soil vapour to affect any future structure built on-site (including basements).

g) Evaluation of potential off-site sources of contamination and the potential for any off-site source of contamination to affect the potential on-site land uses.

h) Where residual contamination remains on-site (post freeway construction), documentation and management of residual contamination.

Given the above points, it is not practical to estimate the scope of work and time required to satisfy this condition of approval. Further, the need to undertake a Statutory Contaminated Land audit to make a suitability statement remains a possibility. In the event that a Statutory audit was required to satisfy this condition, the time required to collect the required information and complete the audit is estimated to be 6-12 months.

It should also be noted that any such 'suitability statement' with respect to the final land use made prior to the commencement of the Main Works contract would likely be negated by the construction work required to deliver the Main Works contract and a new suitability statement would need to be provided at the completion of the Main Works contract.

Hence, any such 'statement of suitability' is most likely best made at the completion of the construction works.

Recommendation (g) and (h): Our recommendation is that compliance with this condition is applied at the completion of the construction program (i.e. post demobilisation of construction equipment/structures) to ensure that surplus land is suitable for use by future occupants.

2.1 Current stage of the construction program

The Warringah Freeway Upgrade and Western Harbour Tunnel Project is divided into the following stages:

- Stage 1A- Critical Utilities Installation, Relocation and Protection (CUT).
- Stage 1B- Cammeray Golf Course Adjustment Works.
- Stage 2A- Warringah Freeway Upgrade Early Works.

- Stage 2B- Warringah Freeway Upgrade Main Works.
- Stage 3- Western Harbour Tunnel Project.

The SPA scope, applicable to this DSI is Stage 1A CUT of the WFU with the Stage 2 Main Works to commence in 2022. The Stage 2 scope will inform the final design and layout of the Warringah Freeway and ancillary facilities. It is noted that each of the Stages are required to manage areas of moderate/high potential contamination in accordance with Conditions E115-E118 and accordingly will require each contractor to prepare Detailed Site Investigations (DSI's) for their relevant scope of works. In line with the Stage 1A scope, SPA have prepared a DSI for Rosalind Street based on the temporary construction support areas that triggered these works.

Currently the EIS nominates that when the Rosalind St Site Compound has ceased operation as an ancillary construction compound, it will be landscaped and reinstated. The EIS also notes that a noise wall will be constructed at the site.

As noted above, there are a number of construction activities to be undertaken onsite that will involve further excavation, construction of temporary works/ancillary facilities, oil/fuel storage facilities and maintenance operations. These activities and the Rosalind Street site will all be managed by other contractors after SPA completes the Stage 1A scope in 2022. These activities and the layout, disturbance footprint and final landform/use are all currently being determined by the Stage 2B contractor (CPB/Downer) and TfNSW.

It is noted that SPA will hand these areas over to CPB/Downer in 2022 and the entire site will be developed as a construction support site (WFU9). Final land use will be determined for this broader area once the final design is determined for the areas discussed above.

The current phase (Stage 1A) of the construction program is related to the 'Early Works Program' and includes various site establishment activities related to the preparation of the site for the Main Works contractor. These works are understood to include:

- Establishment of temporary site construction facility and equipment storage areas for temporary site shed, vehicle parking, laydown areas for equipment/supplies, etc.
- Clearing surface vegetation.
- Installation of boundary hoarding and visual screening to minimise dust generation during excessive winds
- Sealing the site compound area to prevent the migration of dust and sediment off site

The above works are predominantly related to above ground construction works with disturbance of subsurface soils. Where subsurface soil removal is required (e.g. for soil sampling, utility installation), this work is covered by strict protocols to ensure any potentially contaminated soil is managed appropriately and risk to human health and the environment is negated.

2.2 Acknowledgment of pre-existing contamination status of sites

With respect to any known and/or potential contamination within the WFU project area, it should be acknowledged that any such contamination (as identified by the EIS) is likely to have been present for many years.

Similarly, the current/previous site use is predominantly public open space and therefore access by the public to these areas has been relatively unrestricted.

The history of contamination (identified by the EIS) and use appears to be incongruous with Conditions E117(i) and E118 to E122, unless it is concluded that these conditions are intended to apply to areas where:

a) significant levels of contamination have recently been identified that present a human health risk to construction workers and/or future users of the site; and/or

b) the exposure scenario applied to a site is changed by the proposed freeway construction (e.g. soil contamination that was buried becomes exposed at the surface by excavation).

2.3 Key assumptions and limitations

With respect to the scope of this assessment, the following assumptions and limitations are relevant:

i. Assessment of potential contaminants was limited to the potential contaminants of concern identified in the EIS relevant to this investigation area.

ii. The SPA contamination team field assessment (and the SMEC field assessment) were conducted prior to the establishment/occupation of the site by the Early Works contractor. Therefore, the proposed ancillary support areas (i.e. the areas of investigation) were approximated from information provided by SPA. These areas were not located via survey.

iii. Consideration of the potential impact to the health of construction workers was the primary focus of this assessment.

iv. The investigation only targeted soils within the footprint of the proposed construction support site area associated with the Early Works Program.

v. Soil data was the most relevant media for exposure by construction workers. Therefore, collection of near surface soils (i.e. up to 1m depth) soil data was the focus of the assessment. Other exposure pathways (e.g. contact/drinking groundwater, indoor vapour inhalation of soil vapour) were considered highly unlikely to occur given the proposed used of the site and the implementation of a CEMP. The rationale for not targeting other media is provided below:

    - Should soil contamination be identified during the Stage 1A works that is materially different to that identified by this investigation, then assessment would be required as part the requirements of the CEMP.

    - Groundwater is not anticipated to be intersected (i.e. no contact with construction workers, no extraction to support construction) as part of the proposed works.

vi. The assessment of asbestos was primarily based on visual observation and laboratory analysis for asbestos presence/absence. ***Note that this investigation does not constitute full characterisation of the site for the potential presence of asbestos nor does the results of this investigation represent an 'asbestos clearance'.***

vii. This assessment was not designed to provide in-situ classification of soils for off-site disposal. In the event that off-site disposal of soils is required, EPA guidelines with respect to off-site soil classification/disposal will need to be considered.

viii. Ecological receptors were not relevant for the proposed occupation of the investigation area for the purposes of construction activities (refer to information contained within **Section 11.6**).

3 Purpose/objective of this investigation

Given the points raised in Sections 1 and 2, the purpose/objective of this investigation was to:

- This evaluation was primarily framed by the scope of the Early Works Program (as described in Section 2.1 above) and the designated 'sub-areas' within the greater WFU project area.
- Provide advice on the contamination status of the investigation area and the need for further assessment/management in the context of the proposed Early Works Program and the protection of construction workers undertaking the Early Works Program (Stage 1A).
- Comply with Western Harbour Tunnel and Warringah Freeway Upgrade (SSI-8863) conditions of approval.

For the sake of clarity, the SPA assessment scope did not include the investigation of:

- Any potential chemical contaminants or substance not specifically nominated for assessment by this report (including but not limited to chlorinated hydrocarbons, PFAS, fluoride, chlorobenzenes, phenols, dioxins/furans, phthalates, nutrients, PBDEs, phenols, 1,4-Dioxane, insecticides, micro plastics and potential acid sulphate soils).
- Any area of the greater WFU project area, beyond the investigation area specifically nominated within this report.
- Groundwater.
- Soil vapour.
- Off-site sources of contamination.
- In-situ classification of soils for off-site disposal.

SPA acknowledge that assessment of one (or more) of the above will be required as part of the future development stages and confirmation of the future suitability of the site (post construction), however, the SPA assessment was focused on the use of the investigation area for Stage 1A only.

Key aspects used to frame this purpose/objective were:

- A CEMP will be developed for all construction related activities (including the ancillary support areas) undertaken as part of the Early Works program. This plan will include soil management protocols and unexpected finds procedures. This CEMP will be communicated to all on-site staff during induction and tool box meetings.
- The investigation area was to be used for the activities described in Section 2.1 of the report.
- Incidental excavation or soil movement (i.e. level areas for vehicle access) maybe required, however, bulk soil excavation was not required.
- Exposure scenario - Occupation/use of the site was to be consistent with a construction work site (e.g. 8 hours per day, 6 days per week). The duration of occupation for construction workers was likely to be less than 5 years. Note the duration of the Early Works Program is approximately 2 years.

- Commercial/industrial soil quality guidelines were the most relevant exposure scenario for the proposed site use (i.e. construction workers during the Early Works Program). However, we note that the published reference guideline values are based on a much longer exposure period (i.e. 30 years). Therefore, direct application of the published NEPC (2013) commercial/industrial guidelines to the proposed site exposure was conservative.

- All workers occupying the site(s) will be inducted into the safety and environment procedures relevant to works involving contact with potentially contaminated soils.

- No permanent occupiable structure would be built above or below ground within the investigation areas during the proposed use for construction support activities.

- To facilitate the proposed use of the site most of the surface vegetation would be cleared (except for significant trees).

- The general public will not have unrestricted access to the areas occupied for the Early Works Program for the duration of the construction program.

4 Summary of previous assessment work

Appendix M of the EIS (2020) prepared for the Western Harbour Tunnel and Warringah Freeway Upgrade project detailed the following with respect to contamination at the proposed construction support site.

Site	*Location relative to alignment*	*Construction element and anticipated depth*	*Potential contamination source*	*Potential contamination distribution*	*Potential contaminants*	*Risk ranking*
Unsealed areas next to Warringah Freeway – Ernest to Miller Street), Crows Nest	*Within footprint of surface works*	*Rosalind Street construction support site (WFU9)* *Warringah Freeway Upgrade surface work (surface)*	*Deposition of particulate matter*	*Surface (potentially 0-0.1 m)*	*Heavy metals (mainly lead), hydrocarbons (mainly PAH), asbestos*	*High* • *Known contamination* • *Excavation activities within site footprint* • *Excavation activities within potential contamination distribution range (laterally and vertically)*

It is SPA's understanding that the statement of *"Known contamination"* for this area (from the EIS report) is based the *'Western Harbour Tunnel and Beaches Link – Contamination Factual Report (CFR)'*, (AECOM and Coffey, (AEC), 2018. Based on a review of the AEC (2018) in preparation of this assessment, location B342 was excavated adjacent to the Rosalind Street site.

A summary of the information regarding B342 from the AEC (2018) report is provided in **Table 4-1**.

Table 4-1: Investigation summary – B342

Location	Excavation depth	Stratigraphy	Sample depths	Analysis	Exceedance of NEPM (2013) HIL	Exceedance of CRC Care (2011) HSL	Exceedance of NEPM (2013) EIL	Exceedance of NEPM (2013) ESL
B342	1.7m	Concrete seal (0-0.2m) Fill (0.2-0.95m) Sandstone (0.95 – 1.7m)	0.4-0.5m 0.95-1.0m	Metals, TRH, BTEX, PAH, OCP, OPP, asbestos	No exceedance of HIL C (open space) No exceedance HIL D (commercial / industrial)	No exceedance of HSL C (open space) No exceedance HSL D (commercial / industrial)	No exceedance of EIL C (open space) No exceedance EIL D (commercia l/ industrial)	No exceedance of ESL C (open space) No exceedance ESL D (commercia l/ industrial)

With sample location B342 positioned adjacent to the site (not within the investigation area) and with no contamination reported in the samples collected and analysed, it is not understood why this site was ranked as a high risk potential in the EIS (i.e. no known contamination).

4.1 SMEC 2020

SMEC were commissioned by TfNSW to undertake a contamination investigation within and adjacent to the Warringah Freeway to inform design which also included areas to be occupied by the proposed construction support site. The following summary should be read in conjunction with the SMEC (2020) report.

The objective of the SMEC (2020) investigation was to collect and provide factual data to TfNSW for the purpose of informing prospective tenderers of the project of the contamination and geotechnical conditions along the proposed WFU alignment.

The following investigation works were undertaken by SMEC at the site:

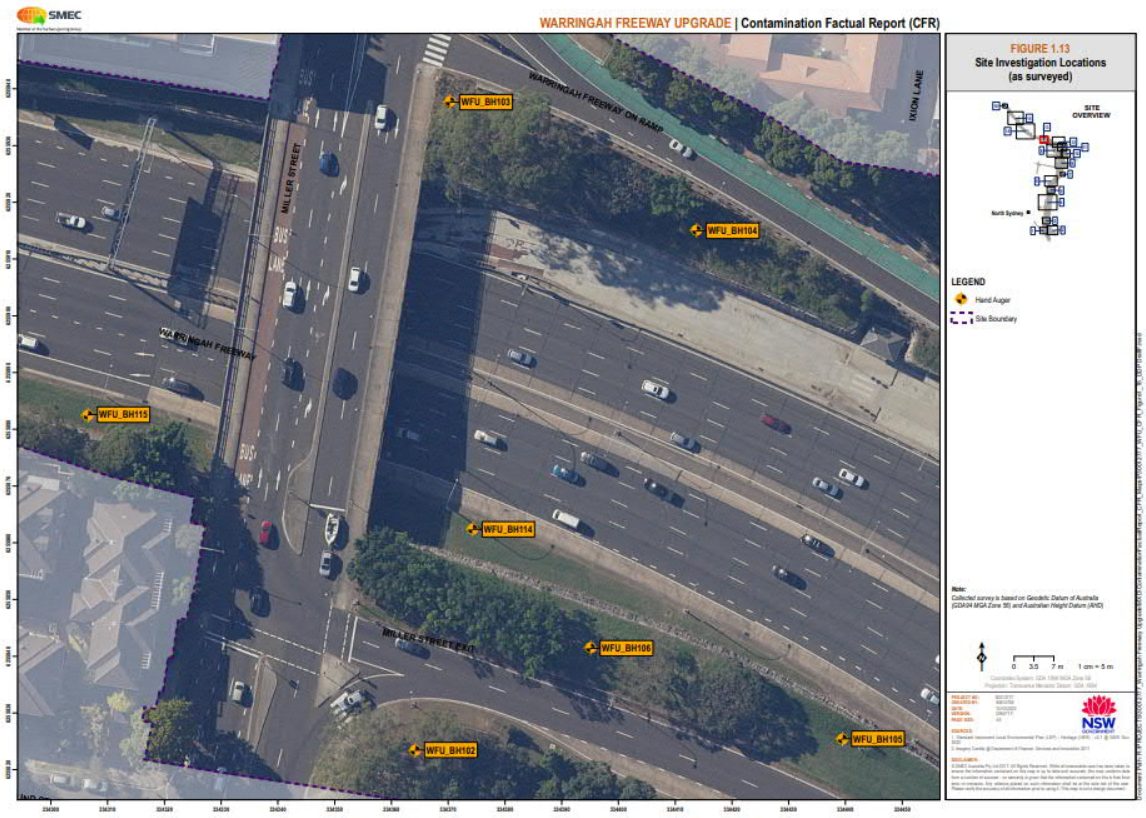
- Soil sampling from one investigation location (WFU_BH102) within the proposed construction footprint between 0.0 metres below ground level (mbgl) and 1.45 mbgl
- Two samples were collected for laboratory analysis at depths of 0-0.1 mbgl and 1.0-1.1 mbgl
- Laboratory analysis for heavy metals, Total Recoverable Hydrocarbons (TRH), Benzene, Toluene, Ethylbenzene, Xylenes (BTEX), PAH, pesticides, Polychlorinated Biphenyls (PCB) and asbestos (presence/absence).

Important notes with respect to the use of the SMEC report/data

- The SMEC assessment was undertaken to assess the broader WFU alignment area and therefore the sample locations did not necessarily correlate with the proposed 'sub-areas' nominated for the Early Work Program. This is discussed further in Sections 6 and 7 of this report. Given the above, the discussion/conclusions of the SMEC (2020) report were not directly applicable to the SPA assessment.
- The SMEC assessment included collection of samples from a depth greater than 1m and analysis for contaminants not identified by the EIS. This data was not aligned with the purpose and limitations of the SPA assessment (refer to Sections 1 to 4 of this report), did not indicate the presence of significant other contamination.
- SPA contamination team only adopted soil data from the SMEC report where it met the following criteria:
    - Was collected from within one of the proposed investigation areas (i.e. Early Works area)
    - Was collected between 0 and 1.0m below ground surface (to align with the assessment strategy). However, where deeper samples of fill where available within the investigation areas, this data was also utilised.
    - Was analysed for potential contaminants identified in Appendix M of the EIS (2020) (i.e. heavy metals, PAHs and asbestos).
- Note the SMEC assessment included additional contaminant analysis not required by the EIS.

Sample locations undertaken as part of the SMEC (2020) investigation (locations on the site and in adjacent areas) are presented on **Figure 4-1**.

Figure 4-1: SMEC (2020) investigation locations (figure sourced from the SMEC, 2020)



5 Description of the investigation area(s)

The site consists of one construction support areas (as defined by SPA) located between Rosalind Street and Miller Street off ramp if the Warringah Freeway in Cammeray, NSW.

At the time of undertaking the assessment, the majority of the areas covering the construction support sites comprised grassed open space and scattered trees.

The proposed construction support site area slopes generally down from west to east towards the Warringah Freeway.

The proposed construction support site area (as detailed **Section 1**) were bound by Miller Street off ramp to the north and east, Rosalind Street to the south and Miller Street to the west.

The combined 'site area' is approximately 800 m^2.

6 Data review and scope of fieldwork

The SPA contamination team reviewed the SMEC (2020) investigation to assess potential data gaps and developed a scope of work to effectively 'fill the gaps' in order to bring the data set to a minimum standard to allow evaluation of the extent and nature of heavy metal, PAH contamination and asbestos.

