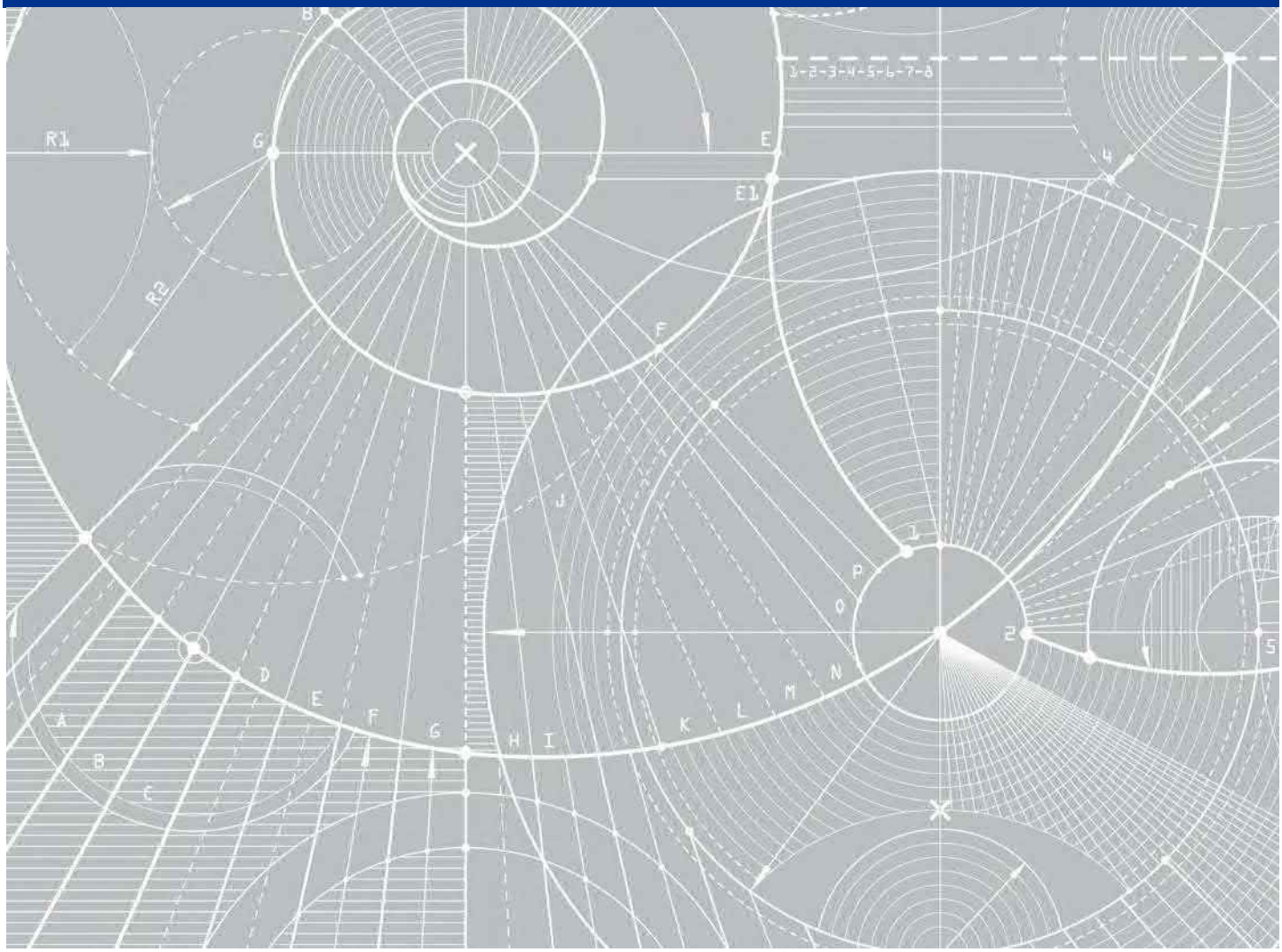
Site Audit Report 278_PREW by Dr Ian Swane

WESTCONNEX STAGE 3A PREW WORKSITE (AREAS C1B & C3B)

PARRAMATTA ROAD, ASHFIELD

Final | 22 NOVEMBER 2022



IAN SWANE & ASSOCIATES

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1. Introduction

1.1 Background Information

WestConnex is a 33 km predominately underground motorway scheme that encompassed widening of the M4 Western Motorway, an eastern extension of the M4 (**M4 East**), a new section for the M5 Motorway (**New M5**), and a new inner western bypass of the Sydney CBD connecting the M4 and New M5 (M4-M5 link). The WestConnex Stage 3A project consisted of a group of underground tunnels connecting the M4-M5 Link with Victoria Road (just east of the Iron Cove Bridge) and The Crescent, the Anzac Bridge, and the City West Link **Figure 1-1**).

There were four worksites / compounds where construction work for the WestConnex Stage 3A project occurred at the ground surface, these being:

- The St Peters Interchange (**SPI**) interface worksite (Area C10) at St Peters;
- The Pyrmont Bridge Road (**PBR**) worksite (Area C9) at Annandale;
- The Parramatta Road East West (**PREW**) worksite (Areas C1b and C3b) at Ashfield; and
- The Northcote Compound (Areas C1a, C2a, C2b and C3a) at Haberfield.

The locations of these areas are shown in **Figure 1-1**.

The land at each of these worksite compounds was the subject of a Statutory Site Audit, as defined by the NSW Contaminated Lands Management (**CLM**) Act 1997. The outcome of the site audit for each property was documented in its own SAR. This SAR documents the outcome of the site audit for the PREW worksite (also referred to as the Site), which consists of two areas located on either side of Parramatta Road (Areas C1b and C3b) located in the Ashfield local government area (**LGA**). The total size of the PREW site compound was 14,100 m^2 (1.41 ha) comprising: Area C1b 7,550 m^2 (0.775 ha) and Area C3b 6,550 m^2 (0.655 ha), with their locations shown in **Figure 1-2**. A Sixmaps subdivision plan for the PREW site is provided in **Figure 1-3**.

The street addresses of the two parts of the PREW site were:

- Area C1b: 244, 2AAA, 244B, 246, 248, 266 & 296 Parramatta Road, Ashfield; and
- Area C3b: 132A & 134 Bland Street; 197, 197A, 199 & 205 Parramatta Road, Ashfield.

The legal property descriptions of these two areas were:

- Area C1b: Lots 21 – 23 in DP1220552, Lots 10 – 14, 16 – 20 in DP1221218, L01 1 in DP121314, Lots A - C in DP337062; and
- Area C3b: Lots 50 & 52 in DP1220795, Lot 1 in DP171194, Lots 26 & 27 in DP4568, Lot 1 in DP900930, Lots 128 – 130 in DP131525, Lot 1 in DP944017.

The PREW site was used by the M4-M5 Link Contractor as a works compound to facilitate the construction of the Stage 3 mainline tunnel. The Site was used for subsurface access or require the development of access drives or shafts. The site layout is shown in **Figure 1-4** and included:

- Utility works including protection and/or adjustment of existing utilities, removal of redundant utilities and installation of new utilities;
- Site offices, amenities and temporary infrastructure;
- Laydown and storage of materials;
- Delivery area for materials, plant and equipment;
- Construction of an acoustic shed
- Construction of a temporary access tunnel;

Figure 1-1 Overview of WestConnex Stage 3A Project Footprint and Construction Ancillary Facilities

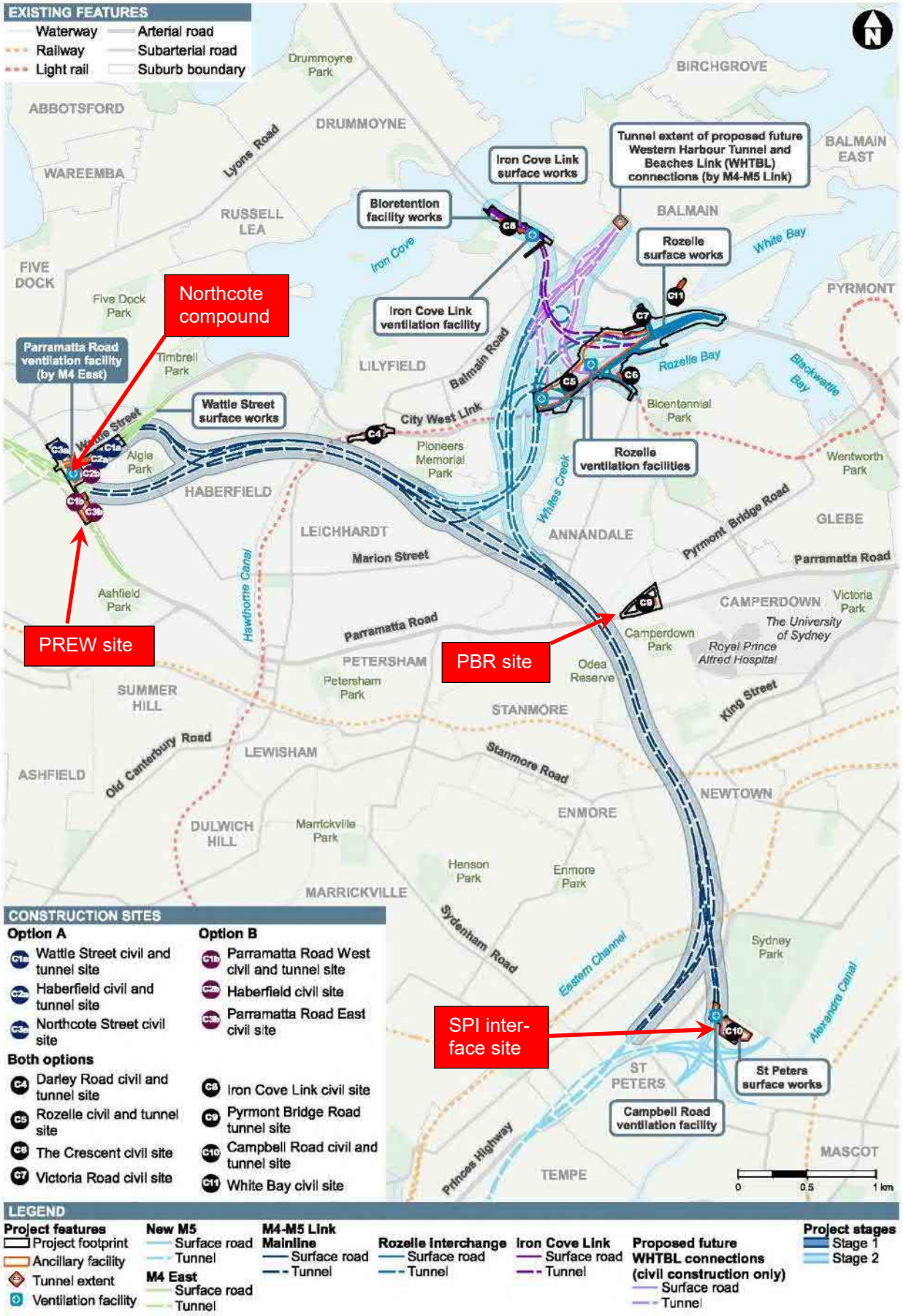


Figure 1-2 Location Plan for PREW site Areas C1b and C3b (Source: Map 1, Ref [52])

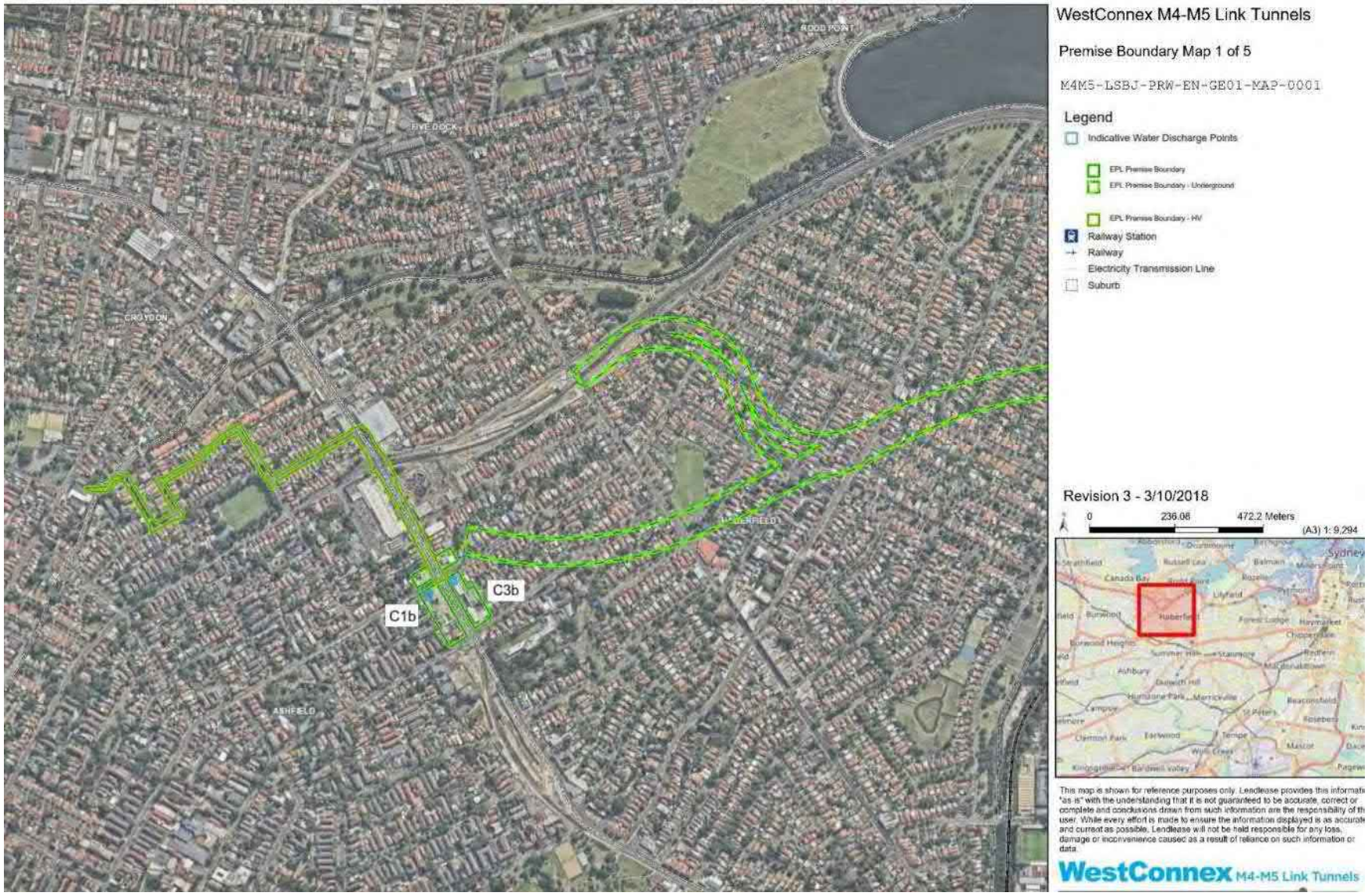


Figure 1-3 Six Maps 2018 Subdivision Plan for PREW site Areas C1b and C3b

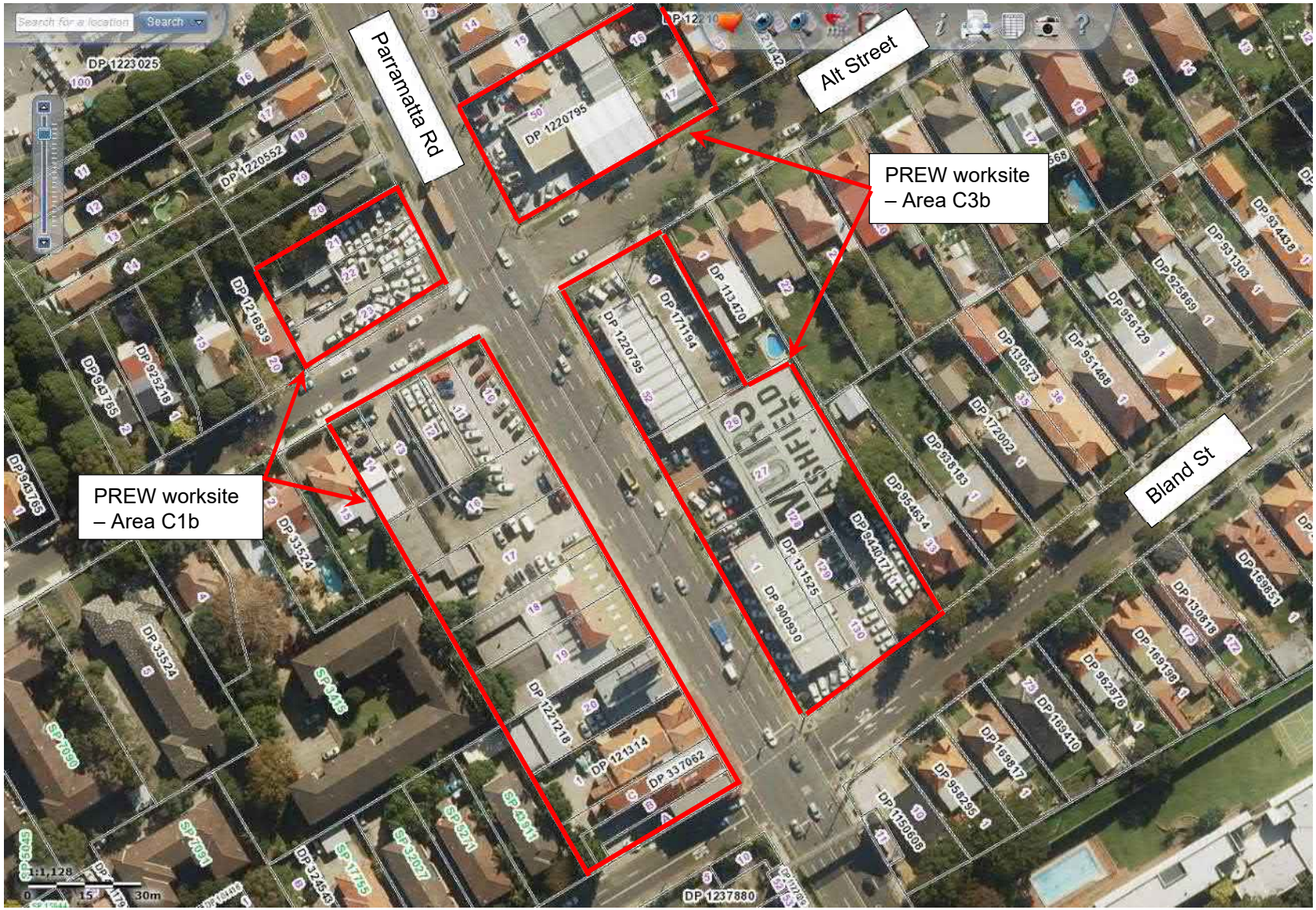
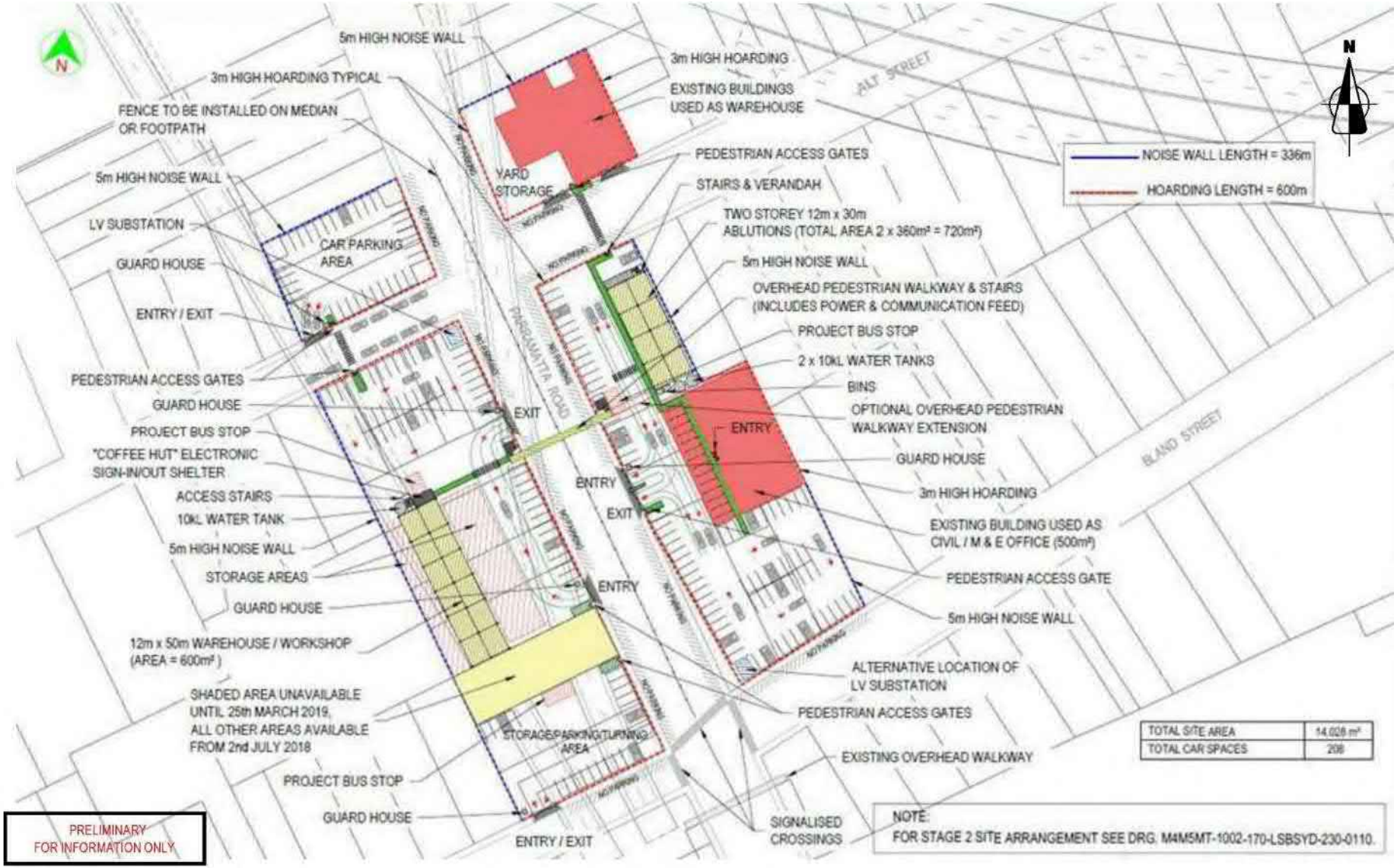


Figure 1-4 Proposed Layout for Works Compound at PREW site (Source: Figure F5, Ref [2])



- Tunnel excavation of the mainline tunnels and the Wattle Street entry and exit ramps, stockpiling of excavated material and spoil haulage;
- Mechanical installation and fit out of the tunnels;
- Finishing works including asphalting; and
- Demobilisation including works to prepare the site for a permissible future use.

At the end of construction work, the PREW site was demobilised and earthworks were carried out to restore surface levels to generally pre-construction levels. The future use of the land was anticipated to be determined in accordance with the Residual Land Management Plan to be prepared for the project. For the purpose of this SAR, the intended use of the land was taken to be Commercial / Industrial D as given in the NEPM (2013) guidelines.

Figure 1-4 showed that the proposed layout for the works compound at the PREW site was to cover the whole Site. As a result, the Site Auditor considered that every part of the PREW site would be or had the potential to be disturbed by construction works and that there was potential for any part of the Site to become contaminated by construction activities. Consequently, the whole of the PREW site was considered by the site audit.

The audit was undertaken by Dr Ian Swane, a NSW Environment Protection Authority (**EPA**) Site Auditor Accreditation No. 9821. The audit was undertaken in accordance with the CLM Act. For annual return purposes to the EPA, the audit was numbered 278 in the records of the Site Auditor. The site audit was commissioned by [redacted] from ASBJV on 20/07/18 and was conducted in accordance with a proposal dated 15/07/18.

All site audit work reported in this SAR was undertaken by the Site Auditor, since all matters that needed to be audited and documented herein were within the expertise of the Site Auditor and no assistance was required from the Audit Support Team.

The Site Auditor checked the EPA website[1] at the beginning and during the audit and found that the PREW site and land within 200 m of the Site were not recorded by the EPA as having been 'Declared' land or a notified site.

1.2 Purpose and Scope of the Audit

1.2.1 Purpose

The purpose and scope of the site audit was based on requirements specified in three documents:

- A contract made on or about June 2018 between the ASBJV and the NSW Government, which required ASBJV to deliver most of the work required by the WestConnex Stage 3A project as described in the Planning Consent. Some work required by the Planning Consent may have been outside the scope of work to be undertaken by ASBJV;
- The Department of Planning Consent SSI 7485 ('Planning Consent') issued for the WestConnex Stage 3A project on 17/04/18 (Ref [50]). The proponent for the Project was Transport for NSW (**TfNSW**), formerly Roads and Maritime Services, from the NSW Government; and
- An Environmental Protection Licence (**EPL**).

Contractual Requirements

With regards to site contamination, the Site Auditor understood that ASBJV was responsible for:

a) Complying with NSW Government environmental legislation regarding contaminated site and waste management;

[1] www.epa.nsw.gov.au/clm

b) Managing contamination that ASBJV interfered or disturbed during the course of carrying out its work;

c) Not generating contamination at the Project site or generating contamination that may cause an increase in contamination migrating from the Project site;

d) Returning the PREW site to a condition suitable for a road construction worksite; and

e) Complying with EPL 21149 (Ref [52]).

With regards to site contamination, the Site Auditor understood that ASBJV was not responsible for engaging the Site Auditor to determine whether:

f) Any part of the Project site had been remediated and made suitable for a specified use other than as a road construction worksite; and

g) Contamination that existed at the Project site prior to the commencement of the Project continued to migrate off-site.

The Site Auditor was understood to be responsible for:

h) Reviewing site environmental management plans that dealt with contamination at the Project site and to check whether these plans met Condition C22 of the Planning Consent as relevant to this site audit;

i) Reviewing contamination assessments for the Project site and whether they met Condition E181 of the Planning Consent relevant to this site audit;

j) Reviewing waste classifications and documentation on the management of waste removed from the Project site[2];

k) Reviewing reports on the management of contamination at the Project site throughout the period construction activities were undertaken by ASBJV and to determine whether:

   i. No additional contamination was generated by the construction work;

   ii. The land was maintained in a condition suitable for a road construction worksite and compliance was achieved with Conditions E182 to E185 of the Planning Consent;

   iii. Waste generated by construction activities at the Project site was managed in accordance with EPA guidance and Conditions E202 to E204 of the Planning Consent; and

   iv. The requirements of Conditions O5.10 and O5.11 of EPL 21149 were met.

l) Notifying ASBJV, TfNSW and the EPA if the Site Auditor concluded that a part of the Project site should be notified to the EPA under the CLM Act[3];

m) Issuing a Section A site audit statement (**SAS**) for each part of the Project site where the ground surface was disturbed by construction work undertaken by ASBJV. Each SAS was to be issued at the completion of ASBJV sitework and needed to determine whether the land was suitable for a road construction worksite at the end of construction period and prior to landscaping by TfNSW.

With regards to site contamination, the Site Auditor understood that the NSW Government was responsible for separately engaging a Site Auditor to:

n) Determine whether land within the Project site was suitable for a specified use other than as a road construction worksite at the end of construction and prior to landscaping by TfNSW;

o) Review documentation prepared by environmental consultants that determined whether contamination migrating from the Project site not caused by ASBJV was posing an unacceptable risk to off-site receptors and needed to be remediated; and

p) Review work undertaken at the Project site in addition to that required by the EPA under Conditions O5.10 and O5.11 of EPL 21149.

[2] A requirement under Section 4.3.7, EPA (October 2017) Site Auditor Guidelines
[3] A requirement under Sections 3.8.2, 4.3.11 & 4.3.12, EPA (October 2017) Site Auditor Guidelines

Interim audit advice report #19 containing the Site Auditor's understanding of the purpose and scope of the site audit, as described above, was issued to ASBJV on 26/11/18 (**Appendix C**).

Planning Consent

The site audit was undertaken in accordance with the requirements of the Conditions of Approval for the WestConnex M4-M5 Link SSI 7485 Project issued by the Department of Planning and Environment dated 17/04/18 (Ref [50]). Relevant conditions of the Planning Consent for the purpose of this site audit were:

Contaminated Sites

E181 A Site Contamination Report, documenting the outcomes of Phase 1 and Phase 2 contamination assessments of land upon which the Critical State Significance Infrastructure (CSSI) is to be carried out, that is suspected, or known to be, contaminated must be prepared by a suitably qualified and experienced person in accordance with guidelines made or approved under the Contaminated Land Management Act 1997 (NSW).

E182 If a Site Contamination Report prepared under Condition E181 finds such land contains contamination, a site audit is required to determine the suitability of a site for a specified use. If a site audit is required, a Site Audit Statement and Site Audit Report must be prepared by a NSW EPA Accredited Site Auditor. Contaminated land must not be used for the purpose approved under the terms of this approval until a Site Audit Statement is obtained that declares the land is suitable for that purpose and any conditions on the Site Audit Statement have been complied with.

E183 A copy of the Site Audit Statement and Site Audit Report must be submitted to the Secretary and relevant council for information no later than one (1) month prior to the commencement of operation.

E184 An Unexpected Contaminated Land and Asbestos Finds Procedure must be prepared and must be followed should unexpected contaminated land or asbestos be excavated or otherwise discovered during construction.

E185 The Unexpected Contaminated Land and Asbestos Finds Procedure must be implemented throughout construction.

Waste

E202 Waste generated during delivery of the CSSI is to be dealt with in accordance with the following priorities:

(a) waste generation is to be avoided and where avoidance is not reasonably practicable, waste generation is to be reduced;

(b) where avoiding or reducing waste is not possible, waste is to be re-used, recycled, or recovered; and

(c) where re-using, recycling or recovering waste is not possible, waste is to be treated or disposed of at a waste management facility or premise lawfully permitted to accept the materials or in accordance with a Resource Recovery Exemption or Order issued under the Protection of the Environment Operations (Waste) Regulation 2014, or to any other place that can lawfully accept such waste.

E203 Waste generated outside the site must not be received at the site for storage, treatment, processing, reprocessing, or disposal on the site, except as expressly permitted by a licence or waste exemption under the Protection of the Environment Operations Act 1997, if such a licence is required in relation to that waste.

E204 All waste generated during construction and operation must be classified in accordance with the EPA's Waste Classification Guidelines, with appropriate records and disposal dockets retained for audit purposes.

Environmental Protection Licence 21149

The EPA issued EPL 21149 for the WestConnex Stage 3A project dated 9/10/19 (Ref [52]). Relevant conditions of the EPL for the purpose of the PREW site audit were:

O5.11 Notwithstanding condition O5.10, construction activities may be undertaken following development of an Environmental Management Plan or similar, subject to written approval from a NSW EPA accredited site auditor.

1.2.2 Scope of Work

The scope of work undertaken for this SAR comprised the following tasks:

- Review a preliminary site investigation report (**PSI**) and a detailed site investigation (**DSI**) report prepared by environmental consultants engaged by ASBJV, provide interim audit advice, and obtain additional information from the ASBJV environment team as required;
- Review plans for the management of contamination during the period of construction work, provide interim audit advice and obtain additional information from the ASBJV environment team as required;
- Inspect the PREW site prior to, during and at the end of construction work and provide interim audit advice;
- Review a close-out report prepared by ASBJV documenting the final site condition and how contamination was managed during the construction work; and
- Prepare a Section A SAS and SAR that determined whether the land disturbed by ASBJV was suitable for a road construction worksite at the end of the construction period and prior to landscaping by TfNSW.

1.3 Standards & Methodology

1.3.1 EPA Approved Guidelines

The site audit was undertaken in accordance with the provisions of the CLM Act and EPA requirements as specified in their endorsed documents as they existed at the time of this SAR, as listed on the EPA website[4].

1.3.2 Decision Process

The EPA[5] decision process for assessing the risks posed by ground contamination at an urban redevelopment site involved ten issues.

The first issue in the EPA decision process was that:

'all site assessment, remediation and validation reports follow applicable guidelines'.

The Data Quality Indicators (**DQI's**) and assessment criteria that the Site Auditor commonly adopted for environmental assessments conducted at an urban redevelopment site are summarised in **Table 1-1**. The Site Auditor used these DQI's and criteria to assess the reliability and adequacy of the data provided by Environmental Consultants and to identify documentation where the level of non-compliance was considered to be significant.

[4] www.epa.nsw.gov.au/clm/guidelines.htm
[5] Appendix A, EPA (October 2017) '*Contaminated Land Management, Guidelines for the NSW Site Auditor Scheme (3rd edition)'*

Table 1-1 Data Quality Indicators and Evaluation Criteria

DQI	Evaluation Criteria
Documentation completeness	• DQO process properly described • Site properly identified • Site history adequately known • The conceptual site contamination model for the site is known to a high level of confidence • The site conditions adequately known • Completion of field calibration records, borehole logs, chain of custody documentation, laboratory test certificates from NATA-registered laboratories
Data completeness	• Sampling density comparison meets EPA (1996) *'Sampling Design Guidelines'* for all potential contaminants of concern at all areas of environmental concern • Use of systematic and judgemental sampling to provide sufficient data representative of all APECs
Data comparability	• Use of appropriate techniques for the sampling, storage and transportation of samples • Use of NATA certified laboratory using NEPM procedures
Data representativeness	• Good sampling coverage of all areas of environmental concern at the site, and selection of representative samples • Location, distribution & extent of samples appropriate to characterise contamination at all APECs
Precision and accuracy for sampling and analysis	• Use properly trained and qualified field personnel • Blind field duplicates to be collected at a minimum rate of 1 in 10 • RPD's < 30% for inorganic and 50% for organic analyses • Acceptable levels for equipment rinsate blanks • Achieve laboratory QC criteria

The remaining issues in the EPA decision process were:

- *'any aesthetic issues relating to site soils have been adequately addressed';*
- *soils have been assessed against relevant health-based investigation levels and potential for migration of contamination from soils to groundwater has been considered';*
- *groundwater (where relevant) has been assessed against relevant health-based investigation levels and, if required, any potential impacts to buildings and structures from the presence of contaminants considered.'*
- *hazardous ground gases (where relevant) have been assessed against relevant health-based investigation levels and screening values'*
- *any issues relating to local area background soil concentrations that exceed relevant investigation levels have been adequately addressed in the site assessment report(s);*
- *the impacts of chemical mixtures have been assessed;*
- *any potential ecological risks have been assessed;*
- *any evidence of, or potential for, migration of contaminants from the site has been appropriately addressed, including potential risks to off-site receptors, and reported to the site owner or occupier; and*
- *the site management strategy (where relevant) is appropriate including post-remediation environmental plans.'*

The contract made between ASBJV and the NSW Government described the PREW site as a road construction worksite. The Site Auditor considered this land use did not correspond to an urban redevelopment site as defined by the EPA (2017) Site Auditor Guidelines because:

- A road construction worksite did not correspond to one of the four land uses considered by the EPA 10-step decision process;
- A road construction worksite is covered by permanent concrete pavements and structures so there is no significant physical contact with underlying soils or groundwater;
- Future activities at a road construction worksite would be managed in accordance with a site-specific management plan;
- The Contract only required the site audit to consider contamination risks where the ground surface was disturbed by construction work undertaken by ASBJV;
- The Contract did not require ASBJV to remediate contamination but to undertake their work so that no additional contamination was generated by construction work;
- The migration of contamination from the PREW site was not an issue if pre-construction levels were not increased; and
- The PREW site was land owned by the NSW Government on which public infrastructure was to be constructed.

Given these circumstances, the Site Auditor applied the EPA decision process in a manner consistent with the ASBJB contractual requirements. This was done by adopting appropriate Data Quality Objectives (**DQOs**) described in the following section.

1.4 Data Quality Objectives

DQOs are performance and acceptance criteria developed during the planning of a site assessment. They were used to evaluate whether there was enough data of a high enough quality to support decision making[6].

The DQO process is a seven-step systematic planning approach used to prepare plans for environmental data collection activities. The DQO process was specified in the NEPM and provided a systematic approach for defining the criteria that a data collection design should satisfy, including: when, where and how to collect samples or measurements; determination of tolerable decision error rates; and the number of samples or measurements that should be collected.

The Site Auditor assessed the appropriateness of the environmental site assessments (**ESAs**) using the following DQO process, which was considered to meet EPA requirements consistent with ASBJB contractual requirements:

- **Step 1: State the Problem** – Contamination at the PREW site needed to be managed consistent with its use as a road construction worksite in accordance with a contract between the ASBJV and the NSW Government.
- **Step 2: Identify the Decisions** – These decisions reflected the purpose and scope of the site audit described in **Section 1.2**. These decisions were:
  - Determine if the PREW site at the end of the construction period was suitable for a road construction worksite and compliance was achieved with Conditions E182 to E185 of the Planning Consent;
  - Determine whether ASBJV managed contamination it interfered or disturbed during the course of carrying out its work;
  - Determine whether operations at the PREW site may have generated contamination or caused an increase in contamination migrating from the site;
  - Recommend management strategies which may be required at the PREW site, including additional investigations and/or remediation works;
  - Determine whether there was sufficient information satisfying guidelines made or approved under the CLM Act to determine that implementation of the contamination management plan was feasible

[6] Section 1.2, EPA (April 2020 '*Consultants reporting on contaminated land, Contaminated land guidelines*'

and would enable the specified use of the PREW site and prevent an increase in contamination migrating from the site;

- Assess compliance with Condition E181 of the Planning Consent and Condition O5.11 of EPL 21149 (Ref [52]) and NSW Government environmental legislation regarding contaminated site and waste management; and
- Waste generated by construction activities at the Project site was to be managed in accordance with EPA guidance and Conditions E202 to E204 of the Planning Consent.

- **Step 3: Identify Inputs to the Decisions** – These included:
  - Existing site information, site history, regional geology, topography, hydrogeology and background conditions;
  - The use of proper investigation techniques;
  - Data collected by investigations and monitoring programs implemented during the project;
  - Development of an appropriate conceptual site model (**CSM**) for assessing contamination risks;
  - The use of appropriate site assessment criteria and compare results as measured against these criteria; and
  - The use of EPA-approved risk assessment methodologies.
- **Step 4: Define the Study Boundaries** – As defined by the contract between ASBJV and the NSW Government comprising:
  - The boundaries of the PREW site; and
  - The condition of the PREW site at the end of construction works.
- **Step 5: Develop a Decision Rule** – The decision rules in characterising contamination at the PREW site were:
  - Data used in contamination assessments were to be of a sufficient quality that allowed decisions to be made regarding contamination risks at the Site and compliance with regulatory requirements;
  - Field and laboratory test results measured against EPA-approved criteria; and
  - The Site was suitable for ongoing use as a road construction worksite if soil, groundwater and soil vapour contamination did not pose an unacceptable risk to users of the motorway, workers stationed at the facilities and maintenance workers.
- **Step 6: Specify Limits on Decision Errors** – These included:
  - The acceptable limits for inter/intra laboratory duplicate sample comparisons were laid out within the fieldwork protocols; and
  - The acceptable limits for laboratory quality assurance / quality control (**QA/QC**) parameters were based upon the laboratory reported acceptable limits and those stated within the NEPM 2013 guidelines.
- **Step 7: Optimise the Design for Obtaining Data** – Identify the most resource-effective sampling and analysis design for general data that were expected to satisfy the DQOs. This may involve the use of field screening tests and use of biased sampling.

A summary of the DQI's for the field and laboratory testing programs are specified in **Table 1-1**.

1.5 Information Reviewed

The environmental reports reviewed for this audit (in approximate chronological order) comprised:

1. Transport for NSW (August 2017) "*M4-M5 Link Environmental Impact Statement, WestConnex*"
2. Epic Environmental (15 August 2018) "*Phase 1 and Sampling and Analysis Plan – Ancillary Site C1b and C3b*". Document No: SY180065.04_rpt_LSBV_Muirs_14Aug18 _Rev04 prepared for LSBJV
3. Epic Environmental (15 March 2019) "*M4-M5 Link Main Tunnel Works – Phase 2 ESA, Muirs (C1b & C3b)*". Document No: SY180065.04_rpt_LSBV_Muirs(C1bC3b) prepared for LSBJV
4. ASBJV (7 October 2021) Email providing additional data on contamination management during construction
5. ASBJV (7 November 2022) Email providing additional data on contamination management during construction

Other information reviewed for this audit comprised:

50. Department of Planning and Environment (17 April 2018) "*Infrastructure Approval, Section 5.19 of the Environmental Planning & Assessment Act 1979, Application No: SSI 7485, Conditions of Approval for WestConnex M4-M5 Link SSI 7485". 76 pages*
51. Not used
52. NSW EPA (9 October 2018) '*Environmental Protection Licence Number 21149, WestConnex Stage 3A – M4-M5 Mainline Tunnels, WestConnex between M4 East at Haberfield and the New M5 at St Peters, Marrickville NSW 2204'. 30 pages*
53. LSBJV (10 October 2018) "*Site Establishment Management Plan, M4-M5 Link Mainline Tunnels*". Document No: M4M5-LSBJ-PRW-EN-MP01-PLN-0018-07
54. LSBJV (23 October 2018) "*Appendix B, Contaminated Land Management Sub-plan, M4-M5 Link Mainline Tunnels*". Document No: M4M5-LSBJ-PRW-EN-MP01-PLN-0021-01 Rev01
55. LSBJV (23 October 2018) "*Unexpected Contaminated Land and Asbestos Finds Procedure, M4-M5 Link Mainline Tunnels*". Appendix A of Ref [54]
56. LSBJV (31 October 2018) "*Parramatta Road East and West Civil Sites Waste Management Plan, M4-M5 Link Mainline Tunnels*". Document No: M4M5-LSBJ-MUI-EN-MP01-PLN-0002-A
57. LSBJV (17 April 2020) "*Appendix B5, Soil and Surface Water Management Sub-plan, M4-M5 Link Mainline Tunnels*". Document No: M4M5-LSBJ-PRW-EN-MP01-PLN-0005-09 Rev09
58. LSBJV (22 June 2020) "*Appendix B9, Waste Management Sub-plan, M4-M5 Link Mainline Tunnels*". Document No: M4M5-LSBJ-PRW-EN-MP01-PLN-0009-07 Rev08
59. Not used
60. Safe Work & Environments (24 August 2019a) "*Hazardous Materials Survey & Management Plan, 132-134 Bland Street, Ashfield, NSW 2131; 197-199 Parramatta Road, Ashfield, NSW 2131; 201-205 Parramatta Road, Haberfield, NSW 2045*". Document No: S107408.2 provided for LSBJV
61. Safe Work & Environments (24 August 2019b) "*Hazardous Materials Survey & Management Plan, 244-246, 266 & 296 Parramatta Road, Ashfield, NSW 2131*". Document No: S107408.1 provided for LSBJV
62. JM Environments (10 January 2019) "*248 – 250 Parramatta Road Ashfield, Hazardous Building Material Survey*". Document No: JME18057-19 provided for LSBJV
63. LSBJV (16 January 2019) "*Construction Work Method Statement, Demolition Works - Haberfield*". Document No: M4M5-LSBJ-MUI-CR-GE01-CWM-0001 Rev01

Additional information was obtained by the Site Auditor when site inspections were conducted at the PREW site on 2/06/21 and 4/11/22, with photographs taken by the Site Auditor provided in **Appendix D**.

1.6 Chronology of Site Audit Program

A chronology of the main activities relevant to the site audit work is provided below:

- 20 July 2018 – The Site Auditor was engaged and issued formal notification for the commencement of the site audit to the EPA;
- 13 August 2018 – The Site Auditor reviewed a draft PSI and Sampling and Analysis Quality Plan (**SAQP**) prepared by Epic and issued interim audit advice (**Appendix C**);
- 15 August 2018 – Epic issued a final version of the PSI and SAQP (Ref [2]);
- 26 November 2018 - Interim audit advice #19 containing the Site Auditor's understanding of the purpose and scope of the site audit was issued to ASBJV (**Appendix C**);
- 24 February 2019 – The Site Auditor reviewed a draft DSI prepared by Epic and issued interim audit advice report #26 (**Appendix C**);
- 8 March 2019 – The Site Auditor reviewed a revised draft DSI prepared by Epic and issued interim audit advice #28 (**Appendix C**);
- 6 May 2019 – The Site Auditor reviewed a further revised draft DSI prepared by Epic and issued interim audit advice #31 (**Appendix C**);
- 15 March 2019 – Epic issued a final version of the DSI (Ref [3]);
- 6 September 2019 – The Site Auditor reviewed the final version of the DSI prepared by Epic and issued interim audit advice #40 (**Appendix C**);
- 2 June 2021 - The Site Auditor inspected the PREW site during construction, with copies of photos taken provided in **Appendix D**;
- 23 July 2021 – The Site Auditor issued a draft SAR to ASBJV that covered **Sections 1** and **2**;
- 7 October 2021 – The ASBJV provided documentation on the management of contamination at the PREW site, as requested in the draft SAR;
- 26 October 2022 – The Site Auditor reviewed the additional documentation and provided interim audit advice #59 (**Appendix C**);
- 4 November 2022 – The Site Auditor conducted a final site inspection of the PREW site, with copies of photos taken provided in **Appendix D**;
- 22 November 2022 – ASBJV approved the draft SAS / SAR and provided an interim environmental management plan (**EMP**) for contamination assessment work that needed to be completed prior to a Section A2 SAS being issued for the PREW site. The Site Auditor then finalised the documents and issued the signed Section B SAS and this SAR to ASBJV, TfNSW, the EPA and Council. Copies of the Section B SAS and the interim plan are provided in **Appendix E**.

1.7 Abbreviations

ABC	Ambient background concentration
ACL	Added contaminant limit
ACM	Asbestos containing material
ADWG	Australian Drinking Water Guidelines
AF	Asbestos fines
AHD	Australian Height Datum
ALF	Alexandria Landfill
AMP	Asbestos management plan
ANZECC	Australia and New Zealand Environment and Conservation Council

ANZG	Australian New Zealand 2018 water quality guidelines
APEC	Area of potential environmental concern
ARIS	Australian Soil Resource Information System
ASBJV	Acciona Samsung Bouygues Joint Venture
ASS	Acid sulphate soil
AST	Above ground storage tank
ATS	Australasian Technical Services
B&D waste	Building and demolition waste
BaP TEQ	Benzo(a)pyrene toxicity equivalent
bgl	Below ground level
BOM	Bureau of Meteorology
BTEX	Benzene, toluene, ethyl benzene, xylenes
BTEXN	BTEX and naphthalene
C&D	Construction and demolition
CCA	Copper chrome arsenate
CEC	Cation exchange capacity
CLM Act	Contaminated Land Management Act 1997 (NSW)
CLMP	Contaminated land management plan
COC	Chain of custody
COV	Coefficient of variation
CQA	Construction quality assurance
CQAR	Construction Quality Assurance Report
CS	Characteristic gas situation
CSI	Contaminated site investigation
CSSI	Critical State Significant Infrastructure
CWMS	Construction Work Method Statement
DBYD	Dial-before-you-dig
DCP	Development control plan
DEC	Department of Environment and Conservation NSW
DECC	Department of Environment and Climate Change NSW
DECCW	Department of Environment, Climate Change and Water NSW
DOH	Department of Health (WA)
DPE	Department of Planning and Environment (NSW)
DQI	Data quality indicator
DQO	Data quality objective
DSI	Detailed site investigation
EFCP	Electrical friction cone penetrometer
EIL	Ecological investigation level

EIS	Environmental impact statement
EMP	Environmental management plan
EPA	Environment Protection Authority (NSW)
EPL	Environmental Protection License
ERP	Emergency response plan
ES	Environmental Strategies
ESA	Environmental site assessment
ESD	Ecologically sustainable development
FA	Fibrous asbestos
FSL	Finished surface level
GIL	Groundwater investigation level
GME	Groundwater monitoring event
GPS	Global positioning system
GSV	Gas screening value
GSW	General Solid Waste
GTA	Geotechnical Testing Authority
HAZMAT	Hazardous materials assessment
HC	Hydrocarbon
HDPE	High density polyethylene
HEIC	High energy impact compaction
HGG	Hazardous ground gas
HGGRA	Hazardous ground gas risk assessment
HHERA	Human health and ecological risk assessment
HIL	Health investigation level
ISEMP	Interim Site Environmental Management Plan
ITP	Inspection and test plan
kg	Kilograms
L	Litres
LCMP	Landfill closure management plan
LCS	Laboratory control sample
LFG	Landfill gas
LFGMS	Landfill gas mitigation system
LGA	Local Government Area
LOP	Level of protection
LOR	Limit of reporting
LSBJV	Lendlease Samsung Bouygues Joint Venture
LTEMP	Long Term Environmental Management Plan
m	Metres

MAHs	Monocyclic aromatic hydrocarbons
mg	Milligrams
MIP	Membrane interface probe
nd	Non-detectible
NEPM	National Environment Protection Measure
NHMRC	National Health and Medical Research Council
NIOSH	National Institute for Occupational Safety and Health (USA)
NMOC	Non-methane organic compounds
NRMMC	Natural Resource Management Ministerial Council
NSW	New South Wales
OCP	Organochlorine pesticides
OHSP	Occupational health and safety plan
OSD	On-site detention basin
PAH	Polycyclic aromatic hydrocarbons
PASS	Potential acid sulphate soil
PBR	Pyrmont Bridge Road
PCBs	Polychlorinated Biphenyls
PCOC	Potential contaminant of concern
PFAS	Perfluoroalkyl and polyfluoroalkyl substance
PID	Photoionisation detector
POEO	Protection of the Environment Operations (Act) 1997 (NSW)
PPE	Personal Protective Equipment
ppm	parts per million
PQL	Practical quantification limit
PREW	Parramatta Road East West worksite, Ashfield
PSI	Preliminary site investigation
QA	Quality assurance
QC	Quality control
QRA	Qualitative risk assessment
RAC	Remediation Acceptance Criteria
RAP	Remediation Action Plan
RMS	Roads and Maritime Services
RPD	Relative percent difference
RL	Reduced level
RRE	Resource Recovery Exemption
RRO	Resource Recovery Order
RSL	Regional soil level (US EPA)
RSW	Restricted Solid Waste

SAC	Soil acceptance criteria
SAQP	Sampling and analysis quality plan
SAR	Site audit report
SAS	Site audit statement
SD	Standard deviation
SEARs	Secretary's Environmental Assessment Requirements
SEMP	Site Establishment Management Plan
SEPP	State environment planning policy
SIL	Soil investigation level
SMDD	Standard maximum dry density
SOMC	Standard optimum moisture content
SMF	Synthetic mineral fibre
SMP	Site management plan
SOP	Standard operating procedure
SPI	St Peters Interchange
SPIR	Submissions and Preferred Infrastructure Report
SVOCs	Semi volatile organic compounds
SWL	Standing water level
SWMP	Soil and water management plan
SWMS	Safe work method statement
TCLP	Toxicity Characteristic Leaching Procedure
TDS	Total dissolved solids
TfNSW	Transport for NSW (formerly RMS)
TPH	Total petroleum hydrocarbons
TRH	Total recoverable hydrocarbons
TSEMP	Task Specific Excavation Management Plan
TSS	Total suspended solids
UCL	Upper confidence limit
UFP	Unexpected Finds Protocol
USA	United States of America
US EPA	United States Environmental Protection Agency
UST	Underground storage tank
VB	Vertical barrier
VENM	Virgin excavated natural material
VHCs	Volatile halogenated compounds
VMP	Voluntary Management Proposal
VOCs	Volatile organic compounds
WCR	Waste classification report

WCX M5	WestConnex New M5
WHS	Worker health safety
WMP	Waste management plan
µg	micrograms

2. Review of Site Conditions in July 2018 Pre-ASBJV Work

This section of the SAR assesses the adequacy of data provided by ESAs on the condition of the PREW site and the contamination risks that existed in July 2018 at the time when ASBJV commenced sitework. The ESAs were:

- *A PSI prepared by Epic dated 15/08/18 (Ref [2]); and*
- *A DSI prepared by Epic dated 15/03/19 (Ref [3]).*

2.1 Site Identification

A summary of the site location details provided by the ESAs, relevant to 2018 prior to the commencement of construction work at the PREW site, is presented in **Table 2-1.** A subdivision plan showing the boundaries of the PREW site provided in **Figure 1-3**.

Table 2-1: Summary of Site Location Details

Site Location Detail	Detail	References
Site name	WestConnex Stage 3A sites C1b and C3b	Sectn 1.1, Ref [2]; Sectn 1.1, Ref [3]
Address/location	Area C1b on western side of Parramatta Road: 244 - 296 Parramatta Road, Ashfield	Sectn 1.4, Ref [2]; Sectn 2.1, Ref [3]
	Area C3b on eastern side of Parramatta Road: 132A & 134 Bland Street; 197, 197A, 199 & 205 Parramatta Road, Ashfield	
Legal property description	Area C1b: Lots 21 – 23 in DP1220552, Lots 10 – 20 in DP1221218, Lot 1 in DP121314, Lots A - C in DP337062	Sectn 1.4, Ref [2]; Sectn 2.1, Ref [3]; NSW Six Maps
	Area C3b: Lots 50 & 52 in DP1220795, Lot 1 in DP171194, Lots 26 & 27 in DP4568, Lot 1 in DP900930, Lots 128 – 130 in DP131525, Lot 1 in DP944017	
Local Government Area	Inner West Council	Sectn 1.4, Ref [2]; Sectn 2.1, Ref [3]
Site area	Whole site 14,100 m^2 (1.41 ha) comprising: • C1b: 7,550 m^2 (0.775 ha); and • C3b: 6,550 m^2 (0.655 ha)	Sectn 1.4, Ref [2]; Sectn 2.1, Ref [3]
Owner	TfNSW (formerly Roads and Maritime Services)	Sectn 1.4, Ref [2]; Sectn 2.1, Ref [3]
Contractor	ASBJV (formerly LSBJV)	Sectn 1, Ref [2]; Sectn 1, Ref [3]
Past Zoning	Commercial / industrial zoning that permitted operation of a car sales yard, car servicing & workshops, office space & general commercial activities	Sectn 1.4, Ref [2]; Sectn 2.1, Ref [3]
Current zoning	B6 – Enterprise corridor	
Future zoning	No known change	
Surrounding land use	The site is surrounded by low-medium density residential properties, with some light commercial also located to the north.	Sectn 2.4, Ref [2]; Sectn 2.4, Ref [3]

Site Location Detail	Detail	References
	Through the centre of the site runs Parramatta Road	

Legend:
Inadequate information provided in ESAs

The Site Auditor assessed the accuracy of the site location information provided in the ESA reports by:

- Comparing the multiple lines of evidence provided by the source data;
- Comparing the supplied data with other publicly available data obtained from NSW Government and other websites;
- Examining Google and SixMaps aerial photos on several occasions throughout the audit period; and
- Inspecting the PREW site throughout the audit period, with a photographic record provided in **Appendix D**.

The Site Auditor considered the information on site location details provided in the ESAs met or was close to meeting the documentation completeness DQO.

2.2 Site History

The historical data provided by the ESAs is summarised in **Table 2-2**, with a copy of the 1943 aerial photo provided in **Figure 2-1**. The data covered the past 80 years over which time land uses at the PREW site changed from predominantly low density residential to a large car yard operation with associated activities.

Table 2-2: Summary of Site History Details

Site History Detail	References
Property zoning and land use changes	Sectns 1.4 & 3, Ref [2]
Property title search	**Not provided**
Review of aerial photographs (1943, 1955, 1961, 1965, 1970, 1982, 1991, 2000, 2009, 2015, 2018)	**Sectn 2.5, Ref [2]**
Review of site photographs	Not available
Data provided by former owners/tenants/local Council	**Not provided**
Inventory of chemicals and wastes associated with site use and their on-site storage location	Sectn 4.1, Ref [2]
Possible contaminant sources & potential off-site effects	Sectn 4.1, Ref [2]
Historic site layout plans	**Not provided**
Sewer and underground service plans	Sectn 6.2 & Appn B, Ref [3]
Extent of any filling or dumping at the site	Sectns 8.1.1 & 8.2.1, Ref [3]
Descriptions of manufacturing processes / operations	Sectn 4.1, Ref [2]
Details and locations of former underground storage tanks (**USTs**) and above ground storage tanks (**ASTs**)	Sectn 3, Ref [2]; Sectns 2.1, 3.5 & Appn A, Ref [3]
Product spill and loss history	Not available
Discharges to land, water and air	Not relevant
Disposal locations	Not relevant

Site History Detail	References
Relevant complaint history	Not available
Local site knowledge of residents and staff – both present and former	Not available
Summary of local literature about the site, including newspaper articles	Sectn 5.4.1, Ref [2]; Sectn 4.2, Ref [3]
Details of building and related permits, licences, approval and trade waste agreements	Sectns 3.3 – 3.5, Ref [3]
Historical use of adjacent land	Sectn 2.5, Ref [2]
Local usage of ground/surface waters, and locations of bores/pumps	Sectn 2.3, Ref [2]
Integrity assessment	Site Auditor

Legend:

Data gaps in ESAs

The data provided by the ESAs indicated that the PREW site had a long history of commercial / industrial use as a car yard with associated activities. The 1943 aerial photo (**Figure 2-1**) showed:

- For Area C1b, the northern portion of the area appeared to be occupied by a commercial / industrial style building on the corner of Alt Street, and Parramatta Road, with vacant land directly to the north. Residential style buildings were observed along Alt Street with various small to medium commercial / industrial style buildings; and
- For Area C3b, residential buildings were observed across the area. A small car park and industrial / commercial shed were observed in the southern portion of the area.

Epic reports that the car yard progressively developed across the site in the 1950s and 1960s. For area C1b, the northern portion of the area became a car storage and possibly a workshop area during the 1950's. By the 1960s, the residential buildings along the remainder of the area were demolished and the area was occupied by a car yard. By the early 1980's the current site layout was established and included mechanical workshops for car repairs and a spray booth (NW corner).

For area C3b, practically all residential buildings were demolished in the 1960's and replaced by a large car yard. A large shed was constructed in the northern part of the area in the early 1980s, most likely used for car storage. Another large shed was constructed in the SW corner in the early 1990's. Further development involving the construction of commercial buildings occurred in 2000.

A search of the UBD Business Directory conducted for the Project EIS indicated that both the C1b and C3b areas were owned by Muirs Motors Pty Ltd and Palmers Car Sales since circa 1970. By 2000, these areas had been developed into the layouts observed during the Epic site inspection on 13/07/18.

Epic also reported there was a risk that a dry cleaners may have been located somewhere on the PREW site and/or adjacent to the Site.

Searches of NSW Government databases found:

- No records of EPA licences or pollution notices for the PREW site or surrounding properties;
- The PREW site and nearby land were not listed as a regulated or notified contaminated site by the EPA;
- SafeWork NSW reported three USTs for fuel storage at the Site; and
- The locations of licensed groundwater bores in the local area.

Figure 2-1 1943 Historic Aerial Photo of PREW site (Source: Sixmaps NSW)

The Site Auditor assessed the accuracy of the historical assessments provided in the ESA reports by:

- Comparing the multiple lines of evidence provided by the source data;
- Comparing the supplied data with other publicly available data obtained from Council and EPA records;
- Checking that the conclusions were consistent with the site condition data (**Section 2.3**);
- Checking that the contaminants of concern agreed with the recommendations given in the Contaminated Sites Monograph Series No. 3 (1994) *'Identification and Assessment of Contaminated Land, Improving Site History Appraisal'* and relevant EPA guidelines; and
- Inspecting the PREW site throughout the WestConnex Stage 3A project, with a photographic record provided in **Appendix D**.