The SPA scope of work was focused on 'known contamination' (PAHs and asbestos) and potential contamination (heavy metals) identified by the EIS.

Based on this review, the investigation strategy adopted to supplement the SMEC (2020) data is detailed in **Table 5-1.**

Table 5-1: Information review and proposed investigation strategy

Aspect	Reference	SMEC (2020) investigation	Additional assessment undertaken (by SPA) to supplement the SMEC data
Number and location of soil borehole locations	NSW EPA (1995) Sampling Design Guidelines recommends a minimum of 6 grid-based locations for the site size (approximate construction footprint of 800m^2).	One location within the investigation area.	Five additional locations. Total number of sample locations = 6 (including SMEC locations).
Sample depth	The EIS refers to 'surface deposition' as the likely source of contamination.	All soil investigation (with the exception of one location) were drilled to excavation method refusal. The maximum fill depth encountered was 1.1 mbgl. Deepest location of 1.45 mbgl. The depth of the SMEC (2020) investigation extended to intersection with the underlying natural materials (extending beyond the potential contamination distribution as detailed in the EIS).	Collection of near surface soils (to approximately 1 m depth). This is inclusive of surface soils. In accordance with Section 4 of this report, the depth of assessment was based on the likelihood of contact by site occupants during the early works program.
Sample analysis	Appendix M EIS (2020) identified the potential contaminants of concern for the site including heavy metals (mainly lead), hydrocarbons (i.e PAHs), asbestos	Heavy metals, Total Recoverable Hydrocarbons (TRH), Benzene, Toluene, Ethylbenzene, Xylenes (BTEX), PAH, pesticides, Polychlorinated Biphenyls (PCB), asbestos. Note the SMEC (2020) assessment included additional	The analytical schedule included the potential contaminants of concern as identified in the EIS including heavy metals (including lead), PAH and asbestos. For completeness, data analysis by SPA also included relevant SMEC data.

Aspect	Reference	SMEC (2020) investigation	Additional assessment undertaken (by SPA) to supplement the SMEC data
		contaminant analysis not required by the EIS.	
Frequency of sample analysis	Not applicable	Two samples were analysed per borehole	Two samples were analysed per borehole.

Notes:

Sample analysis conducted by SPA contamination team was based on the potential contaminants identified in Appendix M of the EIS (i.e. heavy metals, PAHs and asbestos). We note that a broader analysis suite was undertaken by SMEC (including TRH, BTEX, pesticides and PCB).

The SMEC analysis (for TRH, BTEX, pesticides and PCBs) did not indicate contamination that would present a risk to the proposed occupation and use of the site associated with the Early Works Program and therefore further evaluation of these contaminants was considered not to be warranted.

However, note that any future assessment of the site for post construction 'suitability' will need to consider a broad range of potential contaminants.

7 Site investigation

The following information details the fieldworks undertaken during the SPA investigation.

With respect to the purpose and limitations of this assessment, refer to Sections 1 to 4 of this report.

7.1 General overview

The fieldwork for the investigation was undertaken on 28 April 2021. The investigation was undertaken by a contaminated site consultant who was responsible for undertaking the work, site observations, excavation logging and sample collection.

7.2 Potential sources of contamination

Response to Condition 117(a) – Primary sources of contamination

Particulate deposition – Surface soils within the investigation area potentially contaminated by the deposition of particulates from motor vehicle use of the adjoining freeway. Contaminants likely to be present included heavy metals, PAHs and asbestos.

Sampling and analysis of surface soils was undertaken to address potential contamination type (heavy metals, PAH and asbestos) and distribution (surface deposition) detailed in the EIS for the Rosalind Street construction support site.

Other potential sources of contamination were not observed/identified (e.g. underground fuel tanks or historic manufacturing practices that could have resulted in point sources of contamination) within the investigation area.

7.3 Physical and chemical properties of contamination

Response to Condition 117(b) - ***contaminant dispersal in air, hazardous ground gases, surface water, groundwater, soil vapour, separate phase contaminants, sediments, infrastructure (e.g. concrete), biota, soil and dust;***

Response to Condition 117(c) - ***contaminant characterisation and behaviour (volatility, leachability, speciation, degradation products and physical and chemical conditions on-site which may affect how contaminants behave);***

Potential Contaminant	Comments
PAHs (including (B(a)P TEQ)	PAHs are commonly associated with gasworks waste and asphalt. The PAH group (of approximately 16 different PAHs) are generally classed as semi-volatile, however, B(a)P TEQ is non-volatile. Therefore, PAHs (and specifically (B(a)P TEQ)) is unlikely to partition into the soil vapour phase and impact ground gases or disperse into the air. PAHs (including (B(a)P TEQ)) also has a low solubility.

Potential Contaminant	Comments
	Therefore, PAHs (and specifically (B(a)P TEQ)) is unlikely to leach when contacted with water under normal pH conditions. PAHs (including (B(a)P TEQ)) are not expected to have a detrimental effect on concrete (note that asphalt (contains high concentrations of PAHs) is commonly install adjacent to concrete structures). PAHs (including (B(a)P TEQ)) is stable when subject to the environment and not considered to be biodegradable. **Site behaviour** - Note that any soil contamination from particulate deposition (if present) within the investigation area and beyond, is likely to have been present for many years and is likely associated with the use of the adjoining freeway. Therefore, any impact to the environment from this contamination would similarly have been occurring for many years. Left undisturbed this contamination is expected to have negligible impact on the proposed temporary construction use of the site as part of the Early Works program. However, where excavation of subsurface soils is required, any excavated material should be managed appropriately to minimise exposure to humans and the environment (both on and off-site).
Heavy metals	Heavy metals are non-volatile. Therefore, heavy metals are unlikely to partition into the soil vapour phase and impact ground gases or disperse into the air. However, note concentrations of metals in soil would likely need to be greater than background concentrations for a measurable impact to water to be observed. Heavy metals are not expected to have a detrimental effect on concrete. **Site behaviour** - Note that any soil contamination from particulate deposition (if present) within the investigation area and beyond, is likely to have been present for many years and is likely associated with the use of the adjoining freeway. Therefore, any impact to the environment from this contamination would similarly have been occurring for many years. Left undisturbed this contamination is expected to have negligible impact on the proposed temporary construction use of the site as part of the Early Works program. However, where excavation of subsurface soils is required, any excavated material should be managed appropriately to minimise exposure to humans and the environment (both on and off-site).
Asbestos	Asbestos could have been deposited on the surface of the investigation area from fibres released from motor vehicle brake pads. Asbestos is non-volatile and non-leachable.

Potential Contaminant	Comments
	Therefore, asbestos would not partition into the soil vapour phase and impact ground gases or disperse into groundwater. However, if disturbed asbestos containing materials may lose integrity (i.e. break up) or if present as asbestos fibres, may be released as asbestos fibres to the air. Asbestos is not expected to have a detrimental effect on concrete. **Site behaviour** - Note that any asbestos from particulate deposition (if present) within the investigation area and beyond, is likely to have been present for many years and is likely associated with the use of the adjoining freeway. Therefore, any impact to the environment from this contamination would similarly have been occurring for many years. Left undisturbed asbestos is expected to have negligible impact on the proposed temporary construction use of the site as part of the Early Works Program. However, where excavation of subsurface soils is required, any excavated material should be managed appropriately to minimise exposure to human health (both on and off-site).

7.4 Soil investigation

Five locations (BH01, BH02, BH03, BH04, and BH05) were excavated using decontaminated hand tools (hand auger and crowbar) to a maximum depth of 1.0 mbgl (BH03). Other investigation locations were terminated at shallower depths based on excavation method refusal.

The approximate investigation locations undertaken by SMEC (2020) and SPA are presented on **Figure 7-1**.

Figure 7-1: Approximate investigation locations

Approximate SMEC investigation location

Approximate Jacobs investigation location

7.5 Depth intervals of sampling

SPA collected soil samples from the investigation areas at the surface (0.0 – 0.1 mbgl) and at depths of 0.25 mbgl, 0.5 mbgl, and 1.0 mbgl or at discreet sampling depths where potential contamination was observed.

7.6 Method of sample collection

All soil samples were collected as grab samples from below the surface of the grass and from a decontaminated hand auger at depth. Samples were transferred to sample containers by the field staff by hand using disposable nitrile gloves. New nitrile gloves were used for the collection of each sample.

Care was taken to ensure that representative samples were obtained from the depth required and that the integrity was maintained, which is particularly important when dealing with potentially volatile components. As the contaminants of concern (heavy metals, PAH and asbestos) tested for in the samples collected by SPA are not volatile, no PID screening was undertaken by SPA.

SPA acknowledge that the sample collection method (hand auger) had the potential to lose entrainment of asbestos fragments during sampling and for this effect the identification of asbestos fragments. An alternate sampling method (test pits) was considered. This would have resulted in significant disturbance of the subsurface soils in order to provide a higher degree of confidence of the presence/absence of asbestos, however, even this intensive level of assessment would not guarantee all potential asbestos containing materials would be identified and located. Specific site restrictions (i.e. damage to established trees) would not have allowed for test pits to have been excavated.

Given that the purpose of the SPA assessment aligned with the Stage 1A of the construction program and that a CEMP (with unexpected finds procedure) was to be implemented, further assessment to provide an asbestos clearance certificate (or equivalent level of assessment), was not warranted.

SPA was satisfied that the level of asbestos assessment conducted was fit for purpose and aligned with the objectives stated within this report.

7.7 Sample containers, method of sample storage and handling

All soil samples were placed in jars provided by the primary laboratory Envirolab Services (Envirolab). The jars were completely filled with soil, labelled with the date, unique sampling point identification and sampler information.

The soil jars, once filled with sample and sealed, were immediately placed in an esky / cool box in which ice had been added. At the end of the sampling program the samples in the esky / cool box were transported to the primary laboratory. Custody seals were placed on the esky / cool box for delivery to the laboratory.

An inter-laboratory duplicate was collected and submitted to the secondary laboratory, Eurofins Scientific (Eurofins).

7.8 Decontamination procedures

The hand auger and crowbar were decontaminated between sample locations by washing with a solution of phosphate free, PFAS free, laboratory grade detergent (Liquinox) and potable water and rinsed with potable water.

7.9 Sample logging

Experienced contaminated site field staff completed soil logs for the excavation locations. The logs recorded the following data:

- Sample number and depth
- Soil classification, colour, consistency or density, moisture content and obvious indications of contamination
- Depth of excavation
- Excavation refusal
- Method of excavation.

7.10 Laboratory analysis

Soil samples were selected for laboratory analysis based the potential contaminants for the site as detailed in the EIS Appendix M (2020). A summary of the laboratory testing undertaken is detailed in **Table 7-2.**

Table 7-2: Laboratory testing

Laboratory Test	Quantity
Heavy metals (As, Cd, Cr, Cu, Pb, Ni, Hg, Zn),	10 primary and 2 QAQC
Hydrocarbon compounds (PAH)	10 primary and 2 QAQC
Asbestos (presence/absence)	5 primary

7.11 Analytical parameters and methods

SPA commissioned Envirolab and Eurofins as the primary and secondary laboratories respectively. Both laboratories are National Association of Testing Authorities (NATA) accredited for the testing undertaken.

Where appropriate, the soil samples were analysed in accordance with NEPC National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended 2013 (NEPC, 2013) guidelines using methods based on US Environment Protection Agency (US EPA) and American Public Health Association (APHA) approved analytical methods.

7.12 Conceptual site model

Response to Condition 117(g) – the review and update of the conceptual site model from the preliminary and detailed site investigations.

A conceptual site model involves consideration of contamination sources, pathways and receptors.

Sources of contamination –

- The EIS identified the potential for lead, PAH and asbestos deposition from the adjacent freeway.
- The SPA assessment did not identify any other potential point sources of contamination within the investigation area.

Pathways –

Any PAHs, heavy metals and asbestos containing materials from particulate deposition was likely to have been present for many years (i.e. large traffic volumes within the adjacent freeway – current and historical). The investigation areas are unsealed or uncovered meaning that the contamination (if present) has been exposed to environmental conditions for a long period of time. Therefore, contaminant migration/exposure pathways have been present/active for the same period of time.

As discussed in **Section 7.3**, SPA evaluated the physical/chemical properties of the identified contamination related to contaminant migration pathways. The general properties of the contamination present are no to low solubility or volatility. Therefore, these contaminants are expected to be relatively stable in the environment (i.e. if they were soluble/volatile and exposed to the open environment (as soils at the site have been) then they would have already dissociated from the soil matrix.

Left in-situ, the exposure pathways would not change from the pre-existing pathways present for many years (i.e. current site use in unrestricted public open space).

In the event that soils are excavated during the Early Works program the additional exposure pathways (including potential pathways to adjoining receptors) would need to be considered to ensure contaminated

soil was managed appropriately. SPA considered these pathways (e.g. dermal contact, dust ingestion/inhalation, water runoff) within the soil management procedures of the CEMP.

Receptors –

The surface soils within the investigation area has been subject to unrestricted access for many years. Exposed receptors where/are likely to include:

- The general public (i.e. unrestricted public open space).
- Any subcontractors undertaking works at the site (especially those in contact with soil).
- Any other workers undertaking subsurface works (e.g. utility providers).

Conversely all works undertaken by SPA will be controlled under the CEMP. The CEMP provides:

- Establishment of work areas that exclude access by the general public and any unauthorised people.
- A system for the management of any excavated soil.
- Identification and notification of unexpected finds.
- Use of PPE by site workers.

Implementation of the CEMP will eliminate and/or control the exposure to receptors and is likely to be a significantly higher level of management than previously applied to any works undertaken at the site.

Conclusion

SPA considered this 'conceptual site model' sufficient for the development of site management measures related to the Early Works program (as detailed in the CEMP).

8 Quality control plan

Field and laboratory QA/QC requirements compliant with NEPC (2013) requirements (where applicable) were undertaken as part of the fieldwork program as outlined below.

8.1 Field QA/QC program

8.1.1 Environmental samples

Environmental samples or field samples were the representative soil samples collected for analysis to determine aspects of their chemical composition.

8.1.2 Blind replicate sample

A blind replicate sample was provided by the collection of two environmental samples from the same location. These samples were preserved, stored, transported, prepared and analysed in an identical manner. As a minimum, the results of analyses on the blind replicate sample pairs were assessed by calculating the Relative Percentage Differences (RPDs) between the results. The RPD was calculated as the difference between the results divided by their mean value and expressed as a percentage. If the RPD exceeded the value adopted for any analytes, additional investigation would be required, or justification provided for not conducting additional investigation.

Blind replicate samples should be collected at a rate of one duplicate for every 20 environmental samples in accordance with AS 4482.1-2005 *Guide to the sampling and investigation of potentially contaminated soil. Part 1: Non-volatile and semi-volatile compounds* (AS 4482.1-2005).

8.1.3 Blind triplicate sample

A blind triplicate sample was provided by the collection of two environmental samples from the same location. These samples were preserved, stored, transported, prepared and analysed in an identical manner. One of the samples was transported to a secondary laboratory for analysis. As a minimum, the results of analyses on the blind triplicate sample pairs were assessed by calculating the Relative Percentage Differences (RPDs) between the results. The RPD was calculated as the difference between the results divided by their mean value and expressed as a percentage. If the RPD exceeded the value adopted for any analytes, additional investigation would be required, or justification provided for not conducting additional investigation.

Blind triplicate samples should be collected at a rate of one duplicate for every 20 environmental samples in accordance with AS 4482.1-2005.

8.2 Laboratory QA/QC programme

The reliability of test results from the analytical laboratories was monitored according to the QA/QC procedures used by the NATA accredited laboratory. The QA/QC program employed by Envirolab (the primary laboratory) and Eurofins (the secondary laboratory) specified holding times, extraction dates, method descriptions, CoC requirements, analysis, laboratory levels of reporting (LORs) and acceptance criteria for the results. Laboratory QA/QC requirements undertaken by Envirolab and Eurofins are based on NEPC (2013) requirements and are outlined below.

8.2.1 Laboratory duplicate samples

Laboratory duplicates provided data on analytical precision for each batch of samples.

Laboratory duplicates were performed at a rate of one duplicate for batches of 8-10 samples with an additional duplicate for each subsequent ten samples.

8.2.2 Laboratory control samples

Laboratory control samples consisted of a clean matrix (de-ionised water or clean sand) spiked with a known concentration of the analyte being measured. These samples monitored method recovery in clean samples and were used (where required) to evaluate matrix interference by comparison with matrix spikes.

8.2.3 Surrogates

For organic analyses, a surrogate was added at the extraction stage in order to verify method effectiveness. The surrogate was then analysed with the batch of samples and percentage recovery calculated.

8.2.4 Matrix spike

Matrix spikes consisted of samples spiked with a known concentration of the analyte being measured, in order to identify properties of the matrix that may hinder method effectiveness. Samples were spiked with concentrations equivalent to 5 to 10 times the LOR and percentage recovery calculated.

8.2.5 Method blanks

Method blanks (de-ionised water or clean sand) were carried through all stages of sample preparation and analysis at a rate of approximately 10%. Analyte concentrations in blanks should be less than the stated LOR. Reagent blanks were run if the method blank exceeded the LOR. The purpose of method blanks was to detect laboratory contamination.

8.3 Data acceptance criteria

The QA/QC was assessed against the Data Acceptance Criteria (DAC) provided in **Table 7-1**.