Data gaps identified by the Site Auditor in the site history assessment provided by the ESAs comprised:

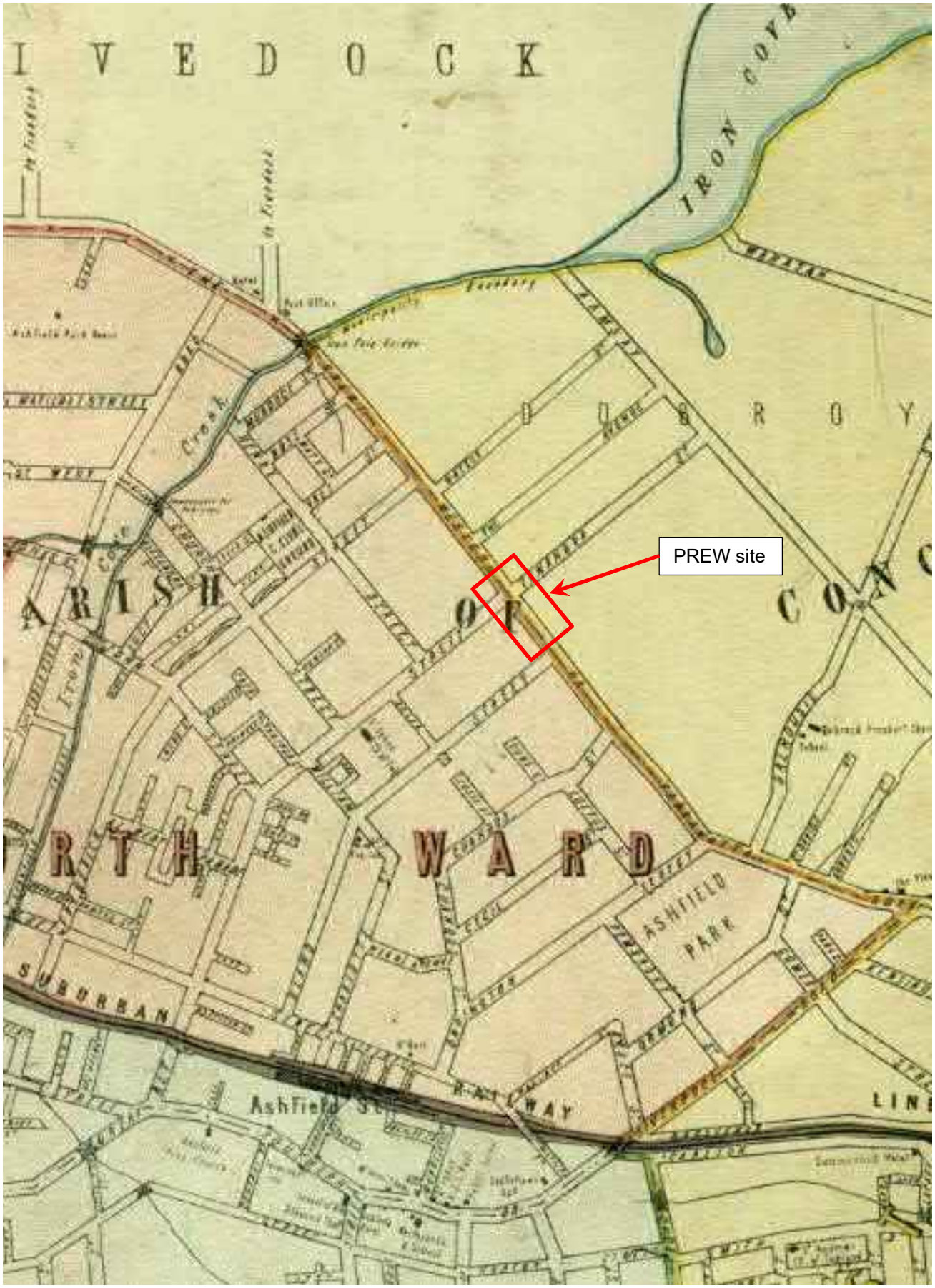
- Property title search;
- Copies of historic aerial photos were not provided by the ESAs;
- Data provided by former owners / tenants / local Council; and
- Historic site layout plans showing the location and use of all above ground structures, buried services / structures and how the layout of on-site developments changed over time.

Despite these data gaps, the Site Auditor considered the site history data provided by the ESAs was sufficient for developing a CSM for the PREW site appropriate for the management of contamination during construction works required by the Project. This is because:

- Property title data was obtained from the NSW Government EIS prepared for the WestConnex project[7];
- A copy of the 1943 aerial photo of the PREW site was obtained from SixMaps NSW website (**Figure 2-1**);
- A copy of the 1886-1888 Higginbotham and Robinson historic map of Ashfield was obtained from the Dictionary of Sydney website[8] showing the street layout around the Site had been established (**Figure 2-2**);
- Historic information was ground-truthed by a site inspection conducted by Epic in July 2018;
- Data gaps in the historical assessment were unlikely to have a material effect on how contamination risks at the PREW site needed to be managed. This was because the intended use of the PREW site was as a road construction worksite, which was not a sensitive land use. Also, major excavations were to be undertaken at the PREW site, which would be capable of uncovering unknown contamination;
- The site history assessment appeared to be consistent with site conditions observed by the Site Auditor at a site inspection on 2/06/21, with a photographic record provided in **Appendix D**; and
- There was potential to address the historical data gaps by making conservative assumptions in the CSM.

[7] Ref [1]
[8] https://dictionaryofsydney.org/subject/maps#ref-uuid=076b2ed8-bde2-0942-539d-7c25042d66ff

Figure 2-2 Extract of Ashfield 1886-1888 Map Showing PREW site (Source: Dictionary of Sydney)



2.3 Site Condition and Surrounding Environment

The data provided by the ESAs on the condition of the PREW site in 2018 prior to the commencement of major construction work is summarised in **Table 2-4**.

Table 2-4: Summary of Site Condition Details

Site Condition Detail	References
Topography and Surface Conditions	
Regional and site topography, flood potential	**Not provided**
Regional and site drainage patterns	Sectn 2.3, Ref [2]; Sectn 2.3, Ref [3]
Conditions at site boundary (e.g. type and condition of fencing, soil stability and erosion)	**Not provided**
On-site developments, buildings and roads	Sectn 1.4, Ref [2]; Sectn 2.1, Ref [3]
Surface conditions (e.g. paving, vegetation)	Sectn 1.4, Ref [2]; Sectns 2.1, 2.3 & 4.1, Ref [3]
Hazardous building materials	Sectn 3, Ref [2]
Sewer and service plans	Sectn 6.2 & Appn B, Ref [3]
Presence of USTs and ASTs	Sectn 3, Ref [2]; Sectns 2.1, 2.3, 3.5 & Appn A, Ref [3]
Presence of drums and wastes	Sectn 3, Ref [2]; Sectn 2.3, Ref [3]
Visible signs of contamination & odours at ground surface	Sectn 8.1.3, Sectn 4.2 & Plate P1, Ref [3]
Visible signs of plant stress	Sectn 1.4, Ref [2]; Sectn 2.1, Ref [3]
Geology and Hydrogeology	
Regional and structural geology	Sectn 2.2, Ref [2]; Sectn 2.5, Ref [3]
Borehole & test pit logs	Appn D, Ref [3]
Site stratigraphy and fill materials	Sectn 2.2, Ref [2]; Sectns 2.5 & 4.1, Ref [3]
Acid sulfate soils	Sectn 2.2, Ref [2]; Sectn 2.5, Ref [3]
On-site wells and springs	Sectn 2.3 & Appn A, Ref [2]; Sectn 2.6, Ref [3]
Nearby wells and springs	
Hydrogeological system operating at the site	Sectn 2.3, Ref [2]; Sectns 2.3, 2.6 & 4.1, Ref [3]
Background water quality	Section 2.3, Ref [2]; Sectn 2.6, Ref [3]
Local meteorology	Not relevant
Surrounding Environment	
Location of nearest groundwater receptors	Sectn 2.3 & Appn A, Ref [2]
Location of nearest surface water receptors	
Surrounding land uses and details of local sensitive environments (e.g. rivers, lakes, creeks, wetlands, local habitat areas, endangered flora and fauna)	Sectn 2.3, Ref [2]

Site Condition Detail	References
Surrounding areas that may pose a pollution hazard to the site	Sectn 2.4, Ref [2]; Sectn 2.4, Ref [3]

Legend:

Data gaps in investigation reports

The main site features described by the ESAs relevant to the assessment of contamination risks at the PREW site are summarised below.

- **Surface water drainage patterns**: Drainage across the Site was in a northerly direction towards Dobroyd Canal, subsequently discharging into Iron Cove Creek.
- **On-site developments:**
  - Area C1b: Small commercial building and hardstand with servicing area to the north of Alt Street; washdown bay and service area (Inc. oil storage) in NW corner; USTs and associated above ground infrastructure in NW corner; possible USTs located in central part; large car service area in the central part, oil storage and AST on the western boundary; commercial building historically used as part of the car dealership and associated commercial space to the east of workshops; two-story commercial buildings at southern part; and
  - Area C3b: Car workshop and single story commercial buildings to the north of Alt Street; large two story commercial building in the central eastern part; two large undercover areas in the northern and southern parts; small commercial office space in the southern part; fuel bowser and associated underground infrastructure adjacent to the small commercial precinct in the southern part.
- **Surface conditions:** The Epic 2019 DSI advised that the majority of the Site was sealed by concrete pavement and buildings. Surface water was directed to stormwater drains, with surface water infiltration expected to be low.
  - Area C1b: Majority of area (>95%) sealed and covered in concrete or building foundations; small garden area in on the western boundary behind the car workshop; small gardens scattered across the area; and
  - Area 3b: Majority of area (>95%) sealed and covered in concrete, brick paving or building foundations; small gardens were observed along the western boundary along Parramatta Road; some small garden beds scattered across area.
- **Hazardous building materials**: The Epic 2018 PSI observed potential asbestos containing material (**ACM**) building materials across the PREW site, with a hazardous materials assessment (**HAZMAT**) in the process of being undertaken.
- **Sewer & service plans**: A dial-before-you-dig (**DBYD**) search was undertaken prior to the Epic 2019 DSI and it was reported that underground services comprised:
  - Main sewer ran along the western boundary approximately 2 mbgl;
  - Telstra services entered the Site from Parramatta Road, Alt Street and Bland Street servicing commercial properties;
  - Electrical services were present across the Site connecting lighting and other services. High voltage electricity entered from Alt Street and ran to the main switchboard located on the northern end of the building; and
  - A gas pipeline entered the Site from Parramatta Road into commercial buildings located at the southern end.
- **Presence of USTs**: The ESAs provided data showing that USTs were present at the PREW site but there was inconsistency with the data. The SafeWork NSW search reported three USTs for fuel storage at:

- 252 Parramatta Road (Area C1b): 20,000 L UST for unleaded petrol;
- Cnr Alt Street and Parramatta Road (Area C1b) : 27,850 L UST for unleaded petrol; and
- 199 Parramatta Road (Area C3b): 30,000 L UST for unleaded fuel.

Copies of plans provided by SafeWork NSW are provided in **Figures 2-3a** and **2-3b**.

On the other hand Epic reported that site inspections identified four USTs at the Site comprising:

- (Area C1b): 18,000 L UST that contained 2,000 L of product;
- (Area C1b): A UST of unknown size appeared to have been concrete infilled;
- (Area C1b): 9,200 L UST in the centre of the area that contained 9,000 L of product;
- (Area C1b): One fuel bowser; and
- (Area C3b): 25,000 L UST in southern part of area that contained 1,500 L of product. A fuel bowser was located nearby.

The UST locations adopted by the CSM are shown in **Figure 2-6**. For the purpose of this SAR, the Site Auditor adopted the UST number and locations adopted by the Epic 2019 DSI because they were based on site inspections. However, the Site Auditor considered there was a risk of additional unknown USTs being present at the PREW site.

- **Presence of ASTs**:
  - Area C1b: One AST (approximately 1,000L) was present on the mid – western boundary; and
  - Area C3b: No ASTs observed in this area.
- **Presence of drums and waste**:
  - Area C1b: Oil filled drums were present adjacent to the washdown bay and in the area of the AST;
  - Area C1b: One underground oil water separator was present in the NW corner. Underground service location indicated the presence of a number of surface drains around the hardstand to be directed into this separator and the mechanical workshops drains and sinks were directed through the oil separator. The separator was in poor condition and not properly maintained, with oil and sludge within it. An above ground oil water separator was located in the workshop along the northern wall. Large areas of oil staining and potential spills were observed;
  - Area C3b: Small quantities of oil storage (>20L) were present across the area; and
  - Area C3b: One above ground oil water separator was present in the workshop in the northern workshop.
- **Visible signs of contamination at ground surface**: Epic advised that an earlier investigation in 2015 found no visual or olfactory impacts at the PREW site. The Epic 2019 DSI reported oil staining at the groundsurface at:
  - (Area C1b): One above ground oil water separator was observed in the workshop along the northern wall. Large areas of oil staining and potential spills were observed; and
  - Oil staining was observed to coat the bailer used at groundwater well GW08.
- **Visible signs of plant distress**: Only a few small gardens were present at the Site with no reported signs of plant distress associated with ground contamination.
- **Geology and site stratigraphy**: Surface geology at the PREW site consisted of Wianamatta Group shales. Ground conditions at the site comprised surface hardstands and a shallow surface layer of fill (0.3m – 1.2m thick), overlying residual clay soils and weathered shale profiles of the Wianamatta group. Shales were underlain by Hawkesbury Sandstone.

Figure 2-3a SafeWork NSW Drawing of USTs at PREW site (Source: Appn B, Ref [3])

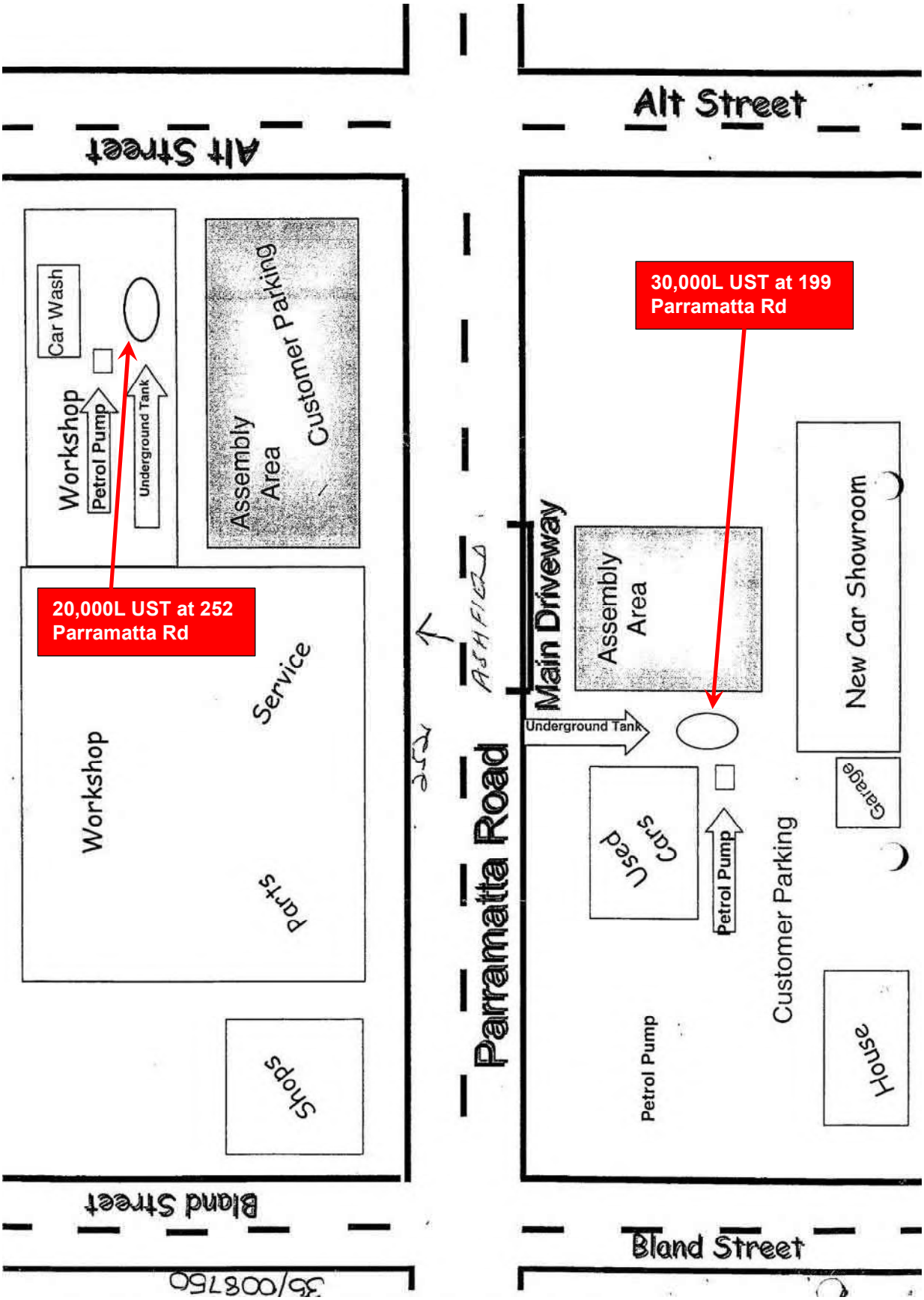
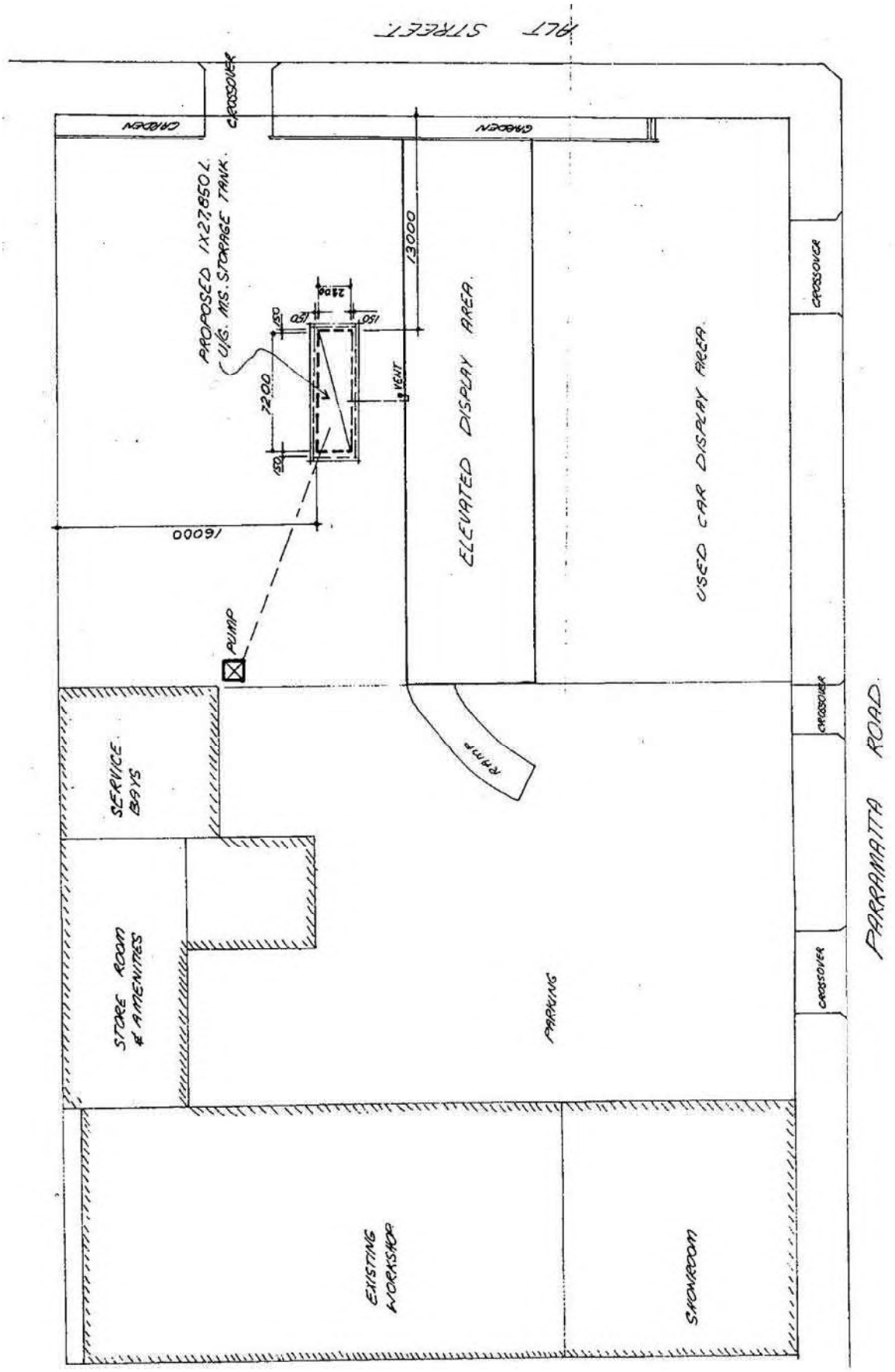


Figure 2-3b SafeWork NSW Drawing of Proposed UST Near Alt Street (Source: Appn B, Ref [3])



- **Acid sulfate soil (ASS) risk**: Low with no known ASS at or near site (Class 5)
- **Licensed groundwater bores**: A search of the NSW Natural Resource database undertaken on 18/07/2018 identified six bores within a 500 m radius of the Site, with all being monitoring bores. The bores were installed between 2002 and 2004 probably as part of contamination assessments at other sites. There were no groundwater extraction bores for beneficial reuse within 500 m of the PREW site. Copies of the licensed groundwater bore summary data were provided in the Epic 2018 PSI. A WaterNSW plan showing the locations of these bores is provided in **Figure 2-4**.
- **Hydrogeological system and background water quality**: The PSI advised that shallow transient perched groundwater was likely to be present at the soil / shale bedrock interface, with deeper permanent groundwater occurring in the underlying Hawkesbury Sandstone where the groundwater aquifer would be fracture-controlled. Groundwater movement in the deeper aquifer was likely to be low and salinity levels > 14,000 mg/L.

  Epic reported that 13 groundwater bores existed at the Site in 2018 and were part of earlier investigations conducted to support the site purchase by TfNSW in 2017. Epic was unable to obtain information on these bores from TfNSW but gauged each well on 14/08/18 and again on 21/11/18 followed by a survey of the well elevations as part of the DSI.

  Shallow groundwater occurred within weathered shales beneath the Site at 4.61 - 11.89 m AHD on C1b and 9.61 – 16.73 m AHD on C3b.
- **Location of nearest surface water and groundwater receptors**: Iron Cove Creek located 700 m north of PREW site, which drained into Iron Cove that was part of the lower Parramatta River.
- **Local sensitive environments**: Iron Cove Creek located 700m north of PREW site drained into Iron Cove that was part of the lower Parramatta River.
- **Surrounding areas that may pose a pollution hazard to the site**: Surrounding land uses were considered to pose a low contamination risk to the PREW site. However, the historic use of leaded fuel and the presence of Parramatta Road running through the Site meant there was an increased risk of lead having been atmospherically deposited across the groundsurface.

The Site Auditor assessed the accuracy of the site condition assessment provided in the ESA reports by:

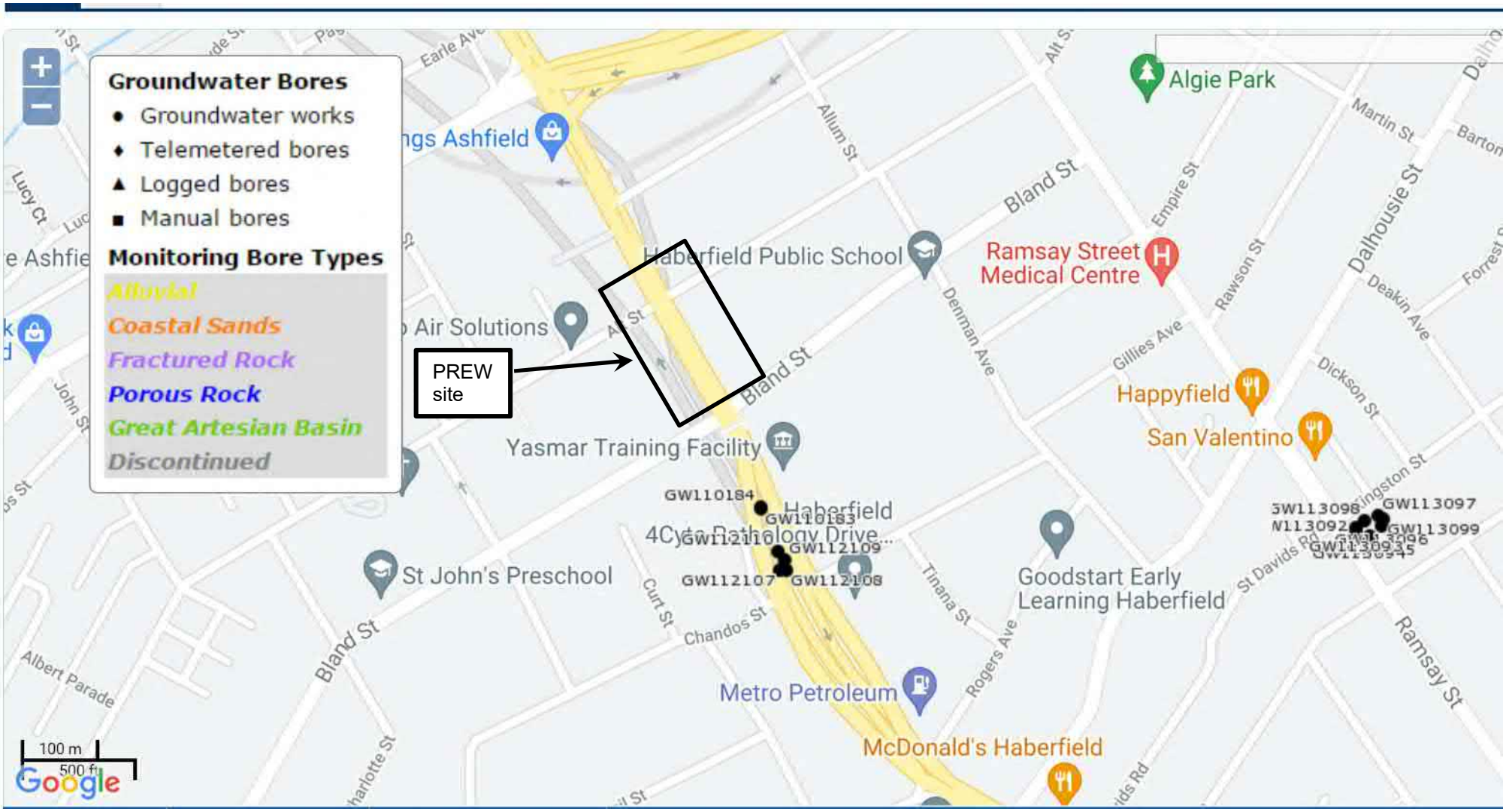
- Comparing the multiple lines of evidence provided by the source data;
- Comparing the supplied data with publicly available data provided by a topographical plan of the local area, the 1:100,000 geological map of Sydney[9], the Australian Soil Resource Information System (**ASRIS**), the WaterNSW website for groundwater bore information[10];
- Checking that the conclusions were consistent with the site history data (**Section 2.2**); and
- Inspecting the PREW site throughout the WestConnex Stage 3A project, with a photographic record provided in **Appendix D**.

The Site Auditor considered the site condition assessment was close to meeting the documentation completeness DQO. The few data gaps identified were:

- Topography; and
- Conditions at site boundaries.

[9] https://gmaps.geoscience.nsw.gov.au/100K/Sydney/
[10] https://realtimedata.waternsw.com.au/water.stm

Figure 2-4 Licensed groundwater bore locations (Source: WaterNSW website)



The Site Auditor considered these data gaps were not a significant matter for the purpose of this site audit because publicly available data was able to be reviewed. This data showed:

- **Topography**: The topographic map (**Figure 2-5**) showed that the PREW site was located in a relatively flat area with an elevation of 22 – 24 mAHD and had a slight northerly dip towards the stormwater drainage channel of Iron Cove Creek. These features were confirmed by a site inspection conducted by the Site Auditor in June 2021; and
- **Conditions at site boundaries**: A site inspection conducted by the Site Auditor in June 2021 found the site boundaries were securely fenced and separated from adjoining residential properties and roadways. There was no abrupt changes in elevation with no obvious evidence of soil erosion, subsidence or ground instability.

Furthermore, the Site Auditor considered data gaps in the site condition data could be addressed by making conservative assumptions in the CSM.

2.4 Preliminary Conceptual Site Model for Contamination

2.4.1 Potential Sources, Contaminants of Concern & APECs

The preliminary CSM provided by the Epic 2019 DSI[11] considered the main contamination risks at the PREW site were posed by imported fill, spills / leaks from a former dry cleaner at or near the Site, operations at the car yards, spillage of hazardous building materials from building demolition work, termite / rodent treatments and buried services. These potential sources were used to identify 11 Areas of Potential Environmental Concern (**APECs**), their potential locations, affected medium and chemicals of concern. The locations of these areas are shown in **Figure 2-6**, and the data summarised in **Table 2-5**.

The Site Auditor considered the available historical and site condition data reviewed in **Sections 2.2** and **2.3** supported these potential sources of contamination, APECs, affected media and contaminants of concern.

2.4.2 Potential Receptors & Exposure Pathways

The potential human / ecological receptors and exposure pathways identified by the Epic 2018 DSI were:

- Construction workers and users (including intrusive maintenance workers) of the Site who may potentially be exposed to contaminants of concern through direct contact and/or inhalation of dust / vapours associated with impacted soils (includes potential future workers at the road construction worksite);
- General public and workers on adjacent land that may potentially be exposed to contaminants through inhalation of dusts / vapours associated with impacted soils;
- Groundwater users of potentially contaminated groundwater for water supply (i.e. groundwater wells and spears); and
- Environmental receptors including Iron Cove Creek, Parramatta River and Sydney Harbour (located 0.7km to the north of the Site).

The Site Auditor considered the available data supported the potential receptors and exposure identified by the Epic 2019 DSI together with potential terrestrial ecosystems at landscaped areas of the road construction worksite.

[11] Section 4, Ref [3]

Figure 2-5 Topographical plan of PREW site and surrounding area (Source: https://en-au.topographic-map.com/maps/janv/Sydney/)

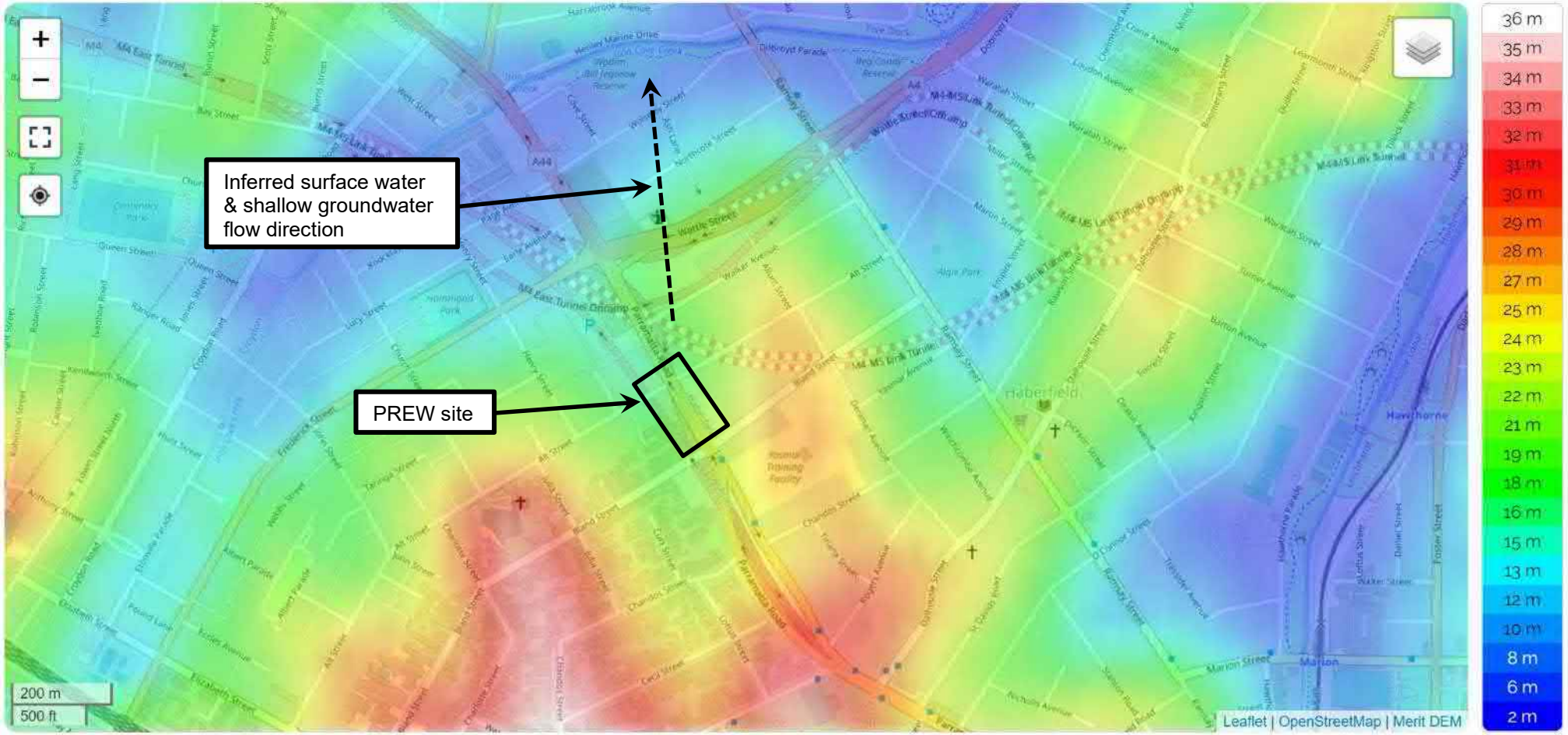


Figure 2-6 APECs Identified by Epic 2019 DSI (Source: Figure F4, Ref [3])

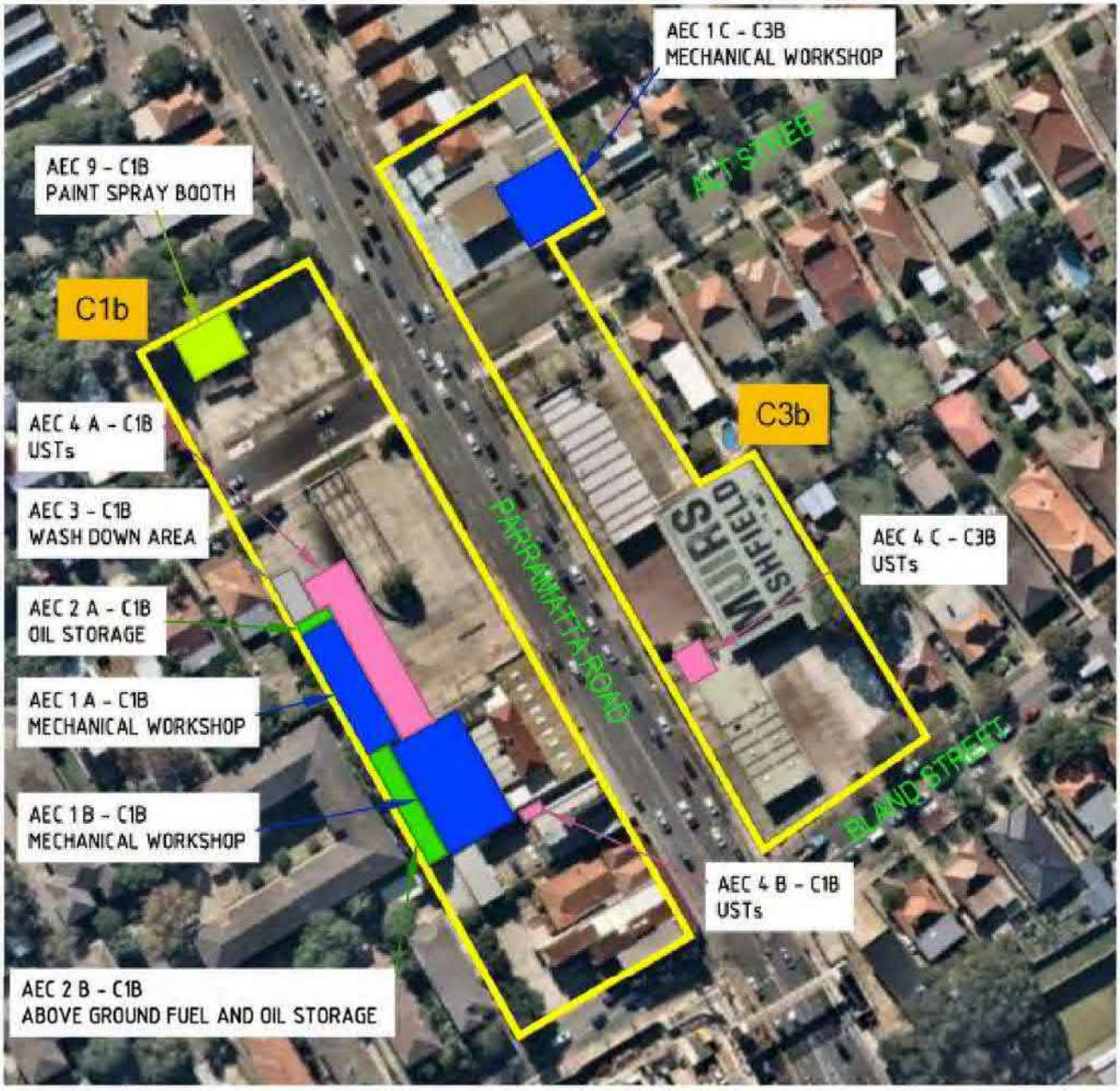


Table 2-5: Potential Sources & Contaminants of Concern for PREW site (page 1 of 2)

AEC	Type	Location	Potentially Contaminating Activity	Medium Affected	Chemicals of Concern
1	Mechanical Workshops	1 A – C1b (North-west) 1 B – C1b (Centre) 1 C – C3b (North)	▪ Surface spills and incidents ▪ Concrete failures ▪ Drainage lines and sediments	Soil & Groundwater	▪ Heavy Metals ▪ TRH ▪ BTEX ▪ PAHs ▪ Phenols ▪ VOCs ▪ Chlorinated solvents (AEC 1)
2	Above Ground Fuel and/or Oil Storage	2 A – C1b (North-west) 2 B – C1b (Centre)	▪ Surface spills and incidents ▪ Concrete failures ▪ Drainage lines and sediments ▪ Inappropriate storage	Soil & Groundwater	
3	Wash Down area	3 - C1b – North west	▪ Surface spills and incidents ▪ Concrete failures ▪ Drainage lines and sediments	Soil & Groundwater	
4	Underground Fuel Storage and associated infrastructure	4A – C1b (north- west) 4B – C1b (Centre) 4C – C3b (South-east)	▪ Surface spills and incidents ▪ Tank integrity failure ▪ Leaks in associate pipework from UST to above ground infrastructure (fuel bowser)	Soil & Groundwater	
5	Imported fill material	Entire Site - C1b & C3b	The quantity (if any) of imported fill across the site is unknown.	Soil (Shallow and at depth)	▪ Heavy Metals ▪ TRH ▪ BTEX ▪ PAHs ▪ VOCs ▪ Asbestos ▪ Phenols ▪ Polychlorinated biphenyls (PCBs) ▪ Organochlorine Pesticides (OCPs) ▪ Organophosphate Pesticides OPPs)
6	Demolition of former buildings potentially containing	Entire Site - C1b & C3b	Historical aerial imagery has indicated that previous site buildings were demolished and developed. There is potential for building	Soil (Shallow layer)	▪ Heavy Metals Inc. Lead ▪ Asbestos

Table 2-5: Potential Sources & Contaminants of Concern for PREW site (page 2 of 2)

	asbestos or lead paint.		products to be present in the site.		
7	Potential dry cleaners historically located on the site and or adjacent to the site.	Entire Site - C1b & C3b	▪ Unknown location ▪ Surface spills and incidents ▪ Tank integrity failure of cleaning products ▪ Disposal of cleaning products down the storm water / sewer line	Soil & Groundwater	▪ Trichlorethylene ▪ Carbon Tetrachloride ▪ Perchloroethylene
8	PFAS Chemicals	Entire Site - C1b & C3b	▪ Surface spills and incidents ▪ Fire suppression	Groundwater	▪ PFAS
9	Paint Spray Booth	9 - C1b	▪ Surface spills and incidents ▪ Dust & air emissions		▪ Heavy Metals ▪ VOCs ▪ SVOCs
10	Termite/rodent /herbicide treatments	Entire Site – C1b & C3b	▪ Under and around building footprints	Soil	▪ OCPs, OPPs, heavy metals
11	Buried services	Entire Site – C1b & C3b	▪ Asbestos pipelines & pits, contaminated backfill, leaks from sewer mains	Soil	▪ Asbestos, TRH, BTEX, PAHs, chlorinated solvents

2.5 Investigation Criteria

2.5.1 Aesthetic

The second check in the EPA decision process was that '*any aesthetic issues relating to site soils have been adequately addressed*'.

The Epic 2019 DSI[12] advised that the NEPM (2013) guideline indicated that further assessment of soil may be required if soil displayed the following aesthetic issues:

- Highly malodorous soils;
- Discoloured chemical deposits or surface staining with chemical waste other than those very minor in nature;
- Large monolithic deposits or otherwise low risk material (e.g. gypsum as powder or plasterboard, cement kiln dust);

[12] Section 6.8, Ref [3]

- Presence of putrescible refuse including material that may generate hazardous levels of methane such as a deep fill profile of green waste or large quantities of timber waste; and
- Soils containing residue from animal burial (e.g. former abattoir sites).

NEPM 2013 further advised that "*Care should be taken to ensure adequate site characterisation, particularly when there is a diverse range of foreign material and associated fill and an appreciable risk inferred from site history (or lack thereof) for the presence of hazardous contaminants. For example, some ash fill may contain PAHs and metals, while other ash deposits may contain no contaminants of concern."*

No aesthetic criteria were specified for the PREW site by the ESAs. The Site Auditor addressed this data gap by reviewing the available data and identifying aesthetic criteria relevant to the preliminary CSM and future land uses.

The future land use of the PREW site was specified as a road construction worksite. The Site Auditor considered the potential aesthetic issues for the PREW site comprised:

- The presence of stained / discoloured, odorous soil conditions;
- Fill containing a significant amount of anthropogenic material;
- Visible ACM fragments in fill material; and
- The presence of buried putrescible waste that had the potential to degrade and generate methane and other types of hazardous gas.

Appropriate criteria that were adopted by the Site Auditor to assess these aesthetic issues comprised:

- No odorous or stained materials were to remain near the groundsurface (say upper 0.3 m);
- Fill material remaining near the groundsurface (upper 0.3 m) was not to contain demolition rubble or other types of anthropogenic material greater than trace quantities (>5%). This criterion was considered to reflect a common condition placed in Development Consents[13], such as '*Contaminated soil, soil for which the contamination status is unknown, waste (including but not limited to concrete/ bricks/ demolition material) is prohibited from being buried, capped, contained or similar onsite as part of any proposed Remediation Action Plan (including under public or private roads and land which will be dedicated or acquired for any other public purpose)'*; and
- No visible asbestos was to remain near the groundsurface (upper 0.1 m), as specified by NEPM (2013) guidelines.

2.5.2 Soil

The third check in the EPA decision process was that '*soils have been assessed against relevant health-based investigation levels and potential for migration of contamination from soils to groundwater has been considered*'.

The sixth check in the EPA decision process was that '*any issues relating to local area background soil concentrations that exceed relevant investigation levels have been adequately addressed in the site assessment report(s).'*

The seventh check in the EPA decision process was that '*the impacts of chemical mixtures have been assessed'*.

The Site Auditor reviewed contamination risks at the PREW site using the NEPM (2013) guidelines, given that they provided the currently EPA-endorsed investigation levels. Where soil investigation levels (**SILs**) were not provided by these guidelines for potential contaminants of concern, reference was made to the CRC-CARE guidelines, the latest US EPA Regional Soil Levels (**RSLs**) or Canadian guidelines.

[13] The Hills Shire Council (24 June 2019) '*Notice of Determination of a Development Application No: 2312/2018/ZB'*

Soil Investigation Levels (**SILs**) were given in the NEPM (2013) guideline for four types of land uses:

A residential with garden / accessible soil (home-grown produce < 10% of fruit and vegetable intake; no poultry), also includes children's day care centres, preschools and primary schools

B residential with minimal opportunities for soil access includes dwellings with fully and permanently paved yard space such as high-rise buildings and flats

C public open space such as parks, playgrounds, playing fields (e.g. ovals), secondary schools and footpaths. It does not include undeveloped public open space (such as urban bushland and reserves) which should be subject to a site-specific assessment where appropriate

D commercial / industrial such as shops, offices, factories and industrial sites.

The land use considered most appropriate for a road construction worksite was Category D commercial / industrial.

Health Investigation Levels (**HILs**) and Environmental Investigation Levels (**EILs**) provided by the Epic 2019 DSI were NEPM (2013) Category D commercial / industrial levels for all soil types and soil depths. No single set of criteria were specified. The Site Auditor addressed this uncertainty by adopting the most conservative (i.e. lowest set of Category D criteria, which corresponded to sandy soils at the ground surface). A summary of the SILs used by the Site Auditor for assessing contamination risks at the PREW site is provided in **Table 2-6**. The adopted soil properties for Site soils used to derive the SILs were:

- Soil type: sand or silt;
- Soil depth: 0 - <1m;
- pH 5.8
- Cation Exchange Capacity (**CEC**): 3.7 cmol/kg;
- Clay content: 1%

2.5.3 Surface and Groundwater

The fourth check in the EPA decision process was that *'groundwater (where relevant) has been assessed against relevant health-based investigation levels and, if required, any potential impacts to buildings and structures from the presence of contaminants considered.'*

The ninth check in the EPA decision process was that '*any evidence of, or potential for, migration of contaminants from the site has been appropriately addressed, including potential risks to off-site receptors, and reported to the site owner or occupier'.*

Prior to 2018, the EPA had endorsed the use of the water quality trigger levels given in the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC & ARMCANZ, 2000). These guidelines provided criteria for aquatic ecosystems (marine and fresh waters), primary industries, recreational water and drinking water. These guidelines were superseded on 29/08/18 by the Australian New Zealand 2018 water quality guidelines (**ANZG**), which was regularly updated online. The NHMRC *"Australian Drinking Water Guidelines"* (**ADWG**) were also regularly updated with the latest version at the time this SAR was issued dated January 2022.

The NEPM (2013) guidelines[14] also advised that *"At the point of use or exposure, GILs may be considered as response levels: the response may include further investigation or management as appropriate. Contaminant levels marginally in excess of the GILs do not imply unacceptability or that a significant human health or ecosystem risk is likely to be present. The decision on whether clean-up is required (and, if so, to what extent) should be based on site-specific assessment. Risk assessment is one aspect of making the decision though other considerations such as practicality, timescale, effectiveness, cost, durability, relevant regulatory policy, and community acceptance are also important"*.

[14] Refer Section 3.5 in NEPM (2013) "*Schedule B6 Guideline on The Framework for Risk-Based Assessment of Groundwater Contamination*"

Table 2-6: Soil Investigation Levels

Substances	HILs (mg/kg)			Commercial / Industrial D EILs (mg/kg)
	Residential A	Recreational C	Commercial / Industrial D	
Metals / Metalloids (in clay)				
Arsenic (total)	100	300	3,000	160
Cadmium	20	90	900	10 (4)
Chromium (III)	--	--	--	310 + bg
Chromium (VI)	100	300	3,600	--
Copper	6,000	17,000	240,000	250 + bg
Lead	300	600	1,500	1,800
Mercury (inorganic)	40	80	730	6.6 (4)
Nickel	400	1,200	6,000	55 + bg
Zinc	7,400	30,000	400,000	330 + bg
Other Organics				
Aldrin + Dieldrin	6	10	45	--
Chlordane	50	70	530	--
Chlorpyriphos	160	250	2,000	--
DDT+DDD+DDE	240	400	3,600	640
Heptachlor	6	10	50	--
PAHs (total)	300	300	4,000	--
Benzo(a)pyrene	3 (BaP TEQ)	3 (BaP TEQ)	40 (BaP TEQ)	1.4 (1)
Phenol (as pentachlorophenol)	100	120	660	--
PCBs (total)	1	1	7	--
Petroleum Hydrocarbons (in sand or silt 0 to <1m)				
TRH F1	40		250	215
TRH F2	110		1,000	170
TRH F3	2,500		3,500	1,700
TRH F4	6,300 (2)	7,400 (2)	10,000	3,300
Benzene	0.5		3	75
Toluene	160		NL	135
Ethyl Benzene	55		NL	165
Xylenes (total)	40		230	95
Naphthalene	3		NL	370
Asbestos				
FA & AF (friable asbestos)	0.001% w/w			--
Bonded ACM	0.01% w/w	0.02% w/w	0.05% w/w	--
All forms of asbestos	No visible asbestos for surface soil			--

Legend:

Applicable SILs for PREW site

Notes:

(1) As given in NEPM erratum at http://nepc.gov.au/system/files/pages/622ffd38-f121-4daf-9ef3-ed7d40af68f2/files/asc-nepm-errata-30april2014.pdf
(2) Direct contact criteria given in Table 4, CRC CARE Technical Report No. 10
(3) BaP TEQ = Benzo(a)pyrene toxicity equivalent
(4) Canadian (Sept 2007) soil quality guideline

As previously discussed in **Section 2.4.2**, the potential receptors of surface or groundwater contamination that needed to be considered by the PREW site were:

- Marine aquatic ecosystems in Iron Cove Creek and the Parramatta River;
- Recreational (i.e. non-potable) use of extracted groundwater and surface water at the Site and off-site; and
- Irrigation use of extracted groundwater and surface water at the Site and off-site.

No surface water bodies were located within or near the PREW site. The groundwater criteria adopted by the Epic 2019 DSI were:

- Marine aquatic ecosystems: The 95% freshwater protection levels from the ANZG values as defined by their website and 99% protection levels for contaminants that were bioaccumulative; and
- Recreational water: Criteria derived by multiplying the NHMRC (August 2018) ADWG criteria by a factor of 10, as recommended by the NEPM (2013) guidelines[15].

The Site Auditor considered these criteria were appropriate together with Irrigation Water criteria given by the long-term irrigation levels given in the ANZECC & ARMCANZ (2000) guidelines. The Site Auditor used the latest criteria that were available in July 2021, which included the US EPA (May 2022) RSLs.

A summary of the criteria used by the Site Auditor for assessing groundwater quality at the PREW site is provided in **Table 2-7**. Note that freshwater criteria provided by the ANZG criteria were used where marine water criteria were not available.

Table 2-7: Groundwater Investigation Levels

Substances	Marine water protection levels (1) (µg/L)	Irrigation criteria (6) (µg/L)	Recreational water criteria (5) (µg/L)
Metals			
Arsenic (V)	13	100	100
Cadmium	0.7	10	20
Chromium (III)	27	100	220,000 (3)
Chromium (IV)	4.4		500
Copper	1.3	200	20,000
Lead	4.4	2,000	100
Mercury (inorganic)	0.1	2	10
Nickel	70	200	200
Zinc	15	2,000	na
Petroleum Hydrocarbons			
TRH (C6-C9)	150 (2)	--	--
TRH (C10-C36)	600 (2)	--	--
Benzene	700	--	10
Toluene	180	--	8,000
Ethylbenzene	80	--	3,000
Xylenes	75 - 350	--	6,000
PAHs			
Naphthalene	70	--	1.2 (3)
Anthracene	PQL (0.1)	--	18,000 (3)
Fluoranthene	1.0	--	8,000 (3)
Phenanthrene	0.6	--	--
Benzo(a)pyrene	0.1	--	PQL (0.01)
Organochlorine Pesticides			
Aldrin	PQL (0.01)	--	PQL (0.01)

[15] Section 2.8 in Schedule B1, NEPM (2013)

Substances	Marine water protection levels (1) (µg/L)	Irrigation criteria (6) (µg/L)	Recreational water criteria (5) (µg/L)
Chlordane	PQL (0.01)	--	20
DDT	PQL (0.01)	--	90
Dieldrin	0.01	--	PQL (0.01)
Heptachlor	PQL (0.01)	--	PQL (0.01)
Organophosphate Pesticides			
Chlorpyrifos	PQL (0.01)	--	100
Fenitrothion	PQL (0.01)	--	70
Glyphosate	PQL (0.01)	--	10,000
Malathion	0.05	--	700
Parathion	PQL (0.01)	--	200
Nutrients			
Ammonia (as NH3)	910	--	5,000
Chlorine	na	--	6,000
Nitrate	na	--	50,000
Total phosphorus (2)	na	--	--
Other Chemicals			
PCBs	0.01-0.3		PQL (0.01)
Chloroethylene (vinyl chloride)	100	--	0.19 (3)
1,1,2-Trichloroethylene	330	--	4.9 (3)
1,1,2,2-Tetrachloroethylene	70		110 (3)

Notes

(1) Marine water protection levels from ANZG guidelines wherever available, otherwise freshwater criteria were used
(2) Dutch (2000) Intervention Level
(3) US EPA RSLs – tapwater criteria (with target cancer risk $1x10^{-6}$ and hazard quotient of 1) multiplied by 10
(4) NHMRC drinking water criteria (health) used wherever possible. Aesthetic criteria not considered since the water use was recreational
(5) ANZECC (2000) LTVs for long-term use (up to 100 years) used for irrigation water criteria where possible
(6) PQL = Practical quantification limit

2.5.4 Soil Vapour Criteria

The fifth check in the EPA decision process was that '*hazardous ground gases (where relevant) have been assessed against relevant health-based investigation levels and screening values.*

The ninth check in the EPA decision process was that '*any evidence of, or potential for, migration of contaminants from the site has been appropriately addressed, including potential risks to off-site receptors, and reported to the site owner or occupier*'.

The EPA endorsed the use of the soil vapour criteria provided in Schedule B1 of the NEPM (2013) guidelines. These guidelines provided a range of criteria for the four main land use types, comprising:

- Interim soil vapour HILs for volatile chlorinated organic compounds based on soil vapour measurements (NEPM Table 1A(2) in mg/m^3);
- Soil HSLs for vapour intrusion based on soil concentrations (NEPM Table 1A(3) in mg/kg);
- Groundwater HSLs for vapour intrusion based on groundwater concentrations (NEPM Table 1A(4) in mg/L); and
- Soil vapour HSLs for vapour intrusion based on soil vapour measurements (NEPM Table 1A(5) in mg/m^3).

The NEPM (2013) guidelines also referred to the CRC CARE source documents[16], which provided additional soil vapour criteria for protecting an intrusive maintenance worker in a shallow trench.

The vapour criteria provided by the Epic 2019 DSI were NEPM (2013) Category D commercial / industrial levels for petroleum hydrocarbons for all soil types, soil depths and groundwater depths. No single set of criteria were specified. The Site Auditor addressed this uncertainty by adopting the most conservative (i.e. lowest set of Category D criteria), which corresponded to sandy soils at the ground surface. The Epic 2019 DSI also did not provide soil vapour criteria based on direct measurements of soil vapour.

For the purpose of this audit, the Site Auditor derived soil vapour criteria using the following conservative assumptions: Soils were sand; depth to source in soil 0 to <1 m; and depth to groundwater 2 to <4 m. A summary of the criteria used by the Site Auditor for the relevant analytes provided in the guidelines is provided in **Table 2-8**.

Table 2-8: Soil Vapour Criteria from NEPM & CRC CARE Guidelines

Contaminant	Commercial / Industrial D	Intrusive Maintenance Worker (Shallow Trench)
Soil vapour (mg/m^3)		
Toluene	4,800	NL
Ethylbenzene	1,300	NL
Xylenes	840	NL
Benzene	4	3,900
Naphthalene	3	NL
F1	680	NL
F2	500	NL
Soil (mg/kg)		
Toluene	NL	NL
Ethylbenzene	NL	NL
Xylenes	230	NL
Benzene	3	77
Naphthalene	NL	NL
F1	250	NL
F2	NL	NL
Groundwater (mg/L)		
Toluene	NL	NL
Ethylbenzene	NL	NL
Xylenes	NL	NL
Benzene	5	NL
Naphthalene	NL	NL
F1	6	NL
F2	NL	NL

Legend: NL = No limit

[16] Friebel E and Nadebaum P (September 2011) "*Technical report No. 10, Health screening levels for petroleum hydrocarbons in soil and groundwater, Part 1: Technical development document*". CRC CARE

2.6 Review of Investigation Data Quality

2.6.1 Overview

Soil investigation data from the PREW site were provided in the Epic 2019 DSI. The scope of field and laboratory work undertaken by the DSI comprised:

- A site inspection conducted on 13/07/18;
- The gauging of 12 existing groundwater wells (GW01 – GW12) on 9/08/18 and 14/08/18;
- The sampling and laboratory testing of groundwater samples collected on 13-14/08/18 from 7 existing wells GW01, GW07-GW12;
- The drilling of 19 boreholes at the C1b area and 17 boreholes at the C3b area in November 2018;
- Photoionisation detector (**PID**) headspace tests and the collection and laboratory testing of soil samples for contaminants of concern;
- Construction of additional groundwater monitoring wells at three boreholes in the C3b area (GW13 – GW15);
- The sampling and laboratory testing of groundwater samples collected on 19-20/11/18 from 7 existing wells GW01, GW07-GW12 and the three additional wells GW13 – GW15;
- Gauging of the 15 groundwater wells on 21/11/18; and
- Assessment of the investigation data and reporting of the findings.

2.6.2 Documentation Completeness DQO

The documentation provided in the Epic 2019 DSI regarding fieldwork and laboratory testing comprised:

- Sample location plan (Figure F2);
- Description of field screening protocols for soil samples (Section 6.1);
- Description of field screening protocols for groundwater samples (Section 6.3);
- Soil investigation and sampling techniques; decontamination procedures; sample preservation methods; field QA/QC; sample management, use of a NATA-registered chemical laboratory/ies (Section 6.2);
- Groundwater investigation and sampling techniques; decontamination procedures; sample preservation methods; field QA/QC; sample management, use of a NATA-registered chemical laboratory/ies (Sections 6.4 & 6.5);
- Borehole and well construction logs (Appendix D);
- PID calibration sheets (Appendix G);
- Groundwater testing field sheets (Appendices E & F);
- A copy of the chain-of-custody (COC) forms acknowledging receipt of date and time, and identity of samples included in shipments (Appendix H);
- Analytical test methods used by the NATA-registered laboratory; laboratory accreditation for analytical methods used; laboratory test certificates (Appendix H);
- QA/QC assessment of the field and laboratory data; description of the surrogates and spikes used; record of holding times and a comparison with method specifications (Section 7);
- Summary of all soil chemical test results in a table that showed sample numbers, sample depth, soil assessment criteria (Tables T1-T5);
- Summary of all groundwater test results (Tables T6 – T8); and
- DQO assessment (Section 7.3).

A data gap identified by the Site Auditor was the absence of copies of field records generated by the site inspection.

Checkprints of the borelogs, laboratory summary tables and figures provided in the Epic 2019 DSI were prepared by the Site Auditor to check the accuracy of the summarised data. Some errors / omissions were identified, these being:

- Section 9.1.1 stated that ACM was observed in the soil sample BH12 (0.2 m), however the borelog did not mention the presence of ACM in the fill.
- The borelog for BH17 incorrectly indicated that a brown gravel layer was natural soil and that the fill depth was 0.2m, whereas Figure F7 is considered to correctly show the fill thickness to include the brown gravelly layer and be 1.20 m.
- The borelog for BH18 showed fill to extend to a depth of 1.2 mbgl but Figure F7 incorrectly showed fill extended to a depth of 0.4 mbgl.
- In Table T1:
  - Soil sample C1b-BH02 3.0m was recorded as being soil (natural) but should been recorded as Shale (bedrock); and
  - Soil sample C1b-BH09 1.0m was recorded as being soil (natural) but should have been recorded as fill.
- In Table T2:
  - Soil sample C3b-BH21 3.0m was recorded as being shale (bedrock) but should been recorded as soil (natural); and
  - Soil sample C1b-BH09 1.0m was recorded as being soil (natural) but should have been recorded as fill.
- The results for four soil samples were not recorded in the lab summary tables, these being:
  - Soil sample DRUM#1: Heavy metals low, TRH/BTEX all non-detect (nd), total PAHs nd, Benzo(a)pyrene (BaP) nd;
  - Soil sample DRUM#2: Heavy metals low, TRH/BTEX all nd, total PAHs 0.5 mg/kg, BaP 0.08mg/kg;
  - Soil sample DRUM#3: Heavy metals low, TRH/BTEX all nd, total PAHs nd, BaP nd;
  - Soil sample DRUM#4: Heavy metals low, TRH/BTEX all nd, total PAHs 0.1 mg/kg, BaP 0.04 mg/kg;
- In Table T3:
  - Soil sample C1b-BH02 3.0m was recorded as being soil (natural) but should been recorded as Shale (bedrock);
  - Soil sample C1b-BH09 1.0m was recorded as being soil (natural) but should have been recorded as fill;
  - Soil samples C1b-BH16 (0.2m), C1b-BH16 (0.5m), C1b-BH18 (1.0m) measured BTEX at nd;
  - Soil sample C1b-BH19 (0.2m) measured VOCs/VHCs at nd
  - Soil samples C1b-BH05 (0.5m) and C1b-BH10 (0.2m) measured TRH F1 at nd
- In Table T4:
  - Soil sample C3b-BH21 3.0m was recorded as being shale (bedrock) but should been recorded as soil (natural);
  - Soil sample C1b-BH25 0.5m was recorded as being soil (natural) but should have been recorded as fill; and
  - BTEX was measured at nd for all soil samples tested.
- In Table T6:

- Groundwater samples C1b-GW01 and C1b-GW08 were not tested for PAHs (except naphthalene) but were tested for BTEX that were measured at non-detectible (**nd**) concentrations; and
- Groundwater sample C1b-GW07 measured Ca^{2+} at 19 mg/L.