Table 7-1: QA/QC compliance assessment

QA/QC sample	DQI	Objectives	Acceptance criteria
Field QA			
Standard procedures	Precision Accuracy Representativeness Completeness	All sampling undertaken by suitably qualified and experienced personnel. Adherence to the relevant work instructions including record keeping.	No deviation from standard procedure All appropriate field records kept and maintained
Sample collection, preservation, handling and analysis	Accurate Representativeness	Analysis within holding times. Samples collected into appropriate containers for the analysis with suitable preservation upon collection.	Use of laboratory supplied sample containers including glass jars with Teflon lined lids for general contaminants.

QA/QC sample	DQI	Objectives	Acceptance criteria
		Samples received at the laboratory in good condition and appropriately chilled.	Preservation and storage of samples chilled in ice chests and transported to laboratories under chain of custody documentation. Attempt to appropriately chill samples (<5°C), with ice. Samples remain not waterlogged and in separate bags to ice. Samples extracted and analysed within holding times relevant for the sample matrix. Use of NATA accredited laboratories for the analysis undertaken.
Decontamination	Accuracy Representativeness Precision Comparability	Prevention of cross-contamination between sampling locations.	Decontamination using triple wash system for all reusable equipment
Calibration	Precision Representativeness	Calibration of field measuring equipment as specified by the manufacturer and retaining of calibration records.	Daily check of equipment against known standards Calibration of equipment if observed to be outside of acceptable range from standard Calibration of field measuring equipment at the rate specified by the manufacturer Calibration records for each event
Data handling	Comparability Completeness	Appropriate labelling of sampling containers Central database of correct field and laboratory data.	Labelling of sample containers to include a unique sample identification number, date of collection, samplers' initials and project number. Field data and laboratory reports undergo review.
Field QC			
Blind replicate/triplicate samples	Precision Comparability	To ensure the primary data is reliable and fit for purpose. The assessment of blind duplicate and split replicate samples is undertaken by calculating the Relative Percent Difference (RPD) of the replicate or split concentration compared with the original sample concentration. The RPD is defined as: $RPD = 100 \times \frac{\lvert X1 - X2 \rvert}{Average}$ Where: X1 and X2 are the concentration of the original and blind or split samples.	Analysed for the same chemicals as the primary sample. Typical RPDs are noted in AS 4482.1-2005 as between 30 – 50%. RPDs exceeding the acceptable range may be considered acceptable for heterogeneous material or where: ▪ No Limit (When the average concentration is < 10 times the LOR)

QA/QC sample	DQI	Objectives	Acceptance criteria
			▪ 0 – 50% RPD (When the average concentration is 10 to 20 times the LOR)
Laboratory QA/QC			
Laboratory duplicates	Precision	To ensure precision of the analysis method and replicability of analysis due to potential sample heterogeneity. Assessment as per blind replicates and split samples	As per laboratory QC report
Matrix spike recoveries Laboratory Control Samples Surrogates	Accuracy	To assess the effect of the matrix, laboratory control samples and surrogates on the accuracy of the analytical method used. Assessment is undertaken by determining the percent recovery of the known spike or addition to the sample. $\% \text{ Recovery} = 100 \times \frac{C - A}{B}$ Where: A = Concentration of analyte determined in the original sample; B = Added Concentration; C = Calculated Concentration.	As per laboratory QC report
Method blanks	Accuracy	To assess potential bias introduced by the laboratory analytical method for a relevant analyte. A method blank assesses the component of the analytical result introduced from laboratory equipment. Each blank is analysed as per the original samples.	Analytical result < LOR

9 Quality assurance / quality control

For the purpose of assessing the quality of data presented in this report, SPA collected and analysed blind replicate samples, while the laboratory completed their own internal QC. The current section of this report is focused on the presentation of the results of these QC samples, adherence to Quality Assurance (QA) systems and discussion of deviations, if any from the DAC.

9.1 Field quality assurance

All samples were collected by experienced contaminated site staff under established Jacobs protocols. Adherence to Jacobs protocols by experienced field staff trained in sample collection and handling techniques ensures the quality and representativeness of the samples collected.

Specific assessment of the field QA is discussed below:

- Standard procedures: Sampling was completed in accordance with standard procedures. Field records were kept and maintained.
- Sample collection, preservation, handling and analysis: All analysis was undertaken within holding times, samples were collected into appropriate containers for the analysis with suitable preservation upon collection, samples were received at the laboratory in good condition and appropriately chilled and laboratories were NATA accredited.
- Decontamination: All sampling equipment was decontaminated (triple washed) between investigation locations.
- Calibration: No equipment requiring calibration was used as part of the investigation
- Data handling: All samples were appropriately labelled. Laboratory data was reviewed and processed using ESDat.

9.2 Field quality control

The following QC samples were collected for laboratory analysis:

- Blind replicate: QAQC1 (duplicate of primary soil sample BH04_B).
- Blind triplicate: QAQC2 (triplicate of primary soil sample BH04_B).

One blind replicate sample was analysed to assess the quality control during the field sampling program. This equates to 10% blind replicate analysis. This blind replicate analysis exceeds and therefore conforms to AS 4482.1-2005.

The RPDs for all analytes for the soil blind replicate pair conformed to the DAC with the exception of the RPDs for selected PAH compounds and lead. The sample collected for the blind replicate pair consisted of fill (clayey SILT). It is inherently difficult to obtain representative duplicate samples from heterogenous fill materials which cannot be homogenised in order to retain the integrity of volatile compounds (e.g. naphthalene). None of the contamination detected in either sample exceeded the adopted investigation levels for commercial / industrial land use. The RPD exceedances of selected PAH compounds and lead between BH04_B) and QAQC1 are unlikely to affect the usability of the data set.

One blind triplicate sample was analysed to assess the quality control during the field sampling program. This equates to 10% blind triplicate analysis. This blind triplicate analysis exceeds and therefore conforms to AS 4482.1-2005.

The RPDs for all analytes for the soil blind triplicate pair conformed to the DAC with the exception of the RPDs for selected PAH compounds and lead. The sample collected for the blind triplicate pair consisted of fill (clayey SILT). It is inherently difficult to obtain representative duplicate samples from heterogenous fill materials which cannot be homogenised in order to retain the integrity of volatile compounds (e.g. naphthalene). None of the contamination detected in either sample exceeded the adopted investigation levels for commercial / industrial land use. The RPD exceedances of selected PAH compounds and lead between BH04_B) and QAQC2 are unlikely to affect the usability of the data set.

RPD results for soil blind replicate and triplicate pairs are detailed in **Table A** presented in **Appendix A**.

9.3 Laboratory quality assurance

All analysis was undertaken by NATA accredited laboratories using NATA accredited analytical methods.

9.4 Laboratory quality control

Where undertaken, laboratory QC data is presented in full in the laboratory certificates in **Appendix B**.

9.4.1 Laboratory duplicates

Where undertaken, the RPDs for the laboratory samples conformed to the DAC.

9.4.2 Laboratory control samples

Where undertaken, the recoveries for all laboratory control samples conformed to the DAC.

9.4.3 Surrogates

Where undertaken, the recoveries for all laboratory surrogate samples conformed to the DAC.

9.4.4 Matrix spikes

Where undertaken, recoveries for all matrix spike samples conformed to the DAC.

9.4.5 Method blanks

Where undertaken, all method blanks reported analyte concentrations below the laboratory LOR and therefore conformed to the DAC.

9.4.6 Sample holding times

All soil samples were extracted and analysed within the specified holding times.

9.4.7 Sample condition

All samples were received by the analytical laboratory in correctly preserved and chilled containers with no reported breakages. The individual sample receipts are presented with the laboratory reports in **Appendix B**.

Laboratory certificates from Envirolab indicate that asbestos testing was undertaken by analysing a sub-sample from jars. The Envirolab reports state "w*e cannot guarantee that this sub-sample is indicative of the entire sample."*

SPA note this qualification by the laboratory. However, SPA was satisfied that this qualification did not conflict with the qualitative asbestos assessment undertaken by SPA (as noted in Section 2.3 (vii)) of this report.

9.5 QA/QC assessment

It is concluded that the fieldwork program and laboratory data are of acceptable quality and are considered useable in making conclusions and recommendations regarding the condition of soils at the site.

10 Site assessment criteria

10.1 Aesthetics

The National Environment Protection (Assessment of Site Contamination) Measure 1999, revised 2013 (NEPC, 2013) notes that there are no specific numeric aesthetic guidelines, however site assessments require a balanced consideration of the quantity, type and distribution of foreign material or odours in relation to the specific land use and its sensitivity. Consideration includes chemically discoloured soils, large quantities of various types of inert refuse and their depth etc.

10.2 Health investigation levels

To evaluate the significance of the reported soil concentrations with respect to the proposed use, SPA compared the analytical testing results against the soil quality guidelines published in the NEPC (2013) (i.e. health-based soil investigation (HIL) levels).

The HILs for a commercial/industrial land use (HIL-Setting D), NEPC (2013) were used to evaluate the significance of contamination.

The published guidelines adopted were based on a commercial/industrial land use as these were the most relevant exposure scenario for the proposed site use (i.e. construction site with no uncontrolled access by the public). However, we note that the published HIL guidelines are based on a much longer exposure period (i.e. 30 years). Therefore, direct application of the published HIL guidelines (for commercial/industrial) to the proposed site exposure (i.e. less than 5 years) was conservative.

As per the guidance provided in the NEPM (2013), average concentrations in soil were used to assess contaminant concentrations with respect to the guidelines rather than individual results. The NEPM also states that in order to use the average concentration of a contaminant, the data set must meet the following criteria:

- No single value should exceed 250% of the relevant investigation or screening level; and
- The standard deviation of the results should be less than 50% of the relevant investigation or screening level'.

Where the above criteria are not met, then the average concentration should not be used and the individual results must be directly compared to the guideline levels.

Published guidelines are also available for the evaluation of soil vapour exposure resulting from soil contaminated with petroleum hydrocarbons (Health Screening Levels (HSLs)). SPA have included HSLs for comparison to the soil assessment results. However, adoption of HSL guideline values is conservative given the proposed (temporary) use/occupation of the site (e.g. no permanent structures for occupation).

The HSLs defined within the NEPC (2013) relate only to the volatile fractions of the petroleum hydrocarbons range i.e. BTEX, naphthalene and TRH C6 – C10, TRH C10 – C16. Based on the presence of fill material across the site, HSLs for coarse grained sand to 0-1 m have been adopted.

Where available, SPA have also utilised the direct contact HSLs under a commercial/industrial land use as detailed in the Table A4, Friebel, E & Nadebaum, P 2011, Soil Health screening levels for direct contact, Technical Report 10. The lower values of the vapour and direct contact HSLs have been used to assess the risk to site occupants (under a commercial/industrial land use).

The SPA assessment also considered the potential presence of asbestos. However, this was limited to:

- Field observations during the collection of soil samples (by the field staff), and
- Testing of selected soil samples by the laboratory for the 'presence or absence' of asbestos.

We note that this was level of assessment does not constitute full characterisation of the site for the potential presence of asbestos nor is an 'asbestos clearance' provided by the SPA contamination team. The potential for asbestos to be discovered during the occupation of the site should be considered within the management plan for any works on site (e.g. unexpected finds protocols).

The adopted soil quality guidelines are detailed in **Table 10-1**.

Table 10-1: Adopted soil quality guidelines (mg/kg)

Compounds / Fraction	Soil Investigation Levels (mg/kg)
	Commercial/Industrial
Heavy Metals	
Arsenic (total)	3,000 [1]
Cadmium	900 [1]
Chromium (VI)	3,600 [1]
Copper	240,000 [1]
Lead	1,500 [1]
Mercury (inorganic)	730[1]
Nickel	6,000 [1]
Zinc	400,000 [1]
Cyanide (free)	1,500 [1]
Polychlorinated Biphenyls (PCBs)	
PCBs	7 [1]
Polycyclic Aromatic Hydrocarbons (PAHs)	
Naphthalene	NL
BaP TEQ	40 [1]
Total PAH	4,000 [1]
Total Recoverable Hydrocarbons (TRH) [3]	
C6-C10	26,000
>C10-C16	20,000
>C16-C34	27,000
>C34-C40	38,000
Organochlorine Pesticides (OCP)	
DDT+DDE+DDD	3,600 [1]
Aldrin and dieldrin	45 [1]
Chlordane	530 [1]

Compounds / Fraction	Soil Investigation Levels (mg/kg)
	Commercial/Industrial
Endosulfan	2,000 [1]
Endrin	100 [1]
Heptachlor	50 [1]
HCB	80 [1]
Methoxychlor	2,500 [1]
Mirex	100 [1]
Toxaphene	160 [1]
F1, F2 and BTEX (based on SAND soil type) #	
Depth (m)	0 – <1
F1 (C6-C10 minus sum of BTEX concentrations)	260 [2]
F2 (>C10-C16 minus naphthalene)	NL [32]
Benzene	3 [2] / 430 [3]
Toluene	NL [2] / 99,000 [3]
Ethylbenzene	NL [2] / 27,000 [3]
Xylenes	NL [2] / 81,000 [3]
Naphthalene	NL [2] / 11,000 [3]
Asbestos	
All forms of asbestos	Visual observation. Laboratory detection.

[1] NEPC (2013) Table 1 A(1) Health investigations levels for soil contaminants – Commercial / Industrial D.
[2] NEPC (2013) Table 1 A(3) Soil HSLs for vapour intrusion – Commercial / Industrial D, 0 to <1m, SAND
[3] HSL-D Commercial / Industrial, Direct Contact detailed within Table A4, Friebel, E & Nadebaum, P 2011, Soil Health screening levels for direct contact, Technical Report 10.
NL – NL indicates the HSL is not limiting (see Footnote 5, Table 1A(3)).
TEQ – Toxic Equivalent.
Soil Vapour as the primary Exposure Pathway to impact potential receptors.

11 Results and discussion

11.1 Site stratigraphy

A summary of the sub-surface material excavated from the SPA investigation locations is provided in **Table 11-1**.

Table 11-1: Summary of sub-surface materials

BH01	
Co-ordinates: Lat: 33º49.503S; Long: 151º12.645'E	
Depth range (mbgl)	**Material description**
0.0	Grass
0.0 - 0.25	FILL: clayey silt, brown, rootlets, fine grained, loose, dry
0.2	Medium to coarse gravel (sub-angular) and small plastic pieces present
0.25-0.65	As above with sand (some white specs) and medium gravel (sub-rounded)
0.45	Red sandstone present (fine to coarse, sub-angular)
0.5	Colour change to light brown
0.65-0.75	FILL: sandy clay, white/light brown mottled orange, medium-coarse grained, moist
0.7	Colour change to white
0.75	FILL: silty sand with clay, reddish brown, medium to coarse grain, red sandstone gravels (coarse, sub-rounded), white clay pieces, dry, loose
0.8	Excavation method refusal on dense clay/rock. Borehole terminated at 0.8mbgl.
BH02	
Co-ordinates: Lat: 33º49.502'S; Long: 151º12.640'E	
Depth range (mbgl)	**Material description**
0.0	Grass
0-0.45	FILL: clayey silt, dark brown, loose, rootlets, fine grained, dry, medium to coarse, dry
0.2	Gravel present, medium to coarse, sub-angular
0.3	Gravel becoming large/coarse, increased clay content, colour change to light brown
0.45-0.63	FILL: sandy clay, yellow/light brown, fine to coarse grained, loose, dry
0.45	Refusal, moved borehole 0.5m south-west
0.5	Colour change to red mottled yellow
0.63	Excavation method refusal on dense clay/rock, dry. Borehole terminated at 0.63mbgl.
BH03	
Co-ordinates: Lat: 33º49.497'S; Long: 151º12.629'E	
Depth range (mbgl)	**Material description**
0.0	Grass
0-0.4	FILL: silty clay, dark brown, rootlets, fine grained, moist
0.4-0.5	FILL: silty sand with clay, white/light brown, fine grained, sandstone gravel (medium to coarse, sub-rounded), loose, dry
0.5-0.9	FILL: clayey sand, light orange/white, fine-coarse grained
0.65	Colour change to orange, sandstone gravel (medium, sub-rounded), loose

0.75	As above with silt, colour change to red/orange
0.85	FILL: silty clay with sand, fine grained, white mottled orange, sandstone gravel (coarse, sub angular), moist
1.00	FILL: sandy clay with silt, orange, dry, loose. Refusal on rock. Borehole terminated at 1.0mbgl (limit of investigation).
BH04	
Co-ordinates: Lat: 33º49.490'S; Long: 151º12.620'E	
Depth range (m)	**Material description**
0.0	Grass
0-0.35	FILL: clayey silt, dark brown, rootlets, loose, dry
0.2	Tree root present
0.35-0.95	Sandy CLAY: white, light brown, loose, dry, some sandstone gravel inclusions (fine to medium, rounded)
0.5	Colour change to brown with rock fragments, moist
0.7	As above but with no rock fragments, white/mottled yellow
0.9	Colour change to orange
0.95	Colour change to white. Excavation method refusal on sandstone. Borehole terminated at 0.95mbgl.
BH05	
Co-ordinates: Lat: 33º49.491'S; Long: 151º12.608'E	
Depth range (m)	**Material description**
0.0	Patchy grass
0-0.7	FILL: silty clay, fine grained, brown, rootlets, dry
0.2	Tree root present, sandstone gravel (medium to coarse, sub-angular), loose
0.25	Colour change to light brown/white specs with sand
0.4	Colour change to white
0.5	As above, sandstone gravel (fine to medium, angular)
0.7-0.8	FILL: sandy clay, light brown, loose, moist, fine to medium rock fragments (possibly weathered sandstone)
0.75	Colour change to reddish brown with sandstone gravel (coarse, sub-angular)
0.77	Excavation method refusal on rock. Borehole terminated at 0.77mbgl.

11.2 Site observations and aesthetics

Fill was identified at all locations to the limit of the investigation (1.0 mbgl) with the exception of BH04 which encountered natural material at 0.3 mbgl. The fill material generally comprised sandy clay and silty clay with sandstone gravels. Plastic was observed at 0.2-0.25 mbgl in BH01. However, no other anthropogenic materials were observed at the sample locations.

The SMEC assessment also reported similar type of fill across the investigation area extending until the underlying natural surface was encountered.

No potential asbestos containing materials, odorous or discoloured materials were identified in the material recovered from the investigation locations. No potential asbestos containing materials were observed on the surface in there near vicinity of the investigation locations.

11.3 Soil analytical results

Soil analytical results from samples collected from the SMEC and SPA investigation locations in comparison to the adopted HIL/HSL are discussed below.

Analytical results (SMEC and SPA combined) are provided in **Table B** presented **in Appendix A**. Laboratory certificates of analysis from the SPA investigation are presented in **Appendix B**.

Laboratory results for all contaminants (heavy metals, TRH, BTEX, PAH, pesticides, PCB) were below the adopted soil quality guidelines (HIL/HSL).

Asbestos was not identified by the laboratory in any of the samples submitted for asbestos identification.

As noted in Section 2.3 (vii), this assessment was not designed to provide in-situ classification of soils for off-site disposal. In the event that off-site disposal of soils is required, EPA guidelines with respect to off-site soil classification/disposal will need to be considered.

11.4 Potential and actual migration routes

Response to Condition 117(e) – potential and actual contaminant migration routes including potential preferential pathways;

Refer to the discussion of sources of contamination provided in **Section 7.2** and the physical and chemical properties of contamination in **Section 7.3**.

Actual migration routes - Note that any soil contamination and/or asbestos from particulate deposition (if present) within the investigation area and beyond, is likely to have been present for many years and is likely associated with motor vehicle use of the adjoining freeway. Therefore, any impact to the environment from this contamination would similarly have been occurring for many years.

Left undisturbed soil contamination and/or asbestos is expected to have negligible impact on the proposed temporary construction use of the site as part of the Early Works Program.

Potential migration routes – Uncontrolled excavation would potentially establish exposure scenarios (i.e. exposure routes) not available to in-situ soil contamination and asbestos.

To manage this issue the CEMP implements soil management and control measures where soil excavation is required.

Furthermore, recommendations (a) and (b), provide further guidance on the management of soils within the investigation areas to mitigate potential exposure scenarios.

11.5 Statistical data analysis

The following information provides a summary of the data obtained from the SMEC (2020) and the SPA investigations.

The data summary has only been undertaken on the potential contaminants (heavy metals, PAH) as detailed in Appendix M of the EIS (2020) prepared for the Western Harbour Tunnel and Warringah Freeway Upgrade project which have a respective adopted SAC. There is insufficient data for other contaminant compounds analysed as part of the SMEC (2020) investigation to enable reliable statistical analysis to be undertaken.

The data summary assumes the following:

- Only those contaminant compounds which have HIL/HSL have been subject to statistical analysis
- Where concentrations of contaminant compounds have been reported at less than the laboratory levels or reporting (LOR), these results have been reported as half the LOR to enable statistical analysis
- Statistical analysis has not been undertaken on samples collected by SMEC (2020) and analysed for TRH, BTEX, pesticides and PCBs as there is insufficient data (only two samples) to produce reliable statistical analysis.

The data summary is detailed in **Table 11-2**.

Table 11-2: Data summary

Contaminant	No. samples analysed	Maximum concentration (mg/kg)	95% UCL concentration (mg/kg)	Arithmetic mean concentration (mg/kg)	Standard deviation (mg/kg)	Adopted HIL/HSL	No. of individual samples above HIL/HSL	No. of individual samples where the 95%UCL above HIL/HSL	Arithmetic mean above HIL/HSL	Maximum concentration >250% of HIL/HSL	Standard deviation >50% of HIL/HSL
BaP TEQ	13	4.6	1.64	1	1.24	40	0	0	No	✓	✓
Total PAH	13	31	10.74	5.48	10.21	4,000	0	0	No	✓	✓
Arsenic	13	8	5.11	4.04	2.08	3,000	0	0	No	✓	✓
Cadmium	13	0.5	0.3	0.25	0.11	900	0	0	No	✓	✓
Chromium	13	70	33.17	24.46	16.92	3,600	0	0	No	✓	✓
Copper	13	23	13.45	9.27	8.13	240,000	0	0	No	✓	✓
Lead	13	85	58.17	43.23	29.04	1,500	0	0	No	✓	✓
Mercury	13	0.2	0.9	0.07	0.04	730	0	0	No	✓	✓
Nickel	13	31	13.19	9.54	7.09	6,000	0	0	No	✓	✓
Zinc	13	82	48.28	34.77	26.26	400,000	0	0	No	✓	✓

✓ Arithmetic mean/individual concentration/maximum concentration/standard deviation soil concentration below soil quality guideline and/or acceptable statistical evaluation criteria.

x Arithmetic mean/individual concentration/maximum concentration/standard deviation soil concentration above soil quality guideline and/or unacceptable statistical evaluation criteria.

11.6 Potential effects on human health and environment

Response to Condition 117(d) –potential effects of contaminants on human health, including the health of occupants of built structures (for example arising from risks to service lines from hydrocarbons in groundwater, or risks to concrete from acid sulphate soils) and the environment;

Potential effects on Human Health

Note: exposure scenarios for site workers is discussed in **Section 3** of this report.

Contaminant	Potential effect on human health
PAHs (including (B(a)P TEQ))	All individual soil results for PAH were reported below the adopted commercial/industrial guideline value and therefore considered not to present a risk to human health to the occupation of the investigation area during the Early Works Program. Left undisturbed this contamination is expected to have negligible impact on the proposed temporary construction use of the site as part of the Early Works Program. However, where excavation of subsurface soils is required, any excavated material (and residual in-situ material) should be managed appropriately to minimise exposure to humans and the environment (as per recommendations (a) and (b)).
Heavy metals	All individual soil results for heavy metals were reported below the adopted commercial/industrial guideline value and therefore considered not to present a risk to human health to the occupation of the investigation areas during the early works program. Left undisturbed heavy metals are expected to have negligible impact on the proposed temporary construction use of the site as part of the Early Works Program. However, where excavation of subsurface soils is required, any excavated material (and residual in-situ material) should be managed appropriately to minimise exposure to humans and the environment (as per recommendations (a) to (e)).
Asbestos	The investigation did not report the presence of asbestos (by visual inspection or by laboratory analysis). However, given the presence of fill across the investigation area, SPA concluded that there is a potential for undiscovered soil contamination and/or asbestos containing materials to also be present within fill. Consequently, SPA recommended the following, *"The potential for undiscovered soil contamination and/or asbestos containing materials to be present within the subsurface should be noted within the CEMP (including an unexpected finds procedure)."* Refer to recommendations (a) and (b).

Potential effects on environment

SPA has undertaken an assessment of surrounding ecological environments that may be impacted by works involving excavation of potentially contaminated materials during construction activities at the Rosalind

Street site. The assessment considered the proximity of aquatic and terrestrial Ecological Environments as well as Groundwater Dependent Ecosystems.

Aquatic environments

The construction site at Rosalind Street Discharges into Willoughby Creek. Willoughby Creek is highly urbanised drain which transports urban runoff from the Rosalind Street site and Surrounding Urban areas into Sydney Harbour near Primrose Park

As noted in the EIS, Willoughby Creek (Table 19.8) Willoughby Creek has not been classified as a sensitive receiving environment and any aquatic fish have been nominated as “Minimally Sensitive” – Class 3 (refer to Table 19.8 of the EIS).

In any case, through the implementation the CEMP, Erosion and Sediment Control Plan, regular site inspections by the independent environmental representative and the experienced, SPA are confident that there will be negligible impact to any aquatic ecosystems as a result of works at Rosalind Street.

To date, there have not been any incidents that would result in discharge of site runoff to Willoughby Creek

Groundwater dependent ecosystems

There are no Groundwater Dependent Ecosystems that would be impacted by the excavation and construction activities at Rosalind Street. There was only one area identified in the EIS located at Flat Rock Creek to the North of the Work area. Willoughby Creek does not drain into Flat Rock Creek. Therefore, the work will not impact any Groundwater Dependent Ecosystems.

Terrestrial ecology

The Rosalind Street site is located within a heavily urbanised area and the site has been subject to filling.

As such there are no sensitive ecological communities or areas that would be impacted by the ground disturbance activities and contamination (if present) at the Rosalind Street site. This has been confirmed by the Environmental Impact Statement.

SPA considers that there will be no impacts to ecologically sensitive areas although if there is an unexpected potential contamination risk to ecological impacts, SPA will manage works in these areas in accordance with the CEMP with particular focus on the following procedures:

- Soil & Water Management Procedure
- Flora & Fauna Management Procedure.

General site environmental management

As part the requirements of the CEMP and protocols detailed above, the management measures and the scope of the Stage 1A works are prioritised to prevent air and water impacts, examples of these controls include:

- Sealing all ancillary facilities with hardstand surface.
- Development and installation of ERSED controls in accordance with the Blue Book (endorsed by an independent Soil Conservationist).
- Minimising disturbance footprint as much as possible (in line with the work areas required by the WFU Stage 1A scope).

11.7 Adequacy of the assessment and uncertainty

Response to Condition 117(f) – the adequacy and completeness of all information available for use in the assessment of risk and for making decisions on management requirements, including an assessment of uncertainty;

Clarification

This report should be read with consideration of the 'Important note about your report" (provided above) and the scope and limitations of this assessment provided thought this report and specifically in Section 1 to 4.

All reports and conclusions that deal with sub-surface conditions are based on interpretation and judgement and as a result have uncertainty attached to them. You should be aware that this report contains interpretations and conclusions which are uncertain, due to the nature of the investigations. No study can investigate every risk, and even a rigorous assessment and/or sampling programme may not detect all problem areas within a site.

Scope of Work

As noted in Section 3 of this report the purpose/objective of this assessment was to:

- This evaluation was primarily framed by the scope of the Early Works Program (as described in Section 2.1) and the designated 'sub-areas' within the greater WFU project area.
- Provide advice on the contamination status of the investigation area and the need for further assessment/management in the context of the proposed Early Works Program and the protection of construction workers undertaking the Early Works Program (Stage 1A).
- Comply with Western Harbour Tunnel and Warringah Freeway Upgrade (SSI-8863) conditions of approval.

Assessment of uncertainty

SPA have acknowledged the inherent uncertainty of the assessment program undertaken and have considered this uncertainty with respect to the interpretation of the data, conclusions, recommendations and implementation of the CEMP. The assessment of certainty is provided below.

Aspect	Completeness/uncertainty
Heavy metals and PAH contamination	Fill with a similar visual/aesthetic appearance was generally identified at all sample locations. Such fill will often demonstrate heterogeneous distribution of contaminants, however, the sample results reported relatively consistent results (for fill). The evaluation of the laboratory data (discussed below) combined with field observations gave SPA a satisfactory level of understanding of PAH and metal contamination likely to be encountered with the investigation area.
Asbestos	Asbestos (visual or verified) was not identified by the SPA assessment. SPA acknowledge that the sample collection method (hand auger) had the potential to lose entrainment of asbestos fragments during sampling and for this effect the identification of asbestos fragments. An alternate sampling method (test pits) was considered. This would have resulted in

Aspect	Completeness/uncertainty
	significant disturbance of the subsurface soils in order to provide a higher degree of confidence of the presence/absence of asbestos, however, even this intensive level of assessment would not guarantee all potential asbestos containing materials would be identified and located. Specific site restrictions (i.e. damage to established trees) would not have allowed for test pits to have been excavated. Given that the purpose of the SPA assessment aligned with the Stage 1A of the construction program and that a CEMP (with unexpected finds procedure) was to be implemented, further assessment to provide an asbestos clearance and certificate (or equivalent level of assessment), was not warranted. SPA was satisfied that the level of asbestos assessment conducted was fit for purpose and aligned with the objectives stated within this report. As noted above fill within the investigation areas likely to demonstrate heterogeneous distribution of contaminants (including asbestos). To address this uncertainty, SPA made conclusions with respect to the potential to encounter asbestos during any excavation works and recommendations aligned with this conclusion.
Other contaminants	There are a number of potential chemical contaminants or substance not specifically nominated for assessment by this report (including but not limited to chlorinated hydrocarbons, PFAS, fluoride, chlorobenzenes, phenols, dioxins/furans, phthalates, nutrients, PBDEs, phenols, 1,4-Dioxane, insecticides, micro plastics and potential acid sulphate soils). Fill was assessed for the contaminants most likely to be present within fill and as identified by the previous SMEC (2020) assessment. The presence of these other contaminants are unlikely to be present at concentrations that would impact on the Stage 1A works (i.e. temporary occupation and use of the site as a construction work area). To address this uncertainty (albeit low), recommendations have been provided to assess soil for off-site disposal in accordance the EPA guidelines and management in accordance with the CEMP (and the unexpected finds protocol).

Conclusion

SPA believe the assessment undertaken was fit for the purpose for which it was intended.

12 Conclusions

The following conclusions and recommendations were made based on the scope/limitations of the SPA assessment data.

Conclusions

1) **Condition E117(i)** requires a Detailed Site Investigation report that conclude "*whether the land is suitable (for the intended final land use) or can be made suitable through remediation*."

   Based on the available information presented within this report, SPA conclude that the **investigation area is not likely to be suitable for all potential unrestricted final land use(s) at this time.** This conclusion is based on the following (but not limited to) reasons:

   - This initial DSI is only for the Early Works Program, in the next project stages there is likely to be a range of construction activities that will involve bulk excavation of material, removal off site of contaminated soil material (if present), reforming the land, construction of paved surfaces and basements and placement of clean spoil on the site. This work is expected to significantly reform the soil profile and therefore change potential exposure scenarios.
   - The next stages of construction activities present a risk of potential contamination (e.g. hydrocarbon/fuel spills that may increase the level of contamination within the soil).
   - There is currently no detailed design available for the final land use arrangements and there are many unknown design parameters that makes it impossible to accurately determine whether or not the site is suitable for its intended land use until Final Design is achieved by the Main Works Contractor in 2022.

   The investigation area could be made suitable through remediation/management; however, any such suitability determination is likely to require confirmation of the following (as a minimum).

   - The proposed final land use(s).
   - Clear designation of the land area requiring a suitability statement. Typically, this would either be a Title boundary or a survey area.
   - The final design/layout of the freeway (post construction). This would need to include areas proposed to be excavated/filled, final design levels and proposed finished paving materials.
   - Soil contamination data representative of the soils where such future soils will be exposed to future occupants. With respect to this point we note that many areas of the proposed WFU project will be excavated, reshaped and/or filled. With the final soil quality of these areas unknown at this time.
   - Assessment of groundwater quality and potential groundwater future extraction and use(s).
   - Assessment of soil vapour quality and the potential for soil vapour to affect any future structure built on-site (including basements).
   - Evaluation of potential off-site sources of contamination and the potential for any off-site source of contamination to affect the potential future on-site land uses
   - Where residual contamination remains on-site (post freeway construction), documentation and management of residual contamination.

2) **Condition E118** – "*Should remediation be required to make land suitable for the final intended land use, a Remediation Action Plan must be prepared or reviewed and approved…"*

Remediation is not required to make the investigation area 'suitable' for the Early Works Program, as potential interaction with soil contamination and/or asbestos was managed by the CEMP for the works.

Determination of the need for remediation (and Remediation Action Plan) to make the site(s) suitable for a future use can only be assessed once additional information is provided (i.e. the proposed land use, final development design, etc,) and further assessment is conducted (i.e. soil, groundwater conditions) over the whole WFU project area.

This conclusion also addresses **Conditions E118, E119 and E120**.

3) Although soil contamination and/or asbestos containing materials was not identified by this assessment, there is the potential for undiscovered soil contamination and/or asbestos containing materials to be present within the subsurface. Undiscovered contamination during the Stage 1A works will be managed in accordance with the Construction Environmental Management Plan (including an unexpected finds procedure).

4) Reported concentrations for all contaminant compounds in soil were below the adopted guideline values (for all individual sample results).

5) Asbestos was not identified by the laboratory in any of the samples submitted for asbestos identification and asbestos containing materials were not observed by the SPA contamination team (Jacobs) while collecting the soil samples.

6) The SMEC analysis (for TRH, BTEX, pesticides and PCBs) did not indicate contamination that would present a risk to the proposed occupation and use of the site associated with the Early Works Program and therefore further evaluation of these contaminants was considered not to be warranted.

7) As noted in Section 2.3 (vii), this assessment was not designed to provide in-situ classification of soils for off-site disposal. In the event that off-site disposal of soils is required, EPA guidelines with respect to off-site soil classification/disposal will need to be considered.

Recommendations for the Construction Environmental Management Plan (CEMP)

A CEMP has been prepared and is being implemented for the site works. The CEMP includes management protocols for soil and water and unexpected contamination finds. This CEMP has been communicated to all on-site staff during induction and tool- box meetings. Compliance with the CEMP and specialist protocols is managed through regular site environmental inspections by the Independent Environmental Representative and the SPA environmental management team. Transport for NSW have also appointed an experienced erosion and sediment control specialist to review soil and water plans and inspect the works as they progress to ensure the risk of migration of any contaminated soil off site is minimised to acceptable levels. The unexpected contamination finds protocol triggers a 'stop work' and assessment (with consultation of a suitably qualified/experience environmental professional). This assessment will evaluate the potential for contamination associated with the 'unexpected find' and the need for implementation of additional management controls to eliminated/reduce any exposure to the identified contamination/material.