The Site Auditor considered these errors and omissions were not significant as they were identified and did not affect the assessment of contamination risk at the Site. Furthermore, the Site Auditor identified numerous typographical errors in the Epic 2019 DSI but considered they were not significant as they were identified and did not affect the assessment of contamination risk at the Site.

2.6.3 Data Completeness and Representativeness

Soils

The Epic 2019 DSI conducted laboratory tests on samples of fill and natural soil from 18 locations spread across the C1b area and from 17 locations spread across the C3b area, as shown in **Figure 2-7**. Summaries of the laboratory tests conducted on fill and soil samples from the C1b and C3b areas are provided in **Tables 2-9** and **2-10**, respectively. These summarises were organised according to the APECs included in the CSM presented in **Table 2-5**.

The Site Auditor considered the data completeness and representativeness DQOs required the sample frequencies and locations achieved at each APEC to meet EPA-guidance. These minimum requirements were:

- Fill layer: The EPA (Sept. 1995) *'Contaminated Sites Sampling Guidelines'* recommended that contamination across a 0.775 ha area (C1b) and a 0.655 ha area (C3b) be characterised using a minimum of 19 and 16 sampling locations, respectively.
- Natural soils: The natural soils underlying the fill layer could be validated at a lower frequency than that given by the EPA (Sept. 1995) *'Contaminated Sites Sampling Guidelines'* provided there was a low risk of migration of contamination from the overlying fill layer, no buried structures were present (e.g. USTs, buried pipes) that could be potential contaminant sources, and groundwater was not contaminated at levels that could impact soils.
- Mechanical workshops and spray booths (APEC1A, 1B & 1C, APEC9): Collect samples at the Site of contamination at depth intervals of 0–200 mm and 200–500 mm. Where pits or hoists were present, sampling should extend below the base of the structure, with a minimum of 5 sample locations for areas 125 to 500 m^2 in size
- ASTs and oil storage areas (APEC2A, 2B): The EPA (April 2014) "*Technical Note – Investigation of Service Station Sites*" recommended one sample per 25 m^2.
- Washdown area (APEC3): Take representative samples in the 0 – 200 mm layer at a frequency of 1 per 25 m^2.
- USTs and associated infrastructure (APEC4A, 4B & 4C): The EPA (April 2014) "*Technical Note – Investigation of Service Station Sites*" recommended:
  - USTs: A minimum two samples per tank or backfill and natural soils, with samples taken at or below base of tank;
  - Fuel feed lines to dispenser: One sample every 5 m of line; and
  - Remote fill points: One sample per fill point.

Figure 2-7 Borehole Locations Used by Epic 2019 DSI at PREW site (Source: Fig F2, Ref [3])

Table 2-9: Summary of Lab Tests on Soil Samples from C1b Area (page 1 of 3)

Location	Sample Depth (m)	Heavy metals [1]	TRH	BTEX	PAHs	Phenols	OCPs	OPPs	PCBs	Asbestos	VOCs/VHCs
Fill Across whole C1b area – APEC5, APEC6, APEC7, APEC9, APEC10 & APEC11											
BH01	0.2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH02	0.2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH03	0.2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH04	0.2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH05	0.2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH07	0.2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH08	1.0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH09	0.2, 0.5, 1.0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH10	0.2, 0.5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH11	1.0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH12	0.2, 0.5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH13	0.2, 0.5, 1.0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH14	0.2	✓								✓	
BH15	0.2, 0.5	✓								✓	
BH16	0.2, 0.5	✓	✓	✓	✓		✓	✓	✓	✓	
BH17	0.2	✓			✓	✓	✓	✓	✓	✓	✓
BH18	0.2, 0.5	✓					✓	✓	✓	✓	
BH19	0.2, 0.5	✓			✓	✓	✓	✓	✓	✓	✓
TOTALS		**18**	**13**	**13**	**15**	**14**	**16**	**16**	**16**	**18**	**14**
Natural soil Across whole C1b area – APEC5, APEC6, APEC7, APEC9, APEC10 & APEC11											
BH01	0.5, 1.0, 2.0, 3.0, 3.7	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH02	0.5, 1.0, 2.0, 3.0, 4.0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH03	0.5, 1.0, 2.0, 3.0, 4.0, 6.5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH04	0.5, 1.0, 2.0, 3.0, 3.7	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH05	0.5, 1.0, 2.0, 2.4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH07	0.5, 1.0, 2.0, 2.7	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH08	2.0, 3.0, 4.0	✓	✓	✓	✓						
BH09	2.0, 3.0, 3.9	✓	✓	✓	✓						✓
BH10	1.0, 2.0, 2.6	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH11	2.0, 2.6	✓	✓	✓	✓						
BH12	1.0, 2.0, 2.6	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH13	2.0, 2.6	✓	✓	✓	✓						
BH14	0.5, 1.0, 2.0, 3.0	✓									
BH15	1.0, 2.0, 3.2	✓									
BH16	1.0, 2.0	✓									
BH17	0.5, 1.0, 2.0, 3.0	✓									
BH18	1.0, 2.0, 3.0	✓	✓	✓	✓						
BH19	1.0, 2.0, 3.0										
TOTALS		**17**	**13**	**13**	**13**	**8**	**8**	**8**	**8**	**8**	**9**

Table 2-9 (cont'd): Summary of Lab Tests on Soil Samples from C1b Area (page 2 of 3)

Location	Sample Depth (m)	Heavy metals [1]	TRH	BTEX	PAHs	Phenols	OCPs	OPPs	PCBs	Asbestos	VOCs/VHCs
Fill at Mechanical Workshop – APEC1A											
BH04	0.2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH09	0.2, 0.5, 1.0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH12	0.2, 0.5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
TOTALS		**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
Fill at Mechanical Workshop – APEC1B											
BH12	0.2, 0.5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH13	0.2, 0.5, 1.0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
TOTALS		**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**
Fill at Oil Storage – APEC2A											
BH09	0.2, 0.5, 1.0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
TOTALS		**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Fill at AST & Oil Storage – APEC2B											
BH12	0.2, 0.5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH13	0.2, 0.5, 1.0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
TOTALS		**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**
Fill at Washdown Area – APEC3											
BH01	0.2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH02	0.2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH03	0.2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
TOTALS		**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
Fill at USTs – APEC4A											
BH03	0.2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH04	0.2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH07	0.2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH08	1.0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH09	0.2, 0.5, 1.0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH10	0.2, 0.5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
TOTALS		**6**	**6**	**6**	**6**	**6**	**6**	**6**	**6**	**6**	**6**
Natural Soil at USTs – APEC4A											
BH03	0.5, 1.0, 2.0, 3.0, 4.0, 6.5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH04	0.5, 1.0, 2.0, 3.0, 3.7	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH07	0.5, 1.0, 2.0, 2.7	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH08	2.0, 3.0, 4.0	✓	✓	✓	✓						
BH09	2.0, 3.0, 3.9	✓	✓	✓	✓						✓
BH10	1.0, 2.0, 2.6	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
TOTALS		**5**	**5**	**5**	**5**	**3**	**3**	**3**	**3**	**3**	**4**

Table 2-9 (cont'd): Summary of Lab Tests on Soil Samples from C1b Area (page 3 of 3)

Location	Sample Depth (m)	Heavy metals [1]	TRH	BTEX	PAHs	Phenols	OCPs	OPPs	PCBs	Asbestos	VOCs/VHCs
Fill at USTs – APEC4B											
BH11	1.0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
TOTALS		**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Natural Soil at USTs – APEC4B											
BH11	2.0, 2.6	✓	✓	✓	✓						
TOTALS		**1**	**1**	**1**	**1**						
Fill at Paint Spray Booth – APEC9											
BH16	0.2, 0.5	✓	✓	✓	✓		✓	✓	✓	✓	
BH17	0.2	✓			✓	✓	✓	✓	✓	✓	✓
BH18	0.2, 0.5	✓					✓	✓	✓	✓	
BH19	0.2, 0.5	✓			✓	✓	✓	✓	✓	✓	✓
TOTALS		**4**	**1**	**1**	**3**	**2**	**4**	**4**	**4**	**4**	**2**

Note: 1. The heavy metals comprise As, Cd, Cr, Cu, Hg, Ni, Pb & Zn.

Legend:

Sampling frequency less than EPA guidance

Table 2-10: Summary of Lab Tests on Soil Samples from C3b Area (page 1 of 2)

Location	Sample Depth (m)	Heavy metals [1]	TRH	BTEX	PAHs	Phenols	OCPs	OPPs	PCBs	Asbestos	VOCs/ VHCs
Fill Across whole C3b Area - APEC5, APEC6, APEC7, APEC9, APEC10 & APEC11											
BH20	0.2, 0.5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH21	0.2, 0.5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH22	0.2, 0.5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH23	0.2, 0.5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH24	0.2, 0.5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH25	0.2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH26	0.2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH27	0.2, 0.5, 1.0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH28	0.2,0.5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH29	0.2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH30	0.2	✓					✓	✓	✓	✓	
BH31	0.2	✓					✓	✓	✓	✓	
BH32	0.2	✓					✓	✓	✓	✓	
BH33	0.2	✓	✓	✓	✓		✓	✓	✓	✓	
BH34	0.2	✓					✓	✓	✓	✓	
BH35	0.2	✓					✓	✓	✓	✓	
BH36	0.2	✓					✓	✓	✓	✓	
TOTALS		**17**	**11**	**11**	**11**	**10**	**17**	**17**	**17**	**17**	**10**

Table 2-10 (cont'd): Summary of Lab Tests on Soil Samples from C3b Area (page 2 of 2)

Location	Sample Depth (m)	Heavy metals [1]	TRH	BTEX	PAHs	Phenols	OCPs	OPPs	PCBs	Asbestos	VOCs/VHCs
Natural soil Across whole C3b Area - APEC5, APEC6, APEC7, APEC9, APEC10 & APEC11											
BH20	1.0, 2.0, 3.0, 4.0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH21	1.0, 2.0, 3.0, 4.0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH22	1.0, 2.0, 3.0, 4.0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH23	1.0, 2.0, 3.0, 4.0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH24	1.0, 1.6	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH25	0.5, 1.0, 1.7	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH26	0.5, 1.0, 1.8	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH27	2.0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH28	1.0, 1.8	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH29	0.5, 1.0, 1.2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH30	0.5, 1.0	✓									
BH31	0.5, 1.0	✓									
BH32	0.5, 1.0	✓									
BH33	0.5, 1.0, 2.0	✓									
BH34	0.5, 1.0, 2.0	✓									
BH35	0.5, 1.0, 2.0	✓									
BH36	0.5, 1.0, 2.0	✓									
TOTALS		**17**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**
Fill at Mechanical Workshop – APEC1C											
BH33	0.2	✓	✓	✓	✓		✓	✓	✓	✓	
BH34	0.2	✓					✓	✓	✓	✓	
BH35	0.2	✓					✓	✓	✓	✓	
BH36	0.2	✓					✓	✓	✓	✓	
TOTALS		**4**	**1**	**1**	**1**	**0**	**4**	**4**	**4**	**4**	**0**
Fill at USTs – APEC4C											
BH21	0.2, 0.5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH22	0.2, 0.5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH23	0.2, 0.5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
TOTALS		**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
Natural Soil at USTs – APEC4C											
BH21	1.0, 2.0, 3.0, 4.0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH22	1.0, 2.0, 3.0, 4.0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BH23	1.0, 2.0, 3.0, 4.0	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
TOTALS		**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

Note: 1. The heavy metals comprise As, Cd, Cr, Cu, Hg, Ni, Pb & Zn.

Legend:

Sampling frequency less than EPA guidance

The Site Auditor considered the laboratory test data for the C1b area met or was close to meeting the minimum soil sampling requirements for:

- Fill layer: Fill was investigated and tested at 13 – 18 sampling locations for the contaminants of concern, with sampling locations spread across the C1b area;
- Natural soils: Natural soil was investigated and tested at 8 - 17 sampling locations for the contaminants of concern, with sampling locations spread across the C1b area;
- Fill layer at mechanical workshop (APEC1A): Fill was investigated and tested at 3 sampling locations for the contaminants of concern, with sampling locations spread across the area;
- ASTs and oil storage areas (APEC2A, 2B): Fill was investigated and tested at 1 and 2 sampling locations at APEC2A and APEC2B for the contaminants of concern, with sampling locations spread across the areas;
- Washdown area (APEC3): Fill was investigated and tested at 3 sampling locations for the contaminants of concern, with sampling locations spread across the area;
- USTs and associated infrastructure (APEC4A): Fill and natural soil (to 6.5 mbgl) were investigated and tested at 3 - 6 sampling locations for the contaminants of concern, with sampling locations spread across the area; and
- Fill layer at spray booth (APEC9): Fill was investigated and tested at 3 – 4 sampling locations for most contaminants of concern, with sampling locations spread across the area.

The Site Auditor considered the available laboratory test data for the C1b area did not meet the minimum soil sampling requirements for:

- Fill layer:
  - No fill samples from locations BH14 and BH15 at the southern end of the C1b area for TRH, BTEX, PAHs, phenols, OCPs, OPPs, PCBs and VOCs/VHCs; and
  - No fill samples from locations BH17 – BH19 at the northern end of the C1b area were tested for TRH / BTEX.
- Fill layer at mechanical workshop (APEC1B): Fill was investigated and tested at 2 sampling locations for the contaminants of concern, which was below the minimum requirement of 5 locations;
- USTs and associated infrastructure (APEC4B): Fill and natural soil (to 2.6 mbgl) were investigated and tested at only one sampling location, which was below the minimum requirement of 2 locations
- Fill layer at spray booth (APEC9): Fill was investigated and tested at 1 sampling locations TRH / BTEX and 2 sampling locations for VOCs/VHCs, which was below the minimum requirement of 5 locations.

The Site Auditor considered the available laboratory test data for the C3b area met or was close to meeting the minimum soil sampling requirements for:

- Fill layer: Fill was investigated and tested at 10 – 17 sampling locations for the contaminants of concern, with sampling locations spread across the C3b area;
- Natural soils: Natural soil was investigated and tested at 10 - 17 sampling locations for the contaminants of concern, with sampling locations spread across the C3b area;
- Fill layer at mechanical workshop (APEC1C): Fill was investigated and tested at 4 sampling locations for heavy metals, OCPs, OPPs, PCBs and asbestos, with sampling locations spread across the area; and
- USTs and associated infrastructure (APEC4C): Fill and natural soil (to 4.0 mbgl) were investigated and tested at 3 sampling locations for the contaminants of concern, with sampling locations spread across the area.

The Site Auditor considered the available laboratory test data for the C3b area did not meet the minimum soil sampling requirements for:

- Fill layer: No fill samples from locations BH30 – BH32, BH34 – BH36 at the northern end of the C3b area were tested for TRH, BTEX, PAHs, phenols and VOCs / VHCs; and
- Fill layer at mechanical workshop (APEC1C): Fill was investigated and tested at one sampling location for TRH, BTEX and PAHs and was not tested at any sampling location for phenols and VOCs/VHCs, which was below the minimum requirement of 5 locations.

The Site Auditor assessed the significance of these deficiencies in the soil sample testing when reviewing soil contamination risks in **Section 2.9**.

Surface Water

No sampling or testing of surface water was undertaken by the Epic 2019 DSI since no surface water bodies were presence at or near the PREW site.

Groundwater

The Epic 2019 DSI conducted laboratory tests on samples of groundwater from 10 locations spread across the PREW site, as shown in **Figure 2-8**. A summary of the total number of groundwater samples (excluding QA samples) chemically tested by the Epic 2019 DSI is provided in **Table 2-11**.

Table 2-11: Summary of Lab Tests on Groundwater Samples

Well	Metals	TPH / BTEX	PAHs	Phenols	VOCs / VHCs	PCBs, OCPs, OPPs	PFAS
GME 1 – 13 & 14/08/18							
C1b – GW01		✓	✓		✓		
C1b - GW07	✓	✓	✓	✓	✓	✓	
C1b – GW08		✓	✓		✓		
C3b – GW09	✓	✓	✓	✓	✓	✓	
C3b – GW10	✓	✓	✓	✓	✓	✓	
C3b – GW11	✓	✓	✓	✓	✓	✓	✓
C3b – GW12	✓	✓	✓	✓	✓	✓	
GME 2 – 19 & 20/11/18							
C1b – GW01	✓	✓	✓	✓	✓	✓	
C1b - GW07	✓	✓	✓	✓	✓	✓	
C1b – GW08	✓	✓	✓	✓	✓	✓	
C3b – GW09	✓	✓	✓	✓	✓	✓	
C3b – GW10	✓	✓	✓	✓	✓	✓	
C3b – GW11	✓	✓	✓	✓	✓	✓	
C3b – GW12	✓	✓	✓	✓	✓	✓	
C3b – GW13	✓	✓	✓	✓	✓	✓	
C3b – GW14	✓	✓	✓	✓	✓	✓	
C3b – GW15	✓	✓	✓	✓	✓	✓	

Figure 2-8 Epic 2019 DSI Groundwater Well Locations at PREW site (Source: Figure F3, Ref [3])

Minimum sampling requirements considered to meet EPA requirements are:

- Installation of a sufficient number of monitoring bores (minimum of 3) to enable triangulation of water levels across the site;
- All bores should penetrate the regional water table to an extent that will allow representative discrete samples to be collected from both shallow and deep groundwater, due to the potential for DNAPLs to be present;
- A minimum of one well should be located up-gradient of potential contaminant sources in order to provide information on background conditions;
- A minimum of one well should be located at or immediately down-gradient of each likely contamination source in order to provide information on the groundwater quality at the likely contaminant source;
- A minimum of one well should be located down-gradient of the potential source zone and near the property boundary in order to provide information on migration potential of contamination, the quality of groundwater leaving the site and the likely presence of a groundwater plume;
- If contamination is found, then install and test a sufficient number of groundwater wells so that the extent of any groundwater plume can be defined;
- Testing a minimum of one round of groundwater samples for the potential contaminants of concern. If contamination is found, then test a sufficient number of monitoring rounds to allow trends to be established for the potential contaminants of concern;
- If groundwater contamination is found and there is a risk to off-site receptors, then conduct sufficient testing to allow the risks to these receptors to be determined;
- Collect and test groundwater samples from a range of depths if a potential contaminant of concern has a density greater than water;
- If a fate-and-transport assessment is required for assessing contamination risks, additional sampling rounds tested over a sufficient period of time need to be undertaken to establish trends and the plume behaviour;
- MNA parameters need to be tested to support a Monitored Natural Attenuation (MNA) assessment, if required; and
- Field tests to determine the hydraulic properties of the strata that form the hydrogeological system.

The Site Auditor considered the test data from the Epic 2019 DSI met or was close to meeting the following minimum sampling requirements for groundwater at the C1b area:

- A sufficient number of wells were installed across the area that allowed the extent of on-site plumes and groundwater levels to be defined, if present;
- All bores that were monitored penetrated the regional water table to an extent that allowed representative discrete samples to be collected;
- One well (GW09) was located up-gradient of potential contaminant sources and provided information on background conditions;
- Two wells (GW07 and GW08) were located around and down-gradient of the UST located at APEC4A at the C1b area;
- One well (GW01) was located on the down-gradient (northern) boundary of the C1b area; and
- One to two sampling rounds were conducted for the potential contaminants of concern.

The Site Auditor considered the laboratory test data for the C1b area did not meet the minimum sampling requirements for:

- No wells were located near the UST at APEC4B; and
- No groundwater samples from the C1b area were tested for PFAS.

The Site Auditor considered the test data from the Epic 2019 DSI met or was close to meeting the following minimum sampling requirements for groundwater at the C3b area:

- A sufficient number of wells were installed across the area that allowed the extent of on-site plumes and groundwater levels to be defined, if present;
- All bores that were monitored penetrated the regional water table to an extent that allowed representative discrete samples to be collected;
- One well (GW09) was located up-gradient of potential contaminant sources and provided information on background conditions;
- Three wells (GW13 to GW15) were located around and down-gradient of the UST located at APEC4C at the C3b area;
- Two wells (GW11 & GW12) were located on the down-gradient (northern) boundary of the C3b area; and
- One to two sampling rounds were conducted for the potential contaminants of concern.

The Site Auditor considered the available laboratory test data for the C3b area did not meet the minimum sampling requirements for:

- Only one groundwater sample from the C3b area (GW11) was tested for PFAS.

The Site Auditor assessed the significance of these deficiencies in the groundwater sample testing when reviewing groundwater contamination risks in **Section 2.11.2**.

Ground Gas

The Epic 2019 DSI did not collect and test soil vapour samples from sampling locations at the PREW site. The Site Auditor considered the absence of such testing was not a significant matter for the purpose of this site audit since the available data indicated there was a low risk of volatile hydrocarbon contamination at the Site. This is because:

- The borelogs reported no widespread odorous or stained soil, the few exceptions being:
  - BH03: Moderate odour in fill to 1.5 mbgl;
  - BH09: Moderate odour in fill to 1.2 mbgl; and
  - BH21: Minor hydrocarbon (**HC**) odour and black stains in fill and natural soil at 0.5 – 1.4 mbgl
- PID headspace tests conducted in the field on soil samples measured low to non-detectible concentrations consistent with background conditions (i.e. <10 ppm) at practically all locations, the few exceptions being:
  - BH03: PID 108-148 ppm in fill at 0.5 – 1.2 mbgl; and
  - BH09: PID 96 ppm in fill at 0.6 mbgl.
- The investigation tested fill and natural soil samples for TRH (C6-C9), BTEX, naphthalene, VHCs and other VOCs at 9 – 14 locations in the C1b area and at 10 - 11 locations in the C3b area
- Practically all soil samples measured volatile hydrocarbon concentrations at non-detectible concentrations, with the few detections having low concentrations well below Residential A HILs
- The investigation tested groundwater for TRH (C6-C9), BTEX and naphthalene at 10 locations spread across the PREW site
- All groundwater samples were described as having no sheen
- Most groundwater samples were recorded as showing no physical signs of petroleum hydrocarbon contamination, the exceptions being:
  - GW07: Very slight HC odour;
  - GW08: Very slight HC odour;

- GW13: Mild HC / sulfur odour; and
- GW14: Slight HC odour.

- All groundwater samples measured non-detectible volatile hydrocarbon concentrations.

2.6.4 Data Comparability

Soils

The documentation provided in the Epic 2019 DSI indicated that the data comparability DQO was largely met for the soil samples collected at the PREW site because:

- Boreholes were used to assess the fill stratigraphy, the extent of fill across the Site, physical presence of contamination;
- The stratigraphic conditions at the sample locations were properly described by the test pit logs;
- Appropriate soil sampling method;
- Appropriate containers (including preservation) used for soil samples;
- Appropriate sample storage and transportation;
- Appropriate management of chain of custody forms;
- Samples tested within recommended holding times;
- The laboratory test methods complied with NEPM (2013) guidelines; and
- Appropriate PQL's for the analytes tested.

Deficiencies in meeting the data comparability DQO in the Epic 2019 DSI comprised:

- No test pits were used to investigate the presence of ACM fragments in fill across the site; and
- No copies of field records generated by site inspections.

The Site Auditor assessed the significance of these deficiencies when reviewing the soil contamination assessment in **Section 2.9**.

Groundwater

The documentation provided in the Epic 2019 DSI indicated that the data comparability DQO was largely met for the groundwater samples collected at the PREW site because:

- Gauging of pre-existing wells suggested that they were likely to have been properly designed and constructed;
- Groundwater well construction logs were provided that showed the wells installed by the investigation were likely to have been properly designed and constructed;
- Data provided by the groundwater sampling field sheets indicated that an appropriate groundwater sampling method was used for most contaminants of concern;
- Appropriate containers (including preservation) used for groundwater samples;
- Appropriate sample storage and transportation;
- Appropriate management of chain of custody forms;
- Samples tested within recommended holding times;
- The laboratory test methods complied with NEPM (2013) guidelines; and
- Appropriate PQL's for the analytes tested.

Deficiencies in meeting the data comparability DQO in the Epic 2019 DSI comprised:

- No mention was made in the report that special sampling procedures were used to collected samples for PFAS testing.

The Site Auditor assessed the significance of these deficiencies when reviewing the groundwater contamination assessment in **Section 2.11.2**.

2.6.5 Precision & Accuracy

The Epic 2019 DSI[17] considered the results of the QA/QC programme provided an acceptable degree of confidence in the analytical program completed and that there were no issues that would preclude using the analytical data.

The documentation provided in the Epic 2019 DSI indicated that the precision and accuracy DQIs were met or close to being met for the soil and groundwater samples tested because:

- Use of properly trained and qualified field personnel;
- 4 - 6 blind field duplicate soil samples from the C1b area were inter- and intra-laboratory tested for heavy metals, TRH, BTEX and PAHs, which was close to meeting the 10% sampling frequency;
- 4 - 6 blind field duplicate soil samples from the C3b area were inter- and intra-laboratory tested for heavy metals, TRH, BTEX and PAHs, which was close to meeting the 10% sampling frequency;
- 3 blind field duplicate groundwater samples were inter- and intra-laboratory tested in the first and second GMEs for heavy metals, which met the 10% sampling frequency;
- A trip blank was used for first GME and tested for BTEX;
- A rinsate blank was tested for heavy metals for the second GME;
- Laboratory QC criteria were achieved; and
- Field data was consistent with laboratory data.

2.7 Aesthetic Issues

The second check in the EPA decision process was that '*any aesthetic issues relating to site soils have been adequately addressed'*.

The location and extent of fill at the PREW site was assessed by the Epic 2019 DSI, with a plot of fill thickness (excluding concrete pavement) measured at each sampling location provided in **Figure 2-9**. The location of aesthetic impacts in fill and natural soils, as recorded in borehole logs, is shown in **Figure 2-10**.

C1b Area

For the C1b area, the Epic 2019 DSI[18] advised that:

- The area was covered by a 0.2 – 1.5 m thick fill layer consisting of brown sand mixed with gravel and some building waste material (bricks / concrete);
- The NW part had shallower fill with deeper fill in the central area;
- Building rubble which included bricks and tiles was observed in one of the boreholes under the former mechanical workshop. Push tube refusal was encountered at BH06 on concrete which was likely to be a secondary slab;
- ACM was observed in fill at BH12 (0.2m) along the western property boundary; and
- Given that the site had undergone various developments since 1943, ACM maybe present below the site's hardstand from previous demolition or filling activities.

[17] Section 7, Ref [3]
[18] Sections 8.1.1 & 9.1.1, Ref [3]

Figure 2-9 Location and Depth of Fill Across PREW site (Source: Figure F7, Ref [3])

Figure 2-10 Aesthetic Impacts in Fill and Natural Soils Across PREW site

The Site Auditor considered the weight of evidence supported the conclusions regarding aesthetic conditions at the C1b area made in the Epic 2109 DSI. The Site Auditor also considered the available data indicated that:

- The fill layer at the C1b area was generally 0.1 – 0.8 m thick, but localised areas of deeper fill over 1.0m thick were present. These localised deeper areas were likely to be associated with USTs and other types of underground structures such as car lift hoists, waste pits, buried services and building foundations. The ESAs were only able to identify the presence of a few of these locations with more unknown deeper fill areas likely to be present;
- The soils surrounding the two known USTs were likely to have a slight to moderate hydrocarbon odour and be possibly stained;
- There was potential for unknown USTs / underground structures to be present; and
- Scattered ACM fragments were likely to be present in the fill layer given the unknown origin of the fill, the long commercial / industrial history of the area, and the identification of ACM in a sample recovered from BH12.

C3b Area

For the C3b area, the Epic 2019 DSI[19] advised that:

- The area was covered by a 0.2 – 1.2 m thick fill layer consisting of brown and dark grey coarse sand with some small irregular gravel; and
- The fill in the western part was slightly deeper, with the deepest fill observed around the UST located on the western central area adjacent to the small showroom.

The Site Auditor considered the weight of evidence supported the conclusions regarding aesthetic conditions at the C3b area made in the Epic 2109 DSI. The Site Auditor also considered the available data indicated that:

- The fill layer at the C3b area was generally 0.2 – 0.6 m thick, but localised areas of deeper fill over 1.0m thick were present. These localised deeper areas were likely to be associated with USTs and other types of underground structures such as car lift hoists, waste pits, buried services and building foundations. The ESAs were only able to identify the presence of one such location with more unknown deeper fill areas likely to be present;
- The soil surrounding the one known UST was likely to have a slight to moderate hydrocarbon odour and be possibly stained;
- There was potential for unknown USTs / underground structures to be present; and
- Scattered ACM fragments were likely to be present in the fill layer given the unknown origin of the fill, the long commercial / industrial history of the area, and the identification of ACM in a sample recovered from BH12.

Site Auditor Review

The Epic 2019 DSI[20] concluded that fill present across the PREW site was generally less than 1.0m thick, with the central C1b area greater than 1.0 m thick. Construction and demolition (**C&D**) waste was observed at numerous locations across both the C1b and C3b areas (e.g. BH02, BH06, BH08, BH10, BH11, BH12, BH13 and BH27). It was anticipated that fill material would be present in the vicinity of the USTs, pits, building foundations and buried services, and that further assessment would be needed for the removal of fill material in accordance with the EPA Waste Classification guidelines;

The Site Auditor considered the available data supported the conclusion made in the Epic 2019 DSI. The Site Auditor also considered the weight of evidence supported the conclusion that the aesthetic condition of soils at the PREW site posed no significant constraint to the future use of the land as a road construction worksite provided:

[19] Sections 8.2.1 & 9.2.1, Ref [3]
[20] Section 10.1, Ref [3]

- Fuels and other wastes in UST / workshop infrastructure were removed and disposed by suitably licensed contractors in accordance with EPA requirements. Copies of liquid waste disposal dockets were to be retained;
- The USTs and other underground structures associated with fuel / oil storage were decommissioned and removed in accordance with SafeWork NSW and EPA requirements. Copies of tank destruction certificates were to be obtained from suitably licensed tank receiving companies. Excavations were to be validated in accordance with EPA guidance;
- Soil contamination found during the removal of USTs or during other excavation work at the site was remediated in accordance with EPA guidance;
- No asbestos was left on the ground surface;
- The ground surface remained predominantly sealed by concrete pavements and/or building slabs;
- In the event that pavements / slabs covering the ground surface were removed and the underlying soils exposed, a grid-based asbestos survey of the ground needed to be undertaken in accordance with the NEPM (2013) Schedule B2 guidelines;
- If a structure was to be demolished, then a HAZMAT would be undertaken and all hazardous building materials removed prior to demolition. Demolition work would then be undertaken in accordance with Australian Standard AS2601-2001, with an asbestos clearance of the area undertaken by a suitably licensed occupational hygienist/environmental consultant and a clearance certificate issued prior to the commencement of other site work; and
- The land use was not changed unless it was subject to a further site audit.

2.8 Background Contaminant Levels

The sixth check in the EPA decision process was that '*any issues relating to local area background soil concentrations that exceed relevant investigation levels have been adequately addressed in the site assessment report(s).'*

The ESAs provided no assessment of background contaminant levels for soils at the PREW site. The Site Auditor addressed this deficiency by adopting the conservative assumption that all contamination at the Site was from past activities at the site and needed to be considered in the contamination risk assessment.

The Epic 2019 DSI did not derive background heavy metal concentrations to be used to define the EIL D criteria for chromium (III), copper, nickel and zinc at the PREW site, as required by the NEPM (2013) guidelines and **Table 2.6**. The Site Auditor addressed this data gap by deriving representative background concentrations based on the laboratory tests on natural soil samples collected and tested by the Epic 2019 DSI. These concentrations and the resultant EILs were:

- Chromium (III) = 30 mg/kg ➔ EIL D = 340 mg/kg
- Copper = 100 mg/kg ➔ EIL D = 350 mg/kg
- Nickel = 15 mg/kg ➔ EIL D = 70 mg/kg
- Zinc = 100 mg/kg ➔ EIL D = 430 mg/kg

2.9 Soil Contamination

The third check in the EPA decision process was that '*soils have been assessed against relevant health-based investigation levels and potential for migration of contamination from soils to groundwater has been considered*'.

2.9.1 Exceedances of SILs

The Epic 2019 DSI found that that practically all soil samples were not contaminated above the Commercial / Industrial HIL D criteria at the 18 sampling locations investigated at the C1b area and the 17 locations investigated at the C3b area. The one exception was a small quantity of asbestos found in the C1b area fill sample at BH12 (0.2m). While this contamination was not visible at the ground surface (location covered by concrete pavement) and concentration data was not available, the Site Auditor considered it prudent to assume asbestos exceeded the HIL D criteria. The location of this exceedance is shown in **Figure 2-11**.

Of the 18 sample locations at the C1b area, exceedances of the EILs occurred at 8 locations (i.e. 44%). These exceedances were for TRH (F2 & F3), BaP, and some heavy metals (copper, zinc). Practically all the exceedances were in fill. These exceedances were:

- BH03 (0.2m) – Fill: TRH F2 = 420 mg/kg (EIL 170 mg/kg)
- BH05 (0.2m) - Fill: BaP = 9.2 mg/kg (EIL 1.4 mg/kg);
- BH05 (0.5m) – Natural soil: BaP = 8.2 mg/kg (EIL 1.4 mg/kg)
- BH09 (0.5m) – Fill: TRH F2 = 180 mg/kg (EIL 170 mg/kg);
- BH11 (1.0m) – Fill: BaP = 1.7 mg/kg (EIL 1.4 mg/kg); TRH F3 = 16,000 mg/kg (EIL 1,700 mg/kg)
- BH13 (0.5m, 1.0m) – Fill: Copper = 650 mg/kg (EIL 350 mg/kg); Zinc = 1,900 and 730 mg/kg (EIL 430 mg/kg);
- BH17 (0.2m) – Fill: BaP = 5.1 mg/kg (EIL 1.4 mg/kg); and
- BH18 (0.5m) – Fill: Zinc 1,700 mg/kg (EIL 430 mg/kg).

No soil samples collected and tested from the C3b area exceeded the EILs.

The Epic 2019 DSI identified the location of the asbestos contamination at BH12 and the TRH contamination at BH03, BH09 and BH11, and showed this in their Figure F8. However, Epic failed to identify the other locations that exceeded the EILs for BaP, copper and zinc. The Site Auditor addressed this data gap by showing the locations of all EIL exceedances at the PREW site in **Figure 2-12**.

With respect to BaP exceedances of the NEPM (2013) low reliability EIL 1.4 mg/kg for commercial / industrial land, the Site Auditor considered that subsequent research showed this EIL was overly conservative and that a more realistic high reliability EIL was given by the Canadian EPA criteria of 72 mg/kg. This research was documented in a report released by CRC CARE in 2017[21]. Consequently, the Site Auditor considers the BaP exceedances of the NEPM EIL of 1.4 mg/kg were not significant for the purpose of protecting terrestrial ecosystems at the PREW site, since the maximum BaP concentration measured was 9.2 mg/kg, which was well below the Canadian criteria.

[21] CRC CARE (January 2017) '*Technical Report No. 39, Risk-based management and remediation guidance for benzo(a)pyrene*'

Figure 2-11 HIL D Exceedances at PREW Site

Figure 2-12 EIL D Exceedances at PREW site

2.9.2 Soil Contamination Assessment

The Epic 2019 DSI[22] concluded that:

- The investigation found no evidence of broadscale soil contamination at the PREW site exceeding Commercial / Industrial D criteria;
- ACM was present below the C1b area hardstand caused by previous demolition or filling work;
- There was potential for fill material at the Site to contain bonded asbestos fragments that were not easily detected by borehole investigations used by the DSI. It was not practical for test pits to have been excavated by the DSI in 2019 due to access restrictions posed by buildings and pavements that covered practically the whole Site;
- The source of TRH contamination in fill at BH03 and BH09 was the UST and oil separator at APEC 4A and APEC 1A, respectively. The source of TRH contamination in fill at BH11 was the operation of the mechanical workshop at APEC 1B;
- There was potential for localised petroleum hydrocarbon contamination to be present in the vicinity of USTs, fuel lines, filling points and pits, which may not have been identified by the investigation; and
- Underground services were likely to be spread out across the Site due to its long history of commercial / industrial land use and various developments that had occurred. It was anticipated that some buried services will be associated with the bulk fuel storage and infrastructure associated with mechanic workshops. Some buried services were anticipated to also contain asbestos and waste material that would need to be removed in accordance with Australian Standards, Safework NSW requirements and EPA guidelines.

The Site Auditor considered the weight of evidence as reviewed by this SAR supported these conclusions made in the Epic 2019 DSI provided:

- Future activities were undertaken at the PREW site that recognised the potential for unknown contamination to be present. This was because of:
  - The inherent limitations of investigations to identify all soil contamination that may be present at a Site;
  - There was potential for unknown USTs / underground structures to be present;
  - Data gaps in the sampling that was undertaken by the Epic 2019 DSI, as identified in **Section 2.6.2**; and
  - The inability to assess the location and extent of asbestos contamination in fill due to reliance on borehole and the inability to excavate test pits.

  Such risks could be managed by an Unexpected Finds Protocol (**UFP**).
- Fuels and other wastes in UST / workshop infrastructure were removed and disposed by suitably licensed contractors in accordance with EPA requirements. Copies of liquid waste disposal dockets were to be retained
- The USTs and other underground structures associated with fuel / oil storage were decommissioned and removed in accordance with SafeWork NSW and EPA requirements. Copies of tank destruction certificates were to be obtained from suitably licensed tank receiving companies. Excavations were to be validated in accordance with EPA guidance
- Soil contamination found during the removal of USTs or during other excavation work at the site was remediated in accordance with EPA guidance
- No asbestos was left on the ground surface
- The groundsurface remained predominantly sealed by concrete pavements and/or building slabs

[22] Sections 9.1.1, 9.2.1 & 10.1, Ref [3]

- In the event that pavements / slabs covering the ground surface were removed and the underlying soils exposed, a grid-based asbestos survey of the ground needed to be undertaken in accordance with the NEPM (2013) Schedule B2 guidelines
- If a structure was to be demolished, then a HAZMAT needed to be undertaken and all hazardous building materials removed prior to demolition. Demolition work then needed to be undertaken in accordance with Australian Standard AS2601-2001, with an asbestos clearance of the area undertaken by a suitably licensed occupational hygienist/environmental consultant and a clearance certificate issued prior to the commencement of other site work
- The land use was not changed unless it was subject to a further site audit.

2.10 Chemical Mixtures

The seventh check in the EPA decision process was that '*the impacts of chemical mixtures have been assessed*'.

The ESAs did not provide an assessment of risks posed by chemical mixtures. The main contaminants of concern, in terms of additive risks posed by chemical mixtures, were contaminants considered to be carcinogenic. These contaminants of concern at the PREW site comprised benzene, PCBs, OCPs, PAHs (principally BaP) and chlorinated solvents.

The Site Auditor assessed the available data and considered there was a low risk of additional health risks posed by chemical mixtures because all samples measured low (below HIL D criteria) to non-detectible concentrations for these contaminants.

2.11 Surface Water & Groundwater Contamination

The fourth check in the EPA decision process was that *'groundwater (where relevant) has been assessed against relevant health-based investigation levels and, if required, any potential impacts to buildings and structures from the presence of contaminants considered.'*

The ninth check in the EPA decision process was that '*any evidence of, or potential for, migration of contaminants from the site has been appropriately addressed, including potential risks to off-site receptors, and reported to the site owner or occupier'.*

Contamination risks to surface water were not an issue for the PREW site since no surface water bodies were located at or near the site,

2.11.1 Groundwater levels & flow direction

The Epic 2018 PSI[23] advised that 13 pre-existing groundwater were identified at the PREW site that had apparently been installed as part of an earlier investigation conducted as part of the property acquisition process by the NSW Government:

- For the C1b area, 9 groundwater monitoring wells were present, with 6 of these wells located in the NW corner and targeted USTs and associated infrastructure. The remaining 3 wells were spread across the remainder of the area. One well on the southern boundary had been concreted over and was unable to be opened; and
- For the C3b area, 4 groundwater monitoring wells were present, with 3 of the wells located along the eastern boundary and the remaining well was located to the north of a UST.

The locations of these pre-existing wells are shown in **Figure 2-13**.

[23] Sections 2.4 & 3, Ref [2]

Figure 2-13 Locations of Pre-existing Groundwater Monitoring Wells (Source: Figure F2, Ref [2])

The Epic 2018 PSI conducted a groundwater monitoring event (**GME**) on 9/08/18 that involved measuring the standing water level (**SWL**), total depth and screened interval for each pre-existing well. Three additional groundwater monitoring wells were installed by Epic as part of the DSI and a second round of well dipping was conducted on 20 - 21/11/2018. A summary of groundwater monitoring data obtained by the PSI for the pre-existing and new wells is presented in **Tables 2-12 and 2-13**.

In most cases during the development of the existing groundwater monitoring well network, Epic reported very slow recharge of all wells, and was only able to purge very small volumes of groundwater until the monitoring well was dry. A plot of groundwater equipotential levels across the PREW site, as measured by the second GME, was prepared by the Epic 2019 DSI, with a copy provided in **Figure 2-14**.

Table 2-12 Groundwater Conditions Measured by Two GMEs (Source: Table 7, Ref [3])

Identify	Standing Water Level (SWL) mbgl 09/08/2018	Standing Water Level (SWL) mbgl 14/08/2018	Standing Water Level (SWL) mbgl 20 & 21/11/2018	Total Depth (TD) mbgl	Screened Interval (estimated)
Existing Groundwater Monitoring Wells (Installed by Others)					
GW01	10.44	11.10	10.37	11.48	No screen recorded less than 8.0 mbgl
GW02	Dry	Dry	Dry	5.90	2.90 – 5.90 (3m screen)
GW03	Dry	Dry	Dry	5.50	2.80 – 5.50 (2.7m screen)
GW04	Dry	Dry	Dry	11.55	No screen recorded less than 8.0 mbgl
GW05	Dry	Dry	Dry	5.93	2.93 – 5.93 (3m screen)
GW06	Dry	Dry	Dry	10.45	7.45 – 10.45 (3m screen)
GW07	2.61	3.96	2.13	5.00	2.00 – 5.00 (3m screen)
GW08	8.68	9.0	9.0	9.40	6.90 – 9.40 (2.5m screen)
GW09	1.99	4.24	1.93	4.94	1.94 – 4.94 (3m screen)
GW10	6.45	5.94	4.85	8.00	5.00 – 8.00 (3m screen)
GW11	2.55	2.99	2.10	4.55	1.55 – 4.55 (3m screen)
GW12	7.64	7.79	7.44	9.95	7.90 – 9.90 (3m screen)
New Groundwater Monitoring Wells (Installed by Epic)					
GW13	-	-	3.58	6.00	3.00 – 6.00 (3m screen)
GW14	-	-	4.49	6.00	3.00 – 6.00 (3m screen)
GW15	-	-	3.13	6.00	3.00 – 6.00 (3m screen)

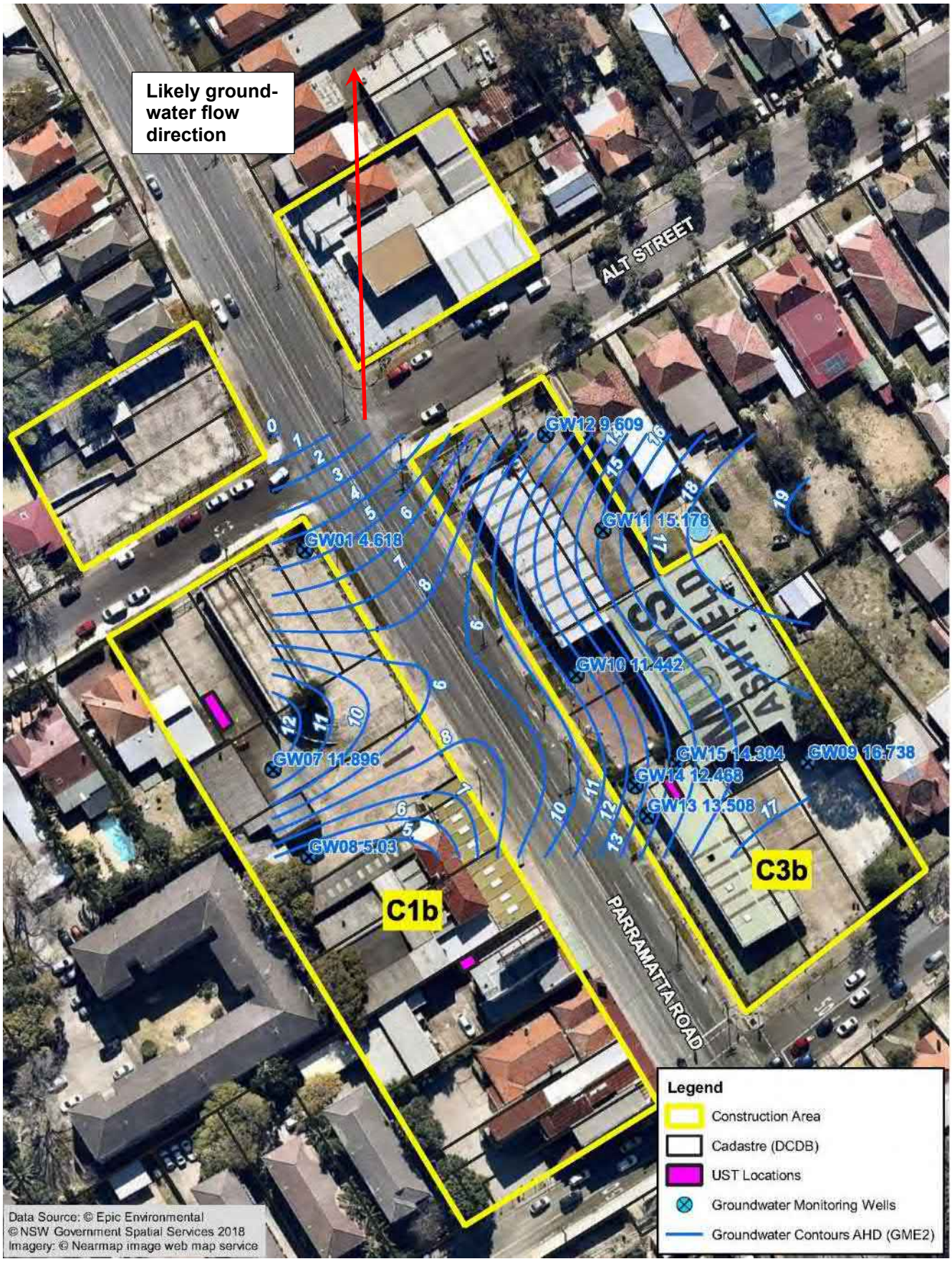
Note: Screen intervals for the existing groundwater monitoring wells were measured in the field, no existing groundwater well installation logs were reviewed by Epic.

Table 2-13 Survey of Groundwater Monitoring Well Network (Source: Table 8, Ref [3])

Well ID	Easting	Northing	R.L (AHD)	SWLs (AHD)	
				GME 1 14 Aug 2018	GME 2 20 & 21 Nov 2018
GW01	327161.375	6249638.354	14.988	3.888	4.618
GW02	327128.554	6249619.656	13.421	NA	NA
GW03	327130.509	6249611.548	13.406	NA	NA
GW04	327141.814	6249615.799	13.664	NA	NA
GW05	327134.682	6249604.802	13.47	NA	NA
GW06	327149.425	6249608.487	13.733	NA	NA
GW07	327155.853	6249597.283	14.026	10.066	11.896
GW08	327159.047	6249581.538	14.03	5.030	5.030
GW09	327263.128	6249598.036	18.668	14.428	16.738
GW10	327215.794	6249613.576	16.292	10.352	11.442
GW11	327225.801	6249636.305	17.278	14.288	15.178
GW12	327215.174	6249655.719	17.049	9.259	9.609
GW13	327230.265	6249585.679	17.088	NA	13.508
GW14	327227.227	6249591.062	16.958	NA	12.468
GW15	327235.47	6249598.493	17.434	NA	14.304

NA = No groundwater observed in the monitoring wells

Figure 2-14 Groundwater Equipotential Plot (Source: Figure F6, Ref [2])



The Epic 2019 DSI[24] concluded that for the C1b and C3b areas:

- The regional groundwater system was expected to be present in the natural bedrock strata (Hawksbury Sandstone) and that shallower transient / perched / discontinuous groundwater may be present within shallow fill or bedrock (i.e. shale);
- Recharge of shallow groundwater was expected to be low due to the surrounding built environment, impermeable nature of clayey soils and shales observed at the site, and the slow recharge of groundwater monitoring wells observed during field sampling; and
- For these reasons, there was a low risk that contaminated groundwater, if present, would migrate from the site and that any such contamination was likely to remain localised to source areas.

The Site Auditor considered the weight of evidence supported these conclusions.

2.11.2 Intrinsic groundwater quality

The Epic 2019 DSI measured field water quality parameters during well purging with a summary of the water quality measurements and field observations provided in **Table 2-14**.

Table 2-14 Groundwater Field Parameters (Source: Tables 24 & 27, Ref [3])

Well ID	pH		EC (µS/cm)		DO (mg/L)		Redox (mV)		Temp (°C)	
	GME 1	GME 2	GME 1	GME 2	GME 1	GME 2	GME 1	GME 2	GME 1	GME 2
GW01	NA	6.26	NA	6,446	NA	1.03	NA	11.2	NA	24.6
GW07	4.83	4.51	7,862	7,065	2.25	0.31	514.7	293.7	21.9	23.9
GW08	6.01	NA	6,122	NA	0.16	NA	27.3	NA	21.1	NA

NA = No field parameters were recorded due to low SWLs reported in the well

C1b Area

Well ID	pH		EC (µS/cm)		DO (mg/L)		Redox (mV)		Temp (°C)	
	GME 1	GME 2	GME 1	GME 2	GME 1	GME 2	GME 1	GME 2	GME 1	GME 2
GW09	4.57	4.68	845	689	3.43	0.26	222.0	230.6	18.2	19.3
GW10	4.71	4.43	3,643	2,406	2.64	0.24	273.1	330.7	20.5	21.6
GW11	4.48	4.57	370	3,410	3.72	1.96	523.0	541.5	19.1	22.4
GW12	7.80	6.86	3,511	4,450	2.41	0.20	268.1	-62	19.5	22.5
GW13	-	5.17	-	625	-	0.74	-	183.4	-	20.8
GW14	-	4.65	-	1,164	-	1.05	-	380	-	21.3
GW15	-	4.88	-	1,360	-	0.59	-	259	-	20.9

NA = No field parameters were recorded due to low SWLs reported in the well

C3b Area

The Epic 2019 DSI[25] concluded that areas C1b and C3b, the intrinsic quality of on-site groundwater was not suitable for beneficial reuse because it was slightly acidic to neutral and typically brackish. The Site Auditor considered this conclusion was appropriate since:

- For drinking water, the ADWG guidelines recommended a pH of 6.5 – 8.5 and considered an EC of 1,875 µS/cm was unacceptable[26]; and
- There was a low risk that groundwater would be extracted directly from the Site and used for recreational or irrigation water.

[24] Sections 8.1.3 & 8.2.3, Ref [3]
[25] Sections 8.1.4 & 8.2.4, Ref [3]
[26] The ADWG converts EC (µS/cm) to TDS (mg/L0 by multiplying EC by 0.64

2.11.3 Groundwater contamination

The Epic 2019 DSI sampled and tested groundwater over two GMEs conducted in August and November 2018. Seven wells were sampled and tested by the August 2018 GME, with 10 wells sampled and tested by the November 2018 GME. Practically all samples were tested for the main contaminants of concern[27], with one sample from well GW11 also tested for PFAS.

The Site Auditor considered the available laboratory groundwater test data collected by the Epic 2019 DSI for the PREW site was close to meeting EPA-guidance for the reasons given in **Section 2.6**. One data gap was that only one groundwater sample from the C3b area (GW11) was tested for PFAS.

The groundwater contamination levels measured by the Epic 2019 DSI for the contaminants of concern were:

- **Heavy metals**: All heavy metals were measured at concentrations below the recreational and irrigation GILs. For the marine water GILs, arsenic, cadmium, chromium and mercury were measured at low concentrations that were below or reasonably close to the GILs. The exceptions were:
  - Copper: Maximum 85 µg/L (Marine GIL 1.3 µg/L);
  - Lead: Maximum 26 µg/L (Marine GIL 4.4 µg/L);
  - Nickel: Maximum 110 µg/L (Marine GIL 70 µg/L); and
  - Zinc: Maximum 500 µg/L (Marine GIL 15 µg/L).
- **TRH**: All samples measured non-detectible TRH (C6-C9) concentrations with practically all samples measuring non-detectible TRH (C10-C36) concentrations. The few exceptions measured concentrations below the Dutch (2000) intervention level of 600 µg/L, the detections being measured at:
  - GW01 (downgradient of UST at APEC 4A – C1b area): 320 µg/L
  - GW08 (near UST at APEC 4A – C1b area): 320 µg/L
  - GW13 (near UST at APEC 4C – C3b area): 150 µg/L
- **BTEX, VOCs, VHCs, phenols and PAHs**: All samples measured at non-detectible concentrations
- **PFAS**: The one sample tested measured non-detectible concentrations.

The Epic 2019 DSI[28] concluded that the exceedances of the marine GILs for some heavy metals were not considered to pose significant risk to the receiving environment because:

- The concentrations were considered to be consistent with the background quality of shallow groundwater in the Sydney urban environment; and
- The closest marine receptor was Iron Cove Creek and Parramatta River located 700 m to the north of the Site.

The Site Auditor considered the weight of evidence supported this conclusion.

The Epic 2019 DSI[29] also concluded that:

- There was a low risk of significant gross contamination from potential primary sources at the PREW site; and
- Leachable contamination from overlaying fill material was likely to be low given the depth to groundwater and the non-detectable concentrations identified by the investigation.

The Site Auditor considered the weight of evidence supported this conclusion. This evidence included the reasons provided by Epic together with:

- The low levels of contamination measured in soil samples across the PREW site;

[27] Comprising heavy metals, TRH, BTEX, PAHs, phenols, VOCs, VHCs, OCPs, OPPs and PCBs
[28] Sections 9.1.2 & 9.2.2, Ref [3]
[29] Sections 9.1.2 & 9.2.2, Ref [3]

- The absence of any major physical evidence of gross contamination reported by the Epic 2019 DSI;
- The fill layer at the Site was relatively thin in most places, so the volume of fill at the Site was not considered to be a potential source of leachable contamination; and
- The low permeability of natural soils and bedrock at and downgradient of the Site.

The Site Auditor considered the weight of evidence also supported the conclusions that there was a low risk of groundwater contamination at the PREW site:

- Impacting the suitability of the Site as a road construction worksite either during or after the WestConnex Stage 3A project due to the low levels of contamination present; and
- Increasing contamination migrating from the PREW site due to the low levels of contamination that were measured by the ESAs.

2.12 Soil Vapours

The fifth check in the EPA decision process was that '*hazardous ground gases (where relevant) have been assessed against relevant health-based investigation levels and screening values.*

The ninth check in the EPA decision process was that '*any evidence of, or potential for, migration of contaminants from the site has been appropriately addressed, including potential risks to off-site receptors, and reported to the site owner or occupier'*.

The Epic 2019 DSI[30] concluded that:

- There was no evidence of broadscale soil vapour risks exceeding Commercial / Industrial D criteria at the PREW site;
- Localised areas of soil vapour risk were likely to be present in the vicinity of USTs and associated petroleum infrastructure that would require further assessment by the ASBJV environment team at the time infrastructure was removed; and
- If significant volatile petroleum hydrocarbons impacts were identified at the Site, the NEPM soil vapour criteria may not be sufficiently protective of workers engaged in hard rock drilling or excavation works due to the potential for such work to generate higher vapour levels than normally existed in ambient subsurface conditions. In these circumstances the risks posed by such work would need to be further investigated and assessed by the ASBJV environment team.

The Site Auditor considered the weight of evidence supported these conclusions. This is because:

- The borelogs reported no widespread odorous or stained soil, the few exceptions being:
  - BH03: Moderate odour in fill to 1.5 mbgl;
  - BH09: Moderate odour in fill to 1.2 mbgl; and
  - BH21: Minor HC odour and black stains in fill and natural soil at 0.5 – 1.4 mbgl.
- PID headspace tests conducted in the field on soil samples measured low to non-detectible concentrations consistent with background conditions (i.e. <10 ppm) at practically all locations, the few exceptions being:
  - BH03: PID 108 - 148 ppm in fill at 0.5 – 1.2 mbgl; and
  - BH09: PID 96 ppm in fill at 0.6 mbgl.
- The investigation tested fill and natural soil samples for TRH (C6-C9), BTEX, naphthalene, VHCs and other VOCs at 9 – 14 locations in the C1b area and at 10 - 11 locations in the C3b area
- Practically all soil samples measured volatile hydrocarbon concentrations at non-detectible concentrations, with the few detections having low concentrations well below Residential A HILs

[30] Section 10.1, Ref [3]

- The investigation tested groundwater for TRH (C6-C9), BTEX and naphthalene at 10 locations spread across the PREW site
- All groundwater samples were described as having no sheen
- Most groundwater samples were recorded as showing no physical signs of petroleum hydrocarbon contamination, the exceptions being:
  - GW07: Very slight HC odour;
  - GW08: Very slight HC odour;
  - GW13: Mild HC / sulfur odour; and
  - GW14: Slight HC odour.
- All groundwater samples measured non-detectible volatile hydrocarbon concentrations
- There was potential for unknown contamination to be present at the Site because of:
  - The inherent limitations of investigations to identify all soil contamination that may be present;
  - There was potential for unknown USTs / underground structures to be present;
  - Data gaps in the sampling undertaken by the Epic 2019 DSI (**Section 2.6.2**); and
  - The inability to assess the location and extent of asbestos contamination in fill due to reliance on borehole and the inability to excavate test pits.

2.13 Ecological Risks

The eighth check in the EPA decision process was that '*any potential ecological risks have been assessed'*.

The soil assessment criteria adopted by the Epic 2019 DSI included EILs for commercial / industrial land use as given by the NEPM (2013) guidelines. The Site Auditor considered these soil criteria were appropriate and would address potential ecological risks associated with landscaped areas for a road construction worksite.

The groundwater assessment criteria adopted by the Epic 2019 DSI and this SAR included GILs for the protection of marine water and irrigation water, as well as recreational water.

The Epic 2019 DSI[31] concluded that the PREW site, prior to the commencement of construction work associated with the WestConnex Stage 3a project, was suitable for the ongoing commercial / industrial land use and thereby was suitable as a road construction worksite.

The Site Auditor considered the weight of evidence supported this conclusion for the reasons given in **Sections 2.7** to **2.12**.

[31] Section 10.2, Ref [3]

2.14 Site Management Strategy

The tenth check in the EPA decision process was that '*the site management strategy (where relevant) is appropriate including post-remediation environmental plans.'*

2.14.1 Proposed Management Strategy

The Epic 2019 DSI[32] recommended that contamination risks at the PREW site needed to be managed during the WestConnex Stage 3A project by ASBJV undertaking the following tasks:

1. Existing site capping and surface coverings should be retained across the Site. If existing capping/ coverings needed to be removed, they should be replaced with suitable capping to minimise access to underlying fill and contaminated soils. If disturbance of underlying soils by construction work was required, further investigations and assessment should be completed by the ASBJV environmental team.
2. Site capping in the central workshop area should be maintained based on reported concentrations of TRH exceeding management limits. If excavation was proposed in this portion of the Site, further delineation of impacts should be undertaken to determine remediation and/or management requirements.
3. The abandoned USTs located on C1b and C3b should be removed from the Site or abandoned in-situ (i.e. foam filled) in accordance with the requirements of AS4976-2008.
4. If soil was to be removed from the Site it should be characterised prior to its off-site disposal. Some areas of the Site had undergone extensive filling that contained C&D waste. The data provided in the Epic 2019 DSI should be used by the ASBJV environment team to classify materials that needed to be excavated and removed from the Site in accordance with EPA Waste Classification guidance.
5. ACM was observed in the garden bed along the western boundary of the C1b area adjacent to the workshop area at 0.2 mbgl. It was recommended that this area be inspected by a licensed asbestos contractor, and visible ACM removed from the ground surface (if present). If excavation was proposed in this part of the Site, further delineation of asbestos impacts needed to be undertaken and any ground disturbance activities managed in accordance with the Work Health and Safety Act 2011 and the UFP prepared by ASBJV for the project.
6. The potential for bonded asbestos fragments to be present in fill at the Site needed to be assessed following the demolition and removal of buildings and pavement and would require a grid-based survey conducted in accordance with the NEPM (2013) Schedule B2 guidelines and possibly test pitting, if warranted.
7. The data provided in the Epic 2019 DSI needed to be used by the ASBJV environment team to determine how soil contamination needed to be managed by the construction works planned for the Site.