These measures have been incorporated into the CEMP (including the use of PPE) to ensure that all fill/soils encountered are treated as potentially contaminated and managed accordingly. These controls should be sufficiently robust to minimise/eliminate any on-site exposure to site workers and/or offsite migration of potentially contaminated materials by various pathways including air and water. The following recommendations are made specifically for consideration within the CEMP.

a) Given the presence of fill across the investigation area, there is a potential for undiscovered soil contamination and/or asbestos containing materials to also be present within fill. The potential for

undiscovered soil contamination and/or asbestos containing materials to be present within the subsurface should be noted within the CEMP (including an unexpected finds procedure).

b) The CEMP should also ensure that any disturbance of the site surface is managed appropriately (this includes scrapping of the surface and vehicle movements). For example, minimise dust generation, surface water/sediment runoff from the site, etc.). In the event that off-site disposal of soils is required, EPA guidelines with respect to off-site soil appropriate classification/disposal will need to be considered.

Recommendations relevant to Planning Approval Conditions

c) **Approval Condition E115** - As noted in Section 1 of this report, it is recommended that further consideration be given to the definition of 'disturbance' in relation to the Early Works Program and subsequent Main Works contract.

d) **Approval Condition E117(i)** - "whether the land is suitable (for the intended final land use) or can be made suitable through remediation." As noted in Conclusion (1) of this report, any such suitability statement is likely to require additional assessment/information.

Further, it is not practical to provide a suitability statement prior to the completion of the freeway construction works as there is the potential for further excavation and removal of soil as well as re-profiling the land and the construction of permanent hard stand surfaces.

In order to make this assessment detailed final design plans are required. It is also possible that further contamination may be caused at the site during the main works construction phase (e.g fuel and oil spills) which may affect the contamination levels within the existing work areas).

e) **Approval Condition E121 and E122** – Provision of Audit Reports/Statements regarding the suitability of the site(s) for a future use.

Considering the staged and dynamic nature of planned construction activities, SPA recommends that further DSI's are undertaken for all forthcoming stages with the final assessment of suitability made at the completion the final stage of the project and when full detailed design for the Rosalind Street site is known.

Our recommendation is that compliance with this condition is applied at the completion of the construction program (i.e. post demobilisation of construction equipment/structures) to ensure that surplus land is suitable for use by future occupants.

13 Approval response

The following section must be read in context with the scope and associated limitations discussed throughout this report.

The results of the SMEC (2020) and SPA investigations in context of the risk management strategy as detailed in the EIS Appendix M (2020) and the draft conditions of approval are presented in **Table 13-1** and **Table 13-2**. Note that these responses apply only to the construction support site for the Early Works Program.

Table 13-1: Responses to risk management strategy

Risk management strategy (EIS Appendix M, 2020)	Response
Based on the information reviewed, a number of moderate to high risk potential AEIs have been identified. Where extensive investigations have not been carried out (all high to moderate risk sites with the exception of the Rozelle Rail Yards site), potentially contaminated areas directly affected by the project will be investigated and managed in accordance with the requirements of guidance endorsed under section 105 of the Contaminated Land Management Act 1997.	Refer to Section 2 of this report, we recommend consideration be given to the definition of 'risk' used by the EIS (and how sites were classified), and how this differs from the interpretation of 'risk' implied by the approval conditions. Consequently, the potential for additional site data to support a 'lower risk rating' should also be considered. This assessment was limited to the proposed temporary construction support areas (associated with the Early Works program) within the larger WFU project area (subject to the Major Works program). Hence, was not inclusive of the larger alignment beyond the specific 'sub areas' nominated within this report. This assessment was designed to assess soil contamination within the Early Works Program areas (for contaminants identified by the EIS) so that appropriate soil management measures could be adopted during the Early Works Program (also refer to Section 2 for background, assumptions, and limitations). Contamination was not identified at concentrations above the adopted HIL/HSL for a commercial / industrial use of the site. Asbestos was not identified in any sample submitted for laboratory identification. SPA did not observe potential asbestos containing materials in the vicinity of the investigation locations or within materials excavated as part of the investigation. Given the presence of fill at all sample location, there is a potential for undiscovered soil contamination and/or asbestos containing materials to also be present within fill. This contamination could be encountered during activities associated with eh Early Works Program. Hence, SPA adopted a conservative position and recommended the potential for undiscovered soil contamination and/or asbestos containing materials to be present within the subsurface be noted within the CEMP (including an unexpected finds procedure).

Table 13-2: Responses to condition of approvals

Number	Condition of approval	Response
E115	Prior to the commencement of any work that would result in the disturbance of moderate to high risk contaminated sites as identified in the documented listed in Condition A1, a Detailed Site Investigations must be undertaken by a Contaminated Land Consultant certified under either the Environment Institute of Australia or New Zealand's "Certified Environmental Practitioner" (Site Contamination) scheme (CEnvP(SC)) or the Soil Science Australia "Certified Professional Soil Scientist Contaminated Site Assessment and Management (CPSS CSAM) scheme	The EIS identified the site as a high potential AEI. The assessment work subject to this report was conducted in April 2021, prior to occupation of the site for the Early Works Program. This DSI was undertaken under the guidance of a Contaminated Land Consultant certified under either the Environment Institute of Australia or New Zealand's "Certified Environmental Practitioner" (Site Contamination) scheme (CEnvP(SC)) or the Soil Science Australia "Certified Professional Soil Scientist Contaminated Site Assessment and Management (CPSS CSAM) scheme (https://www.cenvp.org/directory/#1590450995617-ef660b1f-bb8e). Also refer to Section 1 to 4 of this report for description of the scope of work and limitations associated with this report.
E116	A Detailed Site Investigation Report must be prepared and submitted to the Planning Secretary for information following the completion of Detailed Site Investigations required by Condition E115. The report must be prepared in accordance with relevant guidelines made or approved by the EPA under section 105 of the *Contaminated Land Management Act 1997* (NSW) and prepared by a Contaminated Land Consultant certified under either the Environment Institute of Australia or New Zealand's "Certified Environmental Practitioner" (Site Contamination) scheme (CEnvP(SC)) or the Soil Science Australia "Certified Professional Soil Scientist Contaminated Site Assessment and Management (CPSS CSAM) scheme. Nothing in this condition prevents the Proponent from preparing individual Site Contamination Reports for separate sites	The investigations (by SMEC and SPA) undertaken at the site have been undertaken in general accordance with guidelines endorsed under Section 105 of the Contaminated Land Management Act 1997 and other relevant guidelines and provided to DPIE. This assessment report was prepared by a Contaminated Land Consultant certified under either the Environment Institute of Australia or New Zealand's "Certified Environmental Practitioner" (Site Contamination) scheme (CEnvP(SC)) or the Soil Science Australia "Certified Professional Soil Scientist Contaminated Site Assessment and Management (CPSS CSAM) scheme (https://www.cenvp.org/directory/#1590450995617-ef660b1f-bb8e).
E117	The Detailed Site Investigation Report must provide details on:	
	(a) primary sources of contamination, for example potentially contaminating activities, infrastructure (such as underground storage tanks, fuel line, sumps or sewer lines) or site practices;	Refer to Section 7.2 of this report.
	(b) contaminant dispersal in air, hazardous ground gases, surface water, groundwater, soil vapour, separate phase	Refer to Section 7.3 of this report.

Number	Condition of approval	Response
	contaminants, sediments, infrastructure (e.g. concrete), biota, soil and dust;	
	(c) contaminant characterisation and behaviour (volatility, leachability, speciation, degradation products and physical and chemical conditions on-site which may affect how contaminants behave);	Refer to Section 7.3 of this report.
	(d) potential effects of contaminants on human health, including the health of occupants of built structures (for example arising from risks to service lines from hydrocarbons in groundwater, or risks to concrete from acid sulphate soils) and the environment;	Refer to Section 11.6 of this report.
	(e) potential and actual contaminant migration routes including potential preferential pathways;	Refer to Section 11.4 of this report.
	(f) the adequacy and completeness of all information available for use in the assessment of risk and for making decisions on management requirements, including an assessment of uncertainty;	Refer to Section 11.7 of this report.
	(g) the review and update of the conceptual site model from the preliminary and detailed site investigations;	Refer to Sections 7.2, 7.3, 7.12 and 11.4 of this report.
	(h) nature and extent of any existing remediation (such as impervious surface cappings);	No existing remediation infrastructure was observed or documented at the site.
	(i) whether the land is suitable (for the intended final land use) or can be made suitable through remediation.	Refer to Conclusion (1) of this report. "*SPA conclude that the investigation areas are not likely to be suitable for all potential unrestricted final land use(s) at this time.*" *The investigation areas could be made suitable through remediation/management; however, any such suitability determination is likely to require confirmation of the following (as a minimum).* ▪ *The proposed final land use(s).* ▪ *Clear designation of the land area requiring a suitability statement. Typically, this would either be a Title boundary or a survey area.* ▪ *The final design/layout of the freeway (post construction). This would need to include areas proposed to be*

Number	Condition of approval	Response
		excavated/filled, final design levels and proposed finished paving materials. ▪ *Soil contamination data representative of the soils where such future soils will be exposed to future occupants. With respect to this point we note that many areas of the proposed alignment will be excavated, reshaped and/or filled. With the final soil quality of these areas unknown at this time.* ▪ *Assessment of groundwater quality and potential groundwater future extraction and use(s).* ▪ *Assessment of soil vapour quality and the potential for soil vapour to affect any future structure built on-site (including basements).* ▪ *Evaluation of potential off-site sources of contamination and the potential for any off-site source of contamination to affect the potential future on-site land uses* ▪ *Where residual contamination remains on-site (post freeway construction), documentation and management of residual contamination.*
E118	Should remediation be required to make land suitable for the final intended land use, a Remediation Action Plan must be prepared or reviewed and approved, by consultants certified under either the Environment Institute of Australia and New Zealand's Certified Environmental Practitioner (Site Contamination) scheme (CEnvP(SC)) or the Soil Science Australia Certified Professional Soil Scientist Contaminated Site Assessment and Management (CPSS CSAM) scheme. The Remedial Action Plan must be prepared in accordance with relevant guidelines made or approved by the EPA under section 105 of the Contaminated Land Management Act 1997 and must include measures to remediate the contamination at the site to ensure the site will be suitable for the proposed use when the Remedial Action Plan is implemented. The Remedial Action Plan must be submitted to the Planning Secretary for information prior to undertaking remediation.	Refer to Conclusion (2) of this report. Remediation is not required to make the investigation area 'suitable' for the Early Works program, as potential interaction with soil contamination and/or asbestos was managed by the CEMP for the works. Determination of the need for remediation (and Remediation Action Plan) can only be assessed once additional information is provided (i.e. the proposed land use, final development design, etc,) and further assessment is conducted (i.e. soil, groundwater conditions) over the whole WFU project area.
E119	The Remediation Action Plan must include measures to remediate the contamination at the site to ensure the site will be suitable for the proposed use and detail how the	Refer to Conclusion (2) of this report. Remediation is not required to make the investigation area 'suitable' for the Early Works program, as potential interaction with

Number	Condition of approval	Response
	environmental and human health risks will be managed during the disturbance, remediation and/or removal of contaminated soil/sediment or groundwater. Nothing in this condition prevents the preparation of individual Remediation Action Plans for separate sites.	soil contamination and/or asbestos was managed by the CEMP for the works. Determination of the need for remediation (and Remediation Action Plan) can only be assessed once additional information is provided (i.e. the proposed land use, final development design, etc,) and further assessment is conducted (i.e. soil, groundwater conditions) over the whole WFU project area.
E120	Prior to commencing remediation, a Section B Site Audit Statement(s) must be prepared by a NSW EPA-accredited Site Auditor that certifies that the Remediation Action Plan is appropriate and that the site can be made suitable for the proposed use. The Remedial Action Plan must be implemented and any changes to the Remedial Action Plan must be approved in writing by the NSW EPA accredited Site Auditor. Nothing in this condition prevents the Proponent from engaging the Site Auditor to prepare Site Audit Statements for separate sites.	Refer to Conclusion (2) of this report. Not applicable to the Early Works program However, further evaluation of the need for a Site Audit Statement with respect to site suitable for a future land use (post construction) will be determined following clarification of Condition E117(i).
E121	A Section A1 or A2 Site Audit Statement (accompanied by an Environmental Management Plan) and its accompanying Site Audit Report, which state that the contaminated land disturbed by the work has been made suitable for the intended land use, must be submitted to the Planning Secretary and Council after remediation and no later than prior to the commencement of operation of the CSSI. Nothing in this condition prevents the Proponent from obtaining Section A Site Audit Statements for individual parcels of remediated land.	Refer to Recommendation (e) of this report.
E122	Contaminated land must not be used for the purpose approved under the terms of this approval until a Section A1 or A2 Site Audit Statement is obtained which states that the land is suitable for that purpose and any conditions on the Section A Site Audit Statement have been complied with.	Refer to Recommendation (e) of this report.
E123	An Unexpected Finds Procedure for Contamination must be prepared before the commencement of work and must be followed	An Unexpected Finds Procedure for contamination (is included in the Construction Environmental Management Plan)

Number	Condition of approval	Response
	should unexpected contamination or asbestos (or suspected contamination) be excavated or otherwise discovered. The procedure must include details of who will be responsible for implementing the unexpected finds procedure and the roles and responsibilities of all parties involved. The procedure must be submitted to the Planning Secretary for information.	
E124	The Unexpected Finds Procedure for Contamination must be implemented throughout construction.	An Unexpected Finds Procedure for contamination (is included in the Construction Environmental Management Plan)

Appendix A – Tables

Table A: RPD Results

Compounds	Units	Sample ID	BH04-B	QAQC1	RPD (%)	BH04-B	QAQC2	RPD (%)
		Depth (m)	0.25	-		0.25	-	
		Date	28/04/2021	28/04/2021		28/04/2021	28/04/2021	
		LOR						
Benzo(a)pyrene TEQ calc (zero)	mg/kg	0.5	0.6	2.7	127	0.6	1.4	80
Benzo(a)pyrene TEQ calc(half)	mg/kg	0.5	0.7	2.7	118	0.7	1.7	83
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	0.5	0.7	2.7	118	0.7	2.0	96
Benzo[b+j]fluoranthene	mg/kg	0.1	-	-	-	-	0.9	-
Acenaphthene	mg/kg	0.1	<0.1	<0.1	-	<0.1	<0.5	-
Acenaphthylene	mg/kg	0.1	0.1	0.6	143	0.1	<0.5	-
Anthracene	mg/kg	0.1	0.1	1.1	167	0.1	<0.5	-
Benz(a)anthracene	mg/kg	0.05	0.5	2.6	**135**	0.5	1.1	75
Benzo(a) pyrene	mg/kg	0.2	0.5	1.8	113	0.5	1.1	75
Benzo(b+j) & Benzo(k)fluoranthene	mg/kg	0.1	0.8	2.8	**111**	0.8	-	-
Benzo(g,h,i)perylene	mg/kg	0.1	0.3	0.9	**100**	0.3	0.6	67
Benzo(k)fluoranthene	mg/kg	0.1	-	-	-	-	<1	-
Chrysene	mg/kg	0.1	0.4	1.8	**127**	0.4	0.8	67
Dibenz(a,h)anthracene	mg/kg	0.1	<0.1	0.2	67	<0.1	<0.5	-
Fluoranthene	mg/kg	0.1	0.9	5.1	**140**	0.9	2.0	76
Fluorene	mg/kg	0.1	<0.1	0.4	120	<0.1	<0.5	-
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	0.2	0.8	**120**	0.2	0.7	111
Naphthalene	mg/kg	0.1	<0.1	<0.1	-	<0.1	<0.5	-
Phenanthrene	mg/kg	0.05	0.3	4.1	**173**	0.3	1.0	**108**
Pyrene	mg/kg	4	0.9	4.4	132	0.9	1.9	71
PAHs (Sum of total)	mg/kg	0.4	-	-	-	-	10.1	-
Total +ve PAHs	mg/kg	1	5.0	27	**138**	5.0	-	-
Arsenic	mg/kg	1	<4	<4	-	<4	3.9	-
Cadmium	mg/kg	1	<0.4	<0.4	-	<0.4	<0.4	-
Chromium (III+VI)	mg/kg	0.1	11	11	-	11	8.0	32
Copper	mg/kg	1	6	8	29	6	6.0	-
Lead	mg/kg	1	37	54	**37**	37	21	**55**
Mercury	mg/kg	0.1	<0.1	<0.1	-	<0.1	<0.1	-
Nickel	mg/kg	1.0	4	4	-	4	<5	-
Zinc	mg/kg	1.0	27	33	20	27	45	50
Moisture Content	%	0.1	4.4	4.1	7	4.4	-	-
Moisture Content (dried @ 103°C)	%	1	-	-	-	-	3.8	-