2.14.2 Site Auditor Review

The Site Auditor considered the site management strategy proposed by the Epic 2019 DSI was capable of leaving the PREW site at the end of ASBJV work in a condition suitable for a road construction worksite. This is because:

- The Site was investigated by Epic generally in compliance with EPA guidelines. Where deficiencies / data gaps existed they were not considered to be significant for the purpose of this site audit or the ability for ASBJV to manage contamination risks at the Site;
- The Epic 2019 DSI concluded that the PREW site, prior to the commencement of construction work associated with the WestConnex Stage 3a project, was suitable for the ongoing commercial / industrial land use and thereby was suitable as a road construction worksite. The Site Auditor considered the weight of evidence supported this conclusion for the reasons given in **Sections 2.7** to **2.12**;

[32] Section 10.2, Ref [3]

- There was a low risk of groundwater quality at the PREW site impacting the suitability of the Site as a road construction worksite either during or after the WestConnex Stage 3A project; and
- There was a low risk of contaminated groundwater migrating from the PREW site due to the low levels of contamination present.

The Site Auditor also considered that the ASBJV environment team needed to address additional issues at the PREW site during construction, these being:

8. Allow the Site Auditor to inspect the PREW site during work activities at the Site and then soon after completion of ASBJV activities at the time when the final condition of the Site was achieved.
9. Provide the Site Auditor with a copy of the Site Establishment Management Plan (**SEMP**) and Environmental Management Plan (**EMPs**) that dealt with contamination at the site.
10. Provide the Site Auditor with a copy of an UFP prepared for the Site.
11. Provide the Site Auditor with a copy of other reports that may have been prepared for ASBJV dealing with contamination at the Site.
12. Provide the Site Auditor with documentation dealing with demolition work relevant to this site audit. This information should include:
    a) Copies of HAZMATs prepared for each structure that was to be demolished;
    b) Documentation showing that all hazardous building materials were removed prior to demolition;
    c) Documentation showing that demolition work was undertaken in accordance with Australian Standard AS2601-2001;
    d) Copies of asbestos clearances prepared by a suitably licensed occupational hygienist/ environmental consultant for each demolition area at the site showing each demolition area was cleared of asbestos prior to the commencement of other site work;
    e) Documentation showing that fuels and other wastes in UST / workshop infrastructure were removed and disposed by suitably licensed contractors in accordance with EPA requirements. Copies of liquid waste disposal dockets needed to be provided;
    f) Documentation showing that USTs and other underground structures associated with fuel / oil storage were decommissioned and removed in accordance with SafeWork NSW and EPA requirements. Copies of tank destruction certificates from suitably licensed tank receiving companies needed to be provided. Excavations needed to be validated in accordance with EPA guidance; and
    g) In the event that pavements / slabs covering the ground surface were removed and the underlying soils exposed, a grid-based asbestos survey of the ground needed to be undertaken in accordance with the NEPM (2013) Schedule B2 guidelines.
13. Provide the Site Auditor with summary information on waste classification and documentation of waste management removed from the Site. This information should include, among other things, details on the methodology used to manage waste generated at the site and how it was tracked from cradle-to-grave, plans showing where excavations were undertaken, data on the size of the excavations and the volume of excavation spoil generated and needed to be removed from the site, examples of waste classification reports, a summary table of waste removed from the Site[33].
14. Provide the Site Auditor with documentation that showed:
    a) The tasks specified by the Epic 2019 DSI had been undertaken in accordance with NSW Government environmental legislation;
    b) The Site was managed in accordance with the SEMP, EMPs, the UFP and EPL 21149;

[33] The information should include among other things the date material was removed from the site, a description of the material, volume, waste classification, contractor who removed the waste from the site, location where the waste was disposed, quantity of material disposed based on tip dockets

c) Contamination interfered or disturbed by ASBJV during the course of carrying out its work was properly managed;

d) Contamination was not generated at the PREW site by the ASBJV work;

e) No increase in contamination migrating from the Site was caused by the ASBJV work; and

f) The final condition of the PREW site was left in a condition suitable for a road construction worksite.

3. Contamination Management During ASBJV Work

This section of the SAR reviews documentation provided by ASBJV concerning how contamination risks were managed at the PREW site during the WestConnex Stage 3A project. The reviews comprise:

- *Review of additional ESAs and management plans (Section 3.1);*
- *Compliance with EPA notification requirements (Section 3.2);*
- *Demolition of above ground structures (Section 3.3);*
- *Removal of USTs and associated remediation (Section 3.4);*
- *Removal of other below ground structures (Section 3.5);*
- *Construction activities at Site (Section 3.6);*
- *Waste classification and management (Section 3.7);*
- *Imported fill (Section 3.8);*
- *Final site condition (Section 3.9); and*
- *Review of long-term environmental management plan (Section 3.10).*

3.1 Review of Additional ESAs and Management Plans

As previously discussed in **Section 1.2.1**, the Site Auditor understood that the site audit needed to review:

- Site environmental management plans that dealt with contamination at the PREW site and to check whether these plans met the aspects of Condition C22 of the Planning Consent and Condition O5.11 of EPL 21149, as relevant to this site audit;
- An Unexpected Contaminated Land and Asbestos Finds Procedure that met Condition E185 of the Planning Consent; and
- Contamination assessments for the PREW site and whether they met Condition E181 of the Planning Consent relevant to this site audit.

3.1.1 Further Investigation of Bonded Asbestos Contamination

The Epic 2019 DSI[34] advised that there was potential for fill material at the Site to contain bonded asbestos fragments that could not easily be detected by borehole investigations. It was not practical for test pits to be excavated for the DSI due to access restrictions posed by buildings and pavements that covered practically the whole Site. The potential for bonded asbestos fragments to be present in fill needed to be assessed following the demolition and removal of buildings and pavement, if considered to be warranted. Such an investigation needed to involve:

- A grid-based survey conducted in accordance with the NEPM (2013) Schedule B2 guidelines and possibly test pitting; and
- Provide a report prepared in accordance with EPA guidance that assessed the risk of asbestos contaminated soils remaining at the Site.

ASBJV[35] advised that the ASBJV environment team considered the assessment of bonded asbestos fragments in fill at Site was not warranted because:

- There were no large scale excavation or ground disturbance work that needed to be undertaken that would expose fill material;
- Only minor excavations were required for the removal of USTs, as shown in **Figure 3-3**;

[34] Sections 9.3 and 10, Ref [3]
[35] Comment 1(a), Ref [5]

- Works undertaken at PREW consisted of the demolition of pre-existing structures and the removal of USTs. Asbestos monitoring and testing was undertaken for all buildings where asbestos was identified within the Hazmat surveys completed in 2018;
- All waste classification sampling undertaken for the UST removal classified the material as GSW and no asbestos was observed;
- Any asbestos found during construction work was captured and managed in accordance with the unexpected finds procedure; and
- A large portion of the existing ground surface remained as was upon hand over at site establishment; and
- No ground disturbance works were proposed for the reinstatement of the Site upon project completion.

The Site Auditor considered the approach adopted by the ASBJV environment team for managing contamination at the PREW site met the requirements of their contract, the planning consent and EPL, as described in **Section 1.2.1**, provided the risk of unknown bonded asbestos contamination remaining in fill at the PREW site was managed by a long-term environmental management plan (**LTEMP**). This is because:

- The ESAs found (**Section 2.9.2**):
  - No evidence of broadscale soil contamination at the PREW site exceeding Commercial / Industrial D criteria;
  - Some ACM was present below the C1b area hardstand caused by previous demolition or filling work; and
  - There was potential for fill material at the Site to contain bonded asbestos fragments that were not easily detected by borehole investigations used by the DSI. This is because the investigations undertaken prior to the commencement of construction work was limited to boreholes due to access restrictions that prevented the excavation of test pits.
- The risk posed by low-level bonded asbestos remaining in fill at the Site was capable of being addressed by capping the Site and managing the residual contamination by means of a LTEMP.
- At the end of construction work the PREW site remained capped by a concrete ground slab, as described in **Section 3.9**.
- The required end use of the PREW site was a road construction worksite, which was not a sensitive land use compared to residential or open space parkland.

A LTEMP needed to be prepared to manage the risk of low level asbestos remaining in fill at the Site, which is further discussed in **Section 3.10**.

3.1.2 Asbestos Clearance in Garden Bed

The Epic 2019 DSI[36] advised that ACM was observed in the garden bed along the western boundary of C1b, adjacent to the workshop area at 0.2 mbgl. It was recommended that this area of the Site be inspected by a licensed asbestos contractor, and visible asbestos material removed from the ground surface (if present). If excavation was proposed in this portion of the Site, further delineation of asbestos impacts needed to be undertaken, and any ground disturbance activities needed to be managed in accordance with the Work Health and Safety Act 2011 and the ASBJV Unexpected Finds Protocol for the project.

ASBJV[37] advised that the asbestos find in the garden bed at BH12 was addressed by unexpected finds procedure (UF05). This involved:

- The inspection of the area by a licensed asbestos contractor once the visible material had been removed;
- A clearance certificate was provided to ASBJV on 1/03/19 (job number 44566); and

[36] Section 10.2, Ref [3]
[37] Comment 1b, Ref [5]

- No excavation works were subsequently conducted in this area given its close proximity to the Site boundary and the existing hoarding.

The Site Auditor considered the weight of evidence supported the conclusion that the recommendation made by the Epic 2019 DSI had been addressed because a copy of an asbestos clearance certificate was provided to the Site Auditor that showed:

- The clearance certificate was dated 1/03/19 and labelled job number 44566;
- The certificate was prepared by Airsafe, a licensed asbestos occupational hygienist;
- The certificate provided details of the client, removal work details, inspection details, limitations and photos; and
- The certificate stated that Airsafe carried out a clearance inspection of an asbestos work area prior to the resumption of normal work in the area by unprotected personnel to confirm that the asbestos removal work has been completed. The clearance inspection was carried out in accordance with Section 3.10 of the Code of Practice: How to Safely Remove Asbestos [Safe Work Australia, 2018] under Section 474 of the Work Health and Safety Regulation 2017.

3.1.3 Management of TRH Contamination in Central Workshop Area

The Epic 2019 DSI[38] advised that capping in the central workshop area should be maintained based on reported concentrations of TRH exceeding the management limits. If excavation was proposed in this area, further delineation of impacts needed to be undertaken to determine remediation and/or management requirements.

ASBJV[39] advised that:

- The existing slab had been maintained and remained part of the designated laydown area for the PREW site; and
- This area would not be disturbed as part of the demobilisation works and that the existing ground and levels were being left as is.

The Site Auditor considered the approach adopted by the ASBJV environment team for managing TRH contamination in the central workshop area of the PREW site met the requirements of their contract, the planning consent and EPL, as described in **Section 1.2.1**. This is because the weight of evidence indicated that:

- ASBJV only disturbed contaminated soil required to allow the removal of USTs and that this soil was classified and disposed off-site;
- There was a low risk that construction work undertaken by ASBJV at the Site generated contamination;
- The PREW site was capable of being returned to a condition suitable as a road construction worksite if it was capped and managed by a LTEMP; and
- The requirements of the EPL did affect the management of TRH contamination in the central workshop area.

The Site Auditor considered the PREW site was capable of being returned to a condition suitable as a road construction worksite because:

- The data reviewed in **Sections 3.4.1** and **3.4.2** indicated that USTs were likely to have been removed from the PREW site in general accordance with regulatory requirements;
- The Site Auditor found no evidence that construction activities undertaken at the PREW site had generated contamination.

[38] Section 10.2, Ref [3]
[39] Comment 1c, Ref [5]

- At the end of construction work the PREW site remained capped by a concrete ground slab, as described in **Section 3.9**.
- The risks posed by TRH contamination remaining at former UST areas at the PREW site was capable of being addressed by capping the Site and managing the residual contamination by means of a LTEMP. This is because:
  - The ESA data reviewed in **Section 2** indicated that exceedances of the petroleum hydrocarbon commercial/industrial criteria were not extensive and were likely to be localised and restricted to the former UST areas
  - The data reviewed in **Section 3.4** indicated that:
    - No gross contamination was likely to remained in the former UST excavations;
    - The UST pits were backfilled and compacted with site-won material and/or imported crushed sandstone;
    - The removal of the USTs meant that the main source of petroleum hydrocarbon contamination in this area had been removed and that remaining TRH contamination in the area would degrade with time.
  - The Site Auditor found no evidence that construction activities undertaken at the PREW site had generated contamination
  - A cap would prevent uncontrolled direct contact with underlying contamination that remained at the Site
  - A cap would allow any soil vapours underlying the cap to be managed
  - The required end use of the PREW site was as a road construction worksite, which was not a sensitive land use compared to residential or open space parkland.
  - At the end of construction work the PREW site remained capped by a concrete ground slab, as described in **Section 3.9**.

A LTEMP needed to be prepared to manage the risk of residual TRH contamination remaining at former UST areas within the PREW site, which is further discussed in **Section 3.10**.

3.1.4 Site Environmental Management Plan

The documentation provided by ASBJV (Ref [4]) included a site environmental management plan (**SEMP**) prepared by LSBJV for the Project dated 10/10/18 (Ref [53]). The purpose of the plan was to describe how the Contractor proposed to manage site establishment works at the various surface area worksites, one of which was the PREW site. A summary of the proposed site establishment work is provided in **Table 3-1**.

The plan provided a detailed set of procedures for a wide-range of environmental issues, which included among other things contamination. With regard to contamination, the SEMP[40] advised that:

- The PREW site was known to contain USTs and there was a risk that these tanks may have leaked and contaminated the surrounding soils and groundwater;
- The EIS identified that the eastern part of the PREW site was located on land previously utilised for commercial purposes (including a car dealership and associated maintenance facilities); Previous soil and groundwater sampling works indicated some exceedances of contaminant concentrations above the NEPM (2013) HILs and GILs. Contaminants of potential concern at the Site included metals, TRH, BTEX, PAHs, VOCs, asbestos, PCBs, OCPs and OPPs. GHD (2015) classified the eastern PREW site as a site of moderate potential for contamination;
- The western part of the PREW site was located on land previously utilised for commercial purposes (including a car dealership, a newsagency and television repairs and sales business). Previous soil and groundwater sampling found no asbestos at the sample locations and no exceedances of NEPM (2013) HILs for proposed recreational open space and commercial/industrial land uses;

[40] Sections 4.8.3 & 5.2.11, Ref [53]

Table 3-1 Scope of Site Establishment Work for Project (Source: Table 1-1, Ref [53])

No	Site	Site establishment works									
		Demolition of existing structures	Removal of vegetation	Management of contamination	Erection of site fencing / hoarding	Provision of utility services to the site	Site levelling	Provision of site access	Erection of demountable buildings	Provision of hardstand areas	Provision of erosion and sedimentation controls
C1b	Parramatta Road West civil site	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
C3b	Parramatta Road East civil site	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
C9	Pyrmont Bridge Road tunnel site	✓		✓	✓	✓	✓	✓	✓	✓	✓
C10	Campbell Road civil and tunnel site			✓	✓	✓	✓	✓	✓	✓	✓

- The SEMP advised that there was potential for ground disturbance to result in the spread of contaminated material at both the eastern and western parts of the PREW site if managed inappropriately, through cross contamination and contamination of soils and/or water outside the project area. In addition, there is potential for contaminants to be mobilised during demolition, which could then be inhaled/ingested as dust;
- The SEMP noted the conditions of consent relevant to contamination that needed to be met by the Project, as described in **Section 1.2.1**; and
- The site establishment works at all locations were to be managed in accordance with the management and mitigation measures listed in Appendix B of the SEMP.

The Site Auditor was not provided with a copy of the SEMP until 7/10/21 after the demolition and ground disturbance work at the PREW site had been completed in 2019. The Site Auditor considered this delay in providing the SEMP was not a significant issue for the purpose of the site audit since this SAR reviews and assesses compliance with the matters relevant to contaminated land management raised by the Project contract, planning consent and EPL, as described in **Section 1.2.1**.

3.1.5 Contaminated Land Management Sub-plan

The documentation provided by ASBJV (Ref [4]) included a contaminated land management sub-plan (**CLMP**) prepared by LSBJV for the Project dated October 2018 (Ref [54]). The plan formed part of the Soil and Surface Water Management sub-plan (Ref [57]), which in turn formed Appendix B5 of the CEMP.

The purpose of the CLMP was to:

- Describe how the Contractor proposed to manage contaminated land during construction of the Project;
- Establish a set of best practice procedures for the identification and management of contaminated land and materials if encountered during construction work; and
- Address a contractual condition that required a CLMP to be included in the CEMP that needed to comply with the CLM Act, Roads and Maritime publication "*Contaminated Land Management Guideline*", Roads and Maritime "*Environmental Incident Classification and Reporting Procedure*", and EPA guidelines on contaminated land management.

The CLMP described:

- **Environmental requirements**: Relevant legislation and guidelines, Minister's Conditions of Approval, Revised environmental management measures;
- **Existing environment**: Previous investigations, further investigations;
- **Environmental aspects and impacts:** Construction activities, impacts;
- **Management process**: Phase 1 environmental site assessment, phase 2 sampling, analytical and quality plan, phase 2 environmental site assessment, remediation action plan, remediation validation report, long-term site environmental management plan, site audit report and site audit statements;
- **Environmental control measures**;
- **Compliance management**: Roles and responsibilities; training, monitoring and inspections, auditing, reporting;
- **Review and improvement**: Continuous improvement, CLMP update and amendment;
- **Unexpected contaminated lands and asbestos finds procedure** (Ref [55]); and
- **Asbestos management plan**.

The Site Auditor was not provided with a copy of the CLMP until 7/10/21 after the demolition and ground disturbance work at the PREW site had been completed in 2019. The Site Auditor considered this delay in providing the CLMP was not a significant issue for the purpose of the site audit since:

- The CLMP only provided a framework for contaminated land management and largely repeated the requirements of the Project contract, planning consent and EPL; and
- This SAR reviews and assesses compliance with the matters relevant to contaminated land management raised by the Project contract, the planning consent and EPL, as described in **Section 1.2.1**.

3.1.6 Waste Management Plan

Purpose

The documentation provided by ASBJV (Ref [4]) included a waste management plan (**WMP**) prepared by LSBJV for the Project dated 31/10/18 (Ref [56]). The purpose of the plan was to describe how the Contractor proposed to manage waste generated by demolition work at the PREW site.

General Requirements

The WMP advised that waste generated during demolition at the PREW site was to be generally managed in accordance with the CEMP Waste Management Sub-plan, which required:

- Waste was to be managed in accordance with the waste hierarchy priorities:
  - Waste generation was to be avoided;
  - Where avoidance was not reasonably practicable, waste generation was to be reduced

- Where avoiding or reducing waste was not possible, waste was to be reused, recycled, or recovered on site or off site
- Where waste reuse, recycling or recovery was not possible, waste was to be treated and/or disposed at a waste management facility or premise lawfully permitted to accept the materials or in accordance with a Resource Recovery Exemption (RRE) or Order (RRO) issued under the POEO (Waste) Regulation 2014, or to any other place that can lawfully accept such waste.

- Waste needed to be segregated between recyclable and non-recyclable waste, as well as between categories of recyclable wastes. Wherever possible, packaging needed to be avoided or minimised
- Obtaining relevant licenses / approvals for off-site waste facilities utilised for the disposal of Project waste
- Waste needed to be managed and disposed of in accordance with the POEO Act 1997
- All waste generated during construction needed to be classified in accordance with the EPA (2014) Waste Classification Guidelines
- Suitably licensed waste contractors needed to be used for the collection and transport of all non-domestic, retail and commercial wastes for either off-site processing and/or disposal to an appropriately licensed facility.

The Site Auditor considered these general requirements were appropriate and met EPA requirements.

Estimated Quantities

The WMP advised that:

- Material generated from demolition activities at the PREW site that could not be reused on-site required disposal. The expected waste types, volumes and details on disposal sites provided by the WMP are summarised in **Table 3-2**;
- All waste was to be classified in accordance with the EPA (2014) Waste Classification Guidelines, with appropriate records and disposal dockets retained for audit purposes; and
- Details of waste types, volumes and destinations were to be recorded in a Waste and Spoil Management Tracking Register.

The Site Auditor noted these waste types and estimated quantities when reviewing the actual wastes generated by the construction activities undertaken at the PREW site, which is reviewed in **Section 3.7**.

3.2 Compliance with EPA Notification Requirements

As previously discussed in **Section 1.2.1**, the Site Auditor understood that the site audit needed to determine whether contamination at the PREW site was present and needed to be notified to ASBJV, TfNSW and the EPA under the CLM Act.

The Site Auditor considered that contamination present at the PREW site did not need to be notified because:

- The level of contamination identified by the ESAs was consistent with the levels found as part of the development consent process which involved the review of the data by TfNSW, DPE and the EPA;
- The data produced by the ESAs indicated that the level of soil contamination identified by the ESAs was localised and relatively minor (**Sections 2.7 – 2.13**);
- There was a low risk of construction activities causing an increase in contamination migrating off-site;
- The Site had not previously been regulated or notified to the EPA;
- The weight of evidence indicated that construction activities undertaken at the Site reduced the amount of contamination at the Site. This was achieved through the removal of USTs and their contents, the excavation and removal of fill and other contaminated material from the Site; and
- A concrete capping layer was to be maintained across the Site.

Table 3-2 Waste Types, Volumes & Disposal Sites Estimated by ASBJV (Source: Table 2-1, Ref [56])

Waste Type	Estimated Waste Volume (tonnes)	Waste Disposal Site	Address	EPL No.
Scrap Metal/ Structural Steel	820	Metropolitan Demolitions & Recycling (MDR) Facility, St Peters	396 Princes Highway, St Peters, NSW 2044	11483
Concrete/Brick (Rubble)	2965	Metropolitan Demolitions & Recycling (MDR) Facility, St Peters	396 Princes Highway, St Peters, NSW 2044	11483
Asbestos	6	Suez Environmental, Kemps Creek	1725 Elizabeth Drive, Kemps Creek, NSW 2178	4068
General Waste (Rubbish)	96	Enviroguard, Erskine Park	50 Quarry Rd, Erskine Park, NSW 2759	4865
		Blacktown Waste Services, Marsden Park	25 Harris Avenue, Marsden Park, NSW 2765	11497
PCBs	124 units	Metropolitan Demolitions & Recycling (MDR) Facility, St Peters	396 Princes Highway, St Peters, NSW 2044	11483
Lead Dust	> 70 m^2	Environmental Treatment Solutions Minto/Blayney	7 Pembury Road, Minto, NSW 2566 79 Marshalls Lane, Blayney, NSW 2799	20696/13230
Lead Containing Paints	> 45 m^2	Environmental Treatment Solutions Minto/Blayney	7 Pembury Road, Minto, NSW 2566 79 Marshalls Lane, Blayney, NSW 2799	20696/13230
Green Waste	~50 Trees and Shrubs	Genesis Recycling Facility	Honeycomb Drive, Eastern Creek, NSW 2766	20121

3.3 Demolition of Above Ground Structures

The CSM identified the demolition of structures at the PREW site as a potentially contaminating activity (**Section 2.4**). To address this risk the Site Auditor recommended (**Section 2.9.2**) that a HAZMAT needed to be undertaken and all hazardous building materials removed prior to demolition. Demolition work then needed to be undertaken in accordance with Australian Standard AS2601-2001, with an asbestos clearance of the area undertaken by a suitably licensed occupational hygienist/environmental consultant and a clearance certificate issued prior to the commencement of other site work. This section of the SAR reviews the documentation provided by ASBJV on the demolition of above ground structures.

3.3.1 HAZMATS

Documentation provided by ASBJV (Refs [4] & [5]) indicated that three HAZMATS were prepared for the PREW site prior to the commencement of demolition work. These were:

- Ref [60]: Safe Work & Environments (24 August 2018a) "*Hazardous Materials Survey & Management Plan, 132-134 Bland Street, Ashfield, NSW 2131; 197-199 Parramatta Road, Ashfield, NSW 2131; 201-205 Parramatta Road, Haberfield, NSW 2045*". Document No: S107408.2 prepared for LSBJV [Area C3b on eastern side of Parramatta Road]
- Ref [61]: Safe Work & Environments (24 August 2018b) "*Hazardous Materials Survey & Management Plan, 244-246, 266 & 296 Parramatta Road, Ashfield, NSW 2131*". Document No: S107408.1 prepared for LSBJV [Area C1b on western side of Parramatta Road]
- Ref [62]: JM Environments (10 January 2019) "*248-250 Parramatta Road Ashfield, Hazardous Building Material Survey*". Document No: JME18057-19 prepared for LSBJV [Area C1b on western side of Parramatta Road]

The parts of the PREW site covered by these HAZMATs are shown in **Figures 3-1** and **3-2**. The data indicated that HAZMATS were conducted across all parts of the PREW site.

The Site Auditor considered the weight of evidence supported the conclusion that the HAZMATs were undertaken in general compliance with good practice and regulatory requirements because:

- The HAZMATs were prepared by suitably qualified and licensed occupational hygienists
- The purpose of each survey was to identify hazardous construction materials such as ACM, lead based paints; synthetic mineral fibre (**SMF**) and PCBs
- The scope of works involved:
  - Development of a task specific Safe Work Method Statement (**SWMS**);
  - Walkthrough inspection of the site building/s;
  - Identification of all visible and accessible hazardous materials;
  - Sampling suspect materials where necessary/possible;
  - Laboratory analysis of the samples where the inspector suspected the presence of ACM; and
  - Preparation of a Hazardous Materials Register and Management Plan in accordance with relevant legislative requirements.
- The Safe Work & Environments HAZMAT (Ref [60]) for the eastern side of Parramatta Road (Area C3b) found:
  - The ACM encountered on-site was in good condition and considered a Low Risk;
  - No suspected lead-based paints were encountered;
  - SMF in the form of insulation was identified in ceiling spaces, heaters and in ducting to air conditioning. Further material may be present in areas of difficult access. If the material was found and was in good condition, with limited accessibility, it was unlikely to present a risk to health unless damaged, tooled, cut, sanded or machined;
  - Across the two sites, a total of 425 items were encountered and presumed to contain PCBs. All of these items were fluorescent lights and were considered to be Low Risk;
  - Four items containing ozone depleting substances were considered Low Risk;
  - A full listing of all hazardous items identified and a risk assessment was included in a Hazardous Materials Register; and
  - The report recommended all hazardous materials be removed prior to any demolition or refurbishment works that would disturb these materials. All asbestos removal works needed to be carried out in accordance with the National Code of Practice for the Safe Removal of Asbestos [NOHSC:2002 (2005)].

Figure 3-1 Area Covered by Area C3b HAZMAT (Eastern Parramatta Rd) (Source: Figure 1, Ref [60])

Figure 3-2 Area Covered by Area C1b HAZMATs (Western Parramatta Road) (Source: Figure 1, Ref [61])

- The Safe Work & Environments HAZMAT (Ref [61]) for the western side of Parramatta Road (Area C1b) found:
  - The ACM encountered on-site was in good condition and considered a Low Risk;
  - The dust on top of the sarking beneath the corrugated profile cement roofing sheets was likely to have been contaminated with ACM;
  - A total of 28 paint systems were sampled with 18 samples returning positive results for lead-based paint. Two samples of dust taken from ceiling spaces also returned a positive result for lead above 300 mg/kg. It was recommended that all ceiling spaces be considered contaminated with lead-contaminated dust unless further sampling assessment proved otherwise;
  - SMF in the form of insulation was identified in one location. Further material may have been present in areas of difficult access. If the material was found and it was in good condition, with limited accessibility, it was unlikely to present a risk to health unless damaged, tooled, cut, sanded or machined;
  - Across the three sites, a total of 396 items were encountered and presumed to contain PCBs. In addition, capacitators were identified on electrical equipment and were assumed to contain PCBs. All of these items were considered to be Low Risk;
  - Sixteen items containing ozone depleting substances were considered Low Risk;
  - A full listing of all hazardous items identified and a risk assessment was included in a Hazardous Materials Register; and
  - The report recommended all hazardous materials be removed prior to any demolition or refurbishment works that would disturb these materials. All asbestos removal works needed to be carried out in accordance with the National Code of Practice for the Safe Removal of Asbestos [NOHSC:2002 (2005)].
- The JM Environments HAZMAT (Ref [62]) for 248-250 Parramatta Road (Area C1b) found:
  - Friable ACM in a Telstra pit midway along the driveway and remnant vinyl tiles on the floor of the rear garage;
  - Bonded ACM was presumed to be present in the front first storey eaves; and
  - The window frames of the ground-floor apartment were coated with a 21% lead paint.

3.3.2 Demolition Work

The CWMS (Ref [63]) advised that the demolition work to be undertaken at the PREW site was to comprise:

- Install temporary fencing;
- Progressive decommissioning of services and demolition of structures;
- Remove below ground infrastructure; and
- Remove waste material from Site.

The location of the demolition work undertaken at the PREW site is shown in the ASBJV plan in **Figure 3-3**.

Figure 3-3 ASBJV Location Plan for Demolition Work at PREW Site (Source: Part 2(a), Ref [5])

West Connex M4-M5 Link Project
Construction Area - Muirs (C1B and C3B)

0 10 20 30 40 50 m

Scale: 1:1,000 @ A4

Datum: GDA94 Projection: MGA56

The Site Auditor considered the CWMS was a well prepared document that would allow the demolition work to be undertaken in general accordance with regulatory requirements if followed. This is because the CWMS provided:

- Planning details such as the scope of work, location of work, references, program and resources
- Work health and safety details such as emergency response planning, risk assessment and safe work method statements
- Environment details such as sub-plans, environmental work method statements, surveillance of the works and risk assessment
- Community and stakeholder details
- Quality details such as inspection and test plans, hold and witness points relevant to the works
- Work Method and sequencing
- The appendices provided:
  - A detailed program;
  - HAZMAT;
  - High level risk assessment;
  - Construction noise and vibration impact statement;
  - Sensitive areas;
  - Copy of community notification;
  - Inspection and Test Plan (**ITP**) for the demolition of existing structures;
  - Vehicle movement plan;
  - Subcontractor's demolition work plan; and
  - Subcontractor's project risk assessment.

ASBJV[41] advised that the demolition of buildings at the PREW site occurred in January to May 2019 and that the work was conducted in accordance with the Australian standards as documented in the CWMS (Ref [63]).

The Site Auditor considered the weight of evidence supported the conclusion that demolition work at the PREW site was likely to have been undertaken in general compliance with regulatory requirements because the documentation provided by ASBJV (Refs [4] & [5]) showed that:

- Hazardous building materials were removed by Australasian Technical Services (**ATS**), a licensed asbestos removalist, prior to the commencement of demolition work by Metropolitan Demolition;
- A SWMS for the removal of hazardous building materials was prepared by ATS dated 12/02/19;
- A SWMS for the demolition work was prepared by Metropolitan Demolition dated 23/11/18;
- A well prepared CWMS was prepared for the demolition work;
- The proposed demolition work was documented in detailed construction drawings prepared by LSBJV[42];
- The demolition work required compliance with inspection and test plans;
- The demolition program included hold and witness points relevant to the work;
- A "*Notice of intent to remove friable asbestos*" was sent by ATS to Safework NSW on 15/01/19 for the PREW site;
- ASBJV advised that demolition and asbestos removal was managed by the demolition contractor;

[41] Comment 2, Ref [5]
[42] LSBJV (21 January 2019) "*Haberfield Muirs Site Layout Sequence Construction Method Drawing, M4 – M5 Link Tunnels, Westconnex 3A*" Drawings Nos: M4M5-LSBJ-MUI GEN-MTD-DRG-4002, 8 sheets

- The scope of demolition work conducted at the Site is shown in **Figure 3-1**;
- ASBJV inspected the demolition work as indicated by a site diary record for 8/03/19;
- SafeWork NSW inspected the demolition work as indicated by an inspection record dated 18/02/19;
- Six asbestos test reports were provided for the period 11/02/19 to 1/03/19 as summarised in **Table 3-3**. The reports covered the testing of building materials, air quality monitoring, and the testing of fly tipped material;
- Demolition wastes were removed under the supervision of the ASBJV environmental representative;
- Asbestos clearance reports were provided for the period of the demolition work, which are reviewed in **Section 3.3.4**; and
- The Site Auditor observed that all demolition waste had been removed from the PREW site when inspected on 2/06/21, as shown by photos provided in **Appendix D**.

Table 3-3 Summary of Asbestos Test Reports

Certificate Date	NATA Lab	Site Address	Material Tested	Asbestos Present
11/02/2019	Airsafe	199 Parramatta Rd, Ashfield	Fascia from awning	Chrysotile asbestos detected
13/02/2019	Airsafe	197-199 Parramatta Rd, Ashfield	Air monitoring at 4 locations on 12/02/19 along perimeter fencing	Not detectible (<0.01 fibres/mL)
14/02/2019	Airsafe	197-199 Parramatta Rd, Ashfield	Air monitoring at 4 locations on 13/02/19 along perimeter fencing	Not detectible (<0.01 fibres/mL)
14/02/2019	Airsafe	292-296 Parramatta Rd, Ashfield	Sample of illegally dumped ACM	Chrysotile, amosite and crocidolite asbestos detected
27/02/2019	Airsafe	197-199 Parramatta Rd, Ashfield	Air monitoring at 4 locations on 14/02/19 along perimeter fencing	Not detectible (<0.01 fibres/mL)
1/03/2019	Airsafe	292-296 Parramatta Rd, Ashfield	Air monitoring at 4 locations on 28/02/19 along perimeter fencing	Not detectible (<0.01 fibres/mL)

3.3.3 Disposal of Demolition Waste

Refer **Section 3.7**.

3.3.4 Asbestos Clearances

ASBJV provided copies of six asbestos clearance reports for the PREW site as summarised in **Table 3-4**.

Table 3-4 Summary of Asbestos Clearance Report (Source: Ref [4])

Certificate Date	Occupational Hygienist	Site Address	Results of Clearance Inspection
14/02/2019	Airsafe	197-199 Parramatta Rd, Ashfield	The asbestos material was safely removed in accordance with Safe Work Australia 2018 Code and the asbestos removal area and the area immediately surrounding it were free from visible asbestos contamination
1/03/2019	Airsafe	292-296 Parramatta Rd, Ashfield	The asbestos material was safely removed in accordance with Safe Work Australia 2018 Code and the asbestos removal area and the area immediately surrounding it are free from visible asbestos contamination
15/03/2019	Airsafe	252-266 Parramatta Rd, Ashfield	The asbestos material was safely removed in accordance with Safe Work Australia 2018 Code and the asbestos removal area and the area immediately surrounding it are free from visible asbestos contamination on the ground surface
21/03/2019	Airsafe	252-266 Parramatta Rd, Ashfield	The asbestos material was safely removed in accordance with Safe Work Australia 2018 Code and the asbestos removal area and the area immediately surrounding it are free from visible asbestos contamination
11/04/2019	Airsafe	244-246 Parramatta Rd, Ashfield	The asbestos material was safely removed in accordance with Safe Work Australia 2018 Code and the asbestos removal area and the area immediately surrounding it were free from visible asbestos contamination on the ground surface
13/04/2019	Airsafe	252 Parramatta Road, Ashfield	The asbestos material was safely removed in accordance with Safe Work Australia 2018 Code and the asbestos removal area and the area immediately surrounding it are free from visible asbestos contamination

The Site Auditor considered the weight of evidence supported the conclusion that the asbestos clearance reports were prepared in general compliance with good practice and regulatory requirements and indicated that no visible asbestos remained at the ground surface at the completion of demolition work. This is because:

- The reports were prepared by suitably qualified and licensed occupational hygienists from Airsafe;
- The reports advised that their purpose was for Airsafe to carry out a clearance inspection of an asbestos work area prior to the resumption of normal work in the area by unprotected personnel to confirm that the asbestos removal work has been completed;
- The reports advised that each clearance inspection was carried out in accordance with Section 3.10 of the Code of Practice: How to Safely Remove Asbestos [Safe Work Australia, 2018] under Section 474 of the Work Health and Safety Regulation 2017; and
- The reports provided details of the client, the scope of work, removal work completed, the inspection, and photos of the work undertaken.

3.3.5 Site Auditor Overview

The CSM identified the demolition of structures at the PREW site as a potentially contaminating activity (**Section 2.4**). Following the completion of ESAs between 2018 and 2019, construction activities were undertaken at the PREW site by ASBJV, which involved the demolition of above ground structures between February and April 2019.

The Site Auditor considered the weight of evidence supported the conclusion that the demolition work posed a low risk of generating additional contamination or of disturbing contamination that was present below ground. This is because:

- The HAZMATs prepared for the Site were undertaken in general compliance with good practice and regulatory requirements for the reasons given in **Section 3.3.1**;
- Demolition work at the PREW site was likely to have been undertaken in general compliance with regulatory requirements for the reasons given in **Section 3.3.2**;
- Demolition waste at the PREW site was likely to have been taken to suitably licensed waste facilities for the reasons given in **Section 3.7**; and
- The asbestos clearance reports were prepared in general compliance with good practice and regulatory requirements and indicated that no visible asbestos remained at the ground surface at the completion of demolition work for the reasons given in **Section 3.3.4**.

3.4 Removal of USTs and Associated Remediation

The CSM (**Section 2.4**) identified USTs and associated infrastructure (APEC 4) as areas of potential environmental concern (**APECs**) that posed contamination risks at the PREW site.

The Epic 2019 DSI[43] recommended that ASBJV should have the nature and type of USTs investigated prior to the commencement of bulk earthworks at the Site. Any liquid remaining in the USTs should be removed by a licensed liquid removal contractor and the USTs removed from Site in accordance with the requirements of AS4976-2008. The Site Auditor also requested ASBJV to provide:

- Information on the location, size and condition of USTs removed from the PREW worksite;
- Confirmation that all USTs identified by the Epic 2019 DSI were removed and provide information on any other USTs that were removed;
- A copy of ASBJV site diary entries for all days that USTs were removed from the PREW worksite;
- A copy of liquid waste disposal certificates for liquid waste removed from the USTs (Note: Section 10 of the Epic 2019 DSI advised that the USTs contained petroleum product);
- Copies of tank destruction certificates for all USTs removed from the PREW site;
- All validation sample data, if any, obtained from soils that remained in the UST excavation pits; and
- Assess the risks posed by contaminated soils remaining on-site that exceed the commercial/industrial SILs.

The Epic 2019 DSI[44] also advised that localised areas of soil vapour risk were likely to be present in the vicinity of USTs and associated petroleum infrastructure, which required further assessment by ASBJV at the time the infrastructure was removed. If significant volatile petroleum hydrocarbons impacts were identified, the NEPM soil vapour criteria may not be sufficiently protective of workers engaged in hard rock drilling or excavation works due to the potential for such work to generate higher vapour levels that normally exist in ambient subsurface conditions. In these circumstances the risks posed by such work would need to be further investigated and assessed by ASBJV.

[43] Sections 9.3 and 10, Ref [3]
[44] Section 10, Ref [3]

3.4.1 Removal of USTs

ASBJV (Refs [4] & [5]) advised that:

- A SWMS for the decommissioning and removal of USTs at the Site was prepared by Metropolitan Demolition dated 26/02/19;
- A methodology for the removal of USTs was prepared by Metropolitan Demolition dated 22/08/19;
- USTs were decommissioned prior to removal, as shown by a 12/03/19 hot work permit issued by Metropolitan Demolition for a UST at Area C1b on the western side of Parramatta Road (No. 266);
- Gas vapour testing was conducted around all USTs removed in accordance with the Metropolitan Demolition methodology. The testing was conducted by trained personnel and confirmed no vapour or gas was leaking/vaporising during the removal period, as shown by records of the gas testing undertaken by ASBJV during this process. Daily gas free and continuous monitoring with a PID was undertaken during UST removal. As no significant volatile petroleum hydrocarbon impacts were identified at the Site, no further investigations were undertaken;
- USTs were removed from five areas of the PREW site, as shown in **Figure 3-4**;

Figure 3-4 Locations of USTs Removed from PREW site (Source: Refs [4] & [5])

- The USTs were decommissioned and removed offsite in accordance with the Metropolitan Demolition methodology and SWMS, as shown by photos in **Figures 3-5** to **3-8** and site diary entries dated 26/03/19, 2/05/29, 6 - 9/05/19, 15/05/19 – 16/05/19;
- Liquid waste removal was conducted by the licensed liquid waste contractor Remondis;
- The UST pits were backfilled with compacted soil and covered by steel reinforced concrete paving;

Figure 3-5 Photos of UST Removal Operation at PREW site on 26/03/19 (Sheet 1 of 2) (Source: Ref [5])

Removal of petroleum waste in a UST by licensed liquid waste contractor

Crushing of UST prior to off-site disposal

Figure 3-5 Photos of UST Removal Operation at PREW site on 26/03/19 (Sheet 2 of 2) (Source: Ref [5])

Figure 3-6 Photos of UST Removal Operation at PREW site on 2/05/19 (Sheet 1 of 2) (Source: Ref [5])

Figure 3-6 Photos of UST Removal Operation at PREW site on 2/05/19 (Sheet 2 of 2) (Source: Ref [5])

Figure 3-7 Photos of UST Removal Operation at PREW site on 6/05/19 (Sheet 1 of 4) (Source: Ref [5])

Figure 3-7 Photos of UST Removal Operation at PREW site on 6/05/19 (Sheet 2 of 4) (Source: Ref [5])

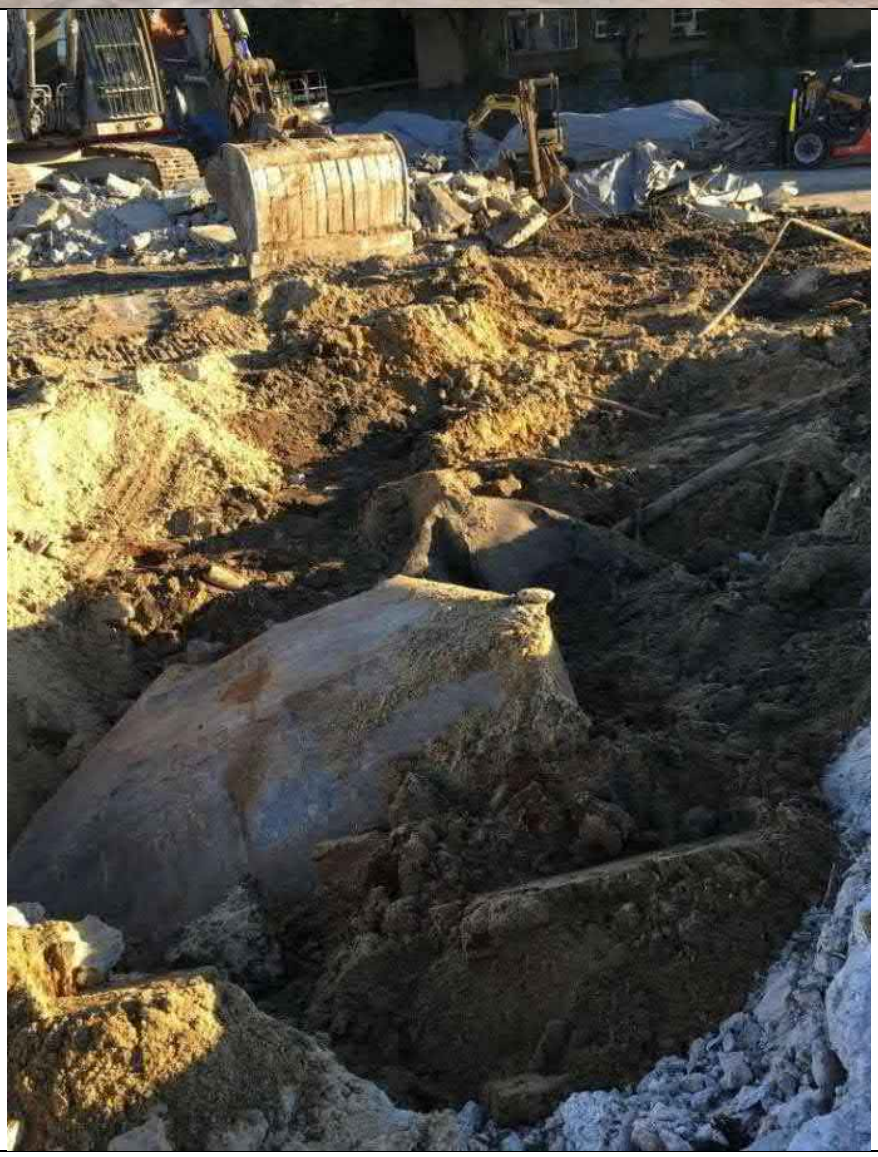


Figure 3-7 Photos of UST Removal Operation at PREW site on 6/05/19 (Sheet 3 of 4) (Source: Ref [5])

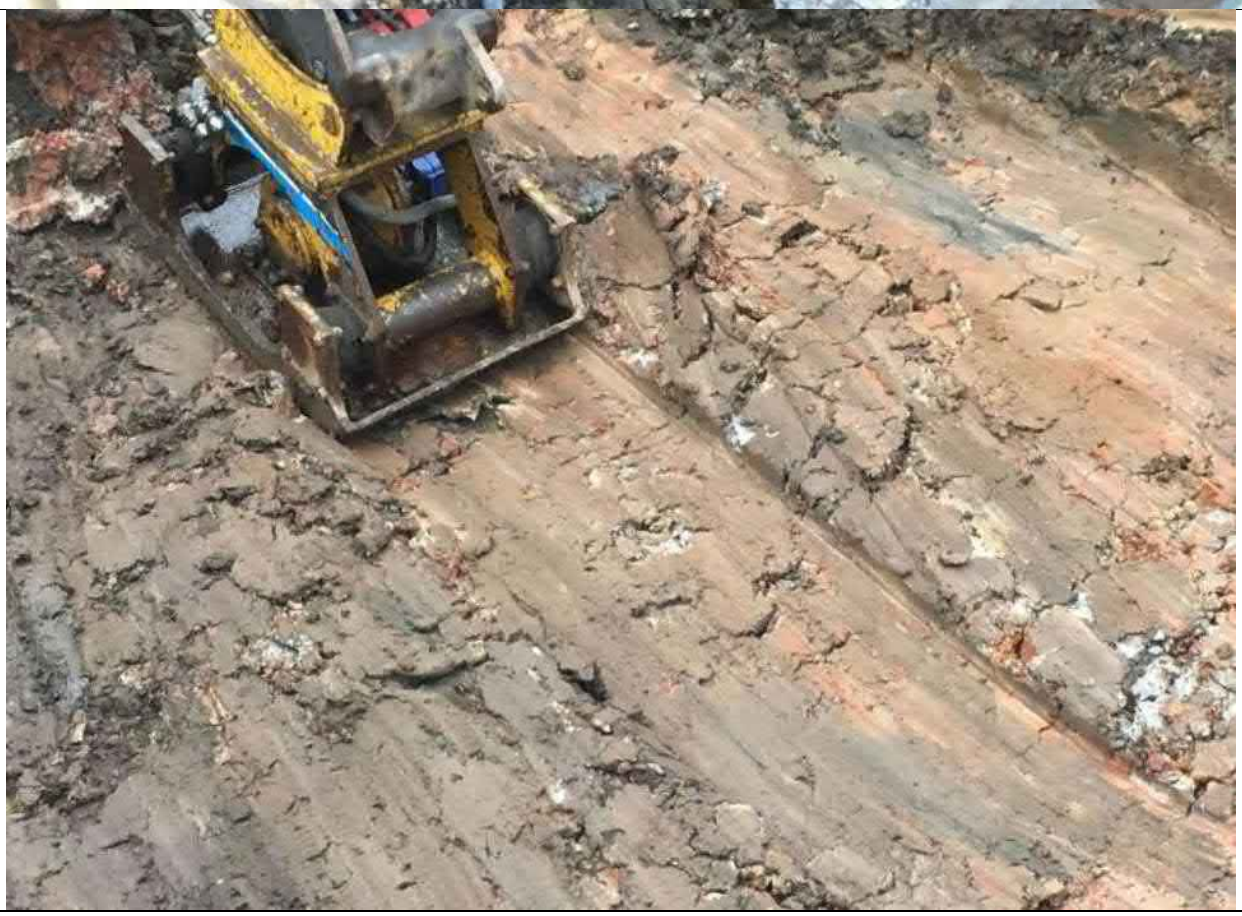


Figure 3-7 Photos of UST Removal Operation at PREW site on 6/05/19 (Sheet 4 of 4) (Source: Ref [5])

Figure 3-8 Photos of UST Removal Operation at PREW site on 8/05/19 (Sheet 1 of 3) (Source: Ref [5])

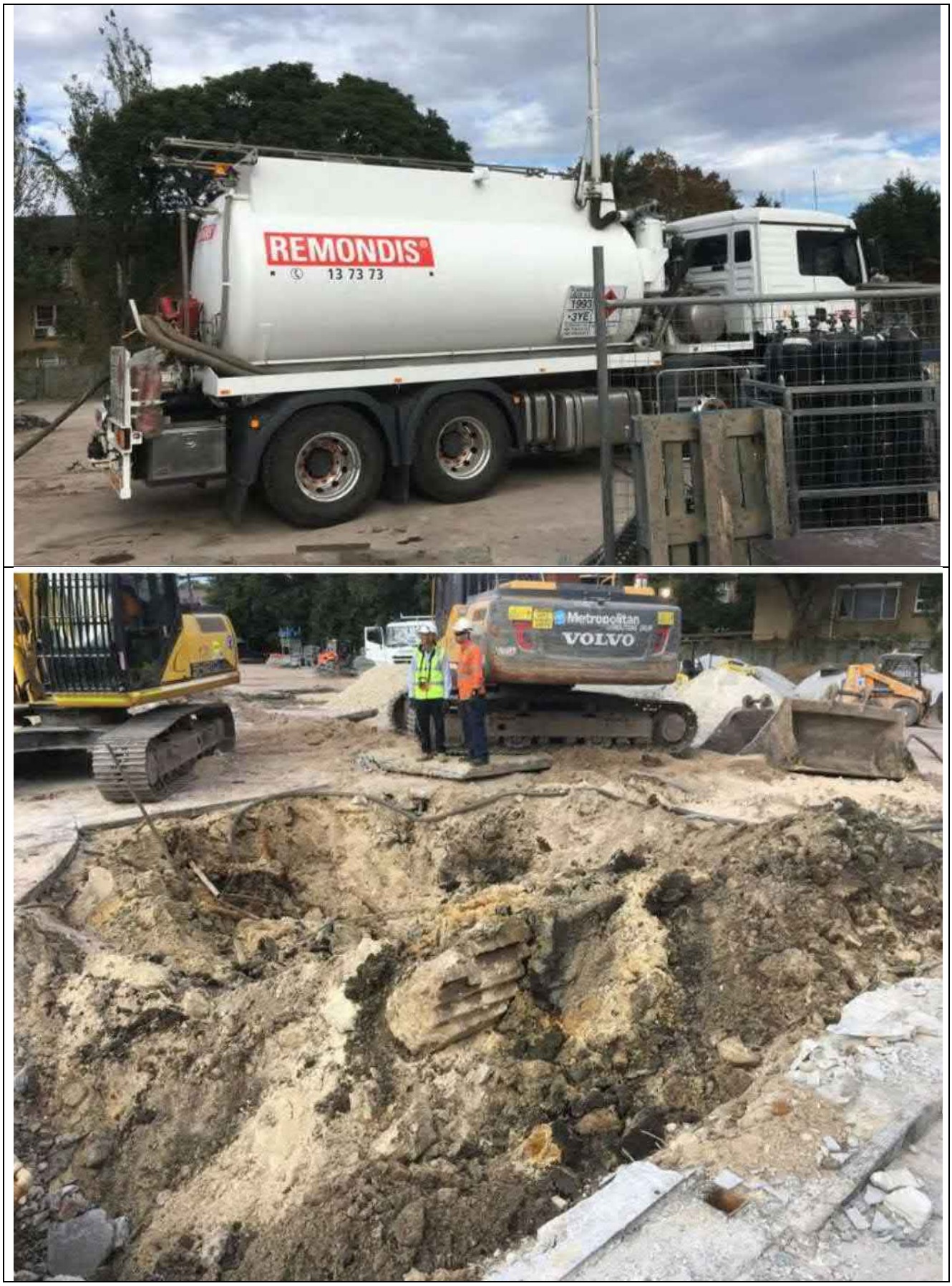


Figure 3-8 Photos of UST Removal at PREW site on 8/05/19 (Sheet 2 of 3) (Source: Ref [5])

Figure 3-8 Photos of UST Removal at PREW site on 8/05/19 (Sheet 3 of 3) (Source: Ref [5])

- The UST removal operation was conducted under ASBJV supervision, which included the site supervisor and site engineer as shown by a ASBJV site diary records dated 9/05/19; and
- Empty USTs were disposed at the Sell and Parker facility, as shown by a tank destruction certificate dated 22/08/19 for a 25,000L tank removed from Area C3b on the eastern side of Parramatta Road.

The Site Auditor identified deficiencies in the data provided by ASBJV concerning the removal of the USTs at the PREW site. These included:

- The USTs appear to have been removed between March and May 2019 before a methodology for removing USTs was documented by Metropolitan Demolition on 22/08/19;
- No records were provided showing the number, size and condition of USTs removed from the Site. During the Site Auditor's 4/11/22 site inspection, the ASBJV site engineer advised that 10 USTs were removed from the PREW site;
- No field record was provided from the demolition contractor or ASBJV site supervisor / engineer showing that each UST was decommissioned in accordance with regulatory requirements;
- No liquid waste trucking and disposal dockets were provided showing that all petroleum liquid waste was removed by Remondis from all USTs prior to being removed from the Site and that the liquid waste was disposed at a suitably licensed waste facility; and
- A certificate was provided for the destruction of only one of the 10 tanks removed from the Site.

Despite these deficiencies, the Site Auditor considered it was likely that the USTs were removed from the PREW site in general accordance with regulatory requirements. This is because:

- The UST removal work was supervised by the ASBJV site supervisor and engineer, as indicated by the site diary records and photos;
- The UST removal work was undertaken by Metropolitan Demolition, an experienced and suitably licensed demolition contractor;
- Site records indicated that liquid waste was removed from USTs by Remondis, an experienced and suitably licensed liquid waste contractor;
- The UST removal methodology prepared by Metropolitan Demolition was prepared in general accordance with regulatory requirements;
- Waste dockets reviewed in **Section 3.4.2** showed that a significant amount of contaminated soil from the UST areas (1,060 m^3) was classified and disposed off-site as GSW;
- Site photos indicated that no gross contamination remained in the tank excavations;
- Site photos indicated that the UST pits were backfilled and compacted with site-won material and/or imported crushed sandstone;
- Site photos indicated the former UST areas were covered by reinforced concrete pavements; and
- The Site Auditor observed no UST remnants or stockpiled contaminated soil at the Site when inspections were conducted on 2/06/21 and 4/11/22.

However, the Site Auditor considered there was a risk that unknown USTs may remain on-site because:

- The Epic 2019 DSI did not identify all USTs present at the Site, since it only identified four USTs that needed to be removed whereas the ASBJV plan (**Figure 3-4**) showed five areas where USTs were removed. The ASBJV site engineer also advised that Site Auditor at the 4/11/22 site inspection that more than one UST was present at some of the areas where USTs were removed;
- During a site inspection conducted by the Site Auditor on 4/11/22, the ASBJV site engineer advised that more USTs were removed from the Site than the four USTs identified by the Epic 2019 DSI, as previously described in **Section 2.3**;
- No methodology was provided showing how ASBJV identified USTs at the Site; and

- ASBJV[45] advised that there were no large scale excavation or ground disturbance work at the Site that would expose the soils underlying the old concrete ground slab. Following the completion of demolition work at the Site, the ground surface across some areas of the Site remained sealed by concrete ground slabs, as shown in **Figure 3-3**. It was possible that an unknown UST may remain below the old concrete ground slab. The Site Auditor has assessed the significance of this risk in **Section 3.4.4**

The Site Auditor also found that some fuel fill points and belowground fuel pipelines associated with removed USTs remained at the Site when inspecting the PREW site on 2/06/11 and 4/11/22, as shown by the photo provided in **Figure 3-9**. There was a risk that localised petroleum hydrocarbon contamination may remain around this buried infrastructure. The Site Auditor has assessed the significance of this risk in **Section 3.4.4**.

Figure 3-9 Fuel Fill Point Remaining in Area C1b on Western Side of PREW Site

(Source: Site Auditor photo taken 2/06/21)

3.4.2 Waste Classification and Disposal

Refer **Section 3.7.**

3.4.3 Remediation of Contaminated Soils around USTs

ASBJV[46] advised that they were not contracted to remediate contaminated soils at UST areas. The Site has assessed the significance of this limitation in the scope of work undertaken by ASBJV at the PREW site in **Section 3.4.4**.

3.4.4 Site Auditor Overview

The CSM identified USTs and associated infrastructure (APEC 4) as APECs that posed contamination risks at the PREW site (**Section 2.4**). Following the completion of ESAs between 2018 and 2019, construction activities were undertaken at the PREW site by ASBJV, which involved the removal of USTs between March and August 2019.

[45] Comment 1(a), Ref [5]
[46] Comment 4(e), Ref [5]

The Site Auditor considered the weight of evidence supported the conclusion that there was a risk of petroleum hydrocarbon contamination remaining in soils at former UST areas within the PREW site at concentrations above commercial / industrial D criteria. This is because:

- There was a risk that unknown USTs may remain on-site for the reasons given in **Section 3.4.1**;
- Some fuel fill points and belowground fuel pipelines associated with removed USTs remained at the Site;
- The UST removal methodology prepared by Metropolitan Demolition dated 22/08/19 did not include any procedures for removing contaminated soils once the UST had been removed;
- ASBJV[47] advised that they were not contracted to remediate contaminated soils at UST areas;
- Photos provided in ASBJV site diaries (**Figures 3-6** to **3-8**) showed stained soils remaining in UST excavated pits consistent with petroleum hydrocarbon contamination;
- ASBJV[48] advised that no validation samples were taken from the sides of excavated UST pits;
- Some samples used for waste classification of stockpiled soil removed from UST excavations exceeded the commercial/industrial D criteria; and
- The documentation indicated that soils excavated from UST pits were placed in stockpiles, which remained on-site for several months. Prior to the stockpiles being removed from Site, samples from the stockpiled soil were collected and tested for waste classification purposes. These samples would have measured petroleum hydrocarbon concentrations lower than and not representative of the soils that remained in the UST areas due to natural degradation processes. Consequently, the petroleum hydrocarbon concentrations in the soil samples used to classify the stockpiled soils would have under-estimated the contaminant concentrations remaining in the unexcavated soil.

Despite the risk of TRH contamination at the former UST areas exceeding commercial/industrial D criteria, the Site Auditor considered the approach adopted by the ASBJV environment team to manage this contamination at the PREW site met the requirements of their contract, the planning consent and EPL, as described in **Section 1.2.1**. This is because the weight of evidence indicated that:

- ASBJV only disturbed contaminated soil required to allow the removal of USTs and that this soil was classified and disposed off-site;
- There was a low risk that construction work undertaken by ASBJV at the Site generated contamination;
- The PREW site was capable of being returned to a condition suitable as a road construction worksite if it was capped and managed by a LTEMP; and
- The requirements of the EPL did affect the management of TRH contamination at the Site.

The Site Auditor considered the risks posed by TRH contamination remaining at former UST areas at the PREW site were capable of being addressed by capping the Site and managing the residual contamination by means of a LTEMP. This is because:

- The ESA data reviewed in **Section 2** indicated that exceedances of the petroleum hydrocarbon commercial/industrial criteria were not extensive and were likely to be localised and restricted to the former UST areas
- The data reviewed in **Section 3.4** indicated that:
  - No gross contamination was likely to remained in the former UST excavations;
  - The UST pits were backfilled and compacted with site-won material and/or imported crushed sandstone;
  - The removal of the USTs meant that the main source of petroleum hydrocarbon contamination in this area had been removed and that remaining TRH contamination in the area would degrade with time.

[47] Comment 4(e), Ref [5]
[48] Comment 4(e), Ref [5]

- The Site Auditor found no evidence that construction activities undertaken at the PREW site had generated contamination
- A cap would prevent uncontrolled direct contact with underlying contamination that remained at the Site
- A cap would allow any soil vapours underlying the cap to be managed
- The required end use of the PREW site was as a road construction worksite, which was not a sensitive land use compared to residential or open space parkland.
- At the end of construction work the PREW site remained capped by a concrete ground slab, as described in **Section 3.9**.

A LTEMP needed to be prepared to manage the risk of residual TRH contamination remaining at former UST areas within the PREW site, which is further discussed in **Section 3.10**.