Table B: Analytical Results

				SPA 2021											SMEC 2020	
			Sample ID	BH01_A	BH01_D	BH02_B	BH02_C	BH03_A	BH03_D	BH04_B	BH04_D	BH05_A	BH05_C	QAQC1	WFU_BH102	WFU_BH102
			Depth (m)	0	0.8	0.25	0.5	0	1	0.25	0.9	0	0.5	-	0.0 - 0.1	1.0 - 1.1
			Date	28/04/2021	28/04/2021	28/04/2021	28/04/2021	28/04/2021	28/04/2021	28/04/2021	28/04/2021	28/04/2021	28/04/2021	28/04/2021	16/07/2020	16/07/2021
Compounds	Commercial/Industrial	Units	LOR													
Polycyclic Aromatic Hydrocarbons																
Naphthalene	NL	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5
Acenaphthylene		mg/kg	0.1	<0.1	<0.1	0.4	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	0.6	<0.5	<0.5
Acenaphthene		mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5
Fluorene		mg/kg	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.4	<0.5	<0.5
Phenanthrene		mg/kg	0.1	0.3	<0.1	2.2	0.2	<0.1	<0.1	0.3	<0.1	<0.1	<0.1	4.1	<0.5	<0.5
Anthracene		mg/kg	0.1	<0.1	<0.1	0.6	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	1.1	<0.5	<0.5
Fluoranthene		mg/kg	0.1	0.9	0.2	5.4	0.3	<0.1	<0.1	0.9	<0.1	0.2	<0.1	5.1	<0.5	<0.5
Pyrene		mg/kg	0.1	0.9	0.2	5.3	0.3	<0.1	<0.1	0.9	<0.1	0.2	<0.1	4.4	<0.5	<0.5
Benzo(a)anthracene		mg/kg	0.1	0.5	<0.1	3.2	0.2	<0.1	<0.1	0.5	<0.1	<0.1	<0.1	2.6	<0.5	<0.5
Chrysene		mg/kg	0.1	0.4	<0.1	2.4	0.2	<0.1	<0.1	0.4	<0.1	<0.1	<0.1	1.8	<0.5	<0.5
Benzo(b,j+k)fluoranthene		mg/kg	0.2	0.9	<0.2	4.6	0.3	<0.2	<0.2	0.8	<0.2	<0.2	<0.2	2.8	<0.5	<0.5
Benzo(a)pyrene		mg/kg	0.05	0.58	0.1	3.2	0.2	<0.05	<0.05	0.5	<0.05	0.08	<0.05	1.8	<0.5	<0.5
Indeno(1,2,3-c,d)pyrene		mg/kg	0.1	0.3	<0.1	1.6	<0.1	<0.1	<0.1	0.2	<0.1	<0.1	<0.1	0.8	<0.5	<0.5
Dibenzo(a,h)anthracene		mg/kg	0.1	<0.1	<0.1	0.4	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.5	<0.5
Benzo(g,h,i)perylene		mg/kg	0.1	0.4	<0.1	2	0.1	<0.1	<0.1	0.3	<0.1	<0.1	<0.1	0.9	<0.5	<0.5
Total +vePAH's	4,000	mg/kg	0.05	5.2	0.4	31	1.7	<0.05	<0.05	5	<0.05	0.4	<0.05	27	<0.5	<0.5
Benzo(a)pyrene TEQ calc (zero)	40	mg/kg	0.5	0.8	<0.5	4.6	<0.5	<0.5	<0.5	0.6	<0.5	<0.5	<0.5	2.7	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	40	mg/kg	0.5	0.8	<0.5	4.6	<0.5	<0.5	<0.5	0.7	<0.5	<0.5	<0.5	2.7	0.6	0.6
Benzo(a)pyrene TEQ calc(PQL)	40	mg/kg	0.5	0.9	<0.5	4.6	<0.5	<0.5	<0.5	0.7	<0.5	<0.5	<0.5	2.7	1.2	1.2
Heavy Metals																
Arsenic	3,000	mg/kg	4	4	6	6	7	4	5	<4	<4	<4	<4	<4	<5	8
Cadmium	900	mg/kg	0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<1	<1
Chromium	3,600	mg/kg	1	11	38	13	24	13	36	11	36	12	70	11	11	32
Copper	240,000	mg/kg	1	23	2	22	2	18	1	6	1	17	3	8	15	<5
Lead	1,500	mg/kg	1	79	19	82	17	51	13	37	9	81	10	54	85	25
Mercury	730	mg/kg	0.1	0.1	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	<0.1	<0.1
Nickel	6,000	mg/kg	1	8	10	7	3	12	6	4	15	10	31	4	10	4
Zinc	400,000	mg/kg	1	82	4	62	10	62	3	27	7	60	7	33	55	40
Inorganics																
Moisture Content		%	0.1	18	7.3	8.7	7.3	20	11	4.4	6.4	10	4.8	4.1	15.9	5.3
Asbestos																
Sample mass tested		g		Approx. 25g	-	Approx. 45g	-	Approx. 40g	-	Approx. 50g	-	Approx. 45g	-	-		
Sample Description		-		Brown fine-grained soil & rocks	-	Brown fine-grained soil & rocks	-	Brown fine-grained soil & rocks	-	Brown fine-grained soil & rocks	-	Brown fine-grained soil & rocks	-	-		
Asbestos ID in soil	ND	-		No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	-	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	-	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	-	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	-	No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected	-	-	ND	ND
Trace Analysis	ND	-		No asbestos detected	-	No asbestos detected	-	No asbestos detected	-	No asbestos detected	-	No asbestos detected	-	-	ND	ND
Benzene Toluene Ethylbenezene Xylenes																
Benzene	3			-	-	-	-	-	-	-	-	-	-	-	<0.2	<0.2
Toluene	99,000			-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5
Xylene (m & p)				-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5
Xylene (o)				-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5
Xylene (total)	81,000			-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5
Ethylbenzene	27,000			-	-	-	-	-	-	-	-	-	-	-	<0.5	<0.5
Total BTEX				-	-	-	-	-	-	-	-	-	-	-	<0.2	<0.2
Total Recoverable Hydrocarbons																
C6-C10	26,000			-	-	-	-	-	-	-	-	-	-	-	16	<10
C6-C10 (F1 minus BTEX)	260			-	-	-	-	-	-	-	-	-	-	-	16	<10
C10-C16	20,000			-	-	-	-	-	-	-	-	-	-	-	<50	<50
C10-C16 (F2 minus Naphthalene)	NL			-	-	-	-	-	-	-	-	-	-	-	<50	<50
C16-C34	27,000			-	-	-	-	-	-	-	-	-	-	-	190	<100
C34-C40	38,000			-	-	-	-	-	-	-	-	-	-	-	<100	<100
C10-C40 (Sum of total)				-	-	-	-	-	-	-	-	-	-	-	190	<50
C10-C14				-	-	-	-	-	-	-	-	-	-	-	<50	<50
C15-C28				-	-	-	-	-	-	-	-	-	-	-	160	<100
C6-C9				-	-	-	-	-	-	-	-	-	-	-	<10	<10
C29-C36				-	-	-	-	-	-	-	-	-	-	-	<100	<100
C10-C36 (Sum of total)				-	-	-	-	-	-	-	-	-	-	-	160	<50
Halogenated Benzenes																
Hexachlorobenzene				-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05
Organochlorine Pesticides																
4,4-DDE				-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05
a-BHC				-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05
Aldrin				-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05
Aldrin + Dieldrin	45			-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05
b-BHC				-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05
Chlordane	530			-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05
Chlordane (cis)				-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05
Chlordane (trans)				-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05
d-BHC				-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05
DDD				-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05
DDT				-	-	-	-	-	-	-	-	-	-	-	<0.2	<0.2
DDT+DDE+DDD	3,600			-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05
Dieldrin				-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05
Endosulfan	2,000			-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05
Endosulfan I				-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05
Endosulfan II				-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05
Endosulfan sulphate				-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05
Endrin	100			-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05
Endrin aldehyde				-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05
Endrin ketone				-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05
g-BHC (Lindane)				-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05
Heptachlor	50			-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05
Heptachlor epoxide				-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05
Methoxychlor	2,500			-	-	-	-	-	-	-	-	-	-	-	<0.2	<0.2
Organophosphorus Resticides																
Azinophos methyl				-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05
Bromophos-ethyl				-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05
Carbophenothion				-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05
Chlorfenvinphos				-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05
Chlorpyrifos				-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05
Chlorpyrifos-methyl				-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05
Diazinon				-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05
Dichlorvos				-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05
Dimethoate				-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05
Ethion				-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05
Fenthion				-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05
Malathion				-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05
Methyl parathion				-	-	-	-	-	-	-	-	-	-	-	<0.2	<0.2
Monocrotophos				-	-	-	-	-	-	-	-	-	-	-	<0.2	<0.2
Prothiofos				-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05
Polychlorinated Biphenyls																
PCBs	7			-	-	-	-	-	-	-	-	-	-	-	<0.1	<0.1
Pesticides																
Demeton-S-methyl				-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05
Fenamiphos				-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05
Parathion				-	-	-	-	-	-	-	-	-	-	-	<0.2	<0.2
Pirimphos-ethyl				-	-	-	-	-	-	-	-	-	-	-	<0.05	<0.05

Notes

Bold	Exceeds human health investigation levels for commercial/industrial land use

Appendix B – Laboratory certificates

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 267823

Client Details

Client	Jacobs Group (Australia) Pty Ltd
Attention	[redacted]
Address	Level 7, 177 Pacific Highway, North Sydney, NSW, 2060

Sample Details

Your Reference	**IA216715**
Number of Samples	20 Soils
Date samples received	28/04/2021
Date completed instructions received	28/04/2021

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	29/04/2021
Date of Issue	29/04/2021

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Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Asbestos Approved By
Analysed by Asbestos Approved Identifier: [redacted]
Authorised by Asbestos Approved Signatory: [redacted]

Results Approved By
[redacted] Senior Chemist
Senior Chemist
os Supervisor
ge, Chemist

Authorised By
[redacted]
[redacted] Laboratory Manager

PAHs in Soil						
Our Reference		267823-1	267823-4	267823-6	267823-7	267823-8
Your Reference	UNITS	BH01_A	BH01_D	BH02_B	BH02_C	QAQC1
Depth		0.0	0.8	0.25	0.5	-
Date Sampled		28/04/2021	28/04/2021	28/04/2021	28/04/2021	28/04/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	28/04/2021	28/04/2021	28/04/2021	28/04/2021	28/04/2021
Date analysed	-	28/04/2021	28/04/2021	28/04/2021	28/04/2021	28/04/2021
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	0.4	<0.1	0.6
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	0.4
Phenanthrene	mg/kg	0.3	<0.1	2.2	0.2	4.1
Anthracene	mg/kg	<0.1	<0.1	0.6	<0.1	1.1
Fluoranthene	mg/kg	0.9	0.2	5.4	0.3	5.1
Pyrene	mg/kg	0.9	0.2	5.3	0.3	4.4
Benzo(a)anthracene	mg/kg	0.5	<0.1	3.2	0.2	2.6
Chrysene	mg/kg	0.4	<0.1	2.4	0.2	1.8
Benzo(b,j+k)fluoranthene	mg/kg	0.9	<0.2	4.6	0.3	2.8
Benzo(a)pyrene	mg/kg	0.58	0.1	3.2	0.2	1.8
Indeno(1,2,3-c,d)pyrene	mg/kg	0.3	<0.1	1.6	<0.1	0.8
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	0.4	<0.1	0.2
Benzo(g,h,i)perylene	mg/kg	0.4	<0.1	2.0	0.1	0.9
Total +ve PAH's	mg/kg	5.2	0.4	31	1.7	27
Benzo(a)pyrene TEQ calc (zero)	mg/kg	0.8	<0.5	4.6	<0.5	2.7
Benzo(a)pyrene TEQ calc(half)	mg/kg	0.8	<0.5	4.6	<0.5	2.7
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	0.9	<0.5	4.6	<0.5	2.7
Surrogate p-Terphenyl-d14	%	117	116	116	121	115

PAHs in Soil						
Our Reference		267823-10	267823-13	267823-15	267823-17	267823-18
Your Reference	UNITS	BH03_A	BH03_D	BH04_B	BH04_D	BH05_A
Depth		0.0	1.0	0.25	0.9	0.0
Date Sampled		28/04/2021	28/04/2021	28/04/2021	28/04/2021	28/04/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	28/04/2021	28/04/2021	28/04/2021	28/04/2021	28/04/2021
Date analysed	-	28/04/2021	28/04/2021	28/04/2021	28/04/2021	28/04/2021
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	0.3	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	0.9	<0.1	0.2
Pyrene	mg/kg	<0.1	<0.1	0.9	<0.1	0.2
Benzo(a)anthracene	mg/kg	<0.1	<0.1	0.5	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1	0.4	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	0.8	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	<0.05	0.5	<0.05	0.08
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	0.2	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	0.3	<0.1	<0.1
Total +ve PAH's	mg/kg	<0.05	<0.05	5.0	<0.05	0.4
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	0.6	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	0.7	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	0.7	<0.5	<0.5
Surrogate p-Terphenyl-d14	%	119	114	117	123	117

PAHs in Soil		
Our Reference		267823-20
Your Reference	UNITS	BH05_C
Depth		0.5
Date Sampled		28/04/2021
Type of sample		Soil
Date extracted	-	28/04/2021
Date analysed	-	28/04/2021
Naphthalene	mg/kg	<0.1
Acenaphthylene	mg/kg	<0.1
Acenaphthene	mg/kg	<0.1
Fluorene	mg/kg	<0.1
Phenanthrene	mg/kg	<0.1
Anthracene	mg/kg	<0.1
Fluoranthene	mg/kg	<0.1
Pyrene	mg/kg	<0.1
Benzo(a)anthracene	mg/kg	<0.1
Chrysene	mg/kg	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2
Benzo(a)pyrene	mg/kg	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1
Total +ve PAH's	mg/kg	<0.05
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5
Surrogate p-Terphenyl-d14	%	118

Acid Extractable metals in soil						
Our Reference		267823-1	267823-4	267823-6	267823-7	267823-8
Your Reference	UNITS	BH01_A	BH01_D	BH02_B	BH02_C	QAQC1
Depth		0.0	0.8	0.25	0.5	-
Date Sampled		28/04/2021	28/04/2021	28/04/2021	28/04/2021	28/04/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	29/04/2021	29/04/2021	29/04/2021	29/04/2021	29/04/2021
Date analysed	-	29/04/2021	29/04/2021	29/04/2021	29/04/2021	29/04/2021
Arsenic	mg/kg	4	6	6	7	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	11	38	13	24	11
Copper	mg/kg	23	2	22	2	8
Lead	mg/kg	79	19	82	17	54
Mercury	mg/kg	0.1	<0.1	0.2	<0.1	<0.1
Nickel	mg/kg	8	10	7	3	4
Zinc	mg/kg	82	4	62	10	33

Acid Extractable metals in soil						
Our Reference		267823-10	267823-13	267823-15	267823-17	267823-18
Your Reference	UNITS	BH03_A	BH03_D	BH04_B	BH04_D	BH05_A
Depth		0.0	1.0	0.25	0.9	0.0
Date Sampled		28/04/2021	28/04/2021	28/04/2021	28/04/2021	28/04/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	29/04/2021	29/04/2021	29/04/2021	29/04/2021	29/04/2021
Date analysed	-	29/04/2021	29/04/2021	29/04/2021	29/04/2021	29/04/2021
Arsenic	mg/kg	4	5	<4	<4	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	13	36	11	36	12
Copper	mg/kg	18	1	6	1	17
Lead	mg/kg	51	13	37	9	81
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	0.1
Nickel	mg/kg	12	6	4	15	10
Zinc	mg/kg	62	3	27	7	60

Acid Extractable metals in soil		
Our Reference		267823-20
Your Reference	UNITS	BH05_C
Depth		0.5
Date Sampled		28/04/2021
Type of sample		Soil
Date prepared	-	29/04/2021
Date analysed	-	29/04/2021
Arsenic	mg/kg	<4
Cadmium	mg/kg	<0.4
Chromium	mg/kg	70
Copper	mg/kg	3
Lead	mg/kg	10
Mercury	mg/kg	<0.1
Nickel	mg/kg	31
Zinc	mg/kg	7

Moisture						
Our Reference		267823-1	267823-4	267823-6	267823-7	267823-8
Your Reference	UNITS	BH01_A	BH01_D	BH02_B	BH02_C	QAQC1
Depth		0.0	0.8	0.25	0.5	-
Date Sampled		28/04/2021	28/04/2021	28/04/2021	28/04/2021	28/04/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	26/04/2021	26/04/2021	28/07/2021	28/07/2021	28/07/2021
Date analysed	-	27/04/2021	27/04/2021	29/04/2021	29/04/2021	29/04/2021
Moisture	%	18	7.3	8.7	7.3	4.1

Moisture						
Our Reference		267823-10	267823-13	267823-15	267823-17	267823-18
Your Reference	UNITS	BH03_A	BH03_D	BH04_B	BH04_D	BH05_A
Depth		0.0	1.0	0.25	0.9	0.0
Date Sampled		28/04/2021	28/04/2021	28/04/2021	28/04/2021	28/04/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	28/07/2021	28/07/2021	28/07/2021	28/07/2021	28/07/2021
Date analysed	-	29/04/2021	29/04/2021	29/04/2021	29/04/2021	29/04/2021
Moisture	%	20	11	4.4	6.4	10

Moisture		
Our Reference		267823-20
Your Reference	UNITS	BH05_C
Depth		0.5
Date Sampled		28/04/2021
Type of sample		Soil
Date prepared	-	28/07/2021
Date analysed	-	29/04/2021
Moisture	%	4.8

Asbestos ID - soils						
Our Reference		267823-1	267823-6	267823-10	267823-15	267823-18
Your Reference	UNITS	BH01_A	BH02_B	BH03_A	BH04_B	BH05_A
Depth		0.0	0.25	0.0	0.25	0.0
Date Sampled		28/04/2021	28/04/2021	28/04/2021	28/04/2021	28/04/2021
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	29/04/2021	29/04/2021	29/04/2021	29/04/2021	29/04/2021
Sample mass tested	g	Approx. 25g	Approx. 45g	Approx. 40g	Approx. 50g	Approx. 45g
Sample Description	-	Brown fine-grained soil & rocks	Brown fine-grained soil & rocks	Brown fine-grained soil & rocks	Brown fine-grained soil & rocks	Brown fine-grained soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected

Method ID	Methodology Summary
ASB-001	Asbestos ID - Qualitative identification of asbestos in bulk samples using Polarised Light Microscopy and Dispersion Staining Techniques including Synthetic Mineral Fibre and Organic Fibre as per Australian Standard 4964-2004.
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
Metals-020	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Org-022/025	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS and/or GC-MS/MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013. For soil results:- 1. 'EQ PQL'values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. 'EQ zero'values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. 'EQ half PQL'values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore "Total +ve PAHs" is simply a sum of the positive individual PAHs.