3.5 Removal of Other Below Ground Structures

The CSM (**Section 2.4**) identified below ground structures as areas of potential environmental concern (**APECs**) that posed contamination risks at the PREW site. These below ground structures in addition to USTs comprised:

- APEC 1: Pits associated with mechanical workshops;
- APEC 3: Pits associated with washdown areas; and
- APEC 11: Buried services.

3.5.1 Pits at Mechanical Workshops and Washdown Areas

The Site Auditor found no evidence of exposed pits remaining at the PREW site, particularly at the former mechanical workshops and washdown areas, during inspections conducted on 2/06/21 and 4/11/22. This outcome is shown by photos taken by the Site Auditor provided in **Appendix D**. It's likely that ASBJV cleaned out these pits and infilled them with concrete to remove trip hazards and provide a reasonably level concrete pavement across the Site.

The Site Auditor considered that contamination risks associated with the former use of pits at the Site could be managed by an LTEMP because:

- The ESA data reviewed in **Section 2** indicated that exceedances of the petroleum hydrocarbon commercial/industrial criteria were not extensive and were likely to be localised and restricted to former below ground structures;
- The Site Auditor found no evidence that construction activities undertaken at the PREW site had generated contamination;
- A cap would prevent uncontrolled direct contact with underlying contamination that remained at the Site;
- A cap would allow any soil vapours underlying the cap to be managed;
- The required end use of the PREW site was as a road construction worksite, which was not a sensitive land use compared to residential or open space parkland; and
- At the end of construction work the PREW site remained capped by a concrete ground slab, as described in **Section 3.9**.

A LTEMP needed to be prepared to manage the risk of residual contamination remaining at pits within the PREW site, which is further discussed in **Section 3.10**.

3.5.2 Removal of Buried Services

ASBJV[49] advised that buried services remained on the property boundaries. These services included water, sewer and gas. All services remained in-situ and had not been disturbed due to their location on the boundary of site. As such investigations into whether these assets contained asbestos or other hazardous materials was not required.

The Site Auditor considered the approach adopted by the ASBJV environment team to manage potential contamination associated with buried services at the PREW site met the requirements of their contract, the planning consent and EPL, as described in **Section 1.2.1**. The Site Auditor considered that contamination risks associated with buried services remaining at the Site could be managed by an LTEMP.

A LTEMP needed to be prepared to manage the risk of residual contamination remaining at buried services within the PREW site, which is further discussed in **Section 3.10**.

3.6 Construction Activities at Site

3.6.1 Description of Construction Activities

ASBJV[50] advised that at the PREW site:

- Site establishment activities were undertaken during 2019 that involved the demolition of buildings and the removal of USTs. The only excavation work that occurred at the Site involved the removal of USTs;
- Existing paved areas were. As work progressed, any temporarily exposed areas from building demolition or UST removal were concreted to withstand heavy vehicle loads at C1b or light vehicles at C3b;
- Other work undertaken at the Site was minor and restricted to the surface of the concrete pavement, involving water connections, speed bumps, line marking, signs and fencing/hoarding;
- The C3b (eastern) area was then used as a vehicle carpark with office space for the mechanical and electrical (**M&E**) team together with a Community Information Centre that was established for residents in the local area to visit; and
- The C1b (western) area was then used as laydown space for material storage, with truck deliveries and forklifts used to store/retrieve pits, pipes, rock bolts etc. Some chemicals were temporarily stored on bunds in this location and were regularly inspected as part of weekly site inspections undertaken by ASBJV. The area was also used to house changing rooms and temporary ablution blocks.

The Site Auditor considered this description of construction activities undertaken at the PREW site is consistent with the construction drawings (**Figure 1-4**) and observations made by the Site Auditor during inspections conducted on 2/06/21 and 4/11/22 as shown by photos provided in **Appendix D**.

3.6.2 Stockpiling of Excavated Material

ASBJV[51] advised that excess material that could not be used as backfill on-site was temporarily stockpiled on-site, covered with geofabric and sandbags prior to removal. The stockpiles were tested by Alliance Geotech before off-site disposal. The Site Auditor considered there was a low risk of site contamination from material stockpiling on-site based on the description provided by ASBJV, which was consistent with site photos provided in **Figures 3-6** to **3.8**.

[49] Comment 3, Ref [5]
[50] Comments 6, 8 & 9, Ref [5]
[51] Comment 6(b), Ref [5]

3.6.3 Environmental Control Measures

ASBJV[52] advised that environmental control measures used at the PREW site included:

- Dust suppression sprinklers placed on scaffolding during demolition work;
- Hosing undertaken on-site during windy periods to control dust;
- Street sweeping as required; and
- Stabilisation of existing hardstand exits throughout construction.

The Site Auditor considered the environmental control measures described above are consistent with photos provided in ASBJV site diary entries and observations of site conditions made during inspections by the Site Auditor. The Site Auditor considered these environmental control measures helped to keep construction activities at the PREW site from posing a site contamination risk.

3.6.4 Unexpected Finds

ASBJV (Ref [4]) provided documentation showing that four unexpected finds were made during construction activities at the PREW site, with a summary provided in **Table 3-5**.

Table 3-5 Unexpected Finds made at PREW Site

UF #	Date	Contaminant	Date of UF record	UFP Intitiated	Notes
3	11/02/2019	Asbestos from former building	11/02/2019	Yes	Test results confirmed asbestos and removed from site
5	26/02/2019	Asbestos in undisturbed soil at Parramatta Road west site	26/02/2019	Yes	Removal completed
8	9/04/2019	Asbestos	**Not provided**	**Not provided**	Test results confirmed asbestos and removed from site
13	6/05/2019	UST	6/05/2019	Yes	Located adjacent to former Barnco building site

The Site Auditor considered the documentation provided by ASBJV indicated that unexpected finds were likely to have been properly managed and helped to keep construction activities at the PREW site from posing a site contamination risk.

3.6.5 Environmental Incidents

ASBJV[53] advised that 10 environmental incidents occurred at the PREW site during the project. These comprised:

- Five incidents were traffic related infringements;
- Two were procedural/reporting incidents;
- One was the result of a burst water main at C1b;
- There were two spills:
  - One spill was reported to the EPA when some water used as dust suppression leaked during the removal of a UST at the C3b (eastern) area. It was cleaned up prior to entering the nearest stormwater pit; and
  - The second spill occurred at the C1b (western) laydown area and was reported to TfNSW. It occurred when the operator of a forklift, in attempting to retrieve a pit, made contact with a Tamshot pod (sprayed concrete quick accelerator liquid compound). This was contained to the hardstand area and did not leave site or cause environmental harm.

[52] Comment 6(c), Ref [5]
[53] Comment 8(c), Ref [5]

The Site Auditor considered these 10 incidents posed a low risk of contamination to the PREW site.

3.6.6 Potential for Construction Activities to Contaminate the Site

ASBJV[54] assessed the risk of construction activities contaminating the PREW site as negligible. The Site Auditor considered the weight of evidence supported this conclusion because:

- The site establishment work involved the demolition of above ground structures, which the Site Auditor considered to pose a low contamination risk for the reasons given in **Section 3.3.5**;
- The Site establishment work involved the removal of USTs, associated liquid waste and 1,060 m^3 of contaminated soil, as described in **Section 3.4**;
- A reinforced concrete pavement was then maintained across the Site, as shown by **Figure 3-3** and observations made by the Site Auditor during site inspections conducted on 2/06/21 and 4/11/22;
- The description of construction activities, stockpiling and environmental control measures provided in **Section 3.6**;
- The Site was subsequently used for passive used as previously described; and
- The Site Auditor found no physical evidence of contaminated soils or chemicals remaining at the Site at the end of the project.

3.7 Waste Classification and Management

The documentation provided by ASBJV (Refs [4] & [5]) on how waste generated at the PREW site was managed comprised:

- Waste classification reports for contaminated soils excavated from UST areas;
- A spreadsheet that tracked loads of waste removed from the Site;
- Disposal dockets provided by waste facilities;
- EPA waste tracking dockets; and
- Tank destruction certificates for USTs removed from the Site.

The data covered the period 18/02/19 to 6/06/19 (referred to as the "tracking period"). A summary of the data provided by ASBJV is provided in **Table 3-5**.

3.7.1 Demolition Waste

In terms of total waste quantities, the data provided by the ASBJV waste documentation showed that:

- The estimated total amount of demolition waste removed from the PREW site was 5,187 t;
- The total amount of C&D waste (i.e. bricks and concrete) disposed during the tracking period was 2,382m^3, which exceeded the predicted waste volume of 1,483 m^3 (**Table 3-2**)[55];
- The total amount of asbestos disposed during the tracking period was 0.8 t, which was below the predicted waste volume of 6 t (**Table 3-2**);
- The total amount of metal (predominantly steel) disposed during the tracking period was more than 67.4t, which was well below the predicted waste volume of 820 t (**Table 3-2**);
- The total amount of GSW rubbish disposed during the tracking period was 619 t[56], which was well above the predicted amount of 96 t (**Table 3-2**);
- The total amount of green waste disposed during the tracking period was 34 t, which was reasonably close to the predicted amount for 50 trees and shrubs (**Table 3-2**);

[54] Comment 8(b), Ref [5]
[55] Based on a unit weight for brick and concrete rubble of 2.0 t/m^3
[56] Based on a unit weight for GSW rubbish of 1.5 t/m^3

Table 3-5 Summary of Waste Disposal Data Provided by ASBJV (page 1 of 2)

			Amount of Waste								Documentation Provided	
Date	Receiving Waste Facility	EPA EPL	C&D Waste (m3)	Non-friable asbestos (t)	Friable asbestos (t)	Metal (t)	GSW (m^3)	Rubbish (GSW) (t)	Rubbish (GSW) (m^3)	Green waste (t)	Waste Facility Docket	EPA Waste Tracking
18/02/2019	SUEZ Elizabeth Drive	12889			0.64						yes	no
18/02/2019	SUEZ Elizabeth Drive	12889		0.15							yes	yes
19/02/2019	Metro Demo	11483							9		no	NR
20/02/2019	Sell & Parker	11555				3.12					yes	NR
20/02/2019	Dial a Dump	4679							30		no	NR
20/02/2019	Dial a Dump	4679								30	no	NR
20/02/2019	Sell & Parker	11555				?					no	NR
21/02/2019	Metro Demo	11483	30								no	NR
21/02/2019	Sell & Parker	11555				10.76					no	NR
25/02/2019	Metro Demo	11483	120								no	NR
25/02/2019	Sell & Parker	11555				?					no	NR
26/02/2019	Sell & Parker	11555				?					no	NR
27/02/2019	Metro Demo	11483	120								no	NR
27/02/2019	Sell & Parker	11555				2.4					no	NR
7/03/2019	Sell & Parker	11555				5.52					no	NR
7/03/2019	Metro Demo	11483	42								no	NR
8/03/2019	Dial a Dump	4679							30		no	NR
8/03/2019	Sell & Parker	11555				?					no	NR
11/03/2019	Metro Demo	11483	180								no	NR
11/03/2019	Dial a Dump	4679							30		no	NR
12/03/2019	Metro Demo	11483	90								no	NR
12/03/2019	Sell & Parker	11555				?					no	NR
13/03/2019	Metro Demo	11483	90								no	NR
13/03/2019	Sell & Parker	11555				2.3					no	NR
14/03/2019	Metro Demo	11483	60								no	NR
15/03/2019	Metro Demo	11483	30								no	NR
23/03/2019	Sell & Parker	11555				?					no	NR
23/03/2019	Metro Demo	11483	60								no	NR
28/03/2019	Dial a Dump	4679							60		no	NR
28/03/2019	Metro Demo	11483	60								no	NR
29/03/2019	Dial a Dump	4679						3.16			yes	NR
29/03/2019	Sell & Parker	11555				4.54					yes	NR
29/03/2019	Sell & Parker	11555				11.16					no	NR
29/03/2019	Dial a Dump	4679							120		no	NR
30/03/2019	Sell & Parker	11555				2.82					yes	NR
30/03/2019	Dial a Dump	4679							30		no	NR
30/03/2019	Metro Demo	11483	30								no	NR
1/04/2019	Sell & Parker	11555				7.02					yes	NR
1/04/2019	Sell & Parker	11555				?					no	NR
1/04/2019	Metro Demo	11483	90								no	NR
3/04/2019	Metro Demo	11483	60								no	NR
4/04/2019	Dial a Dump	4679						8.38			yes	NR
4/04/2019	Sell & Parker	11555				4.12					no	NR
4/04/2019	Dial a Dump	4679						4.00			no	NR
5/04/2019	Sell & Parker	11555				6.16					yes	NR
5/04/2019	Sell & Parker	11555				2.94					no	NR
9/04/2019	Sell & Parker	11555				4.58					no	NR
10/04/2019	Metro Demo	11483	60								no	NR
12/04/2019	Metro Demo	11483	180								no	NR
12/04/2019	Dial a Dump	4679							30		no	NR
12/04/2019	Dial a Dump	4679						5.16			no	NR

Table 3-5 Summary of Waste Disposal Documentation Provided by ASBJV (page 2 of 2)

			Amount of Waste								Documentation Provided	
Date	Receiving Waste Facility	EPA EPL	C&D Waste (m3)	Non-friable asbestos (t)	Friable asbestos (t)	Metal (t)	GSW (m^3)	Rubbish (GSW) (t)	Rubbish (GSW) (m^3)	Green waste (t)	Waste Facility Docket	EPA Waste Tracking
13/04/2019	Metro Demo	11483	270								no	NR
13/04/2019	Sell & Parker	11555				?					no	NR
15/04/2019	Metro Demo	11483	240								no	NR
16/04/2019	Dial a Dump	4679								4.04	yes	NR
16/04/2019	Metro Demo	11483	210								no	NR
17/04/2019	Metro Demo	11483	60								no	NR
17/04/2019	Dial a Dump	4679							30		no	NR
2/05/2019	Sell & Parker	11555				?					no	NR
6/05/2019	Metro Demo	11483	180								no	NR
8/05/2019	Dial a Dump	4679							30		no	NR
9/05/2019	Sell & Parker	11555				?					no	NR
9/05/2019	Metro Demo	11483	60								no	NR
11/05/2019	Metro Demo	11483	60								no	NR
1/06/2019	Albion Park	?					452.4				no	NR
6/06/2019	Albion Park	?					424.3				no	NR
		TOTAL	**2382**	**0.15**	**0.64**	**67.4**	**877**	**20.7**	**399**	**34.0**		

The Site Auditor identified some data gaps in the documentation provided by ASBJV on demolition waste generated at the PREW site, these being:

- None of the demolition waste removed from the PREW site was classified as PCB waste (Note: **Table 3-2** estimated 124 items of PCB waste were present at the Site;
- None of the demolition waste removed from the PREW site was classified as lead dust or covered by lead containing paints (Note: **Table 3-2** estimated >70 m^2 of lead dust and >45 m2 of lead containing painted materials were present at the Site);
- Waste facility dockets were provided for only 40 t of the estimated 5,187 t of the demolition waste removed from the PREW site, which corresponds to less than 0.8%; and
- Waste facility dockets were provided 13 of the 23 loads of metal demolition waste removed from the Site.

Nevertheless, the Site Auditor considered the weight of evidence supported the conclusion that demolition waste generated at the PREW site was likely to have been taken to suitably licensed waste facilities because:

- A well prepared CWMS was prepared for the demolition work;
- The demolition work required compliance with inspection and test plans;
- The demolition program included hold and witness points relevant to the work;
- ASBJV advised that demolition and asbestos removal was managed by the demolition contractor;
- The scope of demolition work conducted at the Site is shown in **Figure 3-1**;
- Demolition wastes were removed under the supervision of the ASBJV environmental representative;
- All demolition waste was taken to an EPA licensed waste facility;
- ASBJV gave all waste loads a unique waste transfer docket number;
- All the missing waste facility dockets were for C&D waste and metal waste; and
- The Site Auditor observed that all demolition waste had been removed from the PREW site when inspected on 2/06/21, as shown by photos provided in **Appendix D**.

3.7.2 Liquid Waste from USTs

ASBJV did not provide copies of liquid waste disposal dockets for petroleum / oily waste removed from the USTS prior to their decommissioning. Despite this data gap, the Site Auditor considered it was likely that the USTs were removed from the PREW site in general accordance with regulatory requirements for the reasons given in **Section 3.4.1**.

3.7.3 Classification of Petroleum Contaminated Soils from UST Excavation Pits

ASBJV[57] provided six waste classification reports (**WCRs**) for soils reported to have been excavated from UST pits at the PREW site and disposed off-site. A summary of data provided by the reports is provided in **Table 3-6**.

Table 3-6 Summary of WCR Data for UST Excavated Soil Disposed Off-site

WCR Date	Enviro Consultant	Site Address	Number USTs Removed	Stockpile Sampling Date	Stockpile Soil Volume (m^3)	Number Samples Tested	Sample Frequency (per m^3)	Exceedances of HIL D (1)
1/04/2019	LSBJV	199 Parramatta Road, Ashfield	1	26/03/2019	120	4	30	Two samples measured TRH F1 at 274 & 346mg/kg
2/04/2019	LSBJV	248-252 Parramatta Road, Ashfield	2	1/04/2019	40	3	13	TRH F2 1000-3100mg/kg TRH F3 2000-5000mg/kg
3/06/2019	Alliance	242-252 Parramatta Road, Ashfield	??	23/05/2019	150	3	50	None
3/06/2019	Alliance	242-252 Parramatta Road, Ashfield	??	23/05/2019	50	3	17	None
3/06/2019	Alliance	242-252 Parramatta Road, Ashfield	??	23/05/2019	700	3	233	None
				Totals	**1060**	**16**	**66**	

Notes:
(1) TRH F1 HIL D = 250 mg/kg; EIL D = 215 mg/kg
TRH F2 HIL D = NL; EIL D = 170 mg/kg
TRH F3 HIL D = 3,500 mg/kg; EIL D = 1,700 mg/kg

The Site Auditor considered the weight of evidence supported the conclusion that the WCRs prepared for UST excavated soils removed from the Site generally met EPA guidance because each report included most of documentation required by the EPA[58], this being:

- The full name, address, Australian Company Number (ACN) or Australian Business Number (ABN) of the organisation and person(s) providing the waste classification;
- Location of the site where the waste was generated, including the site address;
- History of the material and the processes and activities that had taken place to produce the waste;
- Potential contaminating activities that may have occurred at the site where the waste was generated;
- Description of the waste, including photographs, visible signs of contamination, such as discolouration, staining, odours, etc;
- Quantity of the waste;

[57] ASBJV 7/10/21 email
[58] EPA website https://www.epa.nsw.gov.au/your-environment/waste/classifying-waste

- Number of samples collected and analysed;
- Sampling method including pattern, depth, locations, sampling devices, procedures, and photos of the sample locations and samples;
- Contaminants tested;
- Laboratory documentation – chain-of-custody, sample receipt, laboratory report;
- All results regardless of whether they are not used in the classification process;
- Brief summary of findings including discussion of results, exceedances of the relevant contaminant threshold (CT) or specific contaminant concentration (SCC) and toxicity characteristics leaching procedure (TCLP) threshold values; and
- A clear statement of the classification of the waste as at the time of the report.

One data gap was the absence of statistical analyses that gave the sample mean, sample standard deviation and the 95 percent upper confidence limit (**UCL**) of the sample mean. The Site Auditor considered this data gap was not significant because the waste classification met or was close to meeting recommended sample frequencies and the waste classification was based on the highest concentrations measured.

Another data gap identified by the Site Auditor was the absence of a protocol on what soils at a UST were to be excavated, stockpiled, classified and disposed off-site. The Site Auditor considered the weight of evidence supported the conclusion that the soils likely to have been excavated at a UST and disposed off-site were soils that needed to be excavated to allow the removal of the UST and associated infrastructure (e.g. fill points, fuel lines). This is because:

- ASBJV[59] advised that they were not contracted to remediate contaminated soils at UST areas;
- The data provided by ASBJV indicated that no remediation of contaminated soils occurred at UST areas at the Site; and
- Validation samples were not collected from the final excavated surfaces at UST pits.

Disposal of Petroleum Contaminated Soils from UST Excavation Pits

The waste track data summarised in **Table 3-5** indicated that 872 m^3 of GSW was removed from the PREW site and disposed at an unknown location in Albion Park between 1 and 6 June 2019. The Site Auditor considered this volume of GSW soil was likely to correspond to the petroleum contaminated soil that had been excavated from the UST pits between March and May 2019 because:

- Data provided by the ASBJV site diary, which included among other things the photos provided in **Figures 3-5** to **3-8**; and
- The total volume given by the ASBJV waste tracking spreadsheet (872 m^3) was in reasonable agreement with the total volume given by the WCRs in Table 3-6 (1,060 m^3).

One data gap that needed to be addressed was information of the property at Albion Park where the 872 m^3 of petroleum contaminated soil was disposed and whether the property was properly licensed and lawfully able to receive this waste. The Site Auditor considered this data gap did not affect the suitability of the PREW site for its intended road construction worksite land use because the contaminated soil had been removed from the Site. However, the EPA requires the Site Auditor to take reasonable steps to address this data gaps. For the purpose of this SAR, the Site Auditor addressed this data gap by issuing a Section B SAS, which requested ASBJV to provide all available data that would address this data gap.

[59] Comment 4(e), Ref [5]

3.8 Imported Fill

ASBJV[60] advised that no soil was imported to the project at the PREW site other than dry material from the SPI interface site that was used to backfill areas where there was a deficit.

The waste tracking spreadsheet provided by ASBJV (Ref [4]) indicated that 129 t of soil was imported from the SPI interface site, comprising:

- 28/03/19: 9 truck loads = 96 t; and
- 12/03/19: 3 truck loads = 63 t.

The Site Auditor considered the weight of evidence supported the conclusion that the only soil that was imported to the PREW site was crushed sandstone tunnel spoil from the SPI interface site because:

- Only minimal excavation work was undertaken at the Site, which involved the backfilling of UST excavation pits;
- The ASBJV site diary, which included the photos provided in **Figures 3-5** to **3-8** indicated that the imported soil was crushed sandstone tunnel spoil, which was used to backfill the UST excavation pits; and
- A material tracker detailing this information was provided in the evidence submission to the Site Auditor in October 2021

3.9 Final Site Condition

ASBJV[61] advised that final site conditions would consist of:

- Hardstand areas surrounded by fencing or hoarding with water/sewer connections on the property boundaries;
- The thickness of the final concrete pavement would be in accordance with design package CW02 (Construction Site Reinstatement) that required 150 mm thick concrete;
- Some areas that were cracked / worn and needed repair would be sawcut and patched before handover; and
- No exposed soils would remain at the Site.

Copies of final site condition design drawings are provided in Appendix B.

During the site inspection conducted on 4/11/22, construction activities still needed to be made to the western part of the PRE site. These comprised demolition of the retaining wall along the rear of the mechanical workshop, the split-level mechanical workshop and associated car ramp as shown by photos provided in **Figure 3-10**.

The Site Auditor addressed the need for this additional construction work to be completed by issuing a Section B SAS.

[60] Comment 8, Ref [5]
[61] Comment 9, Ref [5]

Figure 3-10 Structures on the Western Side of PREW Site that Needed to be Demolished

3.10 Review of LTEMP

The Site Auditor considered the approach adopted by the ASBJV environment team for managing contamination at the PREW site met the requirements of their contract, the planning consent and EPL, as described in **Section 1.2.1**, provided residual contamination risks were managed by a **LTEMP**. The contamination risks that remained at the Site and required long-term management comprised:

- Unknown bonded asbestos contamination remaining in fill (**Section 3.1.1**);
- TRH contamination remaining at former UST areas (**Sections 3.1.3 & 3.4.4**);
- Unknown USTs remaining at the Site (**Sections 3.4.1** & **3.4.4**);
- Former pit locations at mechanical workshops and washdown areas (**Section 3.5.1**); and
- Buried services (**Section 3.5.2**).

4. Conclusions

The Site Auditor considered the approach adopted by the ASBJV environment team for managing contamination at the PREW site met the requirements of their contract, the planning consent and EPL, as described in **Section 1.2.1**, for the reasons given in **Section 3**.

The Site Auditor considered that the weight of evidence supported the conclusions that:

- ASBJV managed contamination at the PREW site that ASBJV interfered or disturbed during the course of carrying out its work on the WestConnex Stage 3A project;
- Contamination was not generated at the PREW site;
- Contamination was not generated at the PREW site that caused an increase in contamination migrating from the Project site;
- The PREW site was returned to a condition suitable for a road construction worksite provided residual contamination risks were managed in accordance with an LTEMP prepared by an experienced environmental consultant that met EPA guidelines and was approved in writing by the Site Auditor and TfNSW; and
- The work generally complied with the requirements of EPL 21149 in relation to the management of site contamination.

The Site Auditor identified one data gap that needed to be addressed by ASBJV, which was to provide further information showing that 872 m^3 of petroleum contaminated soil removed from UST excavation pits was disposed to a suitably licensed waste facility as described in **Section 3.7.3**.

The contamination risks that remained at the Site and required long-term management by means of an LTEMP comprised:

- Unknown bonded asbestos contamination remaining in fill;
- TRH contamination remaining at former UST areas;
- Unknown USTs remaining at the Site;
- Former pit locations at mechanical workshops and washdown areas; and
- Buried services.

Some minor construction work also needed to be completed before the PREW site had reached its final condition.

The Site Auditor addressed the need for an LTEMP to be prepared and for minor construction work to be completed at the PREW site by:

- Having ASBJV issue an interim plan outlining the additional work that needed to be undertaken prior to the issuing of a Section A2 SAS; and
- Issuing a Section B SAS.

Copies of the Section B SAS and the ASBJV interim plan are provided in **Appendix E**.

5. Other Relevant Information

This SAR and the accompanying SAS relates to the WestConnex Stage 3A PREW site (Areas C1b & C3b) at Ashfield. This SAR was prepared in accordance with the Contaminated Land Management Act 1997 (as amended). Opinions and judgements expressed herein, which are based on our understanding and interpretation of current regulatory standards, should not be construed as legal opinions.

The audit report and statement have been prepared for ASBJV (the 'Client') for the purposes nominated in the audit report. It is acknowledged that the audit report and statement may be used by TfNSW, the Department of Planning and the NSW EPA in reaching their conclusions about the Site. The scope of work performed in connection with the audit review may not be appropriate to satisfy the needs of any other person. Any other person's use of, or reliance on, the audit report and statement, or the findings, conclusions, recommendations or any other material presented in them, is at that person's sole risk.

The audit was, and this report is, limited by and relies on the scope of work undertaken for this audit, the information made available to the Site Auditor by the Client and their environmental consultants on the PREW site (Epic) through the documents provided to us, and also on our observations of the site made during the audit period. The Site Auditor has taken this information to represent a fair and reasonable characterisation of the status of the land. Whilst all reasonable care was taken, to the extent practical under normal auditing procedures, to assure adequacy of the information, the Site Auditor and Ian Swane & Associates cannot warrant that this is the case. If the information is subsequently determined to be false, inaccurate or incomplete, it is possible that the Site Auditor's conclusions, as expressed in the audit report and statement may change.

This Site Audit applies to the condition of the PREW site at the time the audit was undertaken. The Site Auditor and Ian Swane & Associates cannot be responsible for future activities that may result in changes to the site conditions. In the event that site conditions have since changed or are likely to change in the future, the Site Auditor recommends that the property owner engage an environmental consultant to confirm that the PREW site is being properly maintained to a condition suitable for its proposed land uses.

It must also be recognised that sub-surface conditions, including groundwater levels and contaminant concentrations, can change in a limited time. This should be borne in mind if the audit report and statement is used after a protracted delay.

There are always some variations in sub-surface conditions across a site that cannot be fully defined by investigation. No investigation, in practice, can be thorough enough to preclude the presence of materials on the subject property that presently, or in the future, may be considered hazardous. Hence it is possible that the measurements and values obtained from the sampling and testing presented do not represent the extremes of conditions which exist within the site.

Because regulatory evaluation criteria are constantly changing, concentrations of contaminants present and considered to be acceptable at the time of this audit report and statement, may in the future become subject to different regulatory standards and require reassessment. It is not possible in a Site Audit Report to present all data that could be of interest to all readers of this report. Readers are therefore referred to the referenced documentation for further data.

Yours faithfully

Dr Ian C Swane (CPEng, CEnvP & CSCS)
Accredited EPA Site Auditor
Director, Ian Swane & Associates
Phone: 0418 867 112 Email: iswane@bigpond.com

Appendix A. Figures & Tables from Investigation Reports

Epic (August 2018)
PSI & SAQP

N

PRELIMINARY
FOR INFORMATION ONLY

	BY	DATE
DRAWN	D.W.	19.07.18
DESIGNED	M.B.	19.07.18
DESIGN ENGINEER		
LEAD ENGINEER		
CLIENT APPROVAL		
NTS		

CLIENT

LENDLEASE | SAMSUNG | BOUYGUES
JOINT VENTURE

SY180065.04

epic ENVIRONMENTAL

Suite 103, 88 FOVEAUX STREET, SURRY HILLS NSW 2010
T 1800 779 363
www.epicenvironmental.com.au

PROJECT WEST CONNEX M4-M5 LINK PROJECT
SITE CONSTRUCTION AREA - MUIRS (C1B & C3B)
TITLE MUIRS - C1B AND C3B LOCATION

A4	DRAWING NUMBER FIGURE F1	REVISION A

LEGEND

CONSTRUCTION AREA

PRELIMINARY
FOR INFORMATION ONLY

	BY	DATE
DRAWN	D.W.	19.07.18
DESIGNED	M.B.	19.07.18
DESIGN ENGINEER		
LEAD ENGINEER		
CLIENT APPROVAL		

NTS

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PROJECT WEST CONNEX M4-M5 LINK PROJECT
SITE CONSTRUCTION AREA - MUIRS (C1B & C3B)
TITLE MUIRS - EXISTING GROUNDWATER MONITORING

A4

DRAWING NUMBER
FIGURE F2

REVISION
A

LEGEND

CONSTRUCTION AREA

GROUNDWATER MONITORING WELL

$(GETVAR,22)

N

PRELIMINARY
FOR INFORMATION ONLY

	BY	DATE
DRAWN	D.W.	19.07.18
DESIGNED	M.B.	19.07.18
DESIGN ENGINEER		
LEAD ENGINEER		
CLIENT APPROVAL		
NTS		

CLIENT

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Suite 103, 88 FOVEAUX STREET, SURRY HILLS NSW 2010
T 1800 779 363
www.epicenvironmental.com.au

SY180065.04

PROJECT: WEST CONNEX M4-M5 LINK PROJECT
SITE: CONSTRUCTION AREA - MUIRS (C1B & C3B)
TITLE: PROPOSED SOIL BORE LOCATIONS

A4 | DRAWING NUMBER: FIGURE F3 | REVISION: A

LEGEND

CONSTRUCTION AREA

PROPOSED SOIL BORE

N

PRELIMINARY
FOR INFORMATION ONLY

	BY	DATE
DRAWN	D.W.	19.07.18
DESIGNED	M.B.	19.07.18
DESIGN ENGINEER		
LEAD ENGINEER		
CLIENT APPROVAL		
NTS		

CLIENT

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JOINT VENTURE

SY180065.04

epic ENVIRONMENTAL

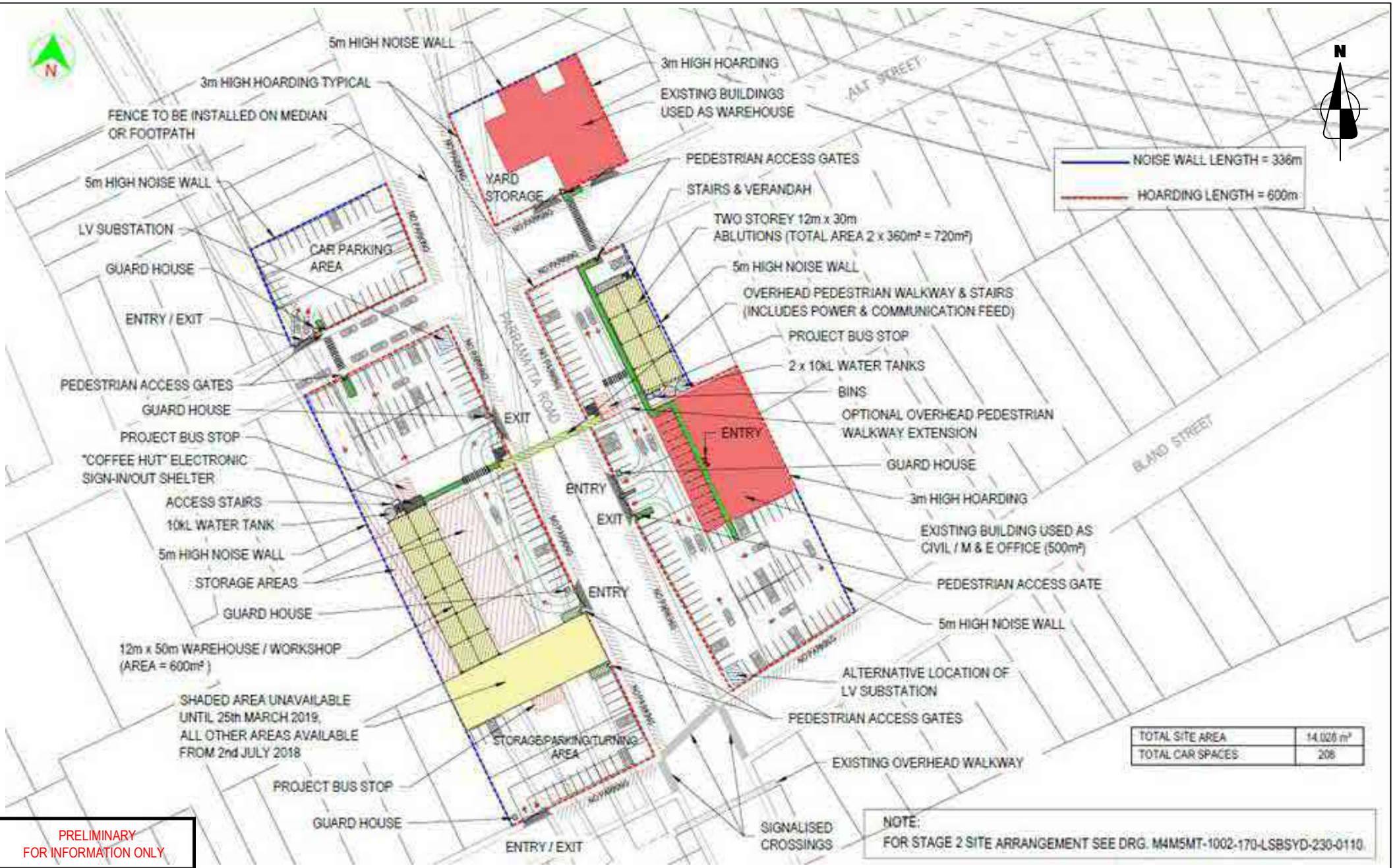
Suite 103, 88 FOVEAUX STREET, SURRY HILLS NSW 2010
T 1800 779 363
www.epicenvironmental.com.au

PROJECT: WEST CONNEX M4-M5 LINK PROJECT
SITE: CONSTRUCTION AREA - MUIRS (C1B & C3B)
TITLE: ENVIRONMENTAL - AREAS OF CONCERN

A4	DRAWING NUMBER: FIGURE F4	REVISION: A

LEGEND

CONSTRUCTION AREA



PRELIMINARY
FOR INFORMATION ONLY

	BY	DATE
DRAWN	D.W.	20.07.18
DESIGNED	C.K.	20.07.18
DESIGN ENGINEER		
LEAD ENGINEER		
CLIENT APPROVAL		
NTS		

CLIENT
LENDLEASE | SAMSUNG | BOUYGUES
JOINT VENTURE

SY180065.04

epic ENVIRONMENTAL
Suite 103, 88 FOVEAUX STREET, SURRY HILLS NSW 2010
T 1800 779 363
www.epicenvironmental.com.au

PROJECT WEST CONNEX M4-M5 LINK PROJECT
SITE CONSTRUCTION AREA - MUIRS (C1B & C3B)
TITLE PROPOSED SITE LAYOUT

A4	DRAWING NUMBER FIGURE F5	REVISION A

Epic (March 2019)
DSI

QGIS 2016 File Path: G\GIS\Epic Environmental\Projects\SY180065.04 - WCX3A - Parramatta Road - Muir\Workspaces\Figure F1 Site Location.qgs

0 10 20 30 40 50 m

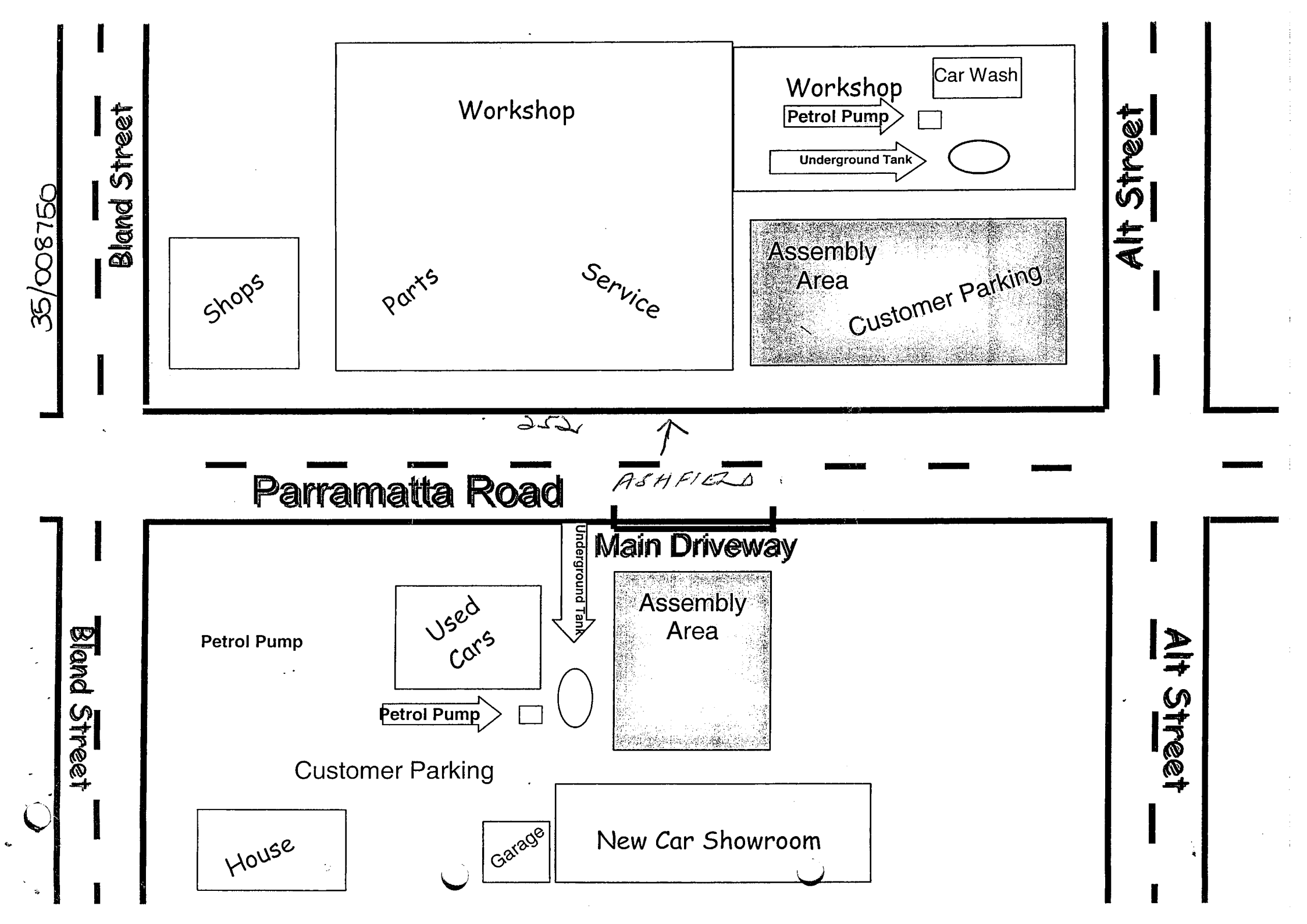
Scale: 1:1,000 @ A4

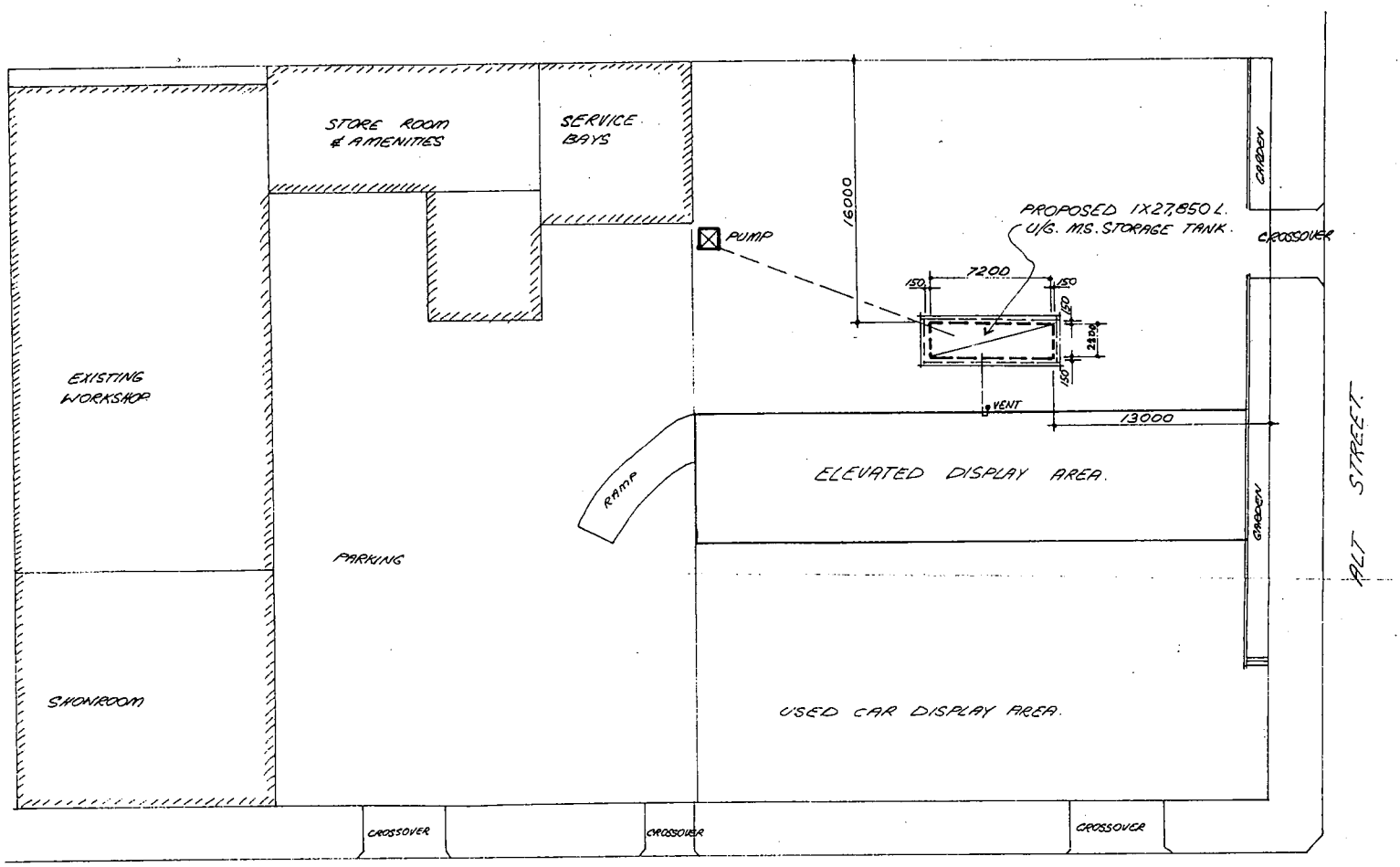
Datum: GDA94 Projection: MGA56

West Connex M4-M5 Link Project
Construction Area - Muirs (C1B and C3B)

Figure F1
Site Location

SY180065.04 Rev 0 May 2019


35/0087S0
Bland Street
Workshop
Workshop
Car Wash
Petrol Pump
Underground Tank
Shops
Parts
Service
Assembly Area
Customer Parking
Alt Street
252
ASHFIELD
Parramatta Road
Main Driveway
Underground Tank
Used Cars
Assembly Area
Petrol Pump
Petrol Pump
Bland Street
Alt Street
Customer Parking
House
Garage
New Car Showroom



SITE PLAN

AMENDMENTS

PROPOSED INSTALLATION OF 1X27,850 Li
UNDERGROUND M.S. STORAGE TANK

MUIRS MOTORS ASHFIELD — CNR. ALT ST. & PMATTA RD

SCALE	DATE	DRAWN	CHECKED
1:300	21/6/76	JHN.	

AMPOL PETROLEUM LIMITED
SYDNEY

JOB No. I.N.D. 29

Reduced) size

File Path: G:\GIS\Epic Environmental\Projects\SY180065.04 - WCX3A - Parramatta Road - Muir\Workspaces\Figure F2 Borehole QGIS 2016

0 10 20 30 40 50 m

Scale: 1:1,000 @ A4

Datum: GDA94 Projection: MGA56

West Connex M4-M5 Link Project
Construction Area - Muirs (C1B and C3B)

Figure F2
Borehole Location

QGIS 2016 File Path: G:\GIS\Epic Environmental\Projects\SY180065.04 - WCX3A - Parramatta Road - Muir\Workspaces\Figure F3 Groundwater Monitoring Well Locations.qgs

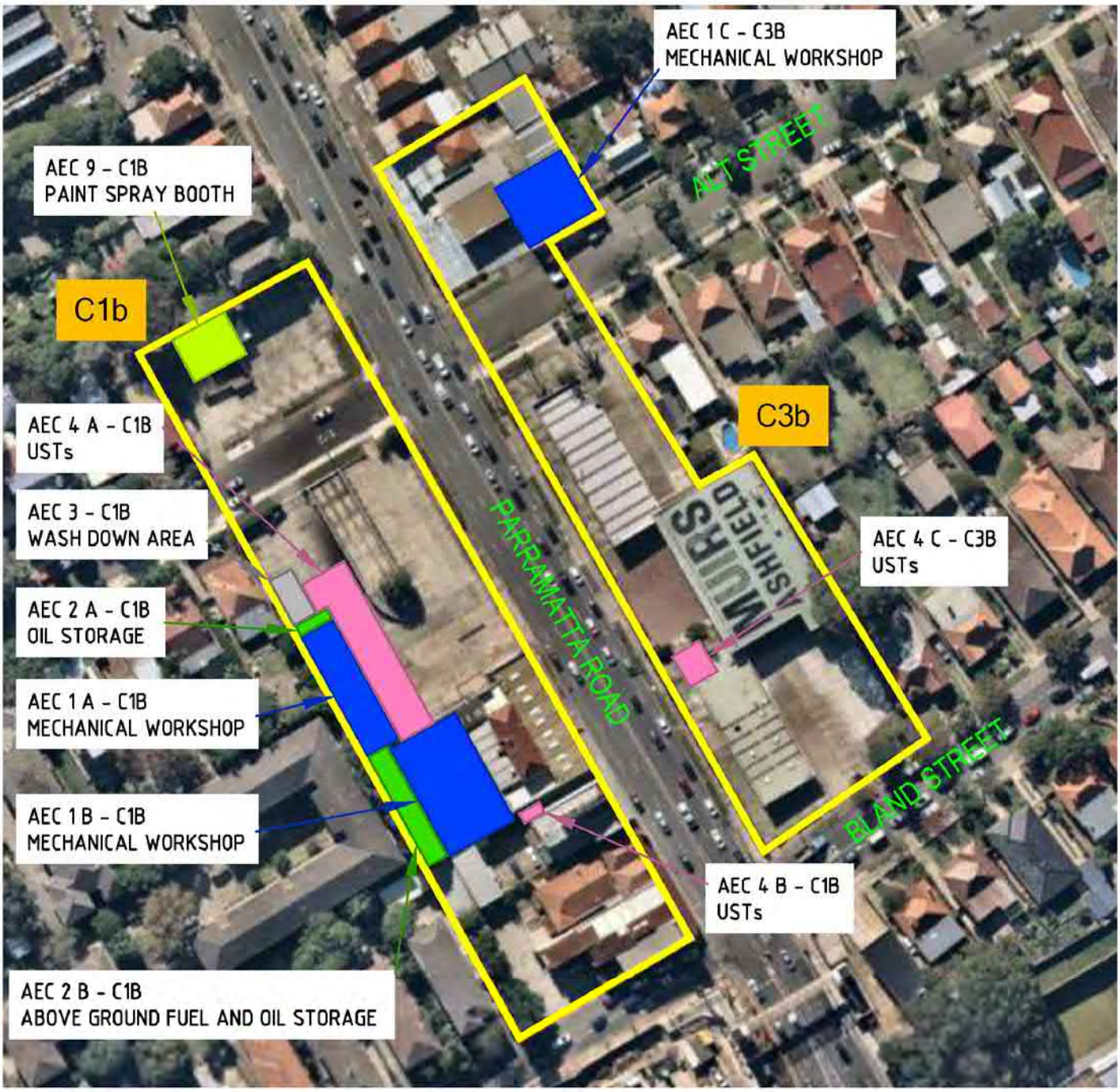
0 10 20 30 40 50 m

Scale: 1:1,000 @ A4

Datum: GDA94 Projection: MGA56

West Connex M4-M5 Link Project
Construction Area - Muirs (C1B and C3B)

Figure F3
Groundwater Monitoring Well Location



QGIS 2016 File Path: C:\GIS\Epic Environmental\Projects\SY180065.04 - WCX3A - Parramatta Road - Muir\Workspaces\Figure F4 Areas of Concern.qgs

Data Source: © Epic Environmental
© NSW Government Spatial Services 2018
Imagery: © Nearmap image web map service

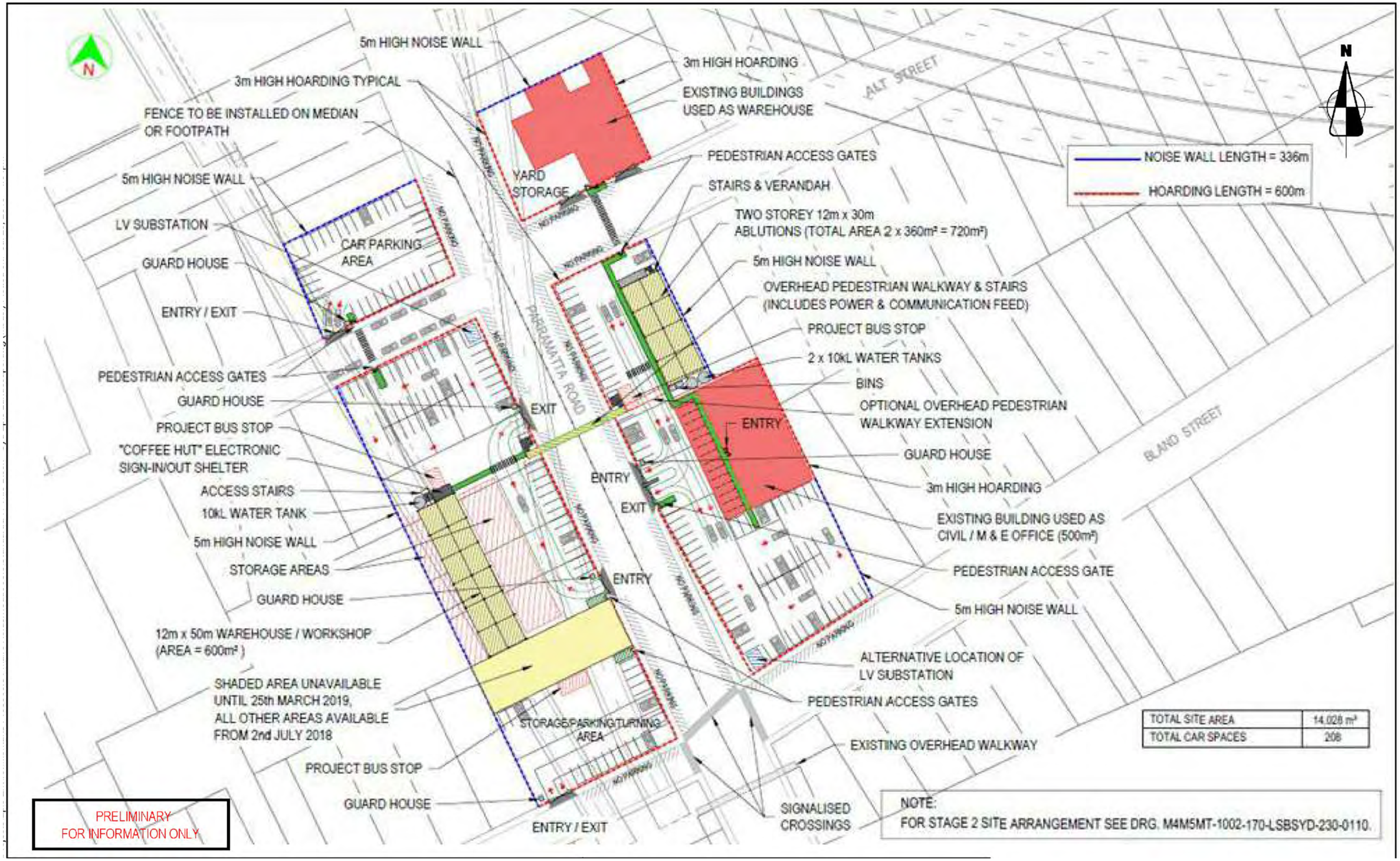
0 10 20 30 40 50 m

Scale: 1:1,000 @ A4

Datum: GDA94 Projection: MGA56

West Connex M4-M5 Link Project
Construction Area - Muirs (C1B and C3B)

Figure F4
Areas of Concern



QGIS 2016 File Path: C:\GIS\Epic Environmental\Projects\SY180065.04 - WCX3A - Parramatta Road - Muir\Workspaces\Figure F5 Proposed Work Area.qgs

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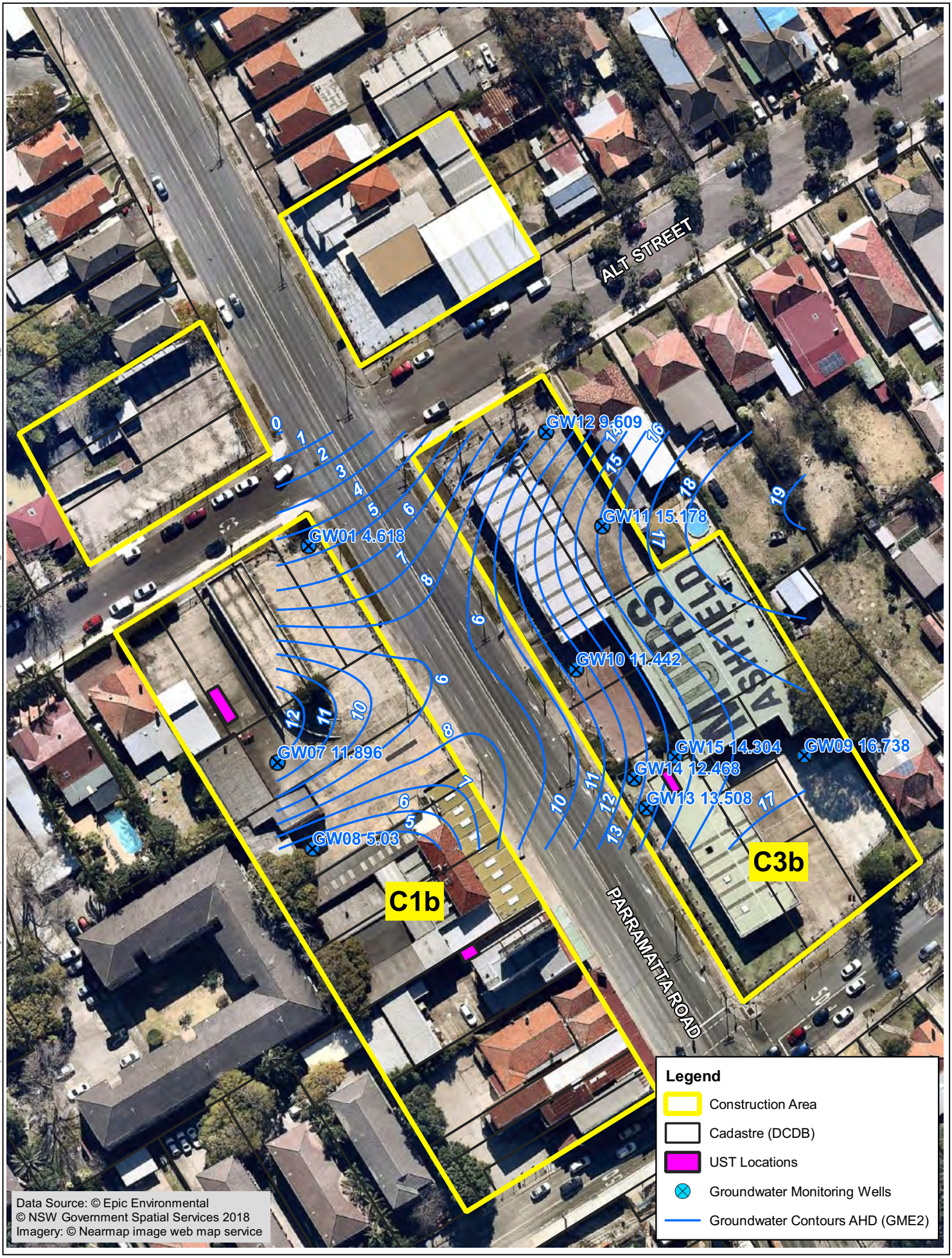
Scale: 1:1,000 @ A4

Datum: GDA94 Projection: MGA56

West Connex M4-M5 Link Project
Construction Area - Muirs (C1B and C3B)

Figure F5
Proposed Work Area



QGIS 2016 File Path: C:\GIS\Epic Environmental\Projects\SY180065.04 - WCX3A - Parramatta Road - Muir\Workspaces\Figure F6 Groundwater Flow Direction.qgs

0 10 20 30 40 50 m

Scale: 1:1,000 @ A4

Datum: GDA94 Projection: MGA56

West Connex M4-M5 Link Project
Construction Area - Muirs (C1B and C3B)

Figure F6
Groundwater Flow Direction

SY180065.04 Rev 0 May 2019

File Path: G:\GIS\Epic Environmental\Projects\SY180065.04 - WCX3A - Parramatta Road - Muir\Workspaces\Figure F7 Borehole Fill QGIS 2016

0 10 20 30 40 50 m

Scale: 1:1,000 @ A4

Datum: GDA94 Projection: MGA56

West Connex M4-M5 Link Project
Construction Area - Muirs (C1B and C3B)

Figure F7
Borehole Fill Thickness

File Path: G:\GIS\Epic Environmental\Projects\SY180065.04 - WCX3A - Parramatta Road - Muir\Workspaces\Figure F8 Extent of Known Contamination.qgs

QGIS 2017

0 10 20 30 40 50 m

Scale: 1:1,000 @ A4

Datum: GDA94 Projection: MGA56

West Connex M4-M5 Link Project
Construction Area - Muirs (C1B and C3B)

Figure F8
Extent of Known Contamination Exceeding Commercial / Industrial D Soil Investigation Levels

Epic File: **SY180065.04**
Site: **Muirs (C1b & C3b)**
Client: **LSBJV**

Epic Environmental Pty Ltd
Level 6, 193 North Quay, Brisbane, QLD, 4000

Table T1: Soil Analytical Results - EILs and HILs

Sample Date	Sample Duplicate	Sample Number	Sample Depth (m)	Material Type	Asbestos	Physico-Chemical		Organics (mg/kg)														Inorganics (mg/kg)							
								PAH			Phenols		Pesticides									Metals							
						pH	Cation Exhange Capacity (meq/100)	Total	Benzo (a) pyrene	Benzo (a) pyrene TEQ	Phenol	PCB	DDT + DDE + DDD	Aldrin & Dieldrin	Chlordane	Endosulfan	Endrin	Heptachlor	HCB	Methoxychlor	Chlorpyrifos	As	Cd	Total Cr[a]	Cu	Pb	Hg[1]	Ni	Zn
Background Levels						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	280	-	-	290	620
NEPM EIL - Commercial and Industrial (mg/kg)						-	-	-	1.4 | 1.4[#]	-	-	-	640	-	-	-	-	-	-	-	-	160	-	310-660^[^]	85-1,200 (400)[*]	1,800[*]	-	55-960[*]	110-2,000[*]
NEPM HIL-D - Commercial/Industrial (mg/kg)						-	-	4,000	-	40	240,000	7	3,600	45	530	2,000	100	50	80	2,500	2,000	3,000	900	3,600	240,000	1,500[*]	730	6,000	400,000
Lanfill Criteria - Maximum Values without TCLP - General Solid Waste						-	-	200	0.8	-	288	<50	-	-	-	60	-	-	-	-	4	100	20	100 (VI)	-	100	4	40	-
Landfill Criteria - Maximum Values without TCLP - Restricted Solid Waste						-	-	800	3.2	-	1,152	<50	-	-	-	240	-	-	-	-	16	400	80	400 (VI)	-	400	16	160	-
Laboratory Level of Reporting (mg/kg)						0.1	1	0.5	0.5	1.2	0.5	0.7	0.7	1	0.5	0.5	0.1	0.5	0.5	0.5	1	0.1	0.5	2	5	5	0.1	2	5
C1b																													
27-Aug-18		C1b-BH01	0.2	Fill	No	-	-	<0.05	<0.5	<0.5	<0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.5	<0.1	<1	<0.1	6	<0.4	3	3	3	<0.1	1	6
27-Aug-18		C1b-BH01	0.5	Soil	No	-	-	1.6	<0.5	<0.5	<0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.5	<0.1	<1	<0.1	8	<0.4	22	8	35	<0.1	3	30
27-Aug-18		C1b-BH01	1.0	Soil	No	-	-	<0.05	<0.5	<0.5	<0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.5	<0.1	<1	<0.1	7	<0.4	21	16	14	<0.1	2	7
27-Aug-18		C1b-BH01	2.0	Soil	-	-	-	<0.05	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	<4	<0.4	3	18	7	<0.1	<1	3
27-Aug-18		C1b-BH01	3.0	Soil	-	-	-	<0.05	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	<4	<0.4	3	62	7	<0.1	<1	11
27-Aug-18		C1b-BH01	3.7	Shale	-	-	-	<0.05	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	5	<0.4	8	68	11	0.1	12	60
27-Aug-18		C1b-BH02	0.2	Fill	No	-	-	<0.05	<0.5	<0.5	<0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.5	<0.1	<1	<0.1	<4	<0.4	4	12	51	<0.1	3	49
27-Aug-18		C1b-BH02	0.5	Soil	No	-	-	<0.05	<0.5	<0.5	<0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.5	<0.1	<1	<0.1	8	<0.4	21	5	17	<0.1	2	4
27-Aug-18		C1b-BH02	1.0	Soil	No	-	-	<0.05	<0.5	<0.5	<0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.5	<0.1	<1	<0.1	6	<0.4	22	5	15	<0.1	2	4
27-Aug-18		C1b-BH02	2.0	Soil	-	-	-	<0.05	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	13	<0.4	12	33	10	<0.1	<1	7
27-Aug-18		C1b-BH02	3.0	Soil	-	-	-	<0.05	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	<4	<0.4	3	26	7	<0.1	<1	9
27-Aug-18		C1b-BH02	4.0	Shale	-	-	-	<0.05	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	21	<0.4	11	53	15	0.1	8	38
27-Aug-18		C1b-BH03	0.2	Fill	No	-	-	<0.05	<0.5	<0.5	<0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.5	<0.1	<1	<0.1	<4	<0.4	4	5	21	<0.1	2	39
27-Aug-18		C1b-BH03	0.5	Soil	No	-	-	1.9	<0.5	<0.5	<0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.5	<0.1	<1	<0.1	7	<0.4	19	7	15	<0.1	2	17
27-Aug-18		C1b-BH03	1.0	Soil	No	-	-	0.1	<0.5	<0.5	<0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.5	<0.1	<1	<0.1	5	<0.4	18	7	16	<0.1	2	9
27-Aug-18		C1b-BH03	2.0	Soil	-	-	-	<0.05	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	<4	<0.4	2	7	9	<0.1	<1	2
27-Aug-18		C1b-BH03	3.0	Soil	-	7.0	4.1	<0.05	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	<4	<0.4	3	5	10	<0.1	<1	2
27-Aug-18		C1b-BH03	4.0	Shale	-	-	-	<0.05	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	<4	<0.4	3	16	11	<0.1	<1	20
27-Aug-18		C1b-BH03	6.5	Shale	-	-	-	0.1	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	6	<0.4	16	25	19	<0.1	13	78
27-Aug-18		C1b-BH04	0.2	Fill	No	-	-	<0.05	<0.5	<0.5	<0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.5	<0.1	<1	<0.1	5	<0.4	2	<1	2	<0.1	1	3
27-Aug-18		C1b-BH04	0.5	Soil	No	-	-	<0.05	<0.5	<0.5	<0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.5	<0.1	<1	<0.1	5	<0.4	16	10	14	<0.1	2	3
27-Aug-18		C1b-BH04	1.0	Soil	No	-	-	<0.05	<0.5	<0.5	<0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.5	<0.1	<1	<0.1	8	<0.4	14	46	12	0.1	<1	4
27-Aug-18		C1b-BH04	2.0	Soil	-	-	-	<0.05	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	<4	<0.4	2	17	5	<0.1	<1	2
27-Aug-18		C1b-BH04	3.0	Shale	-	-	-	<0.05	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	<4	<0.4	10	23	9	<0.1	<1	2
27-Aug-18		C1b-BH04	3.7	Shale	-	-	-	<0.05	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	<4	<0.4	5	73	11	<0.1	7	38
27-Aug-18		C1b-BH05	0.2	Fill	No	-	-	77	9.2	12.0	<0.5	<0.5	<0.1	<0.1	<0.5	<0.1	<0.5	<0.5	<0.1	<1	<0.1	5	1	17	53	470	0.1	12	250
27-Aug-18	C1b-QC01/QC02	C1b-BH05	0.5	Soil	No	-	-	99	8.2	11.0	<0.5	<0.5	<0.1	<0.1	<0.5	<0.1	<0.5	<0.5	<0.1	<1	<0.1	5	<0.4	18	26	35	<0.1	9	37
27-Aug-18		C1b-BH05	1.0	Soil	No	-	-	<0.05	<0.5	<0.5	<0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.5	<0.1	<1	<0.1	7	<0.4	20	6	17	<0.1	1	2
27-Aug-18		C1b-BH05	2.0	Soil	-	-	-	<0.05	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	<4	<0.4	5	11	36	<0.1	<1	1
27-Aug-18		C1b-BH05	2.4	Shale	-	-	-	<0.05	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	<4	<0.4	2	9	10	<0.1	<1	1

Epic File: **SY180065.04**
Site: **Muirs (C1b & C3b)**
Client: **LSBJV**

Epic Environmental Pty Ltd
Level 6, 193 North Quay, Brisbane, QLD, 4000

Table T1: Soil Analytical Results - EILs and HILs

Sample Date	Sample Duplicate	Sample Number	Sample Depth (m)	Material Type	Asbestos	Physico-Chemical		Organics (mg/kg)													Inorganics (mg/kg)							
								PAH			Phenols		Pesticides									Metals							
						pH	Cation Exhange Capacity (meq/100)	Total	Benzo (a) pyrene	Benzo (a) pyrene TEQ	Phenol	PCB	DDT + DDE + DDD	Aldrin & Dieldrin	Chlordane	Endosulfan	Endrin	Heptachlor	HCB	Methoxychlor	Chlorpyrifos	As	Cd	Total Cr[a]	Cu	Pb	Hg[†]	Ni	Zn
Background Levels						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	280	-	-	290	620
NEPM EIL - Commercial and Industrial (mg/kg)						-	-	-	1.4 | 1.4[#]	-	-	-	640	-	-	-	-	-	-	-	-	160	-	310-660^[^]	85-1,200 (400)[*]	1,800[*]	-	55-960[*]	110-2,000[*]
NEPM HIL-D - Commercial/Industrial (mg/kg)						-	-	4,000	-	40	240,000	7	3,600	45	530	2,000	100	50	80	2,500	2,000	3,000	900	3,600	240,000	1,500	730	6,000	400,000
Lanfill Criteria - Maximum Values without TCLP - General Solid Waste						-	-	200	0.8	-	288	<50	-	-	-	60	-	-	-	-	4	100	20	100 (VI)	-	100	4	40	-
Landfill Criteria - Maximum Values without TCLP - Restricted Solid Waste						-	-	800	3.2	-	1,152	<50	-	-	-	240	-	-	-	-	16	400	80	400 (VI)	-	400	16	160	-
Laboratory Level of Reporting (mg/kg)						0.1	1	0.5	0.5	1.2	0.5	0.7	0.7	1	0.5	0.5	0.1	0.5	0.5	0.5	1	0.1	0.5	2	5	5	0.1	2	5
28-Aug-18		C1b-BH07	0.2	Fill	No	-	-	<0.05	<0.5	<0.5	<0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.5	<0.1	<1	<0.1	<4	<0.4	6	51	5	<0.1	90	31
28-Aug-18		C1b-BH07	0.5	Soil	No	-	-	-	<0.5	-	<0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.5	<0.1	<1	<0.1	-	-	-	-	-	-	-	-
28-Aug-18		C1b-BH07	1.0	Soil	No	-	-	-	<0.5	-	<0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.5	<0.1	<1	<0.1	-	-	-	-	-	-	-	-
28-Aug-18		C1b-BH07	2.0	Soil	-	-	-	<0.05	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	9	<0.4	12	28	13	<0.1	<1	3
28-Aug-18		C1b-BH07	2.7	Shale	-	-	-	<0.05	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	<4	<0.4	2	9	38	<0.1	<1	4
28-Aug-18		C1b-BH08	1.0	Fill	No	-	-	11	1	1.4	<0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.5	<0.1	<1	<0.1	<4	<0.4	8	22	200	<0.1	4	230
28-Aug-18		C1b-BH08	2.0	Soil	-	-	-	<0.05	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	6	<0.4	5	14	10	<0.1	<1	2
28-Aug-18		C1b-BH08	3.0	Soil	-	-	-	<0.05	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	<4	<0.4	4	11	7	<0.1	<1	3
28-Aug-18		C1b-BH08	4.0	Soil	-	-	-	<0.05	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	<4	<0.4	3	8	6	<0.1	<1	2
28-Aug-18		C1b-BH09	0.2	Fill	No	-	-	2.2	0.2	<0.5	<0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.5	<0.1	<1	<0.1	5	<0.4	21	22	370	<0.1	9	35
28-Aug-18		C1b-BH09	0.5	Fill	No	-	-	0.1	<0.5	<0.5	<0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.5	<0.1	<1	<0.1	6	<0.4	21	4	15	<0.1	3	5
28-Aug-18		C1b-BH09	1.0	Soil	No	-	-	<0.05	<0.5	<0.5	<0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.5	<0.1	<1	<0.1	8	1	16	15	19	0.1	<1	1
28-Aug-18		C1b-BH09	2.0	Soil	-	-	-	<0.05	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	26	<0.4	6	36	10	<0.1	<1	4
28-Aug-18		C1b-BH09	3.0	Soil	-	-	-	<0.05	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	<4	<0.4	2	10	7	<0.1	<1	7
28-Aug-18		C1b-BH09	3.9	Soil	-	-	-	<0.05	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	<4	<0.4	6	120	14	<0.1	12	88
28-Aug-18	C1b-QC03/QC04	C1b-BH10	0.2	Fill	No	-	-	<0.05	<0.5	<0.5	<0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.5	<0.1	<1	<0.1	<4	<0.4	2	<1	2	<0.1	<1	2
28-Aug-18		C1b-BH10	0.5	Fill	No	-	-	<0.05	<0.5	<0.5	<0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.5	<0.1	<1	<0.1	<4	<0.4	7	24	26	<0.1	5	29
28-Aug-18		C1b-BH10	1.0	Soil	No	-	-	<0.05	<0.5	<0.5	<0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.5	<0.1	<1	<0.1	7	<0.4	27	6	16	0.1	3	5
28-Aug-18		C1b-BH10	2.0	Soil	-	-	-	<0.05	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	<4	<0.4	3	5	5	<0.1	<1	<1
28-Aug-18		C1b-BH10	2.6	Shale	-	-	-	<0.05	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	<4	<0.4	5	14	10	<0.1	<1	2
28-Aug-18		C1b-BH11	1.0	Fill	No	-	-	14	1.7	2.1	<5.0	<1	<1	<1	<5.0	<1	<5.0	<5.0	<1	<10	<1	<4	<0.4	6	46	100	<0.1	6	110
28-Aug-18		C1b-BH11	2.0	Soil	-	-	-	<0.05	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	<4	<0.4	5	8	8	<0.1	<1	1
28-Aug-18		C1b-BH11	2.6	Soil	-	-	-	<0.05	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	<4	<0.4	6	24	10	<0.1	1	9
28-Aug-18		C1b-BH12	0.2	Fill	Yes	-	-	<0.05	<0.5	<0.5	<0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.5	<0.1	<1	<0.1	56	2	5	38	160	<0.1	5	220
28-Aug-18		C1b-BH12	0.5	Fill	No	-	-	3.6	<0.5	0.5	<0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.5	<0.1	<1	<0.1	6	<0.4	19	20	75	0.1	6	56
28-Aug-18		C1b-BH12	1.0	Soil	No	-	-	<0.05	<0.5	<0.5	<0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.5	<0.1	<1	<0.1	6	<0.4	24	5	16	<0.1	3	5
28-Aug-18		C1b-BH12	2.0	Soil	-	-	-	<0.05	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	10	<0.4	22	8	12	<0.1	<1	2
28-Aug-18		C1b-BH12	2.6	Shale	-	-	-	<0.05	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	5	<0.4	5	18	10	<0.1	<1	1
28-Aug-18		C1b-BH13	0.2	Fill	No	-	-	<0.05	<0.5	<0.5	<0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.5	<0.1	<1	<0.1	18	1	5	14	65	<0.1	3	200
28-Aug-18		C1b-BH13	0.5	Fill	No	-	-	17	1.4	2.1	<0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.5	<0.1	<1	<0.1	33	6	150	650	1200	0.7	90	1900
28-Aug-18		C1b-BH13	1.0	Fill	No	-	-	<0.05	<0.5	<0.5	<0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.5	<0.1	<1	<0.1	16	2	29	21	60	<0.1	3	730
28-Aug-18		C1b-BH13	2.0	Soil	-	-	-	<0.05	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	<4	<0.4	4	9	12	<0.1	<1	81
28-Aug-18		C1b-BH13	2.6	Shale	-	-	-	<0.05	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	<4	<0.4	5	12	11	<0.1	1	76
19-Nov-18		C1b-BH14	0.2	Fill	No	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<4	<0.4	11	17	25	<0.1	9	42
19-Nov-18		C1b-BH14	0.5	Soil	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	<0.4	28	12	18	<0.1	2	6
19-Nov-18		C1b-BH14	1.0	Soil	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	49	<0.4	21	25	20	<0.1	<1	3
19-Nov-18		C1b-BH14	2.0	Soil	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19-Nov-18		C1b-BH14	3.0	Shale	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19-Nov-18		C1b-BH15	0.2	Fill	No	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12	0.6	21	91	340	0.3	9	330
19-Nov-18		C1b-BH15	0.5	Fill	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	<0.4	26	36	20	<0.1	2	6
19-Nov-18		C1b-BH15	1.0	Soil	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<4	<0.4	5	12	14	<0.1	<1	3
19-Nov-18		C1b-BH15	2.0	Rock	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19-Nov-18		C1b-BH15	3.2	Rock	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19-Nov-18		C1b-BH16	0.2	Fill	No	7.5	8.4	3.6	0.3	0.5	-	<0.1	<0.1	<0.1	nd	nd	nd	<0.1	<0.1	nd	nd	5	1	11	42	250	<0.1	20	110
19-Nov-18		C1b-BH16	0.5	Fill	-	-	-	1.5	<0.05	<0.5	-	-	-	-	-	-	-	-	-	-	-	<4	<0.4	2	16	7	<0.1	8	15
19-Nov-18		C1b-BH16	1.0	Soil	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19-Nov-18		C1b-BH16	2.0	Soil	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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Table T1: Soil Analytical Results - EILs and HILs

Sample Date	Sample Duplicate	Sample Number	Sample Depth (m)	Material Type	Asbestos	Physico-Chemical		Organics (mg/kg)													Inorganics (mg/kg)							
								PAH			Phenols		Pesticides									Metals							
						pH	Cation Exhange Capacity (meq/100)	Total	Benzo (a) pyrene	Benzo (a) pyrene TEQ	Phenol	PCB	DDT + DDE + DDD	Aldrin & Dieldrin	Chlordane	Endosulfan	Endrin	Heptachlor	HCB	Methoxychlor	Chlorpyrifos	As	Cd	Total Cr^	Cu	Pb	Hg†	Ni	Zn
Background Levels						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	280	-	-	290	620
NEPM EIL - Commercial and Industrial (mg/kg)						-	-	-	**1.4 | 1.4#**	-	-	-	**640**	-	-	-	-	-	-	-	-	**160**	-	**310-660^***	**85-1,200 (400)***	**1,800***	-	**55-960***	**110-2,000***
NEPM HIL-D - Commercial/Industrial (mg/kg)						-	-	**4,000**	-	**40**	**240,000**	**7**	**3,600**	**45**	**530**	**2,000**	**100**	**50**	**80**	**2,500**	**2,000**	**3,000**	**900**	**3,600**	**240,000**	**1,500**	**730**	**6,000**	**400,000**
Lanfill Criteria - Maximum Values without TCLP - General Solid Waste						-	-	**200**	**0.8**	-	**288**	**<50**	-	-	-	**60**	-	-	-	-	**4**	**100**	**20**	**100 (VI)**	-	**100**	**4**	**40**	-
Landfill Criteria - Maximum Values without TCLP - Restricted Solid Waste						-	-	**800**	**3.2**	-	**1,152**	**<50**	-	-	-	**240**	-	-	-	-	**16**	**400**	**80**	**400 (VI)**	-	**400**	**16**	**160**	-
Laboratory Level of Reporting (mg/kg)						**0.1**	**1**	**0.5**	**0.5**	**1.2**	**0.5**	**0.7**	**0.7**	**1**	**0.5**	**0.5**	**0.1**	**0.5**	**0.5**	**0.5**	**1**	**0.1**	**0.5**	**2**	**5**	**5**	**0.1**	**2**	**5**
19-Nov-18		C1b-BH17	0.2	Fill	No	7.7	12	-	**5.1**	-	<0.5	<0.1	<0.1	<0.1	<0.5	<0.5	<0.5	<0.1	<0.1	<1.0	<0.1	7	<0.4	29	14	160	0.1	4	99
19-Nov-18		C1b-BH17	0.5	Soil	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	<0.4	24	27	280	0.2	6	380
19-Nov-18		C1b-BH17	1.0	Soil	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19-Nov-18		C1b-BH17	2.0	Soil	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19-Nov-18		C1b-BH17	3.0	Shale	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19-Nov-18		C1b-BH18	0.2	Fill	No	-	-	-	-	-	-	<0.1	<0.1	<0.1	<0.5	nd	nd	<0.1	<0.1	nd	nd	5	<0.4	8	16	21	<0.1	5	21
19-Nov-18		C1b-BH18	0.5	Fill	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	2	20	190	420	0.1	25	1700
19-Nov-18		C1b-BH18	1.0	Soil	-	-	-	0.1	nd	<0.5	-	-	-	-	-	-	-	-	-	-	-	7	<0.4	21	6	16	<0.1	3	6
19-Nov-18		C1b-BH18	2.0	Soil	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19-Nov-18		C1b-BH18	3.0	Shale	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19-Nov-18		C1b-BH19	0.2	Fill	No	8.8	34	-	1	-	<0.5	<0.1	<0.1	<0.1	<0.5	<0.5	<0.5	<0.1	<0.1	<1.0	<0.1	<4	1	25	54	290	<0.1	59	100
19-Nov-18		C1b-BH19	0.5	Fill	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18	<0.4	26	8	25	<0.1	4	18
19-Nov-18		C1b-BH19	1.0	Soil	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19-Nov-18		C1b-BH19	2.0	Soil	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19-Nov-18		C1b-BH19	3.0	Soil	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C1b - QAQC																													
27-Aug-18	C1b-BH05-0.5	C1b-QC01		Soil				88	**7.4**	**11.0**	-	-	-	-	-	-	-	-	-	-	-	6	<0.4	19	20	31	<0.1	7	19
27-Aug-18	C1b-BH05-0.5	C1b-QC02		Soil		-	-	45.9	**3.6**	4.8	-	-	-	-	-	-	-	-	-	-	-	8	<1	22	11	29	<0.1	9	43
28-Aug-18	C1b-BH10-0.2	C1b-QC03		Soil				<0.5	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	<4	<0.4	2	<1	<1	<0.1	1	2
28-Aug-18	C1b-BH10-0.2	C1b-QC04		Soil		-	-	<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-	-	-	-	<5	<1	<2	<5	<5	<0.1	<2	<5
19-Nov-18	C1b-BH19-0.2	C1b-QA08		Soil																		43	<0.4	26	10	32	<0.1	5	7
19-Nov-18	C1b-BH19-0.2	C1b-QA08		Soil																		20	<0.4	36	11	39	0.2	5.5	33

NOTES:

1	Analyte exceeds the generic EIL Guideline Criteria for Urban Residential and Public Open Space or Commercial and Industrial Land Use
1	Analyte exceeds the HIL-A Guideline Criteria
1	Analyte exceeds the HIL-B Guideline Criteria
1	Analyte exceeds the HIL-D Guideline Criteria
1	Adopted Clean Fill Criteria for unrestricted use of soils
†	Inorganic Mercury
*	Criteria for Cr (VI)
^	Criteria for Cr (III)
#	Ecological Screening Levels (ESLs) for benzo(a)pyrene for coarse | fine soils
"	Generic Added Contaminant Level (ACL), ranges provided for ACLs dependent on physicochemical properties
(190)	Adopted ACL based on typical physicochemical properties of soils in South-East Queensland
>	Zero detection adopted as a suitable qualitative criteria for unrestricted use of soil materials
NAD - OF	No asbestos detected (NAD), organic fibres detected (OF)
-	Not analysed

Epic File: **SY180065.04**
Site: **Muirs (C1b & C3b)**
Client: **LSBJV**

Epic Environmental Pty Ltd
Level 6, 193 North Quay, Brisbane, QLD, 4000

Table T2: Soil Analytical Results - EILs and HILs

Sample Date	Sample Duplicate	Sample Number	Sample Depth (m)	Material Type	Asbestos	Physico-Chemical			Organics (mg/kg)															Inorganics (mg/kg)							
									PAH			Phenols			PCB	Cyanide (free)	Pesticides								Metals						
						pH	Cation Exhange Capacity (meq/100)	Electrical Conductivity (µS/cm)	Total	Benzo (a) pyrene	Benzo (a) pyrene TEQ	Phenol	Pentachloro phenol	Cresols			DDT	Aldrin & Dieldrin	Chlordane	Endosulfan	Endrin	Heptachlor	HCB	Methoxychlor	Chlorpyrifos	As	Cd	Total Cr[a]	Cu	Pb	Hg[†]	Ni	Zn
Background Levels						-		-	0.95-5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NEPM EIL - Commercial and Industrial (mg/kg)						-		-	-	1.4 | 1.4[#]	-	-	-	-	-	-	640	-	-	-	-	-	-	-	160	-	310-660[^*]	85-1,200[*]	1,800[*]	-	55-960[*]	110-2,000[*]
NEPM HIL-D - Commercial/Industrial (mg/kg)						-		-	4,000	-	40	240,000	660	25,000	7	1,500	3,600	45	530	2,000	100	50	80	2,500	2,000	3,000	900	3,600	240,000	1,500	730	6,000	400,000
Lanfill Criteria - Maximum Values without TCLP - General Solid Waste						-		-	-	0.8	-	-	-	4,000	-	320	-	-	-	60	-	-	-	-	4	100	20	100 (VI)	-	100	4	40	-
Landfill Criteria - Maximum Values without TCLP - Restricted Solid Waste						-		-	-	3.2	-	-	-	16,000	-	1,280	-	-	-	240	-	-	-	-	16	400	80	400 (VI)	-	400	16	160	-
Laboratory Level of Reporting (mg/kg)						0.1	1	1	0.5	0.5	1.2	0.5	1	1	0.7	1	0.7	0.5	0.5	0.5	0.1	0.5	0.5	0.5	1	0.1	0.5	2	5	5	0.1	2	5
C3b																																
29-Aug-18		C3b-BH20	0.2	Fill	No	-	-	-	<0.05	<0.5	<0.5	<0.5	-	-	<0.1	-	<0.1	<0.5	<0.5	<0.1	-	<0.5	<0.1	<1	<0.1	6	<0.4	22	13	44	0.1	5	27
29-Aug-18		C3b-BH20	0.5	Fill	No	-	-	-	<0.05	<0.5	<0.5	<0.5	-	-	<0.1	-	<0.1	<0.5	<0.5	<0.1	-	<0.5	<0.1	<1	<0.1	9	<0.4	21	8	17	<0.1	4	15
29-Aug-18		C3b-BH20	1.0	Soil	No	-	-	-	<0.05	<0.5	<0.5	<0.5	-	-	<0.1	-	<0.1	<0.5	<0.5	<0.1	-	<0.5	<0.1	<1	<0.1	<4	<0.4	7	2	18	<0.1	<1	3
29-Aug-18		C3b-BH20	2.0	Soil	-	-	-	-	<0.05	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<4	<0.4	7	6	10	<0.1	<1	1
29-Aug-18		C3b-BH20	3.0	Sandstone	-	-	-	-	<0.05	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<4	<0.4	5	35	6	<0.1	1	8
29-Aug-18		C3b-BH20	4.0	Sandstone	-	-	-	-	<0.05	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	<0.4	9	22	10	<0.1	<1	3
29-Aug-18		C3b-BH21	0.2	Fill	No	-	-	-	<0.05	<0.5	<0.5	<0.5	-	-	<0.1	-	<0.1	<0.5	<0.5	<0.1	-	<0.5	<0.1	<1	<0.1	6	<0.4	18	5	18	<0.1	3	4
29-Aug-18		C3b-BH21	0.5	Fill	No	-	-	-	<0.05	<0.5	<0.5	<0.5	-	-	<0.1	-	<0.1	<0.5	<0.5	<0.1	-	<0.5	<0.1	<1	<0.1	7	<0.4	22	3	16	<0.1	1	2
29-Aug-18		C3b-BH21	1.0	Soil	No	-	-	-	<0.05	<0.5	<0.5	<0.5	-	-	<0.1	-	<0.1	<0.5	<0.5	<0.1	-	<0.5	<0.1	<1	<0.1	6	<0.4	11	3	16	<0.1	<1	2
29-Aug-18		C3b-BH21	2.0	Soil	-	-	-	-	<0.05	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<4	<0.4	3	7	11	<0.1	<1	<1
29-Aug-18		C3b-BH21	3.0	Shale	-	-	-	-	<0.05	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<4	<0.4	2	6	7	<0.1	<1	1
29-Aug-18		C3b-BH21	4.0	Shale	-	-	-	-	<0.05	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	<0.4	6	44	8	0.3	1	11
29-Aug-18		C3b-BH22	0.2	Fill	No	-	-	-	4.4	0.6	0.8	<0.5	-	-	<0.1	-	<0.1	<0.5	<0.5	<0.1	-	<0.5	<0.1	<1	<0.1	6	<0.4	19	200	70	0.5	6	100
29-Aug-18		C3b-BH22	0.5	Fill	No	-	-	-	<0.05	<0.5	<0.5	<0.5	-	-	<0.1	-	<0.1	<0.5	<0.5	<0.1	-	<0.5	<0.1	<1	<0.1	7	<0.4	21	5	17	0.1	2	5
29-Aug-18	C3b-QC05/QC06	C3b-BH22	1.0	Soil	No	-	-	-	<0.05	<0.5	<0.5	<0.5	-	-	<0.1	-	<0.1	<0.5	<0.5	<0.1	-	<0.5	<0.1	<1	<0.1	11	<0.4	25	5	16	0.2	1	6
29-Aug-18		C3b-BH22	2.0	Soil	-	-	-	-	<0.05	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<4	<0.4	5	6	10	<0.1	<1	<1
29-Aug-18		C3b-BH22	3.0	Sandsotne	-	6.1	-	5.1	<0.05	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<4	<0.4	3	7	17	<0.1	<1	2
29-Aug-18		C3b-BH22	4.0	Sandstone	-	-	-	-	<0.05	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15	<0.4	7	38	12	<0.1	4	24
29-Aug-18		C3b-BH23	0.2	Fill	No	-	-	-	0.06	0.06	<0.5	<0.5	-	-	<0.1	-	<0.1	<0.5	<0.5	<0.1	-	<0.5	<0.1	<1	<0.1	6	<0.4	15	13	41	0.1	5	71
29-Aug-18		C3b-BH23	0.5	Fill	No	-	-	-	<0.05	<0.5	<0.5	<0.5	-	-	<0.1	-	<0.1	<0.5	<0.5	<0.1	-	<0.5	<0.1	<1	<0.1	8	<0.4	20	5	22	0.1	2	11
29-Aug-18		C3b-BH23	1.0	Soil	No	-	-	-	<0.05	<0.5	<0.5	<0.5	-	-	<0.1	-	<0.1	<0.5	<0.5	<0.1	-	<0.5	<0.1	<1	<0.1	7	<0.4	19	6	13	<0.1	3	4
29-Aug-18		C3b-BH23	2.0	Soil	-	-	-	-	<0.05	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	<0.4	5	8	9	<0.1	<1	1
29-Aug-18		C3b-BH23	3.0	Shale	-	-	-	-	<0.05	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<4	<0.4	6	14	12	<0.1	<1	4
29-Aug-18		C3b-BH23	4.0	Sandstone	-	-	-	-	<0.05	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	<0.4	5	26	9	0.1	<1	9

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Sample Date	Sample Duplicate	Sample Number	Sample Depth (m)	Material Type	Asbestos	Physico-Chemical			Organics (mg/kg)															Inorganics (mg/kg)							
									PAH			Phenols			PCB	Cyanide (free)	Pesticides								Metals						
						pH	Cation Exhange Capacity (meq/100)	Electrical Conductivity (µS/cm)	Total	Benzo (a) pyrene	Benzo (a) pyrene TEQ	Phenol	Pentachloro phenol	Cresols			DDT	Aldrin & Dieldrin	Chlordane	Endosulfan	Endrin	Heptachlor	HCB	Methoxychlor	Chlorpyrifos	As	Cd	Total Cr[a]	Cu	Pb	Hg[†]	Ni	Zn
Background Levels						-		-	0.95-5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	280	-	-	290	620
NEPM EIL - Commercial and Industrial (mg/kg)						-		-	-	1.4 | 1.4[#]	-	-	-	-	-	-	640	-	-	-	-	-	-	-	-	160	-	310-660^*	85-1,200[*]	1,800[*]	-	55-960[*]	110-2,000[*]
NEPM HIL-D - Commercial/Industrial (mg/kg)						-		-	4,000	-	40	240,000	660	25,000	7	1,500	3,600	45	530	2,000	100	50	80	2,500	2,000	3,000	900	3,600	240,000	1,500	730	6,000	400,000
Lanfill Criteria - Maximum Values without TCLP - General Solid Waste						-		-	-	0.8	-	-	-	4,000	-	320	-	-	-	60	-	-	-	-	4	100	20	100 (VI)	-	100	4	40	-
Landfill Criteria - Maximum Values without TCLP - Restricted Solid Waste						-		-	-	3.2	-	-	-	16,000	-	1,280	-	-	-	240	-	-	-	-	16	400	80	400 (VI)	-	400	16	160	-
Laboratory Level of Reporting (mg/kg)						0.1	1	1	0.5	0.5	1.2	0.5	1	1	0.7	1	0.7	0.5	0.5	0.5	0.1	0.5	0.5	0.5	1	0.1	0.5	2	5	5	0.1	2	5
30-Aug-18		C3b-BH24	0.2	Fill	No	-	-	-	<0.05	<0.05	<0.5	<0.5	-	-	<0.1	-	<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	11	<0.4	24	4	17	0.4	2	4
30-Aug-18		C3b-BH24	0.5	Soil	No	-	-	-	<0.05	<0.05	<0.5	<0.5	-	-	<0.1	-	<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	7	<0.4	19	5	17	<0.1	1	2
30-Aug-18		C3b-BH24	1.0	Soil	No	-	-	-	<0.05	<0.05	<0.5	<0.5	-	-	<0.1	-	<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	5	<0.4	10	6	16	<0.1	<1	1
30-Aug-18		C3b-BH24	1.6	Shale	-	-	-	-	<0.05	<0.05	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<4	<0.4	2	4	9	<0.1	<1	<1
30-Aug-18		C3b-BH25	0.2	Fill	No	-	-	-	3.5	0.2	<0.5	<0.5	-	-	<0.1	-	<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	7	<0.4	20	8	18	<0.1	4	6
30-Aug-18		C3b-BH25	0.5	Soil	No	-	-	-	<0.05	<0.05	<0.5	<0.5	-	-	<0.1	-	<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	6	<0.4	24	7	19	<0.1	4	4
30-Aug-18		C3b-BH25	1.0	Soil	No	-	-	-	<0.05	<0.05	<0.5	<0.5	-	-	<0.1	-	<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<4	<0.4	6	6	14	<0.1	<1	<1
30-Aug-18		C3b-BH25	1.7	Shale	-	-	-	-	<0.05	<0.05	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18	<0.4	15	19	15	<0.1	<1	2
30-Aug-18		C3b-BH26	0.2	Fill	No	-	-	-	0.58	0.05	<0.5	<0.5	-	-	<0.1	-	<0.1	1.2	0.6	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	6	<0.4	14	13	110	0.2	8	63
30-Aug-18		C3b-BH26	0.5	Soil	No	-	-	-	<0.05	<0.05	<0.5	<0.5	-	-	<0.1	-	<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	8	<0.4	24	3	18	<0.1	2	4
30-Aug-18		C3b-BH26	1.0	Soil	No	-	-	-	<0.05	<0.05	<0.5	<0.5	-	-	<0.1	-	<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	10	<0.4	20	3	15	<0.1	<1	1
30-Aug-18		C3b-BH26	1.8	Shale	-	-	-	-	<0.05	<0.05	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<4	<0.4	2	6	19	<0.1	<1	1
30-Aug-18		C3b-BH27	0.2	Fill	No	-	-	-	1.1	0.08	<0.5	<0.5	-	-	<0.1	-	<0.1	1.7	0.8	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	5	1	14	19	110	0.2	9	220
30-Aug-18		C3b-BH27	0.5	Fill	No	-	-	-	5.3	0.5	0.7	<0.5	-	-	<0.1	-	<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	8	<0.4	23	25	160	0.4	5	120
30-Aug-18		C3b-BH27	1.0	Fill	No	-	-	-	<0.05	<0.05	<0.5	<0.5	-	-	<0.1	-	<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	7	<0.4	9	5	14	<0.1	<1	5
30-Aug-18		C3b-BH27	2.0	Shale	-	-	-	-	<0.05	<0.05	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<4	<0.4	4	7	13	<0.1	<1	2
30-Aug-18		C3b-BH28	0.2	Fill	No	-	-	-	0.83	0.09	<0.5	<0.5	-	-	<0.1	-	<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	7	<0.4	19	10	41	<0.1	9	22
30-Aug-18	C3b-QC07/QC08	C3b-BH28	0.5	Fill	No	-	-	-	<0.05	<0.05	<0.5	<0.5	-	-	<0.1	-	<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	5	<0.4	17	7	20	<0.1	4	5
30-Aug-18		C3b-BH28	1.0	Soil	No	-	-	-	<0.05	<0.05	<0.5	<0.5	-	-	<0.1	-	<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	9	<0.4	4	6	26	<0.1	<1	1
30-Aug-18		C3b-BH28	1.8	Shale	-	-	-	-	<0.05	<0.05	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	<0.4	7	8	5	<0.1	<1	2
30-Aug-18		C3b-BH29	0.2	Fill	No	-	-	-	<0.05	<0.05	<0.5	<0.5	-	-	<0.1	-	<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	7	<0.4	20	7	21	<0.1	3	4
30-Aug-18		C3b-BH29	0.5	Soil	No	-	-	-	<0.05	<0.05	<0.5	<0.5	-	-	<0.1	-	<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	10	<0.4	23	9	23	0.1	2	3
30-Aug-18		C3b-BH29	1.0	Shale	No	-	-	-	<0.05	<0.05	<0.5	<0.5	-	-	<0.1	-	<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<4	<0.4	6	15	47	<0.1	<1	3
30-Aug-18		C3b-BH29	1.2	Shale	-	-	-	-	<0.05	<0.05	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<4	<0.4	3	15	9	<0.1	<1	<1

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									PAH			Phenols					Pesticides									Metals						
						pH	Cation Exhange Capacity (meq/100)	Electrical Conductivity (µS/cm)	Total	Benzo (a) pyrene	Benzo (a) pyrene TEQ	Phenol	Pentachloro phenol	Cresols	PCB	Cyanide (free)	DDT	Aldrin & Dieldrin	Chlordane	Endosulfan	Endrin	Heptachlor	HCB	Methoxychlor	Chlorpyrifos	As	Cd	Total Cr^	Cu	Pb	Hg†	Ni	Zn
Background Levels						-		-	0.95-5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	280	-	-	290	620
NEPM EIL - Commercial and Industrial (mg/kg)						-		-	-	1.4 | 1.4#	-	-	-	-	-	-	640	-	-	-	-	-	-	-	-	160	-	310-660^*	85-1,200*	1,800*	-	55-960*	110-2,000*
NEPM HIL-D - Commercial/Industrial (mg/kg)						-		-	4,000	-	40	240,000	660	25,000	7	1,500	3,600	45	530	2,000	100	50	80	2,500	2,000	3,000	900	3,600	240,000	1,500	730	6,000	400,000
Lanfill Criteria - Maximum Values without TCLP - General Solid Waste						-		-	-	0.8	-	-	-	4,000	-	320	-	-	-	60	-	-	-	-	4	100	20	100 (VI)	-	100	4	40	-
Landfill Criteria - Maximum Values without TCLP - Restricted Solid Waste						-		-	-	3.2	-	-	-	16,000	-	1,280	-	-	-	240	-	-	-	-	16	400	80	400 (VI)	-	400	16	160	-
Laboratory Level of Reporting (mg/kg)						0.1	1	1	0.5	0.5	1.2	0.5	1	1	0.7	1	0.7	0.5	0.5	0.5	0.1	0.5	0.5	0.5	1	0.1	0.5	2	5	5	0.1	2	5
19-Nov-18		C3b-BH30	0.2	Fill	No	-	-	-	-	-	-	-	-	-	<0.1		<0.1	<0.1	nd	<0.1	nd	<0.1	<0.1	nd	nd	6	<0.4	17	18	16	<0.1	21	14
19-Nov-18		C3b-BH30	0.5	Soil	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	<4	<0.4	8	7	25	<0.1	<1	<1
19-Nov-18		C3b-BH30	1.0	Shale	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	<4	<0.4	3	6	8	<0.1	<1	<1
19-Nov-18		C3b-BH31	0.2	Fill	No	-	-	-	-	-	-	-	-	-	<0.1		<0.1	<0.1	nd	<0.1	nd	<0.1	<0.1	nd	nd	8	<0.4	20	37	130	<0.1	33	59
19-Nov-18		C3b-BH31	0.5	Soil	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	55	<0.4	14	11	15	<0.1	<1	1
19-Nov-18		C3b-BH31	1.0	Shale	-	5	1.3	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	10	<0.4	7	15	19	<0.1	<1	<1
19-Nov-18		C3b-BH32	0.2	Fill	No	-	-	-	-	-	-	-	-	-	<0.1		<0.1	<0.1	nd	<0.1	nd	<0.1	<0.1	nd	nd	110	<0.4	18	14	22	<0.1	9	6
19-Nov-18		C3b-BH32	0.5	Soil	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	31	<0.4	28	11	20	<0.1	<1	1
19-Nov-18		C3b-BH32	1.0	Shale	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	35	<0.4	16	19	34	<0.1	<1	<1
20-Nov-18		C3b-BH33	0.2	Fill	No	-	-	-	<0.05	<0.05	<0.5	-	-	-	<0.1		<0.1	1.3	nd	<0.1	nd	<0.1	<0.1	nd	nd	7	<0.4	30	4	21	<0.1	3	3
20-Nov-18		C3b-BH33	0.5	Soil	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	8	<0.4	24	3	17	<0.1	<1	2
20-Nov-18		C3b-BH33	1.0	Soil	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	<4	<0.4	10	6	14	<0.1	<1	1
20-Nov-18		C3b-BH33	2.0	Shale	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20-Nov-18		C3b-BH34	0.2	Fill	No	8.6	7.5	-	-	-	-	-	-	-	<0.1		<0.1	<0.1	nd	<0.1	nd	<0.1	<0.1	nd	nd	<4	<0.4	3	3	8	<0.1	2	11
20-Nov-18		C3b-BH34	0.5	Soil	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	9	<0.4	33	5	19	<0.1	2	6
20-Nov-18		C3b-BH34	1.0	Soil	-	4.9	4.3	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	5	<0.4	20	3	16	<0.1	<1	3
20-Nov-18		C3b-BH34	2.0	Shale	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20-Nov-18		C3b-BH35	0.2	Fill	No	-	-	-	-	-	-	-	-	-	<0.1		<0.1	<0.1	nd	<0.1	nd	<0.1	<0.1	nd	nd	7	<0.4	28	4	17	<0.1	2	2
20-Nov-18		C3b-BH35	0.5	Soil	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	8	<0.4	33	3	17	<0.1	1	4
20-Nov-18		C3b-BH35	1.0	Soil	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	10	<0.4	33	4	17	<0.1	<1	<1
20-Nov-18		C3b-BH35	2.0	Shale	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20-Nov-18		C3b-BH36	0.2	Fill	No	7.9	13	-	-	-	-	-	-	-	<0.1		<0.1	<0.1	nd	<0.1	nd	<0.1	<0.1	nd	nd	10	<0.4	38	7	51	<0.1	4	29
20-Nov-18		C3b-BH36	0.5	Soil	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	6	<0.4	31	3	16	<0.1	1	3
20-Nov-18		C3b-BH36	1.0	Soil	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	5	<0.4	18	5	13	<0.1	<1	<1
20-Nov-18		C3b-BH36	2.0	Shale	-	-	-	-	-	-	-	-	-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C3b - QAQC																																
29-Aug-18	C3b-BH22-0.5	C3b-QC05		Soil	-	-	-	-	nd	nd	nd	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	<0.4	21	7	14	0.1	1	7
29-Aug-18	C3b-BH22-0.5	C3b-QC06		Soil	-	-	-	-	<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	<1	22	6	20	<0.1	<2	<5
30-Aug-18	C3b-BH28-0.5	C3b-QC07		Soil	-	-	-	-	<0.05	<0.05	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	<0.4	25	5	18	<0.1	3	4
30-Aug-18	C3b-BH28-0.5	C3b-QC08		Soil	-	-	-	-	<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	<1	30	6	26	<0.1	4	6
19-Nov-18	C3b-BH35-0.2	C3b-QC09		Soil	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13	<0.4	41	<5	23	<0.1	<5	<5
19-Nov-18	C3b-BH35-0.2	C3b-QC10		Soil	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	<0.4	28	3	15	<0.1	2	6

NOTES:

1	Analyte exceeds the generic EIL Guideline Criteria for Urban Residential and Public Open Space or Commercial and Industrial Land Use
1	Analyte exceeds the HIL-A Guideline Criteria
1	Analyte exceeds the HIL-B Guideline Criteria
1	Analyte exceeds the HIL-D Guideline Criteria
1	Adopted Clean Fill Criteria for unrestricted use of soils
†	Inorganic Mercury
*	Criteria for Cr (VI)
^	Criteria for Cr (III)
#	Ecological Screening Levels (ESLs) for benzo(a)pyrene for coarse | fine soils
-	Generic Added Contaminant Level (ACL), ranges provided for ACLs dependent on physicochemical properties
(190)	Adopted ACL based on typical physicochemical properties of soils in South-East Queensland
*	Zero detection adopted as a suitable qualitative criteria for unrestricted use of soil materials
NAD - OF	No asbestos detected (NAD), organic fibres detected (OF)
-	Not analysed

Epic File: **SY180065.04**
Site: **Muirs (C1b & C3b)**
Client: **LSBJV**

Epic Environmental Pty Ltd
Level 6, 193 North Quay, Brisbane, QLD, 4000

Table T3: Soil Analytical Results - ESLs and HSLs

Sample Date	Sample Duplicate	Sample Number	Sample Depth (m)	Material Type	Organics (mg/kg)												
					TRH						BTEXN						
					C_6-C_{10} minus BTEX (F1)	C_6-C_{10}	>C_{10}-C_{16} minus naphthalene (F2)	>C_{10}-C_{16}	>C_{16}-C_{34}	>C_{34}	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene	Styrene	VOCs/ VHCs
Soil Saturation Concentration (Csat) - Sand | Silt | Clay					**950 | 910 | 850**	**950 | 910 | 850**	**560 | 570 | 560**	**560 | 570 | 560**	**-**	**-**	**360 | 440 | 430**	**560 | 640 | 630**	**64 | 69 | 68**	**300 | 330 | 330**	**9 | 10 | 10**		
ESL (Commercial/Industrial) - Coarse | Fine					**215 | 215**	**-**	**170 | 170**	**-**	**1,700 | 2,500**	**3,300 | 6,600**	**75 | 95**	**135 | 135**	**165 | 185**	**180 | 95**	**370^**		
Management Limit (Commercial & Industrial) - Coarse Soil | Fine Soil					**700 | 800**	**-**	**1,000 | 1,000**	**-**	**3,500 | 5,000**	**10,000 | 10,000**	**-**	**-**	**-**	**-**	**-**		
HSL-D (Commercial/Industrial) Vapour Intrusion - 0m to <1m - Sand | Silt | Clay					**260 | 250 | 310**	**-**	NL | NL | NL	-	**-**	**-**	**3 | 4 | 4**	NL | NL | NL	NL | NL | NL	**230 | NL | NL**	NL | NL | NL		
HSL-D (Commercial/Industrial) Vapour Intrusion - 1m to <2m - Sand | Silt | Clay					**370 | 360 | 480**	**-**	NL | NL | NL	-	**-**	**-**	**3 | 4 | 6**	NL | NL | NL	NL | NL | NL	NL | NL | NL	NL | NL | NL		
HSL-D (Commercial/Industrial) Vapour Intrusion - 2m to <4m - Sand | Silt | Clay					**630 | 590 |** NL	**-**	NL | NL | NL	-	**-**	**-**	**3 | 6 | 9**	NL | NL | NL	NL | NL | NL	NL | NL | NL	NL | NL | NL		
HSL-D (Commercial/Industrial) Vapour Intrusion - 4m + - Sand | Silt | Clay					NL | NL | NL	-	NL | NL | NL	-	**-**	**-**	**3 | 10 | 20**	NL | NL | NL	NL | NL | NL	NL | NL | NL	NL | NL | NL		
Lanfill Criteria - Maximum Values without TCLP - General Solid Waste					**650**	**650**	**10,000**	**-**	**-**	**-**	**10**	**288**	**600**	**1,000**	**-**	**60**	**-**
Landfill Criteria - Maximum Values without TCLP - Restricted Solid Waste					**2,600**	**2,600**	**40,000**	**-**	**-**	**-**	**40**	**1,152**	**2,400**	**4,000**	**-**	**240**	**-**
Laboratory Level of Reporting (mg/kg)					**10**	**10**	**50**	**50**	**100**	**100**	**0.2**	**0.5**	**0.5**	**0.5**	**1**	**0.5**	**0.5**
C1b																	
27-Aug-18		C1b-BH01	0.2	Fill	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1	nd
27-Aug-18		C1b-BH01	0.5	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1	nd
27-Aug-18		C1b-BH01	1.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1	nd
27-Aug-18		C1b-BH01	2.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	-	-
27-Aug-18		C1b-BH01	3.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	-	-
27-Aug-18		C1b-BH01	3.7	Shale	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	-	-
27-Aug-18		C1b-BH02	0.2	Fill	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1	nd
27-Aug-18		C1b-BH02	0.5	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1	nd
27-Aug-18		C1b-BH02	1.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1	nd
27-Aug-18		C1b-BH02	2.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	-	-
27-Aug-18		C1b-BH02	3.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	-	-
27-Aug-18		C1b-BH02	4.0	Shale	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	-	-
27-Aug-18		C1b-BH03	0.2	Fill	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1	nd
27-Aug-18		C1b-BH03	0.5	Soil	**57**	**57**	**420**	**420**	**970**	**140**	<0.2	<0.5	<1	<1	<1	<1	nd
27-Aug-18		C1b-BH03	1.0	Soil	<25	<25	**140**	**140**	**1,200**	**240**	<0.2	<0.5	<1	<1	<1	<1	nd
27-Aug-18		C1b-BH03	2.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	-	-
27-Aug-18		C1b-BH03	3.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	-	-
27-Aug-18		C1b-BH03	3.7	Shale	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	-	-
27-Aug-18		C1b-BH03	6.5	Shale	<25	<25	<50	<50	**130**	<100	<0.2	<0.5	<1	<1	<1	-	-
27-Aug-18		C1b-BH04	0.2	Fill	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1	nd
27-Aug-18		C1b-BH04	0.5	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1	nd
27-Aug-18		C1b-BH04	1.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1	nd
27-Aug-18		C1b-BH04	2.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	-	-
27-Aug-18		C1b-BH04	3.0	Shale	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	-	-
27-Aug-18		C1b-BH04	3.7	Shale	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	-	-
27-Aug-18		C1b-BH05	0.2	Fill	<25	<25	<50	<50	**560**	**140**	<0.2	<0.5	<1	<1	<1	<1	nd
27-Aug-18	C1b-QC01/QC02	C1b-BH05	0.5	Soil	<25	<25	<50	<50	**370**	<100	<0.2	<0.5	<1	<1	<1	<1	nd
27-Aug-18		C1b-BH05	1.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1	nd
27-Aug-18		C1b-BH05	2.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	-	-
27-Aug-18		C1b-BH05	2.4	Shale	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	-	-
28-Aug-18		C1b-BH07	0.2	Fill	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1	nd
28-Aug-18		C1b-BH07	0.5	Soil	-	-	-	-	-	-	-	-	-	-	-	<1	nd
28-Aug-18		C1b-BH07	1.0	Soil	-	-	-	-	-	-	-	-	-	-	-	<1	nd
28-Aug-18		C1b-BH07	2.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	-	-
28-Aug-18		C1b-BH07	2.7	Shale	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	-	-
28-Aug-18		C1b-BH08	1.0	Fill	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1	nd
28-Aug-18		C1b-BH08	2.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	-	-
28-Aug-18		C1b-BH08	3.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	-	-
28-Aug-18		C1b-BH08	4.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	-	-
28-Aug-18		C1b-BH09	0.2	Fill	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1	nd
28-Aug-18		C1b-BH09	0.5	Fill	**140**	**140**	**180**	**180**	<100	<100	<0.2	<0.5	<1	<1	<1	<1	nd
28-Aug-18		C1b-BH09	1.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1	nd
28-Aug-18		C1b-BH09	2.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	-	-
28-Aug-18		C1b-BH09	3.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	-	-
28-Aug-18		C1b-BH09	3.9	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	-	-
28-Aug-18	C1b-QC03/QC04	C1b-BH10	0.2	Fill	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1	nd
28-Aug-18		C1b-BH10	0.5	Fill	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1	nd
28-Aug-18		C1b-BH10	1.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1	nd
28-Aug-18		C1b-BH10	2.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	-	-
28-Aug-18		C1b-BH10	2.6	Shale	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	-	-
28-Aug-18		C1b-BH11	1.0	Fill	**99**	**99**	**72**	**72**	**16,000**	**1,700**	<0.2	<0.5	<1	<1	<1	<1	nd
28-Aug-18		C1b-BH11	2.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	-	-
28-Aug-18		C1b-BH11	2.6	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	-	-
28-Aug-18		C1b-BH12	0.2	Fill	<25	<25	<50	<50	**360**	<100	<0.2	<0.5	<1	<1	<1	<1	nd
28-Aug-18		C1b-BH12	0.5	Fill	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1	nd
28-Aug-18		C1b-BH12	1.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1	nd
28-Aug-18		C1b-BH12	2.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	-	-
28-Aug-18		C1b-BH12	2.6	Shale	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	-	-
28-Aug-18		C1b-BH13	0.2	Fill	<25	<25	<50	<50	**160**	<100	<0.2	<0.5	<1	<1	<1	<1	nd
28-Aug-18		C1b-BH13	0.5	Fill	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1	nd
28-Aug-18		C1b-BH13	1.0	Fill	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1	nd
28-Aug-18		C1b-BH13	2.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	-	-
28-Aug-18		C1b-BH13	2.6	Shale	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	-	-

Epic File: **SY180065.04**
Site: **Muirs (C1b & C3b)**
Client: **LSBJV**

Epic Environmental Pty Ltd
Level 6, 193 North Quay, Brisbane, QLD, 4000

Table T3: Soil Analytical Results - ESLs and HSLs

Sample Date	Sample Duplicate	Sample Number	Sample Depth (m)	Material Type	Organics (mg/kg)												
					TRH						BTEXN						
					C_6-C_{10} minus BTEX (F1)	C_6-C_{10}	>C_{10}-C_{16} minus naphthalene (F2)	>C_{10}-C_{16}	>C_{16}-C_{34}	>C_{34}	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene	Styrene	VOCs/ VHCs
Soil Saturation Concentration (Csat) - Sand | Silt | Clay					**950 | 910 | 850**	**950 | 910 | 850**	**560 | 570 | 560**	**560 | 570 | 560**	**-**	**-**	**360 | 440 | 430**	**560 | 640 | 630**	**64 | 69 | 68**	**300 | 330 | 330**	**9 | 10 | 10**		
ESL (Commercial/Industrial) - Coarse | Fine					**215 | 215**	**-**	**170 | 170**	**-**	**1,700 | 2,500**	**3,300 | 6,600**	**75 | 95**	**135 | 135**	**165 | 185**	**180 | 95**	**370^**		
Management Limit (Commercial & Industrial) - Coarse Soil | Fine Soil					**700 | 800**	**-**	**1,000 | 1,000**	**-**	**3,500 | 5,000**	**10,000 | 10,000**	**-**	**-**	**-**	**-**	**-**		
HSL-D (Commercial/Industrial) Vapour Intrusion - 0m to <1m - Sand | Silt | Clay					**260 | 250 | 310**	**-**	NL | NL | NL	-	**-**	**-**	**3 | 4 | 4**	NL | NL | NL	NL | NL | NL	**230 | NL | NL**	NL | NL | NL		
HSL-D (Commercial/Industrial) Vapour Intrusion - 1m to <2m - Sand | Silt | Clay					**370 | 360 | 480**	**-**	NL | NL | NL	-	**-**	**-**	**3 | 4 | 6**	NL | NL | NL	NL | NL | NL	NL | NL | NL	NL | NL | NL		
HSL-D (Commercial/Industrial) Vapour Intrusion - 2m to <4m - Sand | Silt | Clay					**630 | 590 |** NL	**-**	NL | NL | NL	-	**-**	**-**	**3 | 6 | 9**	NL | NL | NL	NL | NL | NL	NL | NL | NL	NL | NL | NL		
HSL-D (Commercial/Industrial) Vapour Intrusion - 4m + - Sand | Silt | Clay					NL | NL | NL	-	NL | NL | NL	-	**-**	**-**	**3 | 10 | 20**	NL | NL | NL	NL | NL | NL	NL | NL | NL	NL | NL | NL		
Lanfill Criteria - Maximum Values without TCLP - General Solid Waste					**650**	**650**	**10,000**	**-**	**-**	**-**	**10**	**288**	**600**	**1,000**	**-**	**60**	**-**
Landfill Criteria - Maximum Values without TCLP - Restricted Solid Waste					**2,600**	**2,600**	**40,000**	**-**	**-**	**-**	**40**	**1,152**	**2,400**	**4,000**	**-**	**240**	**-**
Laboratory Level of Reporting (mg/kg)					**10**	**10**	**50**	**50**	**100**	**100**	**0.2**	**0.5**	**0.5**	**0.5**	**1**	**0.5**	**0.5**
19-Nov-18		C1b-BH14	0.2	Fill	-	-	-	-	-	-	-	-	-	-	-	-	-
19-Nov-18		C1b-BH14	0.5	Soil	-	-	-	-	-	-	-	-	-	-	-	-	-
19-Nov-18		C1b-BH14	1.0	Soil	-	-	-	-	-	-	-	-	-	-	-	-	-
19-Nov-18		C1b-BH14	2.0	Soil	-	-	-	-	-	-	-	-	-	-	-	-	-
19-Nov-18		C1b-BH14	3.0	Shale	-	-	-	-	-	-	-	-	-	-	-	-	-
19-Nov-18		C1b-BH15	0.2	Fill	-	-	-	-	-	-	-	-	-	-	-	-	-
19-Nov-18		C1b-BH15	0.5	Fill	-	-	-	-	-	-	-	-	-	-	-	-	-
19-Nov-18		C1b-BH15	1.0	Soil	-	-	-	-	-	-	-	-	-	-	-	-	-
19-Nov-18		C1b-BH15	2.0	Rock	-	-	-	-	-	-	-	-	-	-	-	-	-
19-Nov-18		C1b-BH15	3.2	Rock	-	-	-	-	-	-	-	-	-	-	-	-	-
19-Nov-18		C1b-BH16	0.2	Fill	<25	<25	<50	<50	<100	<100	-	-	-	<1	<1	-	-
19-Nov-18		C1b-BH16	0.5	Fill	<25	<25	<50	<50	<100	<100	-	-	-	<1	<1	-	-
19-Nov-18		C1b-BH16	1.0	Soil	-	-	-	-	-	-	-	-	-	-	-	-	-
19-Nov-18		C1b-BH16	2.0	Soil	-	-	-	-	-	-	-	-	-	-	-	-	-
19-Nov-18		C1b-BH17	0.2	Fill	-	-	-	-	-	-	<0.2	<0.5	<1	<3	-	<1	nd
19-Nov-18		C1b-BH17	0.5	Soil	-	-	-	-	-	-	-	-	-	-	-	-	-
19-Nov-18		C1b-BH17	1.0	Soil	-	-	-	-	-	-	-	-	-	-	-	-	-
19-Nov-18		C1b-BH17	2.0	Soil	-	-	-	-	-	-	-	-	-	-	-	-	-
19-Nov-18		C1b-BH17	3.0	Shale	-	-	-	-	-	-	-	-	-	-	-	-	-
19-Nov-18		C1b-BH18	0.2	Fill	-	-	-	-	-	-	-	-	-	-	-	-	-
19-Nov-18		C1b-BH18	0.5	Fill	-	-	-	-	-	-	-	-	-	-	-	-	-
19-Nov-18		C1b-BH18	1.0	Soil	<25	<25	<50	<50	<100	<100	-	-	-	<1	<1	-	-
19-Nov-18		C1b-BH18	2.0	Soil	-	-	-	-	-	-	-	-	-	-	-	-	-
19-Nov-18		C1b-BH18	3.0	Shale	-	-	-	-	-	-	-	-	-	-	-	-	-
19-Nov-18		C1b-BH19	0.2	Fill	-	-	-	-	-	-	<0.2	<0.5	<1	<3	-	<1	-
19-Nov-18		C1b-BH19	0.5	Fill	-	-	-	-	-	-	-	-	-	-	-	-	-
19-Nov-18		C1b-BH19	1.0	Soil	-	-	-	-	-	-	-	-	-	-	-	-	-
19-Nov-18		C1b-BH19	2.0	Soil	-	-	-	-	-	-	-	-	-	-	-	-	-
19-Nov-18		C1b-BH19	3.0	Soil	-	-	-	-	-	-	-	-	-	-	-	-	-
C1b - QAQC																	
27-Aug-18	C1b-BH05-0.5	C1b-QC01		Soil	-	-	<50	<50	**310**	<100	<0.2	<0.5	<0.5	<0.5	<1	-	nd
27-Aug-18	C1b-BH05-0.5	C1b-QC02		Soil	<10	<10	<50	<50	**200**	<100	<0.2	<0.5	<0.5	<0.5	<1	-	nd
28-Aug-18	C1b-BH10-0.2	C1b-QC03		Soil	-	-	<50	<50	<100	<100	<0.2	<0.5	<0.5	<0.5	<1	-	nd
28-Aug-18	C1b-BH10-0.2	C1b-QC04		Soil	<10	<10	<50	<50	<100	<100	<0.2	<0.5	<0.5	<0.5	<1	-	nd
19-Nov-18	C1b-BH19-0.2	C1b-QA08		Soil	-	-	-	-	-	-	-	-	-	-	-	-	-
19-Nov-18	C1b-BH19-0.2	C1b-QA08		Soil	-	-	-	-	-	-	-	-	-	-	-	-	-

NOTES:

1	Analyte exceeds the ESL Criteria for Urban Residential and Public Open Space or Commercial and Industrial land use
1	Analyte exceeds reported Management Limits for hydrocarbons
1	Analyte exceeds HSL-A & HSL-B Criteria
1	Analyte exceeds the HSL-D criteria
1	Analyte exceeds the adopted Clean Fill Criteria
1	Adopted Clean Fill Criteria
1	Analyte exceeds the laboratory's limit of reporting (LOR)
-	Not analysed
NL	Not Limiting, for which the derived HSL exceeds the Csat, and cannot result in an unacceptable vapour risk for depth and soil type.
^	Generic Ecological Investigation Levels (EILs) for naphthalene, not dependent on soil type or soil physicochemical properties
*	Landfill criteria based on TPH fractions C_6-C_9, C_{10}-C_{14}, C_{15}-C_{28} and C_{29}-C_{36}

Epic File: **SY180065.04**
Site: **Muirs (C1b & C3b)**
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Table T4: Soil Analytical Results - ESLs and HSLs

Sample Date	Sample Duplicate	Sample Number	Sample Depth (m)	Material Type	Organics (mg/kg)												
					TRH						BTEXN						
					C_6-C_{10} minus BTEX (F1)	C_6-C_{10}	$>C_{10}$-C_{16} minus naphthalene (F2)	$>C_{10}$-C_{16}	$>C_{16}$-C_{34}	$>C_{34}$	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene	Styrene	VOCs/ VHCs
Soil Saturation Concentration (Csat) - Sand | Silt | Clay					**950 | 910 | 850**	**950 | 910 | 850**	**560 | 570 | 560**	**560 | 570 | 560**	**-**	**-**	**360 | 440 | 430**	**560 | 640 | 630**	**64 | 69 | 68**	**300 | 330 | 330**	**9 | 10 | 10**		
ESL (Commercial/Industrial) - Coarse | Fine					**215 | 215**	**-**	**170 | 170**	**-**	**1,700 | 2,500**	**3,300 | 6,600**	**75 | 95**	**135 | 135**	**165 | 185**	**180 | 95**	**370^**		
HSL-D (Commercial/Industrial) Vapour Intrusion - 0m to <1m - Sand | Silt | Clay					**260 | 250 | 310**	**-**	NL | NL | NL	-	**-**	**-**	**3 | 4 | 4**	NL | NL | NL	NL | NL | NL	**230 | NL | NL**	NL | NL | NL		
HSL-D (Commercial/Industrial) Vapour Intrusion - 1m to <2m - Sand | Silt | Clay					**370 | 360 | 480**	**-**	NL | NL | NL	-	**-**	**-**	**3 | 4 | 6**	NL | NL | NL	NL | NL | NL	NL | NL | NL	NL | NL | NL		
HSL-D (Commercial/Industrial) Vapour Intrusion - 2m to <4m - Sand | Silt | Clay					**630 | 590 |** NL	**-**	NL | NL | NL	-	**-**	**-**	**3 | 6 | 9**	NL | NL | NL	NL | NL | NL	NL | NL | NL	NL | NL | NL		
HSL-D (Commercial/Industrial) Vapour Intrusion - 4m + - Sand | Silt | Clay					NL | NL | NL	-	NL | NL | NL	-	**-**	**-**	**3 | 10 | 20**	NL | NL | NL	NL | NL | NL	NL | NL | NL	NL | NL | NL		
Lanfill Criteria - Maximum Values without TCLP - General Solid Waste					**650**	**650**	**10,000**	**-**	**-**	**-**	**10**	**288**	**600**	**1,000**	**-**	**60**	**-**
Landfill Criteria - Maximum Values without TCLP - Restricted Solid Waste					**2,600**	**2,600**	**40,000**	**-**	**-**	**-**	**40**	**1,152**	**2,400**	**4,000**	**-**	**240**	**-**
Laboratory Level of Reporting (mg/kg)					**10**	**10**	**50**	**50**	**100**	**100**	**0.2**	**0.5**	**0.5**	**0.5**	**1**	**0.5**	**0.5**
C1b																	
29-Aug-18		C3b-BH20	0.2	Fill	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1	nd
29-Aug-18		C3b-BH20	0.5	Fill	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1	nd
29-Aug-18		C3b-BH20	1.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1	nd
29-Aug-18		C3b-BH20	2.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	-	-
29-Aug-18		C3b-BH20	3.0	Sandstone	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	-	-
29-Aug-18		C3b-BH20	4.0	Sandstone	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	-	-
29-Aug-18		C3b-BH21	0.2	Fill	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1	nd
29-Aug-18		C3b-BH21	0.5	Fill	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1	nd
29-Aug-18		C3b-BH21	1.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1	nd
29-Aug-18		C3b-BH21	2.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	-	-
29-Aug-18		C3b-BH21	3.0	Shale	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	-	-
29-Aug-18		C3b-BH21	4.0	Shale	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	-	-
29-Aug-18		C3b-BH22	0.2	Fill	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1	nd
29-Aug-18		C3b-BH22	0.5	Fill	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1	nd
29-Aug-18	C3b-QC05/QC06	C3b-BH22	1.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1	nd
29-Aug-18		C3b-BH22	2.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	-	-
29-Aug-18		C3b-BH22	3.0	Sandsotne	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	-	-
29-Aug-18		C3b-BH22	4.0	Sandstone	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	-	-
29-Aug-18		C3b-BH23	0.2	Fill	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1	nd
29-Aug-18		C3b-BH23	0.5	Fill	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1	nd
29-Aug-18		C3b-BH23	1.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1	nd
29-Aug-18		C3b-BH23	2.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	-	-
29-Aug-18		C3b-BH23	3.0	Shale	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	-	-
29-Aug-18		C3b-BH23	4.0	Sandstone	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	-	-
30-Aug-18		C3b-BH24	0.2	Fill	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1	nd
30-Aug-18		C3b-BH24	0.5	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1	nd
30-Aug-18		C3b-BH24	1.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1	nd
30-Aug-18		C3b-BH24	1.6	Shale	<25	<25	<50	<50	<100	<100	-	-	-	<1	<1	-	-
30-Aug-18		C3b-BH25	0.2	Fill	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1	nd
30-Aug-18		C3b-BH25	0.5	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1	nd
30-Aug-18		C3b-BH25	1.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1	nd
30-Aug-18		C3b-BH25	1.7	Shale	<25	<25	<50	<50	<100	<100	-	-	-	<1	<1	-	-
30-Aug-18		C3b-BH26	0.2	Fill	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1	nd
30-Aug-18		C3b-BH26	0.5	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1	nd
30-Aug-18		C3b-BH26	1.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1	nd
30-Aug-18		C3b-BH26	1.8	Shale	<25	<25	<50	<50	<100	<100	-	-	-	<1	<1	-	-
30-Aug-18		C3b-BH27	0.2	Fill	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1	nd
30-Aug-18		C3b-BH27	0.5	Fill	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1	nd
30-Aug-18		C3b-BH27	1.0	Fill	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1	nd
30-Aug-18		C3b-BH27	2.0	Shale	<25	<25	<50	<50	<100	<100	-	-	-	<1	<1	-	-
30-Aug-18		C3b-BH28	0.2	Fill	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1	nd
30-Aug-18	C3b-QC07/QC08	C3b-BH28	0.5	Fill	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1	nd
30-Aug-18		C3b-BH28	1.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1	nd
30-Aug-18		C3b-BH28	1.8	Shale	<25	<25	<50	<50	<100	<100	-	-	-	<1	<1	-	-
30-Aug-18		C3b-BH29	0.2	Fill	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1	nd
30-Aug-18		C3b-BH29	0.5	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1	nd
30-Aug-18		C3b-BH29	1.0	Shale	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1	nd
30-Aug-18		C3b-BH29	1.2	Shale	<25	<25	<50	<50	<100	<100	-	-	-	<1	<1	-	-

Epic File: **SY180065.04**
Site: **Muirs (C1b & C3b)**
Client: **LSBJV**

Epic Environmental Pty Ltd
Level 6, 193 North Quay, Brisbane, QLD, 4000

Table T4: Soil Analytical Results - ESLs and HSLs

Sample Date	Sample Duplicate	Sample Number	Sample Depth (m)	Material Type	Organics (mg/kg)												
					TRH						BTEXN						
					C_6-C_{10} minus BTEX (F1)	C_6-C_{10}	$>C_{10}$-C_{16} minus naphthalene (F2)	$>C_{10}$-C_{16}	$>C_{16}$-C_{34}	$>C_{34}$	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene	Styrene	VOCs/ VHCs
Soil Saturation Concentration (Csat) - Sand | Silt | Clay					**950 | 910 | 850**	**950 | 910 | 850**	**560 | 570 | 560**	**560 | 570 | 560**	**-**	**-**	**360 | 440 | 430**	**560 | 640 | 630**	**64 | 69 | 68**	**300 | 330 | 330**	**9 | 10 | 10**		
ESL (Commercial/Industrial) - Coarse | Fine					**215 | 215**	**-**	**170 | 170**	**-**	**1,700 | 2,500**	**3,300 | 6,600**	**75 | 95**	**135 | 135**	**165 | 185**	**180 | 95**	**370^**		
HSL-D (Commercial/Industrial) Vapour Intrusion - 0m to <1m - Sand | Silt | Clay					**260 | 250 | 310**	**-**	NL | NL | NL	-	**-**	**-**	**3 | 4 | 4**	NL | NL | NL	NL | NL | NL	**230** | NL | NL	NL | NL | NL		
HSL-D (Commercial/Industrial) Vapour Intrusion - 1m to <2m - Sand | Silt | Clay					**370 | 360 | 480**	**-**	NL | NL | NL	-	**-**	**-**	**3 | 4 | 6**	NL | NL | NL	NL | NL | NL	NL | NL | NL	NL | NL | NL		
HSL-D (Commercial/Industrial) Vapour Intrusion - 2m to <4m - Sand | Silt | Clay					**630 | 590** | NL	**-**	NL | NL | NL	-	**-**	**-**	**3 | 6 | 9**	NL | NL | NL	NL | NL | NL	NL | NL | NL	NL | NL | NL		
HSL-D (Commercial/Industrial) Vapour Intrusion - 4m + - Sand | Silt | Clay					NL | NL | NL	-	NL | NL | NL	-	**-**	**-**	**3 | 10 | 20**	NL | NL | NL	NL | NL | NL	NL | NL | NL	NL | NL | NL		
Lanfill Criteria - Maximum Values without TCLP - General Solid Waste					**650**	**650**	**10,000**	**-**	**-**	**-**	**10**	**288**	**600**	**1,000**	**-**	**60**	**-**
Landfill Criteria - Maximum Values without TCLP - Restricted Solid Waste					**2,600**	**2,600**	**40,000**	**-**	**-**	**-**	**40**	**1,152**	**2,400**	**4,000**	**-**	**240**	**-**
Laboratory Level of Reporting (mg/kg)					**10**	**10**	**50**	**50**	**100**	**100**	**0.2**	**0.5**	**0.5**	**0.5**	**1**	**0.5**	**0.5**
19-Nov-18		C3b-BH30	0.2	Fill	-	-	-	-	-	-	-	-	-	-	-	-	-
19-Nov-18		C3b-BH30	0.5	Soil	-	-	-	-	-	-	-	-	-	-	-	-	-
19-Nov-18		C3b-BH30	1.0	Shale	-	-	-	-	-	-	-	-	-	-	-	-	-
19-Nov-18		C3b-BH31	0.2	Fill	-	-	-	-	-	-	-	-	-	-	-	-	-
19-Nov-18		C3b-BH31	0.5	Soil	-	-	-	-	-	-	-	-	-	-	-	-	-
19-Nov-18		C3b-BH31	1.0	Shale	-	-	-	-	-	-	-	-	-	-	-	-	-
19-Nov-18		C3b-BH32	0.2	Fill	-	-	-	-	-	-	-	-	-	-	-	-	-
19-Nov-18		C3b-BH32	0.5	Soil	-	-	-	-	-	-	-	-	-	-	-	-	-
19-Nov-18		C3b-BH32	1.0	Shale	-	-	-	-	-	-	-	-	-	-	-	-	-
20-Nov-18		C3b-BH33	0.2	Fill	<25	<25	<50	<50	<100	<100	-	-	-	<1	<1	-	-
20-Nov-18		C3b-BH33	0.5	Soil	-	-	-	-	-	-	-	-	-	-	-	-	-
20-Nov-18		C3b-BH33	1.0	Soil	-	-	-	-	-	-	-	-	-	-	-	-	-
20-Nov-18		C3b-BH33	2.0	Shale	-	-	-	-	-	-	-	-	-	-	-	-	-
20-Nov-18		C3b-BH34	0.2	Fill	-	-	-	-	-	-	-	-	-	-	-	-	-
20-Nov-18		C3b-BH34	0.5	Soil	-	-	-	-	-	-	-	-	-	-	-	-	-
20-Nov-18		C3b-BH34	1.0	Soil	-	-	-	-	-	-	-	-	-	-	-	-	-
20-Nov-18		C3b-BH34	2.0	Shale	-	-	-	-	-	-	-	-	-	-	-	-	-
20-Nov-18		C3b-BH35	0.2	Fill	-	-	-	-	-	-	-	-	-	-	-	-	-
20-Nov-18		C3b-BH35	0.5	Soil	-	-	-	-	-	-	-	-	-	-	-	-	-
20-Nov-18		C3b-BH35	1.0	Soil	-	-	-	-	-	-	-	-	-	-	-	-	-
20-Nov-18		C3b-BH35	2.0	Shale	-	-	-	-	-	-	-	-	-	-	-	-	-
20-Nov-18		C3b-BH36	0.2	Fill	-	-	-	-	-	-	-	-	-	-	-	-	-
20-Nov-18		C3b-BH36	0.5	Soil	-	-	-	-	-	-	-	-	-	-	-	-	-
20-Nov-18		C3b-BH36	1.0	Soil	-	-	-	-	-	-	-	-	-	-	-	-	-
20-Nov-18		C3b-BH36	2.0	Shale	-	-	-	-	-	-	-	-	-	-	-	-	-
					-												
C1b - QAQC																	
29-Aug-18	C3b-BH22-0.5	C3b-QC05	-	Soil	<25	<25	<50	<50	<100	<100	-	-	-	-	-	-	-
29-Aug-18	C3b-BH22-0.5	C3b-QC06	-	Soil	<10	<10	<50	<50	<100	<100	<0.2	<0.5	<0.5	<0.5	<1	-	-
30-Aug-18	C3b-BH28-0.5	C3b-QC07	-	Soil	<25	<25	<50	<50	<100	<100	-	-	-	-	<1	-	-
30-Aug-18	C3b-BH28-0.5	C3b-QC08	-	Soil	<10	<10	<50	<50	<100	<100	<0.2	<0.5	<0.5	<0.5	<0.5	-	-
19-Nov-18	C3b-BH35-0.2	C3b-QC09		Soil	-	-	-	-	-	-	-	-	-	-	-	-	-
20-Nov-18	C3b-BH35-0.2	C3b-QC10		Soil	-	-	-	-	-	-	-	-	-	-	-	-	-

NOTES:

1	Analyte exceeds the ESL Criteria for Urban Residential and Public Open Space or Commercial and Industrial land use
1	Analyte exceeds reported Management Limits for hydrocarbons
1	Analyte exceeds HSL-A & HSL-B Criteria
1	Analyte exceeds the HSL-D criteria
1	Analyte exceeds the adopted Clean Fill Criteria
1	Adopted Clean Fill Criteria
1	Analyte exceeds the laboratory's limit of reporting (LOR)
-	Not analysed
NL	Not Limiting, for which the derived HSL exceeds the Csat, and cannot result in an unacceptable vapour risk for depth and soil type.
^	Generic Ecological Investigation Levels (EILs) for naphthalene, not dependent on soil type or soil physicochemical properties
*	Landfill criteria based on TPH fractions C_6-C_9, C_{10}-C_{14}, C_{15}-C_{28} and C_{29}-C_{36}

Epic File: **SY180065.04**
Site: **Muirs (C1b & C3b)**
Client: **LSBJV**

Epic Environmental Pty Ltd
Level 6, 193 North Quay, Brisbane, QLD, 4000

Table T5: Soil RPD Results

Sample Date	Sample Duplicate	Sample Number	Sample Depth (m)	Material Type	Inorganics (mg/kg)							
					Metals							
					As	Cd	Total Cr*	Cu	Pb	Hg†	Ni	Zn
27-Aug-18	C1b-QC01/QC02	C1b-BH05	0.5	Soil	5	<0.4	18	26	35	<0.1	9	37
27-Aug-18	C1b-BH05	C1b-QC01	-	Soil	6	<0.4	19	20	31	<0.1	7	19
27-Aug-18	C1b-BH05	C1b-QC02	-	Soil	8	<1	22	11	29	<0.1	9	43
Blind Duplicate					18	#VALUE!	5	26	12	#VALUE!	25	**64**
Split Duplicate					**46**	#VALUE!	20	**81**	19	#VALUE!	0	15
28-Aug-18		C1b-BH10-0.2			<4	<0.4	2	<1	2	<0.1	<1	2
28-Aug-18		C1b-QC03			<4	<0.4	2	<1	<1	<0.1	1	2
28-Aug-18		C1b-QC04			<5	<1	<2	<5	<5	<0.1	<2	<5
Blind Duplicate					#VALUE!	#VALUE!	0	#VALUE!	#VALUE!	#VALUE!	#VALUE!	0
Split Duplicate					#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
30-Aug-18	C3b-QC07/QC08	C3b-BH28	0.5	Soil	5	<0.4	17	7	20	<0.1	4	5
30-Aug-18	C3b-BH28-0.5	C3b-QC07		Soil	10	<0.4	25	5	18	<0.1	3	4
30-Aug-18	C3b-BH28-0.5	C3b-QC08		Soil	10	<1	30	6	26	<0.1	4	6
Blind Duplicate					**67**	#VALUE!	**38**	**33**	11	#VALUE!	29	22
Split Duplicate					**67**	#VALUE!	**55**	15	26	#VALUE!	0	18
Blind Duplicate					**67**	#VALUE!	**38**	**33**	11	#VALUE!	29	22
Split Duplicate					**67**	#VALUE!	**55**	15	26	#VALUE!	0	18
19-Nov-18		C1b-BH19	0.2	Soil	<4	1	25	54	290	<0.1	59	100
19-Nov-18	C1b-BH19-0.2	C1b-QA08		Soil	43	<0.4	26	10	32	<0.1	5	7
19-Nov-18	C1b-BH19-0.2	C1b-QA08		Soil	20	<0.4	36	11	39	0.2	5.5	33
Blind Duplicate					#VALUE!	#VALUE!	4	**138**	**160**	#VALUE!	**169**	**174**
Split Duplicate					#VALUE!	#VALUE!	**36**	**132**	**153**	#VALUE!	**166**	**101**
20-Nov-18		C3b-BH35	0.2	Soil	7	<0.4	28	4	17	<0.1	2	2
19-Nov-18	C3b-BH35-0.2	C3b-QC09		Soil	13	<0.4	41	<5	23	<0.1	<5	<5
19-Nov-18	C3b-BH35-0.2	C3b-QC10		Soil	7	<0.4	28	3	15	<0.1	2	6
Blind Duplicate					**60**	#VALUE!	**38**	#VALUE!	30	#VALUE!	#VALUE!	#VALUE!
Split Duplicate					0	#VALUE!	0	29	13	#VALUE!	0	**100**

NOTES:

-	RPD value exceeds 50% range
NA	Not Applicable
-	Not analysed

Epic File: **SY180065.01**

Site: **WCX3A - Muirs: Ancillary Site C1b & C3b**

Client: **Lendlease Samsung Bouygues Joint Venture (LSBJV)**

Table T6: Groundwater Analytical Results

Sample Date	Sample Location	Sample Duplicate	Sample Number	Depth to Groundwater (SWL mbgl)	Material Type	Aesthetic Parameters		Physico-Chemical Parameters		Alka	
						Sheen	Odour	pH	Electrical Conductivity (µS/cm)	Hydroxide Alkalinity as $CaCO_3$	Carbonate Alkalinity as $CaCO_3$
Solubility Limit											
ANZ (2019) Website										-	-
NHMRC (August 2018)							**No visible films or odours**	**6.5 - 8.5**		-	-
Recreational Criteria (10 times drinking water criteria) except for aesthetic impacts										-	-
HSL-D (Commercial/Industrial) Vapour Intrusion - 2m to <4m - Sand | Silt | Clay										-	-
HSL-D (Commercial/Industrial) Vapour Intrusion - 4m to <8m - Sand | Silt | Clay										-	-
HSL-D (Commercial/Industrial) Vapour Intrusion - 8m+ - Sand | Silt | Clay										-	-
Laboratory Level of Reporting								**1 to 14**	**5**	**1**	**1**
GME 1 - 13 & 14 August 2018											
14-Aug-18			C1b-GW01	11.10	Groundwater	No Sheen	No Odour	-	-	-	-
14-Aug-18			C1b-GW07	3.96	Groundwater	No Sheen	Very Slight Hydrocarbon Odour	4.8	8300	<5	<5
14-Aug-18			C1b-GW08	9.00	Groundwater	No Sheen	Possible Hydrocarbon Odour	-	-	-	-
13-Aug-18			C3b-GW09	4.24	Groundwater	No Sheen	No Odour	4.4	950	<5	<5
13-Aug-18			C3b-GW10	5.94	Groundwater	No Sheen	No Odour	5	3800	<5	<5
13-Aug-18			C3b-GW11	2.99	Groundwater	No Sheen	No Odour	4.5	620	<5	<5
13-Aug-18		C3b-QC01-W	C3b-GW12	7.79	Groundwater	No Sheen	No Odour	7.9	3900	<5	<5
GME 2 - 19 & 20 November 2018											
20-Nov-18			C1b-GW01	10.37	Groundwater	No Sheen	No Odour	-	-	-	-
20-Nov-18			C1b-GW07	2.13	Groundwater	No Sheen	No Odour	-	-	-	-
20-Nov-18			C1b-GW08	9.00	Groundwater	No Sheen	Slight Hydrocarbon Odour	-	-	-	-
20-Nov-18			C3b-GW09	1.93	Groundwater	No Sheen	No Odour	-	-	-	-
20-Nov-18			C3b-GW10	4.85	Groundwater	No Sheen	No Odour	4	1400	<5	<5
20-Nov-18			C3b-GW11	2.10	Groundwater	No Sheen	No Odour	-	-	-	-
20-Nov-18		C3b-QC02 & QC03 - W	C3b-GW12	7.44	Groundwater	No Sheen	No Odour	-	-	-	-
20-Nov-18			C3b-GW13	3.58	Groundwater	No Sheen	Mild Hydrocarbon/ Sulphur Odour	-	-	-	-
20-Nov-18			C3b-GW14	4.49	Groundwater	No Sheen	Light Hydrocarbon Odour	-	-	-	-
20-Nov-18			C3b-GW15	3.13	Groundwater	No Sheen	No Odour	-	-	-	-
QAQC Samples											
14-Aug-18		C3b-GW12	C3b-QC01-W	-	Groundwater	-	-	-	-	-	-
8-Aug-18		-	TB	-	Trip Blank	-	-	-	-	-	-
20-Nov-18		C3b-GW12	C3b-QC02-W	-	Groundwater	-	-	-	-	-	-
20-Nov-18		C3b-GW12	C3b-QC03-W	-	Groundwater	-	-	-	-	-	-
21-Nov-18		-	Rinsate	-	-	-	-	-	-	-	-

NOTES:

1	Analyte exceeds the HSL-D criteria
1	Analyte exceeds the GIL Criteria for Marine Waters
1	Analyte exceeds the GIL Criteria for Drinking Water
1	Analyte exceeds the Recreational Criteria (based on 10 times the drinking water criteria or NEPM Water Quality Guidelines for Recreational Purposes)
-	Not analysed
NL	Not Limiting, for which the derived GIL exceeds the solubility limit, and cannot result in an unacceptable vapour risk for depth and soil type.
†	The Australian and New Zealand Environment Guidelines for Fresh and Marine Water Quality, 2000 (Trigger Values - 95% Protection)
C	Figure may not protect key species from chronic toxicity, refer to ANZECC & ARMCANZ (2000) for further guidance.
D	Chemical for which possible bioaccumulation and secondary poisoning effects should be considered, refer to ANZECC & ARMCANZ (2000) for further guidance.
E	For changes in GIL with pH refer to ANZECC & ARMCANZ (2000) for further guidance.
F	Criteria for As (III) / As (V)
G	Criteria for Cr (III) / Cr (VI)
H	Values have been calculated using a hardness of 30 mg/L CaCO3 refer to ANZECC & ARMCANZ (2000) for further guidance on recalculating for site-specific hardness.
I	GIL of 30ug/L for each individual OR total trichlorobenzenes

Physical Properties (mg/L)									Organics (ug/L)			
linity		Major Anions		Major Cations				Ionic Balance	PAH			
Bicarbonate Alkalinity as $CaCO_3$	Total Alkalinity as $CaCO_3$	SO_4^{2-}	Cl^-	Ca^{2+}	Mg^{2+}	Na^+	K^+	Ionic Balance (%)	Naphthalene	Benzo (a) pyrene	Total PAH	C_6-C_{10} minus BTEX
									170	**-**	**-**	**9,000**
-	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**50[C]**	**0.0001**	**-**	**-**
-	**-**	**250**	**250**	**-**	**-**	**-**	**-**	**-**	**-**	**0.01**	**-**	**-**
-	**-**	**2,500**	**2,500**	**-**	**-**	**-**	**-**	**-**	**-**	**0.10**	**-**	**-**
-	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**NL | NL | NL**	**-**	**-**	**6,200 | NL | NL**
-	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**NL | NL | NL**	**-**	**-**	**6,300 | NL | NL**
-	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**NL | NL | NL**	**-**	**-**	**6,500 | NL | NL**
1	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0.01**	**1**	**1.0**	**16**	**10**
-	-	-	-	-	-	-	-	-	<1	nd	nd	-
9	9	**750**	**2100**	19	160	1400	18	0	<1	<1	<16	<10
-	-	-	-	-	-	-	-	-	<1	nd	nd	-
<5	<5	270	80	1	4.4	170	2	-1	<1	<1	<16	<10
12	12	150	**1100**	12	75	570	6.1	-3	<1	<1	<16	<10
<5	<5	140	71	0.9	2.1	110	1.3	1	<1	<1	<16	<10
330	330	270	**860**	40	50	600	13	-6	<1	<1	<16	<10
-	**-**	-	-	-	-	-	-	-	<1	<2	<16	<10
-	**-**	-	-	0	160	1400	18	0	<1	<2	<16	<10
-	**-**	-	-	-	-	-	-	-	<1	<2	<16	<10
-	**-**	-	-	1	4.4	170	20	-1	<1	<2	<16	<10
<5	<5	120	380	12	75	570	6.1	-3	<1	<2	<16	<10
-	**-**	-	-	0.9	2.1	110	1.3	1	<1	<2	<16	<10
-	**-**	-	-	40	50	600	13	-6	<1	<2	<16	<10
-	**-**	-	-	-	-	-	-	-	<1	<2	<16	<10
-	**-**	-	-	-	-	-	-	-	<1	<2	<16	<10
-	**-**	-	-	-	-	-	-	-	<1	<2	<16	<10
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-

TRH			MAH											
			BTEX											
>C_{10}-C_{16} minus Naphthalene	>C_{16}-C_{34}	>C_{34}	Benzene	Toluene	Ethylbenzene	o-xylene	p-xylene	Xylenes (total)	Styrene	Isopropylbenzene	n-Propylbenzene	1.3.5-Trimethylbenzene	sec-Butylbenzene	1.2.4-Trimethylbenzene
3,000	-	-	59,000	61,000	3,900	-	-	21,000	-	-	-	-	-	-
-	-	-	700	180	5	350	200	75-350	-	-	-	-	-	-
-	-	-	1	800	300 / 3	-	-	600 / 20	30	-	-	-	-	-
-	-	-	10	8,000	30	-	-	200	300	-	-	-	-	-
NL | NL | NL	-	-	4,900 | 28,000 | 29,000	NL | NL | NL	NL | NL | NL	-	-	NL | NL | NL	-	-	-	-	-	-
NL | NL | NL	-	-	5,100 | 28,000 | 30,000	NL | NL | NL	NL | NL | NL	-	-	NL | NL | NL	-	-	-	-	-	-
NL | NL | NL	-	-	5,400 | 30,000 | 33,000	NL | NL | NL	NL | NL | NL	-	-	NL | NL | NL	-	-	-	-	-	-
50	100	100	1	1	1	1	2	3	1	1	1	1	1	1
-	nd	nd	<1	<1	<1	<1	<2	<3	<1	<1	<1	<1	<1	<1
<50	<100	<100	<1	<1	<1	<1	<2	<3	<1	<1	<1	<1	<1	<1
-	nd	nd	<1	<1	<1	<1	<2	<3	<1	<1	<1	<1	<1	<1
<50	<100	<100	<1	<1	<1	<1	<2	<3	<1	<1	<1	<1	<1	<1
<50	<100	<100	<1	<1	<1	<1	<2	<3	<1	<1	<1	<1	<1	<1
<50	<100	<100	<1	<1	<1	<1	<2	<3	<1	<1	<1	<1	<1	<1
<50	<100	<100	<1	<1	<1	<1	<2	<3	<1	<1	<1	<1	<1	<1
<50	<100	<100	<1	<1	<1	<1	<2	<3	<1	<1	<1	<1	<1	<1
320	<100	<100	<1	<1	<1	<1	<2	<3	<1	<1	<1	<1	<1	<1
<50	<100	<100	<1	<1	<1	<1	<2	<3	<1	<1	<1	<1	<1	<1
320	<100	<100	<1	<1	<1	<1	<2	<3	<1	<1	<1	<1	<1	<1
<50	<100	<100	<1	<1	<1	<1	<2	<3	<1	<1	<1	<1	<1	<1
<50	<100	<100	<1	<1	<1	<1	<2	<3	<1	<1	<1	<1	<1	<1
<50	<100	<100	<1	<1	<1	<1	<2	<3	<1	<1	<1	<1	<1	<1
<50	<100	<100	<1	<1	<1	<1	<2	<3	<1	<1	<1	<1	<1	<1
150	<100	<100	<1	<1	<1	<1	<2	<3	<1	<1	<1	<1	<1	<1
nd	<100	<100	<1	<1	<1	<1	<2	<3	<1	<1	<1	<1	<1	<1
<50	<100	<100	<1	<1	<1	<1	<2	<3	<1	<1	<1	<1	<1	<1
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	<1	<1	<1	<1	<2	<3	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

tert-Butylbenzene	p-Isopropyltoluene	n-Butylbenzene	Fumigants	Halogenated Aliphatic Compounds							
				Trichloromethane (chloroform)	Tetrachloromethane (carbon tetrachloride)	1,2-Dichloroethane	1,1,2-Trichloroethane	Hexachloroethane	Chloroethene (vinyl chloride)	1,1-Dichloroethene	1,2-Dichoroethene
-	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
-	**-**	**-**	**-**	**-**	**-**	**-**	**1,900**	**-**	**-**	**700**	**-**
-	**-**	**-**	**-**	**250**	**3**	**3**	**-**	**-**	**0.3**	**30**	**60**
-	**-**	**-**	**-**	**2,500**	**30**	**30**	**-**	**-**	**3.0**	**300**	**600**
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
1	**1**	**1**	**6**	**1**	**1**	**1**	**1**	**2**	**10**	**1**	**2**
<1	<1	<1	<6	<1	<1	<1	<1	-	<10	<1	<2
<1	<1	<1	<6	<1	<1	<1	<1	<2	<10	<1	<2
<1	<1	<1	<6	<1	<1	<1	<1	-	<10	<1	<2
<1	<1	<1	<6	<1	<1	<1	<1	<2	<10	<1	<2
<1	<1	<1	<6	<1	<1	<1	<1	<2	<10	<1	<2
<1	<1	<1	<6	<1	<1	<1	<1	<2	<10	<1	<2
<1	<1	<1	<6	<1	<1	<1	<1	<2	<10	<1	<2
<1	<1	<1	<6	<1	<1	<1	<1	<2	<10	<1	<1
<1	<1	<1	<6	<1	<1	<1	<1	<2	<10	<1	<1
<1	<1	<1	<6	<1	<1	<1	<1	<2	<10	<1	<1
<1	<1	<1	<6	<1	<1	<1	<1	<2	<10	<1	<1
<1	<1	<1	<6	<1	<1	<1	<1	<2	<10	<1	<1
<1	<1	<1	<6	<1	<1	<1	<1	<2	<10	<1	<1
<1	<1	<1	<6	<1	<1	<1	<1	<2	<10	<1	<1
<1	<1	<1	<6	<1	<1	<1	<1	<2	<10	<1	<1
<1	<1	<1	<6	<1	<1	<1	<1	<2	<10	<1	<1
<1	<1	<1	<6	<1	<1	<1	<1	<2	<10	<1	<1
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-

	Chlorinated Benzenes						Phenols						
Tetrachloroethene (PCE)	Chlorobenzene	1,2-Dichlorobenzene	1,3-Dichlorobenzene	1,4-Dichlorobenzene	1,2,3-Trichlorobenzene	1,2,4-Trichlorobenzene	Phenol	2-Chlorophenol	2,4-Dichlorophenol	2,4,6-Trichlorophenol	2,3,4,6-Tetrachlorophenol	Pentachlorophenol	2,4-Dinitrophenol
-	-	-	-	-	-	-	-	-	-	-	-	-	-
70	**55**	**160**	**260**	**60**	**3**	**20^{D}**	**400**	**340**	**120**	**3**	**10**	**11^{D}**	**45**
50	**300 / 10**	**1500 / 1**	**20**	**40 / 0.3**	**30^{I} / 5**	**30^{I} / 5**	**-**	**300 / 0.1**	**200 / 0.3**	**43,516**	**-**	**10**	**-**
500	**3,000**	**15,000**	**-**	**400**	**300**	**300**	**-**	**3,000**	**2,000**	**200**	**-**	**100**	**-**
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**2**	**2**	**2**	**2**	**10**	**20**
<1	<1	<1	<1	<1	<1	<1	-	-	-	-	-	-	-
<1	<1	<1	<1	<1	<1	<1	<2	<2	<2	<2	<2	<10	<20
<1	<1	<1	<1	<1	<1	<1	-	-	-	-	-	-	-
<1	<1	<1	<1	<1	<1	<1	<2	<2	<2	<2	<2	<10	<20
<1	<1	<1	<1	<1	<1	<1	<2	<2	<2	<2	<2	<10	<20
<1	<1	<1	<1	<1	<1	<1	<2	<2	<2	<2	<2	<10	<20
<1	<1	<1	<1	<1	<1	<1	<2	<2	<2	<2	<2	<10	<20
<1	<1	<2	<2	<2	<1	<2	<2	<2	<2	<2	<2	<10	<20
<1	<1	<2	<2	<2	<1	<2	<2	<2	<2	<2	<2	<10	<20
<1	<1	<2	<2	<2	<1	<2	<2	<2	<2	<2	<2	<10	<20
<1	<1	<2	<2	<2	<1	<2	<2	<2	<2	<2	<2	<10	<20
<1	<1	<2	<2	<2	<1	<2	<2	<2	<2	<2	<2	<10	<20
<1	<1	<2	<2	<2	<1	<2	<2	<2	<2	<2	<2	<10	<20
<1	<1	<2	<2	<2	<1	<2	<2	<2	<2	<2	<2	<10	<20
<1	<1	<2	<2	<2	<1	<2	<2	<2	<2	<2	<2	<10	<20
<1	<1	<2	<2	<2	<1	<2	<2	<2	<2	<2	<2	<10	<20
<1	<1	<2	<2	<2	<1	<2	<2	<2	<2	<2	<2	<10	<20
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-

PCB		Pesticides (OCPs)							Pesticides (OPPs)						
Aroclor 1242	Aroclor 1254	DDT	Aldrin & Dieldrin	Chlordane	Endosulfan	Endrin	Heptachlor	Chlorpyrifos	Dichlorvos	Dimethoate	Diazinon	Ethion	Malathion	As	Cd[H]
-	-	-	-	-	-	-	-		-	-	-	-	-	-	-
0.3	0.01	0.0004	0.003 / 0.01	0.001	0.005[D]	0.004[D]	0.0004	0.009	-	0.15	0.01	-	0.05	-	0.0007[D]
-	-	9	0.3	2	20	-	0.3	10	5	7	4	4	70	0.010	0.002
-	-	90	3.0	20	200	-	3	100	50	70	40	40	700	0.100	0.020
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	2	0.6	0.4	0.4	0.6	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.001	0.0001
-	-	-	-	-	-	-	-							-	-
<2	<2	<0.6	<0.4	<0.4	<0.6	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.001	0.0003
-	-	-	-	-	-	-	-							-	-
<2	<2	<0.6	<0.4	<0.4	<0.6	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.001	<0.0001
<2	<2	<0.6	<0.4	<0.4	<0.6	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.001	**0.001**
<2	<2	<0.6	<0.4	<0.4	<0.6	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.001	<0.0001
<2	<2	<0.6	<0.4	<0.4	<0.6	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.002	<0.0001
<2	<2	<0.2	<2	<0.4	<0.6	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.001	**0.001**
<2	<2	<0.2	<2	<0.4	<0.6	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.001	<0.001
<2	<2	<0.2	<2	<0.4	<0.6	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.001	<0.001
<2	<2	<0.2	<2	<0.4	<0.6	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.001	<0.001
<2	<2	<0.2	<2	<0.4	<0.6	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.001	**0.002**
<2	<2	<0.2	<2	<0.4	<0.6	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.001	<0.001
<2	<2	<0.2	<2	<0.4	<0.6	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.006	<0.001
<2	<2	<0.2	<2	<0.4	<0.6	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.001	<0.001
<2	<2	<0.2	<2	<0.4	<0.6	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.001	<0.001
<2	<2	<0.2	<2	<0.4	<0.6	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.001	**0.002**
-	-	-	-	-	-	-	-							0.002	<0.0001
-	-	-	-	-	-	-	-							-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.005	<0.0002
-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.005	<0.0001
-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.001	<0.0001

Epic Environmental Pty Ltd
Level 6, 193 North Quay, Brisbane QLD 4000

Inorganics (mg/L)					
Heavy Metals					
Cr	Cu[H]	Pb[H]	Hg (total)	Ni[H]	Zn[H]
-	-	-	-	-	-
0.027 / 0.0044[G]	0.0013	0.0044	0.0001[D]	0.007	0.015[C]
0.050	43,467	0.010	0.001	0.020	3,000
0.500	10	0.100	0.010	0.200	3,000
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
0.001	0.001	0.001	0.00005	0.001	0.001
-	-	-	-	-	-
<0.001	**0.028**	**0.026**	<0.00005	**0.063**	**0.19**
-	-	-	-	-	-
<0.001	**0.036**	0.003	<0.00005	0.006	**0.051**
<0.001	**0.068**	**0.005**	<0.00005	**0.11**	**0.5**
<0.001	**0.085**	**0.006**	<0.00005	0.007	**0.098**
<0.001	**0.036**	0.002	<0.00005	0.004	0.03
<0.001	<0.001	<0.001	<0.00005	**0.097**	**0.089**
<0.001	**0.052**	**0.006**	<0.00005	**0.035**	**0.14**
<0.001	<0.001	<0.001	<0.00005	**0.043**	0.002
<0.001	**0.004**	<0.001	<0.00005	0.003	**0.016**
<0.001	**0.01**	<0.001	<0.00005	**0.052**	**0.21**
<0.001	**0.003**	<0.001	<0.00005	0.001	0.012
<0.001	<0.001	<0.001	<0.00005	0.005	0.002
<0.001	**0.11**	**0.009**	<0.00005	0.007	**0.091**
<0.001	**0.055**	**0.004**	<0.00005	0.005	**0.057**
<0.001	**0.049**	**0.006**	<0.00005	**0.011**	**0.084**
<0.001	**0.002**	<0.001	<0.00005	0.002	0.001
-	-	-	-	-	-
<0.001	<0.001	<0.001	0.0005	0.004	<0.005
<0.001	<0.001	<0.001	<0.00005	0.005	0.001
<0.001	<0.001	<0.001	<0.00005	<0.001	<0.001

Epic File: **SY180065.01**

Site: **WCX3A - Muirs: Ancillary Site C1b & C3b**

Client: **Lendlease Samsung Bouygues Joint Venture (LSBJV)**

Epic Environmental Pty Ltd
Level 6, 193 North Quay, Brisbane QLD 4000

Table T7: Groundwater Analytical Results - PFAS

Sample Date	Sample Location	Sample Duplicate	Sample Number	Depth to Groundwater	Material Type	Organics (µg/L)				
						Per- and poly-fluorinated alkyl substances (PFAS)				
						Perfluoroalkyl Sulfonic Acids		Perfluoroalkyl Carboxylic Acids	Fluorotelomer Sulfonic Acids	
						PFOS	PFHxS	PFOA	6:2 FTS	8:2 FTS
Solubility Limit						-	-	-	-	-
PFAS NEMP Human Health - Drinking Water						**0.07**	**0.07**	**0.56**	-	-
PFAS NEMP Human Health - Recreational Water						**0.7**	**0.70**	**5.60**	-	-
PFAS NEMP 95% species protection interim marine						**13**	-	**220**	-	-
Laboratory Level of Reporting						**0.01**	**0.02**	**0.01**	**0.05**	**0.05**
14/08/2018			C1b-GW01		Groundwater	-	-	-	-	-
14/08/2018			C1b-GW07		Groundwater	-	-	-	-	-
14/08/2018			C1b-GW08		Groundwater	-	-	-	-	-
13/08/2018			C3b-GW09		Groundwater	-	-	-	-	-
13/08/2018			C3b-GW10		Groundwater	-	-	-	-	-
14/08/2018			C3b-GW11		Groundwater	<0.01	<0.01	<0.01	<0.01	<0.01
14/08/2018			C3b-GW12		Groundwater	-	-	-	-	-
14/08/2018			C3b-QC01-W		Groundwater	-	-	-	-	-
08/08/2018			TB		Trip Blank	-	-	-	-	-

NOTES:

1	Analyte exceeds the PFAS NEMP Human Health - Drinking Water Criteria
1	Analyte exceeds the PFAS NEMP Human Health - Recreational Water Criteria
1	Analyte exceeds the PFAS NEMP 95% species protection in marine waters (interim values based on freshwater values) for highly disturbed systems
-	Not analysed

Epic File: **SY180065.01**

Site: **WCX3A - Muirs: Ancillary Site C1b & C3b**

Client: **Lendlease Samsung Bouygues Joint Venture (LSBJV)**

Epic Environmental Pty Ltd
Level 6, 193 North Quay, Brisbane QLD 4000

Table T8: Groundwater RPD Results

Sample Date	Sample Duplicate	Sample Number	Sample Depth (m)	Material Type	Inorganics (mg/L)							
					Metals							
					As	Cd	Total Cr*	Cu	Pb	Hg†	Ni	Zn
14-Aug-18	C3b-QC01-W	C3b-GW12	-	Groundwater	0.002	<0.0001	<0.001	**0.036**	0.002	<0.00005	0.004	0.03
14-Aug-18	C3b-GW12	C3b-QC01-W	-	Groundwater	0.002	<0.0001	<0.001	**0.002**	<0.001	<0.00005	0.002	0.001
					-	-	-	-	-	-	-	-
Blind Duplicate					0	#VALUE!	#VALUE!	**179**	#VALUE!	#VALUE!	**67**	**187**
Split Duplicate					#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
20-Nov-18	C3b-QC02 & QC03 - W	C3b-GW12			0.006	<0.001	<0.001	<0.001	<0.001	<0.00005	0.005	0.002
20-Nov-18	C3b-GW12	C3b-QC02-W			0.005	<0.0002	<0.001	<0.001	<0.001	0.0005	0.004	<0.005
20-Nov-18	C3b-GW12	C3b-QC03-W			0.005	<0.0001	<0.001	<0.001	<0.001	<0.00005	0.005	0.0001
Blind Duplicate					18	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	22	#VALUE!
Split Duplicate					18	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	0	**181**

NOTES:

-	RPD value exceeds 50% range for organics or 30% range for inorganics
NA	Not Applicable
-	Not analysed

Appendix B. Final Site Condition Design Drawings

CW02 Drawing Reference	Temporary works element	Temporary works drawing reference
CW02-DRG-2001	Temporary 3m hoarding / noise wall	M4M5-SWPL-PRW-TWK-TN01-DRG-1117
CW02-DRG-2001	Temporary 4m hoarding / noise wall	M4M5-SWPL-PRW-TWK-TN01-DRG-1115
CW02-DRG-2001	Temporary wire fence	M4M5-SWPL-MUI-TWK-HD03-DRG-1100 - 1103
CW02-DRG-2001	Temporary vehicle entrance gate	M4M5-SWPL-MUI-TWK-HD03-DRG-1104
CW02-DRG-2001	Temporary pedestrian entrance gate	M4M5-SWPL-MUI-TWK-HD03-DRG-1105
CW02-DRG-2001	Temporary bracing to existing wall next to 142 Alt Street	GRASSO Design - J6-SK1 and SK2 contained in M4M5-LSBJ-MUI-TN04-RPT-0005

GENERAL ARRANGEMENT NOTES:

1. ALL PORTABLE STRUCTURES AND ELECTRICAL EQUIPMENTS ARE TO BE REMOVED AS PART OF THE FINAL REINSTATEMENT PACKAGE.
2. ALL STORM WATER INFRASTRUCTURES WITHIN THE SITE ARE TO BE RETAINED.
3. ALL SHEDS AND PORTABLE STRUCTURES TO BE REMOVED FROM THE SITE .
4. SEVERELY DAMAGED PAVEMENTS E.G. POT HOLE TO BE REPAIRED PRIOR TO HANDOVER.
5. ALL WHEEL STOPPERS AND HUMP ARE TO BE REMOVED.
6. ALL CONCRETE PAVEMENTS ARE TO BE RETAINED.
7. ALL EXISTING DRIVEWAYS TO BE RETAINED.
8. UTILITIES CONNECTIONS SUCH AS: SEWER, COMMUNICATIONS AND WATER SERVICES ARE TO BE PROVIDED TO EACH OF THE FOUR SITES. IF THE CONNECTIONS ARE PREVIOUSLY AVAILABLE AND STILL ACCESSIBLE. ACTUAL LOCATION TO BE LOCATED AND IDENTIFIED ON SITE.
9. FILTER BASKET TO BE INSTALLED IN ALL PROPOSED NEW STORMWATER PITS.
10. CLASS D GRATE TO BE PROVIDED OR TO BE INSTALLED FOR ALL PROPOSED STORMWATER PITS.
11. ANY EXISTING DRAINS, PITS, DRAINAGE LINES PROPOSED TO BE LEFT IN PLACE ARE REQUIRED TO BE FLUSHED AND CLEARED OF BLOCKAGES AND EVIDENCED AS FIT FOR PURPOSE WITH MEASURES SUCH AS CCTV PRIOR TO HANDOVER.
12. THE RETENTION OF THE EXISTING 4M HIGH NOISE WALL WILL BE SUBJECT TO THE AGREEMENT FROM THE CONSULTATION WITH PROPERTIES ADJACENT AND DIRECTION FROM TFNSW.

PAVEMENT NOTES:

1. SEVERELY DAMAGED PAVEMENTS TO BE REPAIRED PRIOR TO HANDOVER FOR PAVEMENT DETAIL REFER TO M4M5-RBGP-PRW-CIV-CW02-DRG-2031.
2. ALL WHEEL STOPPERS AND HUMP ARE TO BE REMOVED.
3. ALL CONCRETE PAVEMENTS ARE TO BE RETAINED.
4. ALL EXISTING DRIVEWAYS TO BE RETAINED.

ACCEPTED FOR CONSTRUCTION

DRAWING FILE LOCATION \ NAME - PLOT DATE \ TIME - PLOT BY
C:\Users\chris.waite\Documents\WCX\Drawings\MUIRS\Parramatta Road\M4M5-RBGP-PRW-CIV-CW02-DRG-2000.dwg-27/06/2022 2:53:52 AM-Michael.Arellano

DESIGN MODEL FILE(S) USED FOR DOCUMENTATION OF THIS DRAWING	REV	DATE	AMENDMENT / REVISION DESCRIPTION	APPROVAL
-	00	27.06.22	ISSUED FOR CONSTRUCTION	C.WAITE

DESIGN PACKAGE CODE: M4M5-RBGP-PRW-CIV-CW02-DPK-0001
SCALES ON THIS A3 SIZE DRAWING
CO-ORDINATE SYSTEM: MGA ZONE 56 HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY
WestConnex M4-M5 Link Tunnels
acciona SAMSUNG SAMSUNG C&T BOUYGUES CONSTRUCTION AUSTRALIA

TITLE	NAME	DATE
DRAWN	M.ARELLANO	31.03.22
DRG CHECK	J.SUN	31.03.22
DESIGN	J.SUN	31.03.22
DESIGN CHECK	J.SUN	31.03.22
DESIGN VERIFIER	C.WAITE	31.03.22
DESIGN MNGR	C.WAITE	31.03.22
PROJECT MNGR	C.WAITE	31.03.22

Sydney Motorway Corporation WestConnex

DOCUMENT NUMBER: M4M5-RBGP-PRW-CIV-CW02-DRG-2000

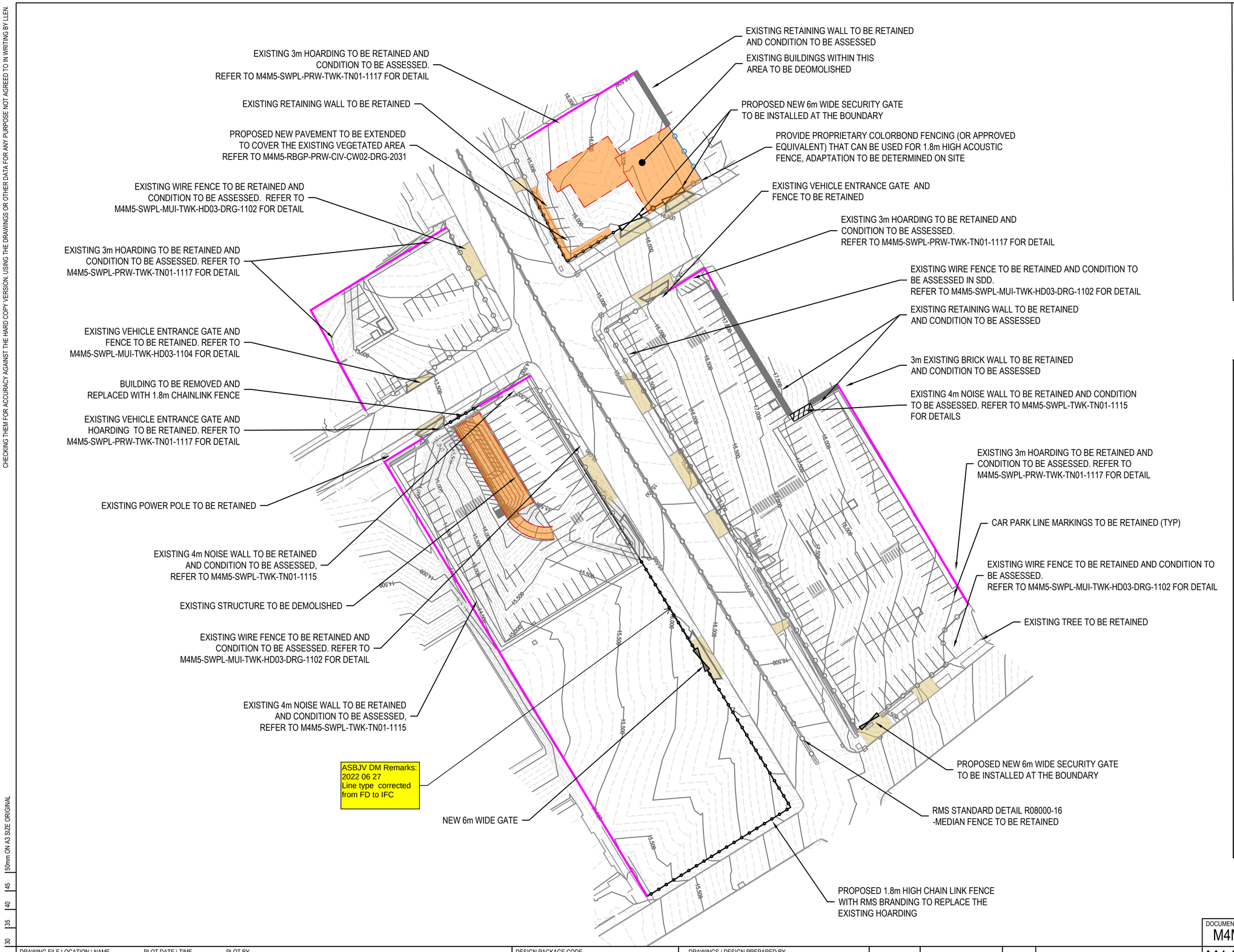
M4-M5 LINK MAIN TUNNEL WORKS

A3

PROJECT WIDE
CONSTRUCTION SITE REINSTATEMENT
PARRAMATTA ROAD SITES
TEMPORARY WORKS DRAWINGS REFERENCE LIST & GENERAL NOTES

RMS REGISTRATION No. | PART 1

ISSUE STATUS	EDMS No.	SHEET No.	REV
ISSUED FOR CONSTRUCTION	-	CW02-DRG-2000	00



LEGEND

- HOARDING
- GRASSO EXISTING BRICK WALL
- EXISTING
- 00.00 EXISTING MAJOR CONTOUR
- 00.00 EXISTING MINOR CONTOUR
- ADD PROPOSED 1.8m CHAIN LINK FENCE WITH RMS BRANDING
- PROPOSED 1.8m ACOUSTIC FENCE
- PROPOSED SECURITY GATE
- SECURITY GATE
- EXISTING AND PREVIOUS DRIVEWAYS TO BE RETAINED AS IS
- PROPOSED PAVEMENT - REFER TO M4M5-RBGP-PRW-CIV-CW02-DRG-2030
- EXISTING BILDING TO BE DEMOLISHED

NOTES:

1. ALL PORTABLE STRUCTURES AND ELECTRICAL EQUIPMENTS ARE TO BE REMOVED AS PART OF THE FINAL REINSTATEMENT PACKAGE
2. ALL STORM WATER INFRASTRUCTURES WITHIN THE SITE ARE TO BE RETAINED
3. ALL SHEDS AND PORTABLE STRUCTURES TO BE REMOVED FROM THE SITE
4. SEVERELY DAMAGED PAVEMENTS E.G. POT HOLE TO BE REPAIRED PRIOR TO HANDOVER
5. ALL WHEEL STOPPERS AND HUMP ARE TO BE REMOVED
6. ALL CONCRETE PAVEMENTS ARE TO BE RETAINED
7. ALL EXISTING DRIVEWAYS TO BE RETAINED
8. UTILITIES CONNECTIONS SUCH AS: SEWER, COMMUNICATIONS AND WATER SERVICES ARE TO BE PROVIDED TO EACH OF THE FOUR SITES. IF THE CONNECTIONS ARE PREVIOUSLY AVAILABLE AND STILL ACCESSIBLE. ACTUAL LOCATION TO BE LOCATED AND IDENTIFIED ON SITE.
9. FILTER BASKET TO BE INSTALLED IN ALL PROPOSED NEW STORMWATER PITS
10. CLASS D GRATE TO BE PROVIDED OR TO BE INSTALLED FOR ALL PROPOSED STORMWATER PITS
11. ANY EXISTING DRAINS, PITS, DRAINAGE LINES PROPOSED TO BE LEFT IN PLACE ARE REQUIRED TO BE FLUSHED AND CLEARED OF BLOCKAGES AND EVIDENCED AS FIT FOR PURPOSE WITH MEASURES SUCH AS CCTV PRIOR TO HANDOVER
12. THE RETENTION OF THE EXISTING 4M HIGH NOISE WALL WILL BE SUBJECT TO THE AGREEMENT FROM THE CONSULTATION WITH PROPERTIES ADJACENT AND DIRECTION FROM TFNSW.

ACCEPTED FOR CONSTRUCTION

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SCALES ON THIS A3 SIZE DRAWING
CO-ORDINATE SYSTEM: MGA ZONE 56
HEIGHT DATUM: AHD

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PROJECT MNGR	C.WAITE	31.03.22

Sydney Motorway Corporation | WestConnex

DOCUMENT NUMBER: M4M5-RBGP-PRW- CIV -CW02-DRG- 2001

M4-M5 LINK MAIN TUNNEL WORKS

A3

PROJECT WIDE
CONSTRUCTION SITE REINSTATEMENT
PARRAMATTA ROAD SITES
GENERAL ARRANGEMENT PLAN

SHEET 1 OF 1

RMS REGISTRATION No.: PART 1

ISSUE STATUS	EDMS No.	SHEET No.	REV
ISSUED FOR CONSTRUCTION	-	CW02-DRG-2001	00

LEGEND

- HOARDING
- GRASSO EXISTING BRICK WALL
- EXISTING
- 00.00 EXISTING MAJOR CONTOUR
- 00.00 EXISTING MINOR CONTOUR
- ADD PROPOSED 1.8m CHAIN LINK FENCE WITH RMS BRANDING
- EXISTING CHAIN LINK SECURITY FENCE
- PROPOSED SECURITY GATE
- EXISTING SECURITY GATE
- PAVEMENT TO BE RETAINED
- PROPOSED CONCRETE PAVEMENT
- EXISTING BILDING TO BE DEMOLISHED

NOTES:

1. DAMAGED PAVEMENTS TO BE REPAIRED PRIOR TO HANDOVER FOR PAVEMENT DETAIL REFER TO M4M5-RBGP-PRW-CIV-CW02-DRG-2031
2. ALL WHEEL STOPPERS AND HUMP ARE TO BE REMOVED
3. ALL CONCRETE PAVEMENTS ARE TO BE RETAINED
4. ALL EXISTING DRIVEWAYS TO BE RETAINED

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PROJECT MNGR	C.WAITE	31.03.22

Sydney Motorway Corporation | WestConnex

DOCUMENT NUMBER
M4M5-RBGP-PRW- CIV -CW02-DRG- 2030

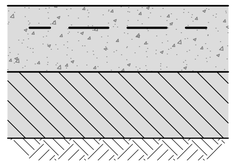
M4-M5 LINK MAIN TUNNEL WORKS

A3

PROJECT WIDE
CONSTRUCTION SITE REINSTATEMENT
PARRAMATTA ROAD SITES
PAVEMENT PLAN
SHEET 1 OF 1

RMS REGISTRATION No.
PART 1

ISSUE STATUS: ISSUED FOR CONSTRUCTION
EDMS No.: -
SHEET No.: CW02-DRG-2030
REV: 00

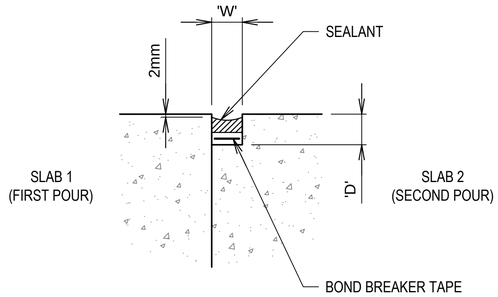


CONCRETE PAVEMENT TYPICAL DETAIL
NOT TO SCALE

HARDSTAND DESIGN NOTE:

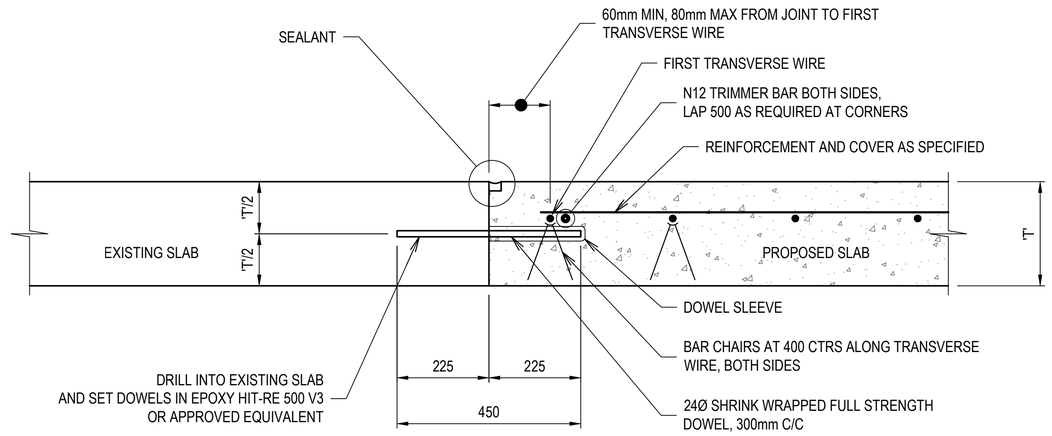
3% DESIGN SUBGRADE CBR HAS BEEN ASSUMED FOR DESIGN PURPOSES, THE ACTUAL SUBGRADE CBR IS RECOMMENDED TO BE VERIFIED ON SITE.