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-8	267823-4
Date extracted	-			28/04/2021	1	28/04/2021	28/04/2021		28/04/2021	28/04/2021
Date analysed	-			28/04/2021	1	28/04/2021	28/04/2021		28/04/2021	28/04/2021
Naphthalene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	108	108
Acenaphthylene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	79	79
Fluorene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	84	84
Phenanthrene	mg/kg	0.1	Org-022/025	<0.1	1	0.3	0.3	0	99	101
Anthracene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022/025	<0.1	1	0.9	0.8	12	91	90
Pyrene	mg/kg	0.1	Org-022/025	<0.1	1	0.9	0.9	0	93	91
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	<0.1	1	0.5	0.6	18	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	<0.1	1	0.4	0.5	22	67	62
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-022/025	<0.2	1	0.9	0.9	0	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	<0.05	1	0.58	0.56	4	88	87
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	<0.1	1	0.3	0.3	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-022/025	<0.1	1	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-022/025	<0.1	1	0.4	0.4	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	124	1	117	113	3	128	116

QUALITY CONTROL: PAHs in Soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date extracted	-			[NT]	20	28/04/2021	28/04/2021		[NT]	[NT]
Date analysed	-			[NT]	20	28/04/2021	28/04/2021		[NT]	[NT]
Naphthalene	mg/kg	0.1	Org-022/025	[NT]	20	<0.1	<0.1	0	[NT]	[NT]
Acenaphthylene	mg/kg	0.1	Org-022/025	[NT]	20	<0.1	<0.1	0	[NT]	[NT]
Acenaphthene	mg/kg	0.1	Org-022/025	[NT]	20	<0.1	<0.1	0	[NT]	[NT]
Fluorene	mg/kg	0.1	Org-022/025	[NT]	20	<0.1	<0.1	0	[NT]	[NT]
Phenanthrene	mg/kg	0.1	Org-022/025	[NT]	20	<0.1	<0.1	0	[NT]	[NT]
Anthracene	mg/kg	0.1	Org-022/025	[NT]	20	<0.1	<0.1	0	[NT]	[NT]
Fluoranthene	mg/kg	0.1	Org-022/025	[NT]	20	<0.1	<0.1	0	[NT]	[NT]
Pyrene	mg/kg	0.1	Org-022/025	[NT]	20	<0.1	<0.1	0	[NT]	[NT]
Benzo(a)anthracene	mg/kg	0.1	Org-022/025	[NT]	20	<0.1	<0.1	0	[NT]	[NT]
Chrysene	mg/kg	0.1	Org-022/025	[NT]	20	<0.1	<0.1	0	[NT]	[NT]
Benzo(b,j+k)fluoranthene	mg/kg	0.2	Org-022/025	[NT]	20	<0.2	<0.2	0	[NT]	[NT]
Benzo(a)pyrene	mg/kg	0.05	Org-022/025	[NT]	20	<0.05	<0.05	0	[NT]	[NT]
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-022/025	[NT]	20	<0.1	<0.1	0	[NT]	[NT]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-022/025	[NT]	20	<0.1	<0.1	0	[NT]	[NT]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-022/025	[NT]	20	<0.1	<0.1	0	[NT]	[NT]
Surrogate p-Terphenyl-d14	%		Org-022/025	[NT]	20	118	119	1	[NT]	[NT]

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	267823-4
Date prepared	-			29/04/2021	1	29/04/2021	29/04/2021		29/04/2021	29/04/2021
Date analysed	-			29/04/2021	1	29/04/2021	29/04/2021		29/04/2021	29/04/2021
Arsenic	mg/kg	4	Metals-020	<4	1	4	<4	0	105	82
Cadmium	mg/kg	0.4	Metals-020	<0.4	1	<0.4	<0.4	0	96	74
Chromium	mg/kg	1	Metals-020	<1	1	11	11	0	98	70
Copper	mg/kg	1	Metals-020	<1	1	23	22	4	99	88
Lead	mg/kg	1	Metals-020	<1	1	79	81	2	96	74
Mercury	mg/kg	0.1	Metals-021	<0.1	1	0.1	0.1	0	107	117
Nickel	mg/kg	1	Metals-020	<1	1	8	9	12	98	78
Zinc	mg/kg	1	Metals-020	<1	1	82	84	2	96	75

QUALITY CONTROL: Acid Extractable metals in soil						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Date prepared	-			[NT]	20	29/04/2021	29/04/2021		[NT]	[NT]
Date analysed	-			[NT]	20	29/04/2021	29/04/2021		[NT]	[NT]
Arsenic	mg/kg	4	Metals-020	[NT]	20	<4	<4	0	[NT]	[NT]
Cadmium	mg/kg	0.4	Metals-020	[NT]	20	<0.4	<0.4	0	[NT]	[NT]
Chromium	mg/kg	1	Metals-020	[NT]	20	70	70	0	[NT]	[NT]
Copper	mg/kg	1	Metals-020	[NT]	20	3	3	0	[NT]	[NT]
Lead	mg/kg	1	Metals-020	[NT]	20	10	10	0	[NT]	[NT]
Mercury	mg/kg	0.1	Metals-021	[NT]	20	<0.1	<0.1	0	[NT]	[NT]
Nickel	mg/kg	1	Metals-020	[NT]	20	31	31	0	[NT]	[NT]
Zinc	mg/kg	1	Metals-020	[NT]	20	7	7	0	[NT]	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

Asbestos: A portion of the supplied sample was sub-sampled for asbestos analysis according to Envirolab procedures.
We cannot guarantee that this sub-sample is indicative of the entire sample. Envirolab recommends supplying 40-50g of sample in its own container.
Note: Samples were sub-sampled from jars provided by the client.

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

SAMPLE RECEIPT ADVICE

Client Details

Client	Jacobs Group (Australia) Pty Ltd
Attention	[redacted]

Sample Login Details

Your reference	IA216715
Envirolab Reference	267823
Date Sample Received	28/04/2021
Date Instructions Received	28/04/2021
Date Results Expected to be Reported	29/04/2021

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	31 Soil
Turnaround Time Requested	1 day
Temperature on Receipt (°C)	8
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

[redacted]	[redacted]
Phone: 02 9910 6200	**Phone: 02 9910 6200**
Fax: 02 9910 6201	**Fax: 02 9910 6201**
Email: [redacted]@envirolab.com.au	**Email: [redacted]@envirolab.com.au**

Analysis Underway, details on the following page:

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

Sample ID	PAHs in Soil	Acid Extractable metalsin soil	Asbestos ID - soils	On Hold
BH01_A-0.0	✓	✓	✓	
BH01_B-0.25				✓
BH01_C-0.5				✓
BH01_D-0.8	✓	✓		
BH02_A-0.0				✓
BH02_B-0.25	✓	✓	✓	
BH02_C-0.5	✓	✓		
QAQC1	✓	✓		
QAQC2				✓
BH03_A-0.0	✓	✓	✓	
BH03_B-0.25				✓
BH03_C-0.5				✓
BH03_D-1.0	✓	✓		
BH04_A-0.0				✓
BH04_B-0.25	✓	✓	✓	
BH04_C-0.5				✓
BH04_D-0.9	✓	✓		
BH05_A-0.0	✓	✓	✓	
BH05_B-0.25				✓
BH05_C-0.5	✓	✓		
BH06_A_CGC-0.0	✓	✓	✓	
BH06_B_CGC-0.25				✓
BH06_C_CGC-0.5	✓	✓		
BH07_A_CGC-0.0	✓	✓	✓	
BH07_B_CGC-0.25				✓
BH07_C_CGC-0.5				✓
BH07_D_CGC-1.0	✓	✓		
BH08_A_CGC-0.0	✓	✓	✓	
BH08_B_CGC-0.25				✓
BH08_C_CGC-0.5				✓
BH08_D_CGC-1.0	✓	✓		

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

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customerservice@envirolab.com.au
www.envirolab.com.au

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.
Requests for longer term sample storage must be received in writing.
Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.
TAT for Micro is dependent on incubation. This varies from 3 to 6 days.

CHAIN OF CUSTODY FORM - Client

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ENVIROLAB GROUP
National phone number 1300 424 344

Sydney Lab - Envirolab Services
12 Ashley St, Chatswood, NSW 2067
02 9910 6200 | sydney@envirolab.com.au

Perth Lab - MPL Laboratories
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08 9317 2505 | lab@mpl.com.au

Melbourne Lab - Envirolab Services
25 Research Drive, Croydon South, VIC 3136
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Brisbane Office - Envirolab Services
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07 3266 9532 | brisbane@envirolab.com.au

Darwin Office - Envirolab Services
Unit 20/119 Reichardt Road, Winnellie, NT 0820
08 8967 1201 | darwin@envirolab.com.au

Company:	JACOBS
Contact Person:	[redacted]
Project Mgr:	
Sampler:	
Address:	
Phone:	Mob: [redacted]
Email Results to:	[redacted]
Email Invoice to:	[redacted]

Client Project Name/Number/Site etc (ie report title): 1A216715

PO No. (if applicable): —

Envirolab Quote No. : —

Date results required:

Or choose: ☒ Standard ☐ Same Day ☒ 1 day ☐ 2 day ☐ 3 day

Note: Inform lab in advance if urgent turnaround is required - surcharges apply

Additional report format: ☐ Esdat ☐ Equis

Lab Comments:

Envirolab Sample ID (Lab use only)	Client Sample ID or Information	Depth	Date Sampled	Type of Sample	Heavy Metals 8	PAH	Asbestos (e/a)	HOLD	Comments
1	BH01-A	0.0	28/4/21	SOIL	X	X	X		
2	BH01-B	0.25						X	Please note
3	BH01-C	0.5			~~X~~	~~X~~		X	24hr TAT.
4	BH01-D	0.8			X	X			
5	BH02-A	0.0						X	
6	BH02-B	0.25			X	X	X		
7	BH02-C	0.5			X	X			
8	~~BH02~~ QAQC 1				X	X			
9	QAQC 2				X	X			Please send
10	BH03-A	0.0			X	X	X		QAQC 2 to
11	BH03-B	0.25						X	Envirolab.

☐ *Please tick the box if observed settled sediment present in water samples is to be included in the extraction and/or analysis*

24HR TAT

Relinquished by (Company):	JACOBS	Received by (Company):	ELS SYD.
Print Name:	[redacted]	Print Name:	[redacted]
Date & Time:	28/4/21 5.10pm	Date & Time:	28/04/21 1720
Signature:		Signature:	

Lab Use Only

Job number: 267823.	Cooling: Ice / Ice pack / None
Temperature: 8°C	Security seal: Intact / Broken / None
TAT Req - SAME day / 1 / 2 / 3 / 4 / STD	

CH 28/04/21 # 267823 1/3

CHAIN OF CUSTODY FORM - Client

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ENVIROLAB GROUP
National phone number 1300 424 344

Sydney Lab - Envirolab Services
12 Ashley St, Chatswood, NSW 2067
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Perth Lab - MPL Laboratories
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Brisbane Office - Envirolab Services
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Darwin Office - Envirolab Services
Unit 20/119 Reichardt Road, Winnellie, NT 0820
08 8967 1201 | darwin@envirolab.com.au

Company:	JACOBS
Contact Person:	[redacted]
Project Mgr:	
Sampler:	
Address:	
Phone:	Mob: [redacted]
Email Results to:	[redacted]
Email Invoice to:	

Client Project Name/Number/Site etc (ie report title): IA216715

PO No. (if applicable): —

Envirolab Quote No. : —

Date results required:

Or choose: ☐ Standard ☐ Same Day ☒ 1 day ☐ 2 day ☐ 3 day

Note: Inform lab in advance if urgent turnaround is required - surcharges apply

Additional report format: (Esdat) ☐ Equis

Lab Comments:

Envirolab Sample ID (Lab use only)	Client Sample ID or Information	Depth	Date Sampled	Type of Sample	Heavy Metals 8	PAH	Asbestos (ID)	HOLD	Comments
12	BH03_C	0.5	28/4/21	SOIL				X	
13	BH03_D	1.0			X	X		X	
14	BH04_A	0.0						X	
15	BH04_B	0.25			X	X	X		
16	BH04_C	0.5						X	
17	BH04_D	0.95			X	X			
18	BH05_A	0.0			X	X	X		
19	BH05_B	0.25						X	
20	BH05_C	0.5			X	X			
21	BH05_A_QC	0.0			X	X	X		
22	BH06_B_QC	0.25						X	

☐ *Please tick the box if observed settled sediment present in water samples is to be included in the extraction and/or analysis*

Relinquished by (Company):	JACOBS	Received by (Company):	ELS SYD
Print Name:	[redacted]	Print Name:	Christine.
Date & Time:	28/4/21 5.10pm	Date & Time:	28/04/21 1720.
Signature:		Signature:	

Lab Use Only

Job number: 267823	Cooling: (Ice) / Ice pack / None
Temperature: 8°C	Security seal: Intact / Broken / None
TAT Req - (SAME day) / 1 / 2 / 3 / 4 / STD	

CH 28/04/21 # 267823 2/3

CHAIN OF CUSTODY FORM - Client

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ENVIROLAB GROUP
National phone number 1300 424 344

Sydney Lab - Envirolab Services
12 Ashley St, Chatswood, NSW 2067
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Darwin Office - Envirolab Services
Unit 20/119 Reichardt Road, Winnellie, NT 0820
08 8967 1201 | darwin@envirolab.com.au

Company:	JACOBS
Contact Person:	[redacted]
Project Mgr:	
Sampler:	
Address:	
Phone:	Mob:
Email Results to:	[redacted] jacobs.com
Email Invoice to:	[redacted] jacobs.com

Client Project Name/Number/Site etc (ie report title): 1A216715

PO No. (if applicable): —

Envirolab Quote No. : —

Date results required:

Or choose: ☐ Standard ☐ Same Day ☒ 1 day ☐ 2 day ☐ 3 day

Note: Inform lab in advance if urgent turnaround is required - surcharges apply

Additional report format: (Esdat) Esdat ☐ Equis

Lab Comments:

Sample information					Tests Required																Comments
Envirolab Sample ID (Lab use only)	Client Sample ID or Information	Depth	Date Sampled	Type of Sample	Heavy Metals 8	PAH	Asbestos (ID in soil)	ON HOLD													Provide as much information about the sample as you can
23	BH06_C_CGC	0.5	28/4/21	SOIL	X	X															
24	BH07_A_CGC	0.0			X	X	X														
25	BH07_B_CGC	0.25						X													
26	BH07_C_CGC	0.5						X													
27	BH07_D_CGC	1.0			X	X															
28	BH08_A_CGC	0.0			X	X	X														
29	BH08_B_CGC	0.25						X													
30	BH08_C_CGC	0.5						X													
31	BH08_D_CGC	1.0	↓	↓	X	X															

☐ *Please tick the box if observed settled sediment present in water samples is to be included in the extraction and/or analysis*

Relinquished by (Company):	JACOBS	Received by (Company):	ECS SYD
Print Name:	[redacted]	Print Name:	[redacted]
Date & Time:	28/4/21 5.10pm	Date & Time:	28/04/21 1720
Signature:		Signature:	

Lab Use Only

Job number: 267823	Cooling: Ice / Ice pack / None
Temperature: 8°C	Security seal: Intact / Broken / None
TAT Req - SAME day / 1 / 2 / 3 / 4 / STD	

CH 28/04/21 # 267823

3/3

Jacobs Group (Australia) P/L NSW
Level 7, 177 Pacific Highway
North Sydney
NSW 2065

NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025 – Testing
NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration, inspection and proficiency testing scheme providers reports.

Attention: [redacted]

Report **791128-S**
Project name 1A216715
Received Date Apr 29, 2021

Client Sample ID			**QAQC2**
Sample Matrix			**Soil**
Eurofins Sample No.			**S21-Ap52937**
Date Sampled			**Apr 28, 2021**
Test/Reference	LOR	Unit	
Polycyclic Aromatic Hydrocarbons			
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	1.4
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	1.7
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	2.0
Acenaphthene	0.5	mg/kg	< 0.5
Acenaphthylene	0.5	mg/kg	< 0.5
Anthracene	0.5	mg/kg	< 0.5
Benz(a)anthracene	0.5	mg/kg	1.1
Benzo(a)pyrene	0.5	mg/kg	1.1
Benzo(b&j)fluoranthene[N07]	0.5	mg/kg	0.9
Benzo(g.h.i)perylene	0.5	mg/kg	0.6
Benzo(k)fluoranthene	0.5	mg/kg	< 1
Chrysene	0.5	mg/kg	0.8
Dibenz(a.h)anthracene	0.5	mg/kg	< 0.5
Fluoranthene	0.5	mg/kg	2.0
Fluorene	0.5	mg/kg	< 0.5
Indeno(1.2.3-cd)pyrene	0.5	mg/kg	0.7
Naphthalene	0.5	mg/kg	< 0.5
Phenanthrene	0.5	mg/kg	1.0
Pyrene	0.5	mg/kg	1.9
Total PAH*	0.5	mg/kg	10.1
2-Fluorobiphenyl (surr.)	1	%	100
p-Terphenyl-d14 (surr.)	1	%	120
Heavy Metals			
Arsenic	2	mg/kg	3.9
Cadmium	0.4	mg/kg	< 0.4
Chromium	5	mg/kg	8.0
Copper	5	mg/kg	6.0
Lead	5	mg/kg	21
Mercury	0.1	mg/kg	< 0.1
Nickel	5	mg/kg	< 5
Zinc	5	mg/kg	45
% Moisture	1	%	3.8

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Polycyclic Aromatic Hydrocarbons	Sydney	Apr 29, 2021	14 Days
- Method: LTM-ORG-2130 PAH and Phenols in Soil and Water			
Metals M8	Sydney	Apr 29, 2021	180 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
% Moisture	Sydney	Apr 29, 2021	14 Days
- Method: LTM-GEN-7080 Moisture			

eurofins | Environment Testing

ABN: 50 005 085 521 web: www.eurofins.com.au email: EnviroSales@eurofins.com

Australia

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Phone : +61 3 8564 5000
NATA # 1261
Site # 1254 & 14271

Sydney
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Lane Cove West NSW 2066
Phone : +61 2 9900 8400
NATA # 1261 Site # 18217

Brisbane
1/21 Smallwood Place
Murarrie QLD 4172
Phone : +61 7 3902 4600
NATA # 1261 Site # 20794

Perth
46-48 Banksia Road
Welshpool WA 6106
Phone : +61 8 9251 9600
NATA # 1261
Site # 23736

Newcastle
4/52 Industrial Drive
Mayfield East NSW 2304
PO Box 60 Wickham 2293
Phone : +61 2 4968 8448
NATA # 1261 Site # 25079

New Zealand

Auckland
35 O'Rorke Road
Penrose, Auckland 1061
Phone : +64 9 526 45 51
IANZ # 1327

Christchurch
43 Detroit Drive
Rolleston, Christchurch 7675
Phone : 0800 856 450
IANZ # 1290

Company Name: Jacobs Group (Australia) P/L NSW
Address: Level 7, 177 Pacific Highway
North Sydney
NSW 2065

Project Name: 1A216715

Order No.:
Report #: 791128
Phone: 02 9928 2100
Fax: 02 9928 2504

Received: Apr 29, 2021 1:00 PM
Due: Apr 30, 2021
Priority: 1 Day
Contact Name: [redacted]

Eurofins Analytical Services Manager : [redacted]

Sample Detail						Polycyclic Aromatic Hydrocarbons	Metals M8	Moisture Set
Melbourne Laboratory - NATA Site # 1254 & 14271								
Sydney Laboratory - NATA Site # 18217						X	X	X
Brisbane Laboratory - NATA Site # 20794								
Perth Laboratory - NATA Site # 23736								
Mayfield Laboratory - NATA Site # 25079								
External Laboratory								
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**			
1	QAQC2	Apr 28, 2021		Soil	S21-Ap52937	X	X	X
Test Counts						1	1	1

eurofins | Environment Testing

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer, that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per kilogram | **mg/L:** milligrams per litre | **ug/L:** micrograms per litre

ppm: Parts per million | **ppb:** Parts per billion | **%:** Percentage

org/100mL: Organisms per 100 millilitres | **NTU:** Nephelometric Turbidity Units | **MPN/100mL:** Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.3
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 20-130% Phenols & 50-150% PFASs

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.3 where no positive PFAS results have been reported have been reviewed and no data was affected.

WA DWER (n=10): PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling.Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " -" in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	mg/kg	< 0.5			0.5	Pass	
Acenaphthylene	mg/kg	< 0.5			0.5	Pass	
Anthracene	mg/kg	< 0.5			0.5	Pass	
Benz(a)anthracene	mg/kg	< 0.5			0.5	Pass	
Benzo(a)pyrene	mg/kg	< 0.5			0.5	Pass	
Benzo(b&j)fluoranthene	mg/kg	< 0.5			0.5	Pass	
Benzo(g.h.i)perylene	mg/kg	< 0.5			0.5	Pass	
Benzo(k)fluoranthene	mg/kg	< 0.5			0.5	Pass	
Chrysene	mg/kg	< 0.5			0.5	Pass	
Dibenz(a.h)anthracene	mg/kg	< 0.5			0.5	Pass	
Fluoranthene	mg/kg	< 0.5			0.5	Pass	
Fluorene	mg/kg	< 0.5			0.5	Pass	
Indeno(1.2.3-cd)pyrene	mg/kg	< 0.5			0.5	Pass	
Naphthalene	mg/kg	< 0.5			0.5	Pass	
Phenanthrene	mg/kg	< 0.5			0.5	Pass	
Pyrene	mg/kg	< 0.5			0.5	Pass	
Method Blank							
Heavy Metals							
Arsenic	mg/kg	< 2			2	Pass	
Cadmium	mg/kg	< 0.4			0.4	Pass	
Chromium	mg/kg	< 5			5	Pass	
Copper	mg/kg	< 5			5	Pass	
Lead	mg/kg	< 5			5	Pass	
Mercury	mg/kg	< 0.1			0.1	Pass	
Nickel	mg/kg	< 5			5	Pass	
Zinc	mg/kg	< 5			5	Pass	
LCS - % Recovery							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	%	82			70-130	Pass	
Acenaphthylene	%	86			70-130	Pass	
Anthracene	%	88			70-130	Pass	
Benz(a)anthracene	%	88			70-130	Pass	
Benzo(a)pyrene	%	85			70-130	Pass	
Benzo(b&j)fluoranthene	%	107			70-130	Pass	
Benzo(g.h.i)perylene	%	84			70-130	Pass	
Benzo(k)fluoranthene	%	83			70-130	Pass	
Chrysene	%	91			70-130	Pass	
Dibenz(a.h)anthracene	%	90			70-130	Pass	
Fluoranthene	%	88			70-130	Pass	
Fluorene	%	88			70-130	Pass	
Indeno(1.2.3-cd)pyrene	%	101			70-130	Pass	
Naphthalene	%	84			70-130	Pass	
Phenanthrene	%	89			70-130	Pass	
Pyrene	%	90			70-130	Pass	
LCS - % Recovery							
Heavy Metals							
Arsenic	%	100			80-120	Pass	
Cadmium	%	102			80-120	Pass	
Chromium	%	102			80-120	Pass	
Copper	%	102			80-120	Pass	

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Lead			%	105			80-120	Pass	
Mercury			%	101			80-120	Pass	
Nickel			%	103			80-120	Pass	
Zinc			%	96			80-120	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Spike - % Recovery									
Polycyclic Aromatic Hydrocarbons				Result 1					
Acenaphthene	S21-Ap49912	NCP	%	104			70-130	Pass	
Acenaphthylene	S21-Ap49912	NCP	%	109			70-130	Pass	
Anthracene	S21-Ap49912	NCP	%	111			70-130	Pass	
Benz(a)anthracene	S21-Ap49912	NCP	%	103			70-130	Pass	
Benzo(a)pyrene	S21-Ap49912	NCP	%	111			70-130	Pass	
Benzo(b&j)fluoranthene	S21-Ap49900	NCP	%	124			70-130	Pass	
Benzo(g.h.i)perylene	S21-Ap49912	NCP	%	98			70-130	Pass	
Benzo(k)fluoranthene	S21-Ap49912	NCP	%	86			70-130	Pass	
Chrysene	S21-Ap49912	NCP	%	105			70-130	Pass	
Dibenz(a.h)anthracene	S21-Ap49912	NCP	%	118			70-130	Pass	
Fluoranthene	S21-Ap49912	NCP	%	109			70-130	Pass	
Fluorene	S21-Ap49912	NCP	%	113			70-130	Pass	
Indeno(1.2.3-cd)pyrene	S21-Ap49912	NCP	%	109			70-130	Pass	
Naphthalene	S21-Ap49912	NCP	%	116			70-130	Pass	
Phenanthrene	S21-Ap49912	NCP	%	114			70-130	Pass	
Pyrene	S21-Ap49912	NCP	%	109			70-130	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic	S21-Ap52689	NCP	%	100			75-125	Pass	
Cadmium	S21-Ap52689	NCP	%	96			75-125	Pass	
Chromium	S21-Ap52689	NCP	%	92			75-125	Pass	
Copper	S21-Ap52689	NCP	%	82			75-125	Pass	
Lead	S21-Ap52689	NCP	%	94			75-125	Pass	
Mercury	S21-Ap52689	NCP	%	87			75-125	Pass	
Nickel	S21-Ap52689	NCP	%	98			75-125	Pass	
Zinc	S21-Ap52689	NCP	%	88			75-125	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
Polycyclic Aromatic Hydrocarbons				Result 1	Result 2	RPD			
Acenaphthene	S21-Ap49911	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Acenaphthylene	S21-Ap49911	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Anthracene	S21-Ap49911	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benz(a)anthracene	S21-Ap49911	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(a)pyrene	S21-Ap49911	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(b&j)fluoranthene	S21-Ap49911	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(g.h.i)perylene	S21-Ap49911	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(k)fluoranthene	S21-Ap49911	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Chrysene	S21-Ap49911	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Dibenz(a.h)anthracene	S21-Ap49911	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Fluoranthene	S21-Ap49911	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Fluorene	S21-Ap49911	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Indeno(1.2.3-cd)pyrene	S21-Ap49911	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Naphthalene	S21-Ap49911	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Phenanthrene	S21-Ap49911	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Pyrene	S21-Ap49911	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	

Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Arsenic	S21-Ap53551	NCP	mg/kg	2.8	2.5	15	30%	Pass	
Cadmium	S21-Ap53551	NCP	mg/kg	< 0.4	< 0.4	<1	30%	Pass	
Chromium	S21-Ap53551	NCP	mg/kg	17	16	5.0	30%	Pass	
Copper	S21-Ap53551	NCP	mg/kg	30	33	9.0	30%	Pass	
Lead	S21-Ap53551	NCP	mg/kg	50	61	19	30%	Pass	
Mercury	S21-Ap53551	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Nickel	S21-Ap53551	NCP	mg/kg	40	36	10	30%	Pass	
Zinc	S21-Ap53551	NCP	mg/kg	80	100	26	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
% Moisture	S21-Ap52691	NCP	%	6.4	7.0	8.0	30%	Pass	

Comments

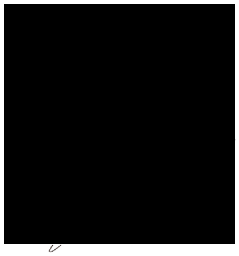
Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
N07	Please note:- These two PAH isomers closely co-elute using the most contemporary analytical methods and both the reported concentration (and the TEQ) apply specifically to the total of the two co-eluting PAHs

Authorised by:



Analytical Services Manager
Senior Analyst-Organic (NSW)
Senior Analyst-Metal (NSW)

[redacted]

General Manager

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

eurofins | Environment Testing

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Site # 1254 & 14271

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16 Mars Road
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Phone : +61 2 9900 8400
NATA # 1261 Site # 18217

Brisbane
1/21 Smallwood Place
Murarrie QLD 4172
Phone : +61 7 3902 4600
NATA # 1261 Site # 20794

Perth
46-48 Banksia Road
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Phone : +61 8 9251 9600
NATA # 1261
Site # 23736

Newcastle
4/52 Industrial Drive
Mayfield East NSW 2304
PO Box 60 Wickham 2293
Phone : +61 2 4968 8448
NATA # 1261 Site # 25079

New Zealand

Auckland
35 O'Rorke Road
Penrose, Auckland 1061
Phone : +64 9 526 45 51
IANZ # 1327

Christchurch
43 Detroit Drive
Rolleston, Christchurch 7675
Phone : 0800 856 450
IANZ # 1290

Company Name: Jacobs Group (Australia) P/L NSW
Address: Level 7, 177 Pacific Highway
North Sydney
NSW 2065

Project Name: 1A216715

Order No.:
Report #: 791128
Phone: 02 9928 2100
Fax: 02 9928 2504

Received: Apr 29, 2021 1:00 PM
Due: Apr 30, 2021
Priority: 1 Day
Contact Name: [redacted]

Eurofins Analytical Services Manager : [redacted]

Sample Detail						Polycyclic Aromatic Hydrocarbons	Metals M8	Moisture Set
Melbourne Laboratory - NATA Site # 1254 & 14271								
Sydney Laboratory - NATA Site # 18217						X	X	X
Brisbane Laboratory - NATA Site # 20794								
Perth Laboratory - NATA Site # 23736								
Mayfield Laboratory - NATA Site # 25079								
External Laboratory								
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**			
1	QAQC2	Apr 28, 2021		Soil	S21-Ap52937	X	X	X
Test Counts						1	1	1

eurofins | Environment Testing

ABN: 50 005 085 521 www.eurofins.com.au EnviroSales@eurofins.com

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Phone : +64 9 526 45 51
IANZ # 1327

Christchurch
43 Detroit Drive
Rolleston, Christchurch 7675
Phone : 0800 856 450
IANZ # 1290

Sample Receipt Advice

Company name:	Jacobs Group (Australia) P/L NSW
Contact name:	Amanda Mullen
Project name:	1A216715
Project ID:	Not provided
Turnaround time:	1 Day
Date/Time received	Apr 29, 2021 1:00 PM
Eurofins reference	791128

Sample Information

✓	A detailed list of analytes logged into our LIMS, is included in the attached summary table.
✓	All samples have been received as described on the above COC.
✓	COC has been completed correctly.
✓	Attempt to chill was evident.
✓	Appropriately preserved sample containers have been used.
✓	All samples were received in good condition.
✓	Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.
✓	Appropriate sample containers have been used.
✓	Sample containers for volatile analysis received with zero headspace.
X	Split sample sent to requested external lab.
X	Some samples have been subcontracted.
N/A	Custody Seals intact (if used).

Notes

Contact

If you have any questions with respect to these samples, please contact your Analytical Services Manager:

Andrew Black on phone : (+61) 2 9900 8490 or by email: AndrewBlack@eurofins.com

Results will be delivered electronically via email to Amanda Mullen - amanda.mullen@jacobs.com.

Global Leader - Results you can trust

CHAIN OF CUSTODY FORM - Client

[Copyright and Confidential]

Company:	JACOBS
Contact Person:	[redacted]
Project Mgr:	
Sampler:	
Address:	
Phone:	Mob: [redacted]
Email Results to:	[redacted]
Email Invoice to:	

Client Project Name/Number/Site etc (ie report title): IA216715

PO No. (if applicable): —

Envirolab Quote No. : —

Date results required:

Or choose: ☒ Standard ☐ Same Day ☒ 1 day ☐ 2 day ☐ 3 day

Note: Inform lab in advance if urgent turnaround is required - surcharges apply

Additional report format: ☐ Esdat ☐ Equis

Lab Comments:

ENVIROLAB GROUP
National phone number 1300 424 344

Sydney Lab - Envirolab Services
12 Ashley St, Chatswood, NSW 2067
02 9910 6200 | sydney@envirolab.com.au

Perth Lab - MPL Laboratories
16-18 Hayden Crt, Myaree, WA 6154
08 9317 2505 | lab@mpl.com.au

Melbourne Lab - Envirolab Services
25 Research Drive, Croydon South, VIC 3136
03 9763 2500 | melbourne@envirolab.com.au

Adelaide Office - Envirolab Services
7a The Parade, Norwood, SA 5067
08 7087 6800 | adelaide@envirolab.com.au

Brisbane Office - Envirolab Services
20a, 10-20 Depot St, Banyo, QLD 4014
07 3266 9532 | brisbane@envirolab.com.au

Darwin Office - Envirolab Services
Unit 20/119 Reichardt Road, Winnellie, NT 0820
08 8967 1201 | darwin@envirolab.com.au

Sample information | **Tests Required**

Envirolab Sample ID (Lab use only)	Client Sample ID or Information	Depth	Date Sampled	Type of Sample	Heavy Metals 8	PAH	Asbestos (c/a)	HOLD	Comments
1	BH01_A	0.0	28/4/21	SOIL	X	X	X		Relinquished by Jacobs Envirolab 29/4/21 8:00 AM
2	BH01_B	0.25						X	
3	BH01_C	0.5			[redacted]	[redacted]		X	Please note 24hr TAT.
4	BH01_D	0.8			X	X		X	
5	BH02_A	0.0						X	
6	BH02_B	0.25			X	X	X		
7	BH02_C	0.5			X	X			
8	[redacted] QAQC 1				X	X			
9	QAQC 2				X	X	X		
10	BH03_A	0.0						X	Please send QAQC 2 to Eurofins. 24HR TAT
11	BH03_B	0.25							

☐ Please tick the box if observed settled sediment present in water samples is to be included in the extraction and/or analysis

Relinquished by (Company):	JACOBS
Print Name:	[redacted]
Date & Time:	28/4/21 5.10pm
Signature:	

Received by (Company):	ELS SYD.
Print Name:	Christine.
Date & Time:	28/04/21 1720
Signature:	

Lab Use Only

Job number:	267823.
Temperature:	8°C
TAT Req - SAME day / 1 / 2 / 3 / 4 / STD	
Cooling:	Ice / Ice pack / None
Security seal:	Intact / Broken / None

Form 302_V007

Issue date: 21 April 2021

Lua D. 29/04/21
T: 2.5°C 1:00 PM #791128

CH 28/04/21 # 267823/3