DESIGN TRAFFIC LOADING: 100000 ESA



MOVEMENT JOINT SEALANT DETAILS
(FOR DCJ, EJ, DEJ, KJ & DDJ JOINTS)
SCALE 1:10

STEPS:
1. FORM REBATE IN SLAB 2 AGAINST FACE OF SLAB 1.
2. AFTER SLAB CURING PERIOD (MIN. 28 DAYS) WASH OUT REBATE USING HIGH PRESSURE WATER. DRY USING HIGH PRESSURE COMPRESSED AIR AND ALLOW ADDITIONAL 16HRS TO DRY THOROUGHLY.
3. INSTALL POLYETHYLENE BOND BREAKER TAPE FOR FULL WIDTH 'W'.
   FOR IJ, EJ AND DEJ JOINTS OMIT BOND BREAKER TAPE.
4. PRIME FACES OF SIDES OF REBATE (REFER SEALANT TABLE)
5. INSTALL SEALANT AS SPECIFIED (REFER SEALANT TABLE) IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.



CONCRETE PAVEMENT TYPICAL INTERFACE DETAIL
NOT TO SCALE

NOTES
1. WHERE EXISTING SLAB TOP EDGE IS BADLY CHIPPED SAW CUT PARALLEL TO EDGE AND REMOVE.

SEALANT/PRIMER TYPES		
LOCATION	SEALANT	PRIMER
AREAS SUBJECT TO FUEL SPILLAGE	THIOFLEX 600	FOSROC PRIMER 14
OTHER EXTERNAL PAVEMENTS	EMER-ROAD SEAL SL	FOSROC PRIMER 10

NOTES
ALTERNATIVE SEALANTS MUST HAVE:
- MOVEMENT ACCOMMODATION FACTOR +/- 50%
- PRIMER TO MANUFACTURER'S SPECIFICATION
- INSTALLATION TO MANUFACTURER'S RECOMMENDATIONS
- PRIOR APPROVAL BY SUPERINTENDENT.

SEALANT DIMENSIONS		
MEAN SLAB LENGTH (m)	SEALANT WIDTH 'W' (mm)	SEALANT DEPTH 'D' (mm)
≤ 4	7 ± 1	7 ± 1
5	9 ± 2	7 ± 1
6	9 ± 2	7 ± 1
7	10 ± 2	8 ± 1
8	11 ± 2	9 ± 2
9	12 ± 2	10 ± 2
10	13 ± 2	10 ± 2
11	14 ± 2	11 ± 2
12	15 ± 2	12 ± 2

NOTE:
THIS TABLE APPLIES TO EXTERNAL PAVEMENTS. FOR JOINTS WITHIN BUILDINGS REFER TO STRUCTURAL DETAILS.

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DESIGN PACKAGE CODE
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SCALES ON THIS A3 SIZE DRAWING

CO-ORDINATE SYSTEM: MGA ZONE 56
HEIGHT DATUM: AHD

DRAWINGS / DESIGN PREPARED BY
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DESIGN MNGR	C.WAITE	31.03.22
PROJECT MNGR	C.WAITE	31.03.22

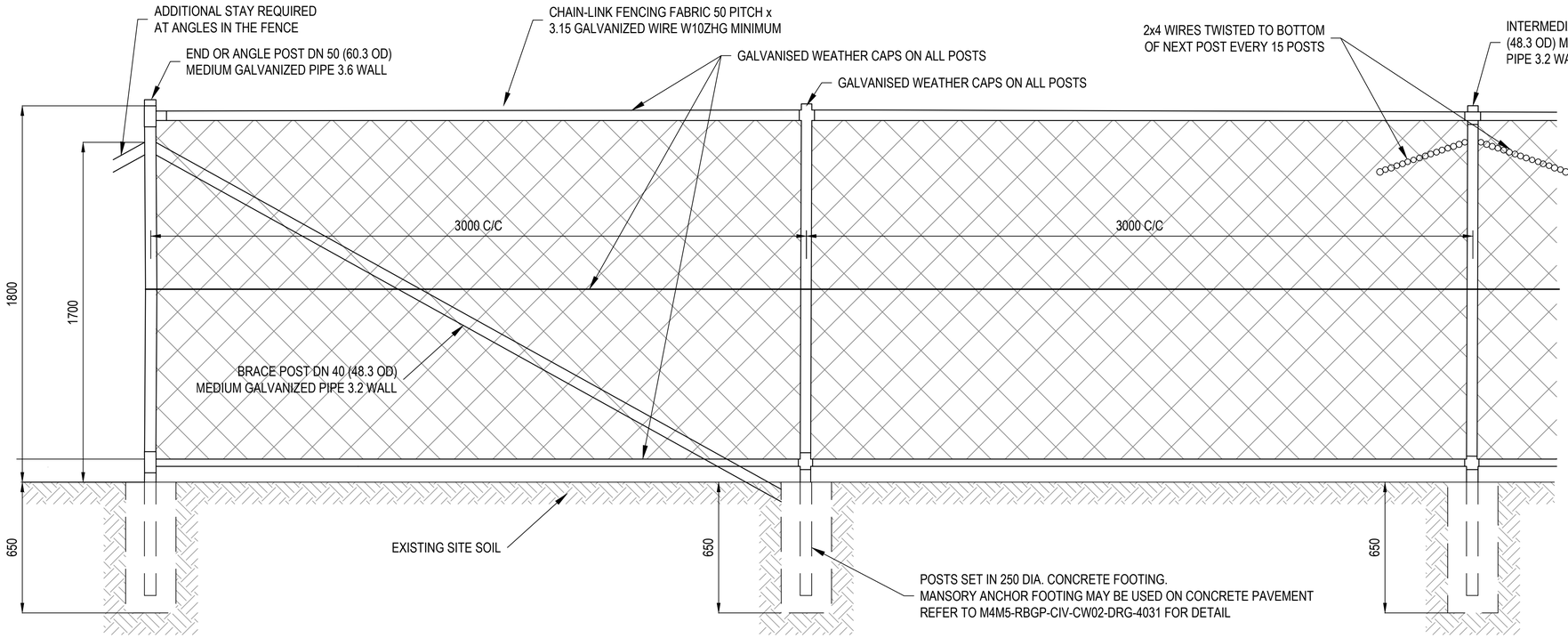
Sydney Motorway Corporation | WestConnex

M4-M5 LINK MAIN TUNNEL WORKS
A3

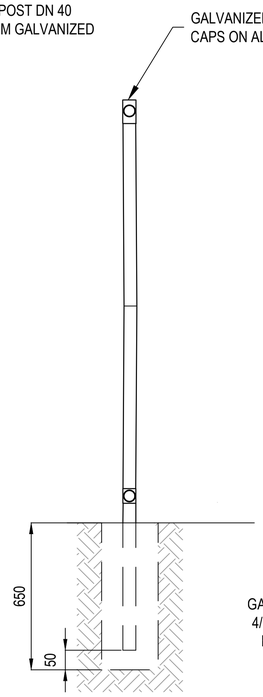
PROJECT WIDE
CONSTRUCTION SITE REINSTATEMENT
PARRAMATTA ROAD SITES
PAVEMENT DETAILS
SHEET 1 OF 1

RMS REGISTRATION No. | PART 1

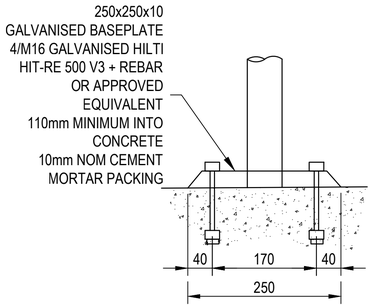
ISSUE STATUS: ISSUED FOR CONSTRUCTION | EDMS No.: - | SHEET No.: CW02-DRG-2031 | REV: 00



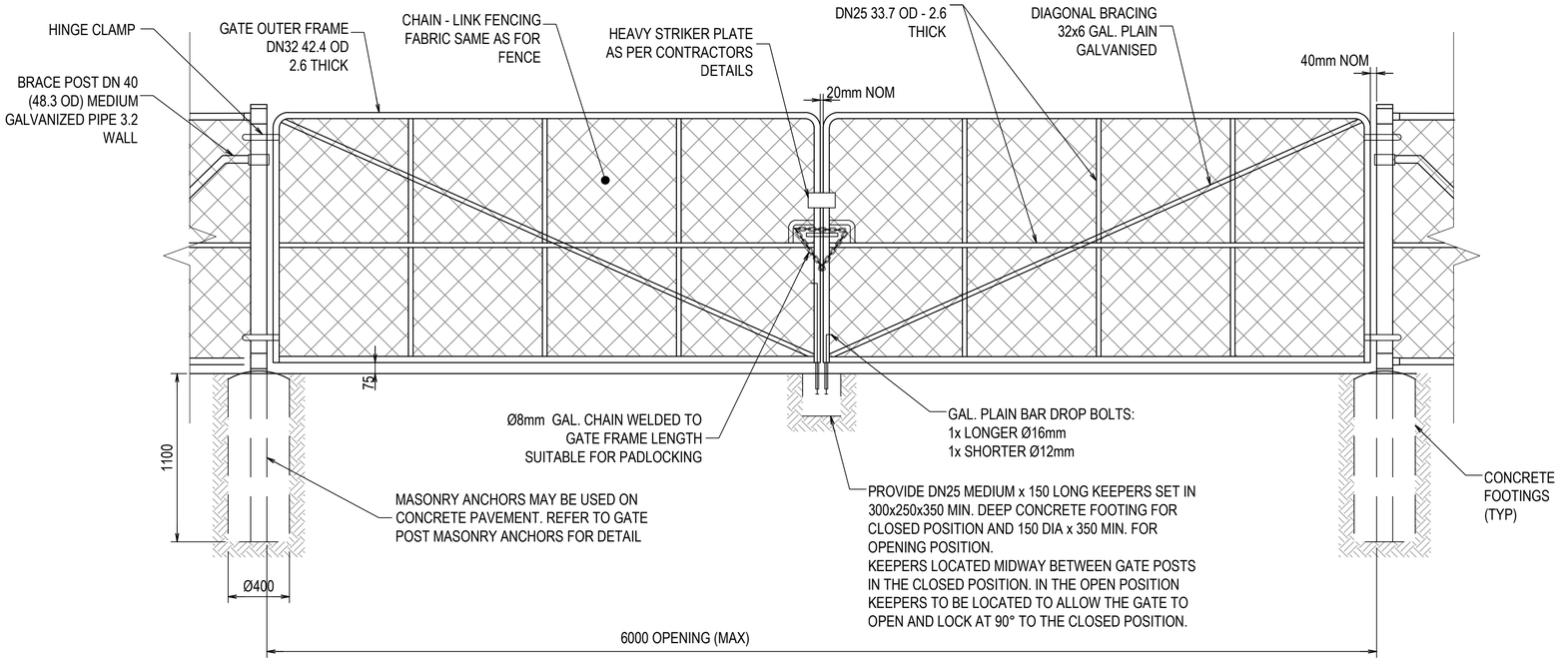
CHAIN LINK FENCE DETAIL
NOT TO SCALE



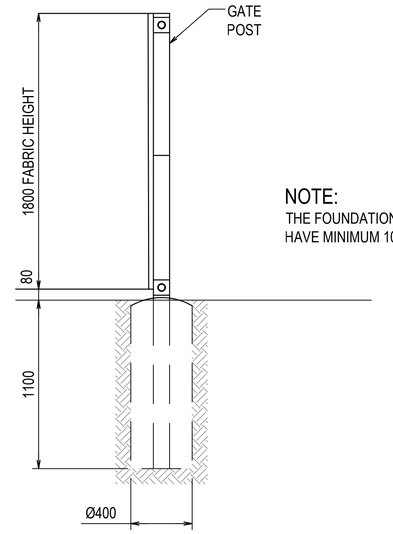
FENCE POST DETAIL
NOT TO SCALE



FENCE AND GATE POST MASONRY ANCHORS IF APPLICABLE
NOT TO SCALE



CHAINLINK DOUBLE GATE DETAIL
NOT TO SCALE



GATE POST DETAILS
NOT TO SCALE

NOTE:
THE FOUNDATION MATERIAL IS ASSUMED TO HAVE MINIMUM 100 KPA BEARING CAPACITY

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THIS DRAWING MAY BE PREPARED IN COLOUR AND MAY BE INCOMPLETE IF COPIED
0 5 10 15 20 25 30 35 40 45 50mm ON A3 SIZE ORIGINAL

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Sydney Motorway Corporation | WestConnex

DOCUMENT NUMBER: M4M5-RBGP-PRW-CIV-CW02-DRG-2032

M4-M5 LINK MAIN TUNNEL WORKS

A3

PROJECT WIDE
CONSTRUCTION SITE REINSTATEMENT
PARRAMATTA ROAD SITES
FENCE AND GATE DETAILS
SHEET 1 OF 1

RMS REGISTRATION No.: -
PART: 1

ISSUE STATUS	EDMS No.	SHEET No.	REV
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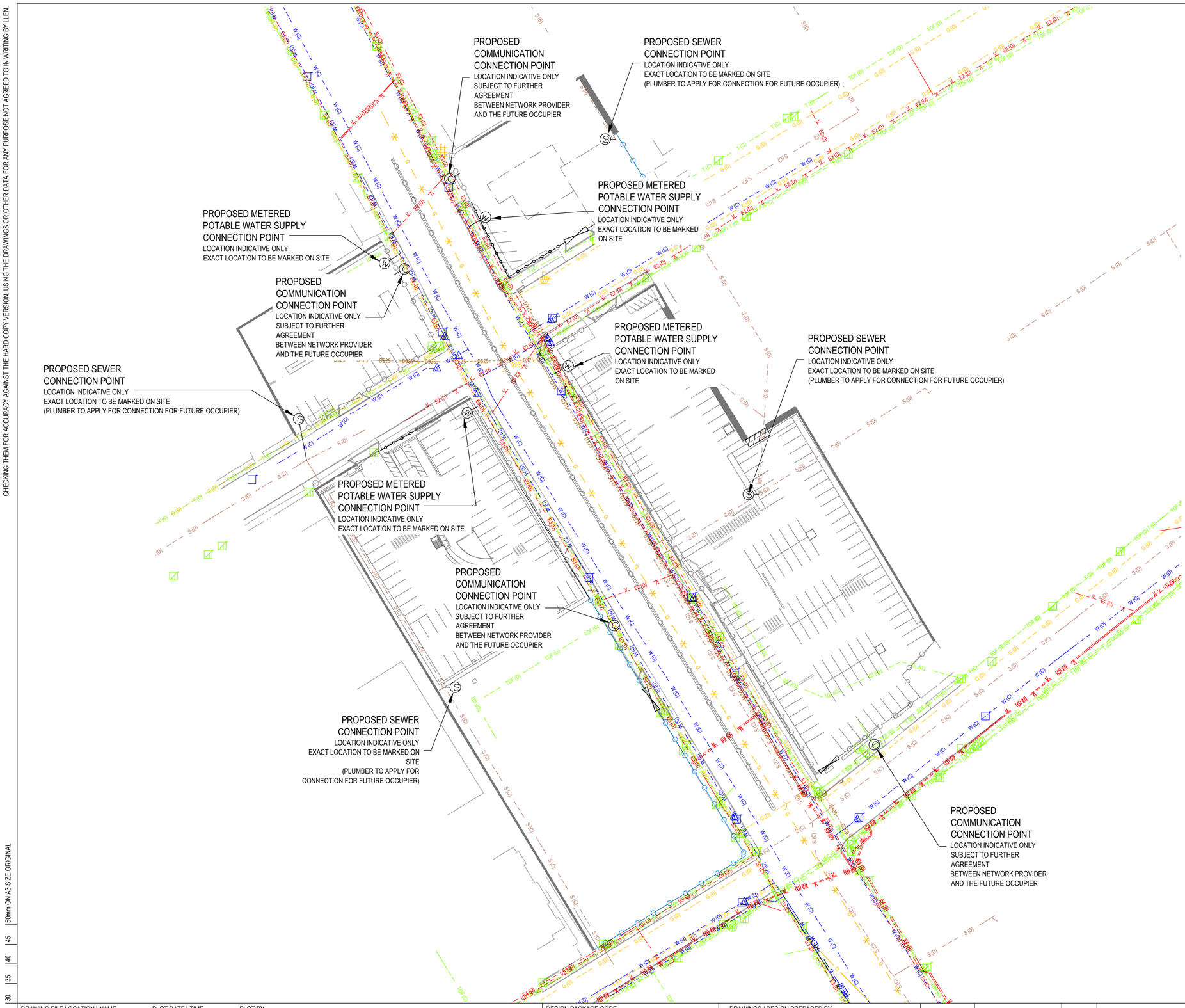

LEGEND

- EXISTING WATER MAIN (X)
- EXISTING WATER MAIN TO BE REMOVED
- EXISTING ELECTRICAL AG HV (X)
- EXISTING ELECTRICAL AG LV (X)
- EXISTING ELECTRICAL UG HV (X)
- EXISTING ELECTRICAL UG LV (X)
- EXISTING ELECTRICAL COU (X)
- EXISTING ELECTRICAL ER (X)
- EXISTING AAPT OPTIC FIBRE (X)
- EXISTING OPTIC FIBRE (X)
- EXISTING COMMS OPTIC FIBRE (X)
- EXISTING COMMS U (X)
- EXISTING COMMS VOC (X)
- EXISTING COMMS T (X)
- EXISTING GAS (X)
- EXISTING GAS O (X)
- EXISTING SEWER (X)
- EXISTING SEWER RISING MAIN (X)
- EXISTING SERVICE TO BE REMOVED
- EXISTING SERVICE TO BE - ABANDONED
- EXISTING DRAINAGE SYSTEM
- EXISTING DRAINAGE (SURVEYED)

NOTES:
1. THIS UTILITIES PLAN SHOWS THE CURRENT KNOWN STATUS OF THE SURROUNDING UTILITIES AND UTILITIES WITHIN THE SITE TO BE LEFT-IN-PLACE AND HANDED OVER.
2. THIS UTILITIES PLAN WILL BE FURTHER UPDATED IN FINAL DESIGN TO INCLUDE THE SEWER, WATER AND COMMUNICATION CONNECTIONS AS PER SWTC APPENDIX B.30.

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DOCUMENT NUMBER
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M4-M5 LINK MAIN TUNNEL WORKS

A3

PROJECT WIDE
CONSTRUCTION SITE REINSTATEMENT
PARRAMATTA ROAD SITES
UTILITIES PLAN

SHEET 1 OF 1

RMS REGISTRATION No.

PART 1

ISSUE STATUS	EDMS No.	SHEET No.	REV
ISSUED FOR CONSTRUCTION	-	CW02-DRG-2060	00

Appendix C. Site Audit Correspondence

IAN SWANE & ASSOCIATES P/L
PO Box 359, MORTDALE NSW 2223

Mob: +61 0418 867 112
Email: iswane@bigpond.com

Lendlease Samsung Bouygues Joint Venture
Tower Three, International Towers Sydney
Exchange Place, 300 Barangaroo Avenue
BARANGAROO NSW 2000

Attention: [redacted] - Senior Environmental Coordinator
(email: [redacted]

13/08/2018

IS&A_180813_Interim advice 2018_WestConnexStage 3A

Dear [redacted]

INTERIM ADVICE FOR STATUTORY SITE AUDIT No. 278 BY DR IAN SWANE
REVIEW OF EPIC (26/07/18) SAQP for C1B & C3B SITES (MUIRS ASHFIELD) FOR WESTCONNEX STAGE 3A PROJECT

1. Introduction

This letter provides the Lendlease Samsung Bouygues Joint Venture (LSB_JV) with interim advice as part of Statutory Site Audit No. 278 being undertaken by Dr Ian Swane, a NSW EPA Site Auditor accredited under the Contaminated Land Management (CLM) Act. The advice forms part of a statutory site audit for the WestConnex Stage 3A Project.

The purpose of this interim advice is to provide a review of a Sampling Analysis and Quality Plan (SAQP) prepared by Epic Environmental ('Epic') for the former Muirs Ashfield property. This property is located on both sides of the Parramatta Road and are now referred to as C1B (western side) and C3B (eastern side). The property is hereafter referred to as the 'site'. The Epic document was dated 26/07/18.

This interim advice has also involved the review of:

- A preliminary site investigation (PSI) report prepared by GHD, which forms Appendix P of Volume 2F in the WestConnex (September 2015) M4 East Environmental Impact Statement;
- An AECOM (August 2017) Technical Working Paper: Contamination that forms Appendix R of the WestConnex (2017) M4-M5 Link, Roads and Maritime Services Environmental Impact Statement; and
- An AECOM (August 2017) Technical Working Paper: Groundwater that forms Appendix T of the WestConnex (2017) M4-M5 Link, Roads and Maritime Services Environmental Impact Statement

This interim advice is considered to be consistent with EPA guidelines and policy and does not pre-empt conclusions to be drawn at the end of the site audit process. This interim advice does not represent a site audit statement (SAS) or a site audit report (SAR). It is intended that a SAS / SAR will be prepared for the C1B and C3B site towards the end of the WestConnex Stage 3A Project.

2. Review Comments of Epic SAQP

The Site Auditor considers the Epic SAQP will meet NSW EPA guidance provided the following review comments are addressed by an up-dated version of the Epic document:

1. Various editorial comments and corrections, as indicated in a marked-up version of the Epic SAQP attached to this letter.
2. Include reference to additional relevant guidelines.
3. Conceptual site model - Add two additional AECs, namely:

a) AEC10: Termite / rodent / herbicide treatments under and around building footprints across the whole site; and

b) AEC11: Buried services such as asbestos pipelines and pits, contaminated backfill, leaks from sewer mains that may be present across the site.

4. Scope of Work – Include:

   a) A data gap historical assessment (Land titles, Council records, Dangerous Goods WorkCover search, Dial Before You Dig underground services, previous ESA[1]);

   b) Possible need to increase target depth of investigation near USTs, pits, etc;

   c) PID headspace field screening tests;

   d) The results of the Phase 2 DSI to be documented in a report prepared in accordance with NSW EPA approved guidance; and

   e) Note: It is assumed that a HAZMAT has been completed for all existing buildings that need to be demolished and that all hazardous building materials will be removed from structures prior to their demolition.

5. Data quality objectives – Include:

   a) Soil gas as a potential environmental medium needing to be investigated;

   b) A Step 2 decision regarding the whether the proposed construction work may encounter contaminated groundwater that will require treatment / management in addition to normal construction requirements;

   c) Additional Step 5 decision rules concerning groundwater and PFAS contamination; and

   d) Additional details in Step 7 optimise the design for obtaining data. These additional details cover the potential for localised hotspots at USTs, pits, buried services; soil gas; investigation of bonded asbestos fragments in fill; and, PFAS contamination.

6. Fieldwork plan – Include additional details on:

   a) Supervision of work;

   b) Location of boreholes / wells;

   c) PID headspace testing; and

   d) Accurate survey of well collar elevations.

7. Laboratory analysis – Analytical methods to comply with NSW EPA approved guidance, PQLs less than criteria (particularly important for groundwater and PFAS tests).

8. QA/QC - Include testing of trip spikes for volatile contaminants of concern.

O – O - O

[1] The additional historical data may be available in existing ESAs conducted for the purchase of the Muirs Ashfield property, which also included the installation of groundwater monitoring wells that remain at the property

IAN SWANE & ASSOCIATES P/L

I trust the review comments made herein are self-explanatory and agreeable to the LSB_JV and Epic. In the event that any of the review comments need to be discussed, please don't hesitate to contact me.

Yours sincerely

Dr Ian C Swane (CPEng & CEnvP)
EPA Site Auditor NSW, WA & NT
Director, Ian Swane & Associates
Phone: 0418 867 112

Email: iswane@bigpond.com

Attachments:

1. Marked-up copy of EPIC (26/07/18) SAQP (49 pages)

IAN SWANE & ASSOCIATES P/L
PO Box 359, MORTDALE NSW 2223

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Lendlease Samsung Bouygues Joint Venture
WestConnex M4-M5 Link Tunnels
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PO Box 63
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Attention: [redacted] - Senior Environmental Coordinator
(email: [redacted])

26/11/2018

IS&A_181126_Interim advice#19
2018_WestConnexStage 3A

Dear [redacted]

INTERIM ADVICE #19 FOR STATUTORY SITE AUDIT No. 278 BY DR IAN SWANE
BASIS FOR SITE AUDIT WORK ON WESTCONNEX STAGE 3A PROJECT

1. Introduction

This letter provides the Lendlease Samsung Bouygues Joint Venture (LSB_JV) with interim advice as part of Statutory Site Audit No. 278 being undertaken by Dr Ian Swane, a NSW EPA Site Auditor accredited under the Contaminated Land Management (CLM) Act. The advice forms part of a statutory site audit for the WestConnex Stage 3A Project (the 'Project').

The purpose of this interim advice is to document the Site Auditor's understanding of the basis for site audit work to be undertaken for the LSB_JV on the Project and the outcomes that the site audit work will need to achieve. This advice should assist the identification of the site audit matters that the LSB_JV will need to meet under their contract with the NSW Government, and identify other site audit matters that may need to be met separately by the NSW Government.

The Site Auditor considers this interim advice is required at this early stage of the Project because statutory site audits can have different objectives, as indicated by the range of options given on the NSW EPA site audit statement proforma, with the objectives required by the LSB_JV being possibly different from those of the NSW Government. The advice provided herein is also limited to site contamination issues and does address any planning or legal matters, which are outside the expertise of the Site Auditor.

This interim advice is considered to be consistent with NSW EPA guidelines and policy and does not pre-empt conclusions to be drawn at the end of the site audit process. This interim advice does not represent a site audit statement (SAS) or a site audit report (SAR). It is intended that a SAS / SAR will be prepared towards the end of the Project for each part of the Project site where the ground surface is disturbed by construction work undertaken by the LSB_JV.

2. Assumptions

The following assumptions have been made for the purpose of this interim advice and site audit work to be undertaken for the LSB_JV:

1. The Department of Planning issued Planning Consent SSI 7485 for the Project on 17/04/18 ('Planning Consent'). The proponent for the Project is Roads and Maritime Services (RMS) from the NSW Government.
2. On or about June 2018, the LSB_JV was awarded a contract with the NSW Government to deliver most of the work required by the Project as described in the Planning Consent. Some work required by the Planning Consent may be outside the scope of work to be undertaken by the LSB_JV.

3. With regards to site contamination, the LSB_JV is understood to be responsible for:
   a) Complying with NSW Government environmental legislation regarding contaminated site and waste management;
   b) Managing contamination it interferes or disturbs during the course of carrying out its work;
   c) Not generating contamination at the Project site or generating contamination that may cause an increase in contamination migrating from the Project site; and
   d) Complying with Environmental Protection Licence 21149.
4. With regards to site contamination, the LSB_JV is understood NOT to be responsible for engaging the Site Auditor to determine whether:
   a) Any part of the Project site has been remediated and is suitable for a specified use other than as a road construction worksite; and
   b) Contamination that existed at the Project site prior to the commencement of the Project continues to migrate off-site.
5. The Site Auditor engaged by the LSB_JV is understood to be responsible for:
   a) Reviewing site environmental management plans that deal with contamination at the Project site and whether these plans meet Condition C22 of the Planning Consent.
   b) Reviewing contamination assessments for the Project site and whether they meet Condition E181 of the Planning Consent.
   c) Reviewing waste classifications and documentation on the management of waste removed from the Project site[1].
   d) Reviewing reports on the management of contamination at the Project site throughout the period construction activities are undertaken by the LSB_JV and to determine whether:
      i. No additional contamination was generated by the construction work;
      ii. The land was maintained in a condition suitable for a road construction worksite and compliance was achieved with Conditions E182 to E185 of the Planning Consent;
      iii. Waste generated by construction activities at the Project site was managed in accordance with NSW EPA guidance and Conditions E202 to E204 of the Planning Consent; and
      iv. The requirements of Conditions O5.10 and O5.11 of EPL 21149 were met.
   e) Notifying the LSB_JV, RMS and the NSW EPA if the Site Auditor concludes that a part of the Project site should be notified to the EPA under the CLM Act[2].
   f) Issuing a Section A1 SAS for each part of the Project site where the ground surface is disturbed by construction work undertaken by the LSB_JV. Each SAS is to be issued at the completion of LSB_JV sitework and needs to determine whether the land is suitable for a road construction worksite at the end of construction period and prior to landscaping by RMS. Each SAS also needs to determine whether:
      i. The site auditor reviewed site environmental management plans that dealt with contamination at the site and considered the plans met Condition C22 of the Planning Consent;

[1] A requirement under Section 4.3.7, NSW EPA (October 2017) Site Auditor Guidelines
[2] A requirement under Sections 3.8.2, 4.3.11 & 4.3.12, NSW EPA (October 2017) Site Auditor Guidelines

ii. The site auditor reviewed contamination assessments for the site and considered they met Condition E181 of the Planning Consent;

iii. The site auditor reviewed reports on the management of contamination at the site throughout construction and considered that:

- No additional contamination was generated by the construction work,
- The land was maintained in a condition suitable for a road construction worksite and compliance was achieved with Conditions E182 to E185 of the Planning Consent;
- Waste generated by construction activities at the site was managed in accordance with NSW EPA guidance and Conditions E202 to E204 of the Planning Consent; and
- The requirements of Conditions O5.10 and O5.11 of EPL 21149 were met.

6. With regards to site contamination, the NSW Government is responsible for engaging the Site Auditor to:

a) Determine whether land within the Project site is suitable for a specified use other than as a road construction worksite at the end of construction and prior to landscaping by RMS;

b) Review documentation prepared by environmental consultants that determines whether contamination migrating from the Project site is posing an unacceptable risk to off-site receptors and needs to be remediated; and

c) Review work undertaken at the Project site in addition to that required by the NSW EPA under Conditions O5.10 and O5.11 of EPL 21149.

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The Site Auditor requests that the LSB_JV confirms that the assumptions made in this interim advice letter are correct and that the assumptions form the basis for the site audit work to be undertaken for the LSB_JV and the outcomes that the site audit work need to achieve.

Yours sincerely

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Attention: [redacted] - Environmental Manager
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24/02/2019

SA278_190224_Interim advice#26
2018_WestConnexStage 3A

Dear [redacted]

INTERIM ADVICE #26 FOR STATUTORY SITE AUDIT No. 278 BY DR IAN SWANE
REVIEW OF EPIC ENVIRONMENTAL (20/12/18) DSI FOR MAINLINE TUNNELS ANCILLARY SITES (MUIRS SITE), WESTCONNEX STAGE 3A PROJECT (5 pages)

This letter provides the Lendlease Samsung Bouygues Joint Venture (LSB_JV) with interim advice as part of Statutory Site Audit No. 278 being undertaken by Dr Ian Swane, a NSW EPA Site Auditor accredited under the Contaminated Land Management (CLM) Act. The advice forms part of a statutory site audit for the WestConnex Stage 3A Project.

The purpose of this interim advice is to provide a review of a draft version of the Epic Environmental (20/12/18) '*M4-M5 Link Main Tunnel Works – Phase 2 ESA*' report that was received by the Site Auditor on 11/02/19.

This interim advice is considered to be consistent with NSW EPA guidelines and policy and does not pre-empt conclusions to be drawn at the end of the site audit process. This interim advice does not represent a site audit statement (SAS) or a site audit report (SAR). It is intended that a SAS / SAR will be prepared for the SPI site towards the end of the WestConnex Stage 3A Project.

The Site Auditor has reviewed the draft report and provides the following review comments that should be addressed in a revised draft version of the report:

1. Typographical errors need to be corrected.
2. **Executive Summary:**
   a) The objective of the DSI should also include the provision of contamination assessments relevant to LSBJV's contractual obligations under their contract with the NSW Government, namely:
      - Managing contamination it interferes or disturbs during the course of carrying out its work;
      - Not generating contamination at the Project site or generating contamination that may cause an increase in contamination migrating from the Project site; and
      - Preliminary waste classifications.
   b) Provide conclusions regarding the likely extent of fill across the site.
   c) Provide conclusions regarding the nature and type of USTs at the site, the presence of waste liquids within the USTs, and contamination caused by the USTs. As mentioned in Section 5.7 of the report, advise that there is potential for localised petroleum hydrocarbon contamination to be present in the vicinity of USTs, fuel lines, filling points and pits, which may not be identified by the present investigation. A decision of the need for additional investigation will be considered together with the option of delineating such contamination by implementing appropriate procedures during UST / buried services removal.
   d) Provide conclusions regarding soil contamination at the site for each AEC.

e) Advise that there is a risk that unknown asbestos contamination may exist in fill across the site because of its long use as a commercial facility, much of the fill is described as containing demolition rubble, no test pits were excavated and soil samples collected by the 50mm push tubes were unlikely to recovery any bonded asbestos fragments. As mentioned in Section 5.7, advise that the potential for bonded asbestos fragments to be present in fill at the site will be assessed following the demolition and removal of buildings and pavement and will involve a grid-based survey conducted in accordance with the NEPM (2013) Schedule B2 guidelines and possibly test pitting, if considered to be warranted. Advise that fill at the site should be regarded as asbestos contaminated until investigations show otherwise.

f) Assess the location and type of buried services at the site.

g) Provide conclusions regarding risks posed by hazardous soil vapour.

h) Provide conclusions regarding the potential for contamination to be disturbed by construction work.

i) Assess the likely classification of excavated soils at the site if disposed off-site.

j) Provide recommendations for how soil contamination at the site needs to be managed by the construction work.

3. **Section 1.3 Objective:** The objective of the DSI should also include the provision of contamination assessments relevant to LSBJV's contractual obligations under their contract with the NSW Government, namely:

   a) Managing contamination it interferes or disturbs during the course of carrying out its work;

   b) Not generating contamination at the Project site or generating contamination that may cause an increase in contamination migrating from the Project site; and

   c) Preliminary waste classifications.

4. **Section 1.4 Scope of Works:** The SAQP advises that the scope of work of the DSI would be:

   a) A data gap historical assessment (Land titles, Council records, Dangerous Goods WorkCover search, Dial Before You Dig underground services).

   b) Borehole drilling, soil logging, sampling and analysis for chemicals of concern, beneath the Site targeting areas of concerns such as underground fuel storage, mechanical workshops and imported fill material and selected locations across the site to assess the extent of potential contamination;

   c) Groundwater well sampling and surveying to assess the current site conditions that may have been impacted from historical site activities; and

   d) Document the results of the DSI in a report prepared in accordance with NSW EPA approved guidance.

   These tasks should be included in the report.

5. **Section 1.5 Roles and Responsibilities**: Provide the names and experience of the personnel who undertook the fieldwork. Advise whether they were experienced in observing asbestos contamination.

6. **Section 1.6 Technical Framework**:

   a) Change PSI to DSI

   b) Remove reference to the Queensland guideline and include relevant NSW EPA guidelines, such as those given in Section 1.6 of the SAQP

7. **Section 2.2 Proposed WCX3A Works and Layout**: Make edits as indicated in the copy of the draft report provided to me.
8. **Section 5.1 Step 1: State the Problem**: Advise that the objective of the DSI also included the provision of contamination assessments relevant to LSBJV's contractual obligations under their contract with the NSW Government, namely:
    a) Managing contamination it interferes or disturbs during the course of carrying out its work;
    b) Not generating contamination at the Project site or generating contamination that may cause an increase in contamination migrating from the Project site; and
    c) Preliminary waste classifications.
9. **Section 5.6 Step 6: Specify Limits on Decision Errors**: Don't refer to this report as being the SAQP.
10. **Section 6.2.1 C1b**:
    a) Borehole logging needed to be undertaken in accordance with AS1726-2017.
    b) Section 7.4.4 of the SAQP specified waste disposal procedures for the investigation. Document whether these were followed.
11. **Section 6.2.2 C3b**:
    a) Borehole logging needed to be undertaken in accordance with AS1726-2017.
    b) Section 7.4.4 of the SAQP specified waste disposal procedures for the investigation. Document whether these were followed.
12. **Section 6.7.2 Groundwater Assessment Criteria:** GAC should correspond to the 2018 Australian & New Zealand Guidelines for Fresh and Marine Water Quality criteria available at http://waterquality.gov.au/anz-guidelines .
13. **Section 8.1.1 Stratigraphic Conditions:**
    a) Provide a figure that shows contours of fill thickness across the site.
    b) Given the presence of demo rubble in the fill assess the potential for asbestos contamination to be present.
    c) Assess the aesthetic condition of the fill and the potential to reuse fill at the site.
14. **Section 8.1.2 Groundwater Conditions**:
    a) Provide well collar elevations for each monitoring well and calculate hydraulic gradients and flow direction as required by the SAQP (Section 7.3.3).
    b) Explain why no electronic interface probe was used as required by the SAQP (Section 7.3.4).
    c) Identify the wells where oil staining was observed.
15. **Section 8.1.5 Groundwater Laboratory Data**: Explain why no groundwater sample from C1b was tested for PFAS.
16. **Section 8.2.1 Stratigraphic Conditions:**
    a) Provide a figure that shows contours of fill thickness across the site.
    b) Given the presence of demo rubble in the fill assess the potential for asbestos contamination to be present.
    c) Assess the aesthetic condition of the fill and the potential to reuse fill at the site.
17. **Section 8.2.2 Groundwater Conditions**:

d) Provide well collar elevations for each monitoring well and calculate hydraulic gradients and flow direction as required by the SAQP (Section 7.3.3).

e) Explain why no electronic interface probe was used as required by the SAQP (Section 7.3.4).

f) Identify the wells where oil staining was observed.

18. **Section 9.1.1 Nature of Soil Contamination**:

    a) Assess the likely source. extent and significance of contamination in this area. Assess the likely source. extent and significance of the petroleum hydrocarbon contamination recorded in the logs for BH03 and BH09.

    b) Assess the risk of unknown contamination being present at the site.

    c) In my opinion there is an unacceptable risk that fill at the site maybe contaminated by asbestos. This is because much of the fill is described as containing demolition rubble, no test pits were excavated and soil samples collected by the 50mm push tubes were unlikely to recovery any bonded asbestos fragments. Advise that fill at the site should be regarded as asbestos contaminated until investigations show otherwise.

    d) Assess the potential for unknown soil contamination to be present in the area of BH06, since the push tube refused at 0.14 m.

19. **Section 9.2.1 Nature of Soil Contamination**:

    a) Assess the likely source. extent and significance of contamination in this area. Assess the likely source. extent and significance of the petroleum hydrocarbon contamination recorded in the logs for BH03 and BH09.

    b) Assess the risk of unknown contamination being present at the site.

    c) In my opinion there is an unacceptable risk that fill at the site maybe contaminated by asbestos. This is because much of the fill is described as containing demolition rubble, no test pits were excavated and soil samples collected by the 50mm push tubes were unlikely to recovery any bonded asbestos fragments. Advise that fill at the site should be regarded as asbestos contaminated until investigations show otherwise.

20. **Section 9.3 Development Considerations:** Provide a preliminary waste classification assessment for soils that are likely to be excavated at the site.

21. **Section 10.1 Conclusions**: Up-date this section.

22. **Section 10.2 Recommendation**: Up-date this section.

23. **Figure F1 Site Location**: Show the location of all USTs at the site and show these locations on Figures F2 – F4 and F6.

24. **Tables**: I am unable to read laboratory summary tables T1 – T4, T6 and T7 when I print them on A3 sheets. Please get Epic to reformat these tables so a person with average eye-sight can read the data when printed on A3 sheets without going blind in the process. Send me copies so I can complete my review of the draft report.

25. **Appendix B Borelogs**: The borelogs contain numerous errors and omissions:

    a) General: None of the borelogs indicate the author of the log and who checked them. The report needs to advise the person who prepared each log and confirm that each log has been checked by a senior environmental consultant and their name;

    b) BH08: The reworked sandy clay at 0.9-1.5m should be described as fill;

    c) BH12: The log records that no ACM was found, which contradicts the statement made in Section 9.1.1 !!!!

IAN SWANE & ASSOCIATES P/L

d) BH13: The log incorrectly describes a clay layer at 0.2-0.6m overlying a fill layer !!!

e) BH14: The three soil layers between 0.2 – 0.5m are likely to be fill;

f) BH15: The top two soil layers appear to be fill;

g) BH16: The top 5 soil layers appear to be fill;

h) BH17: The top 2 soil layers appear to be fill;

i) BH18: The top soil layer appears to be fill ?

j) BH19: The top 2 soil layers appear to be fill;

k) BH20/GW13: The clay soil layer at 0.3-0.7m is fill. Show the water table encountered during drilling;

l) BH21/GW14: Show the water table encountered during drilling;

m) BH23/GW15: Show the water table encountered during drilling;

n) BH30: The dark grey coarse sand layer at 0.15-0.3m appears to be fill;

o) BH32: The sandy gravel layer at 0.15-0.3m appears to be fill;

p) BH33: The brown silty clay layer at 0.15-0.3m appears to be fill. Why were no PID headspace tests conducted at this location?

q) BH34: The top 3 soil layers appear to be fill. Why were no PID headspace tests conducted at this location?

r) BH35: The sandy clay mixed with small gravel layer at 0.15-0.3m appears to be fill. Why were no PID headspace tests conducted at this location?

s) BH36: The brown silty clay layer at 0.2-0.5m appears to be fill.

The Site Auditor considers the final version of the CMP for the SPI site dated 21/01/19 has addressed all review comments made by the Site Auditor in earlier interim advice reports, is consistent with NSW EPA guidance, and is suitable for use by the WestConnex Stage 3A Project.

Yours sincerely

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Attention: [redacted] - Environmental Manager
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8/03/2019

SA278_190308_Interim advice#28
2018_WestConnexStage 3A

Dear [redacted]

INTERIM ADVICE #28 FOR STATUTORY SITE AUDIT No. 278 BY DR IAN SWANE
REVIEW OF EPIC ENVIRONMENTAL (6/03/19) REVISED DRAFT DSI FOR MAINLINE TUNNELS ANCILLARY SITES (MUIRS SITE), WESTCONNEX STAGE 3A PROJECT (25 pages)

This letter provides the Lendlease Samsung Bouygues Joint Venture (LSB_JV) with interim advice as part of Statutory Site Audit No. 278 being undertaken by Dr Ian Swane, a NSW EPA Site Auditor accredited under the Contaminated Land Management (CLM) Act. The advice forms part of a statutory site audit for the WestConnex Stage 3A Project.

The purpose of this interim advice is to provide a review of an amended draft version of the Epic Environmental (6/03/19) '*M4-M5 Link Main Tunnel Works – Phase 2 ESA*' report that was revised in response to review comments provided by the Site Auditor in Interim Advise Report #26 issued on 24/02/19.

This interim advice is considered to be consistent with NSW EPA guidelines and policy and does not pre-empt conclusions to be drawn at the end of the site audit process. This interim advice does not represent a site audit statement (SAS) or a site audit report (SAR). It is intended that a SAS / SAR will be prepared for the SPI site towards the end of the WestConnex Stage 3A Project.

The Site Auditor has reviewed the draft report and considers it still needs more work, much of which was requested in the 24/02/19 interim advice report. The following review comments should be addressed in a revised draft version of the report:

1. **Executive Summary:**

   a) **24/02/19 interim advice report - Provide conclusions regarding the likely extent of fill across the site**. To assist Epic address this request, I attach to this report a plot showing the fill thickness Epic measured at each investigation location. The data indicate that a fill layer is present across the whole site, with the thickness in most areas being thin and less than 1 m thick. Localised areas of thicker fill were found at a few sample locations (BH8, BH27), with deeper areas of fill likely to be present in the vicinity of USTs / pits, building foundations and buried services.

   b) **24/02/19 interim advice report - Provide conclusions regarding the nature and type of USTs at the site, the presence of waste liquids within the USTs, and contamination caused by the USTs**. It appears that the DSI did not collect any data on this issue. The DSI should recommend that all necessary data regarding the nature and type of USTs at the site should be collected and assessed by LSBJV-appointed environmental personnel prior to the commencement of bulk earthworks at the site.

   c) **24/02/19 interim advice report - Provide conclusions regarding soil contamination at the site**. In my opinion, the available data supports the following conclusions:

      - The DSI found no evidence of broad-scale contamination in soils at the site exceeding Commercial / Industrial D criteria;

- The DSI found localised areas of petroleum hydrocarbon contamination on western side of Parramatta Road in the vicinity of the UST near BH3, in the area of BH9, and in the vicinity of the UST near BH11; and
- Asbestos was found in fill in the vicinity of BH12 on the western side of the site.

The DSI should include a figure that shows all exceedances of the Commercial / Industrial D investigation levels and the extent of known contamination at the site. I attach a plot showing this data. The report should remind the reader that there is a high risk of unknown contamination being present at the site due to its long history of commercial / industrial use and the inherent limitations of discrete investigation methods.

d) **24/02/19 interim advice report - Assess the location and type of buried services at the site**. In my opinion, the available data supports the following conclusions and recommendations:

- Buried services are likely to be spread out across the site given its long history of commercial / industrial land use;
- Significant uncertainty remains regarding the number, location and type of buried services;
- Some buried services will be associated with bulk fuel storage and infrastructure associated with vehicle maintenance. Other buried services will contain asbestos and waste materials. All buried services and infrastructure will need to be carefully removed in accordance with Australian Standards, Safework NSW requirements and NSW EPA guidelines; and
- The DSI should recommend that all necessary data regarding the location and type of buried services at the site should be collected and assessed by LSBJV-appointed environmental personnel prior to the commencement of bulk earthworks at the site.

e) **24/02/19 interim advice report - Provide conclusions regarding risks posed by hazardous soil vapour**. In my opinion, the available data supports the following conclusions and recommendations:

- The DSI found no evidence of broad-scale soil vapour risks exceeding Commercial / Industrial D criteria;
- Localised areas of soil vapour risk are likely to be present in the vicinity of USTs and associated petroleum infrastructure, which need to be assessed by LSBJV environmental personnel at the time the infrastructure is removed; and
- Should volatile petroleum hydrocarbons have seeped into the ground, the NEPM soil vapour criteria may not be sufficiently protective of workers engaged in hard rock drilling or excavation work due to the potential for such work to generate higher vapour levels than normally exist in ambient subsurface conditions. In these circumstances, the risks posed by such work would need to be further investigated and assessed by LSBJV-appointed environmental personnel.

f) **24/02/19 interim advice report - Provide conclusions regarding the potential for contamination to be disturbed by construction work**. The DSI should recommend that the potential for contamination to be disturbed by construction work needs to be further investigated and assessed by LSBJV-appointed environmental personnel.

g) **24/02/19 interim advice report - Assess the likely classification of excavated soils at the site if disposed off-site**. The DSI should recommend that the data provided by the DSI should be used by LSBJV-appointed environmental personnel to classify materials that need to be excavated and removed from the site in accordance with NSW EPA Waste Classification guidance.

h) **24/02/19 interim advice report - Provide recommendations for how soil contamination at the site needs to be managed by the construction work**. The DSI should recommend that the data provided by the DSI should be used by LSBJV-appointed environmental personnel to determine how soil contamination needs to be managed by the construction work.

2. **Section 1.6 Technical Framework:**

   a) Replace the ANZECC 2000 fresh and marine water guidelines with the ANZ Guidelines for Fresh and Marine Water Quality available online at http://waterquality.gov.au/anz-guidelines; and

   b) Replace the NHMRC October 2017 version with the August 2018 version.

3. **Section 6.2 Intrusive Soil Methodology:** I am concerned about the quality of the borelogs that were prepared for the DSI. This is because:

   a) The presence of fill in a large number of the borelogs was not correctly labelled, as picked up in my 24/02/19 interim advice report;

   b) The soil descriptions provided in the logs do not cover all matters required by Australian Standards such as moisture condition, seepage or water table observed during drilling (even in groundwater monitoring wells), the components of fill material appear not to be fully described;

   c) All the samples were simply described as soil and didn't differentiate between fill, natural soil and bedrock;

   d) The

   e) None of the logs identify the person who logged the soil conditions in the field during drilling;

   f) None of the logs show that they were checked by a senior environmental consultant.

   There is a risk that some of the logs may have been prepared by the driller or an environmental consultant not sufficiently experienced in logging boreholes for a site contamination investigation. More attention to the quality of borelog preparation should be given in future investigations on the WestConnex Project.

4. **Section 6.6 Laboratory Analysis:** In my opinion, the laboratory testing program could have been more streamlined and better targeted. This is because:

   a) A large number of natural soil and bedrock samples were tested for analytes that were unlikely to measure contamination due to the laydown mechanism being located at or near the ground surface and most likely confined to the fill layer. Examples include samples of natural soil and bedrock being tested for asbestos, OCPs, OPPs.

   b) Petroleum hydrocarbon contamination in natural soils and bedrock at the site is most likely to be associated with leakage / spillage at USTs and associated infrastructure. However, a large number of natural soil and bedrock samples were tested for a range of petroleum hydrocarbon analytes at locations where the deeper strata were unlikely to have been impacted by these analytes, which included TRH, BTEX, phenols, VOC / SVOC scans.

   c) On the other hand, no soil samples were tested at BH6, BH14, B15, BH30, BH31, BH32, BH34, BH35 and BH36.

   Laboratory testing program should be made more streamlined and better targeted in future investigations on the WestConnex Project.

5. **Section 6.8.1 Groundwater Assessment Criteria:**

   a) This section should be renumbered 6.7.2; and

b) 24/02/19 interim advice report - GAC should correspond to the 2018 Australian & New Zealand Guidelines for Fresh and Marine Water Quality criteria available at http://waterquality.gov.au/anz-guidelines and the NHMRC (August 2018) drinking water guidelines.

6. **Sections 8.1.1 & 8.2.1Stratigraphic Conditions:**

   a) **24/02/19 interim advice report - Provide a figure that shows contours of fill thickness across the site.** An example of such a figure is attached to this interim advice report.

7. **Sections 8.1.2 & 8.2.2 Groundwater Conditions**: Provide an assessment of what the hydrogeological data means for contamination at the site. Examples of issues you may want to raise include:

   a) The regional groundwater system is present in the natural soil / bedrock strata.

   b) Transient perched groundwater may flow within the fill layer after heavy rainfall, but the relatively small thickness of fill and the depth of the regional water table means that there is a low potential for significant groundwater contamination to flow through the fill layer;

   c) The very slow recharge of the monitoring wells indicates a low contaminant migration potential, which suggests that groundwater contamination is likely to be localised to source areas; and

   d) Etc, etc.

8. **Sections 8.1.3 & 8.2.3 Groundwater Field Parameters:** Assess the groundwater field parameters and advise what the data means in terms of the likely source of groundwater at the site, and assess its beneficial reuse potential.

9. **Sections 8.1.4 & 8.2.4 Soil Laboratory Data**:

   a) The approach used in these sections of the report appears to be to verbalise the data presented in the laboratory summary Tables T1 to T4. The DSI also lumps all the soil data together, which is rather pointless. I recommend that you assess the soil data in terms of the three main types of samples that were tested, these being fill, natural soils, and bedrock;

   b) The report needs to derive background levels for natural soils at the site so that VENM waste classification assessments can be done and EILs can be derived that include provision for background levels;

   c) The report should also examine the soil contamination data in terms of the AECs listed in Section 4.2, so conclusions can be made regarding those AECs were contamination was found exceeding the Commercial / Industrial D investigation levels; and

   d) The DSI should include a figure that shows all exceedances of the Commercial / Industrial D investigation levels and the extent of known contamination at the site. I attach a plot showing this data. The report should remind the reader that there is a high risk of unknown contamination being present at the site due to its long history of commercial / industrial use and the inherent limitations of discrete investigation methods.

10. **Sections 8.1.5 & 8.2.5 Groundwater Laboratory Data**: The approach used in these sections of the report appears to be to verbalise the data presented in the laboratory summary Tables T6 and T7. The DSI needs to assess the data in terms of:

    a) Establish background levels for groundwater at the site;

    b) Does the data indicate any sources of contamination at the site that are impacting groundwater;

    c) Are the elevated levels of some analytes consistent with baseline conditions in the Ashfield area; and

d) What does the large number of non-detect results indicate about leachability of contamination from the overlying fill layer., etc, etc.

11. **Section 9 Discussion:** Expand on the matters I have previously discussed so that the objectives of the DSI, as given in Section 1.3 of the report, are addressed.
12. **Section 9.3 Development Considerations:**
    a) **24/02/19 Interim Advice Report - Provide a preliminary waste classification assessment for soils that are likely to be excavated at the site**, as indicated by the 'Comment on waste classification?' text included in the report.
13. **Section 10.1 Conclusions**: Up-date this section.
14. **Section 10.2 Recommendation**: Up-date this section.
15. **Tables**: Thanks for making the text in the tables slightly big (it still sent me blind trying to read them). I have done a checkprint of Tables T1 – T4, T6 and T7. This involved me checking the criteria against the source documents and the concentration data against the laboratory test certificates. Correct data are highlighted in green while incorrect data are indicated by red pen and highlighter. My main comments that need to be addressed by the DSI are:
    a) Background levels for soils used in Tables T1 – T3 should be based on the site-specific values (refer Comment 9b);
    b) Errors exist in the soil and groundwater criteria used;
    c) Use the borelogs to define the types of soil samples tested (e.g. fill, natural soil, bedrock);
    d) Correct errors in some of the concentration data included in the tables;
    e) Include data missing from the tables;
    f) Highlight the asbestos contamination found in the fill sample from BH12;
    g) Delete reference to an 'Adopted Clean Fill Criteria' in Table T3.

Yours sincerely

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Attachments:
(1) Fill thickness plot (1 page)
(2) Known soil contamination plot (1 page)
(3) Checkprint of laboratory summary tables (18 pages)

epic ENVIRONMENTAL

0 10 20 30 40 50 m

Scale: 1:1,000 @ A4

Datum: GDA94 Projection: MGA56

West Connex M4-M5 Link Project
Construction Area - Muirs (C1B and C3B)

Draft

Fill Thickness (m)

epic ENVIRONMENTAL

0 10 20 30 40 50 m

Scale: 1:1,000 @ A4

Datum: GDA94 Projection: MGA56

West Connex M4-M5 Link Project
Construction Area - Muirs (C1B and C3B)

Extent of Known Contamination Exceeding Commercial / Industrial D Soil Investigation Levels

Higher values allowed by CRC CARE study

DDT+DDE+DDD

Derive Site-specific values.

Epic File: SY180065.04
Site: Muirs (C1b & C3b)
Client: LSBJV

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Table T1: Soil Analytical Results - EILs and HILs

Sample Date	Sample Duplicate	Sample Number	Sample Depth (m)	Material Type	Asbestos	Physico-Chemical: pH	Physico-Chemical: Cation Exchange Capacity (meq/100)	PAH: Total	PAH: Benzo (a) pyrene	PAH: Benzo (a) pyrene TEQ	Phenols: Phenol	Organics (mg/kg): PCB	Pesticides: DDT	Pesticides: Aldrin & Dieldrin	Pesticides: Chlordane	Pesticides: Endosulfan	Pesticides: Endrin	Pesticides: Heptachlor	Pesticides: HCB	Pesticides: Methoxychlor	Pesticides: Chlorpyrifos	Inorganics (mg/kg) Metals: As	Cd	Total Cr	Cu	Pb	Ni	Hg	Zn
Background Levels						-	-	-	1.4 | 1.4[#]	-	-	-	-	-	-	-	-	-	-	-	-	<4 - 56	<0.4 - 2	2 - 150	<1 - 650	2 - 1200	<0.1-0.7	1-400	2-1,900
NEPM EIL - Commercial and Industrial (mg/kg)						-	-	-	-	-	-	640	-	-	-	-	-	-	-	-	-	160	-	310-660[^]	85-1,200 (400)[^]	1,000[^]	-	55-960[^]	110-2,000[^]
NEPM HIL-D - Commercial/Industrial (mg/kg)						-	-	4,000	-	40	240,000	7	3,600	45	530	2,000	100	50	80	2,500	2,000	3,000	900	3,600	240,000	1,500	730	6,000	400,000
Landfill Criteria - Maximum Values without TCLP - General Solid Waste						-	-	200	0.8	-	288	≤50	-	-	-	80	-	-	-	-	4	100	20	100 (VI)	-	100	4	40	-
Landfill Criteria - Maximum Values without TCLP - Restricted Solid Waste						-	-	800	3.2	-	1152	≤50	-	-	-	240	-	-	-	-	16	400	80	400 (VI)	-	400	16	160	-
Laboratory Level of Reporting (mg/kg)						0.1	1	0.5	0.5	1.2	0.5	0.7	0.7	1	0.5	0.5	0.1	0.5	0.5	0.5	1	0.1	0.5	2	5	5	0.1	2	5
C1b																													
27-Aug-18		C1b-BH01	0.2	Soil	No			<0.05	<0.5	<0.5	<0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.5	<0.1	<0.5	<0.1	6	<0.4	3	3	3	<0.1	1	6
27-Aug-18		C1b-BH01	0.5	Soil	No			1.6	<0.5	<0.5	<0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.5	<0.1	<0.5	<0.1	8	<0.4	22	8	35	<0.1	3	30
27-Aug-18		C1b-BH01	1.0	Soil	No			<0.05	<0.5	<0.5	<0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.5	<0.1	<0.5	<0.1	7	<0.4	21	16	14	<0.1	2	7
27-Aug-18		C1b-BH01	2.0	Soil	-			<0.05	<0.5	<0.5	<0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.5	<0.1	<0.5	<0.1	<4	<0.4	3	18	7	<0.1	<1	3
27-Aug-18		C1b-BH01	3.0	Soil	-			<0.05	<0.5	<0.5	<0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.5	<0.1	<0.5	<0.1	<4	<0.4	3	62	7	<0.1	<1	11
27-Aug-18		C1b-BH01	3.7	~~Soil~~ Shale	-			<0.05	<0.5	<0.5	<0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.5	<0.1	<0.5	<0.1	5	<0.4	8	68	11	0.1	12	60
27-Aug-18		C1b-BH02	0.2	~~Soil~~ F	No			<0.05	<0.5	<0.5	<0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.5	<0.1	<0.5	<0.1	<4	<0.4	4	12	51	<0.1	3	49
27-Aug-18		C1b-BH02	0.5	Soil	No			<0.05	<0.5	<0.5	<0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.5	<0.1	<0.5	<0.1	8	<0.4	21	5	17	<0.1	2	4
27-Aug-18		C1b-BH02	1.0	Soil	No			<0.05	<0.5	<0.5	<0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.5	<0.1	<0.5	<0.1	6	<0.4	22	5	15	<0.1	2	4
27-Aug-18		C1b-BH02	2.0	Soil	-			<0.05	<0.5	<0.5	<0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.5	<0.1	<0.5	<0.1	13	<0.4	12	33	10	<0.1	<1	7
27-Aug-18		C1b-BH02	3.0	~~Soil~~ Shale	-			<0.05	<0.5	<0.5	<0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.5	<0.1	<0.5	<0.1	<4	<0.4	3	28	7	<0.1	<1	9
27-Aug-18		C1b-BH02	4.0	~~Soil~~ Shale	-			<0.05	<0.5	<0.5	<0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.5	<0.1	<0.5	<0.1	21	<0.4	11	53	15	0.1	8	38
27-Aug-18		C1b-BH03	0.2	F ~~Soil~~	No			<0.05	<0.5	<0.5	<0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.5	<0.1	<0.5	<0.1	<4	<0.4	4	5	21	<0.1	2	39
27-Aug-18		C1b-BH03	0.5	Soil	No			1.9	<0.5	<0.5	<0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.5	<0.1	<0.5	<0.1	7	<0.4	19	7	15	<0.1	2	17
27-Aug-18		C1b-BH03	1.0	Soil	No			0.1	<0.5	<0.5	<0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.5	<0.1	<0.5	<0.1	5	<0.4	18	7	16	<0.1	2	9
27-Aug-18		C1b-BH03	2.0	Soil	-			<0.05	<0.5	<0.5	<0.5											<4	<0.4	2	7	8	<0.1	<1	2
27-Aug-18		C1b-BH03	3.0	Soil	-	7.0	4.1	<0.05	<0.5	<0.5	<0.5											<4	<0.4	3	5	10	<0.1	<1	2
27-Aug-18		C1b-BH03	3.4-0	~~Soil~~ Shale	-			<0.05	<0.5	<0.5	<0.5											<4	<0.4	3	16	11	<0.1	<1	20
27-Aug-18		C1b-BH03	6.5	F ~~Soil~~ Shale	-			0.1	<0.5	<0.5	<0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.5	<0.1	<0.5	<0.1	6	<0.4	16	25	19	13	78
27-Aug-18		C1b-BH04	0.2	~~Soil~~	No			<0.05	<0.5	<0.5	<0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.5	<0.1	<0.5	<0.1	5	<0.4	2	<1	2	<0.1	1	3
27-Aug-18		C1b-BH04	0.5	Soil	No			<0.05	<0.5	<0.5	<0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.5	<0.1	<0.5	<0.1	5	<0.4	16	10	14	<0.1	2	3
27-Aug-18		C1b-BH04	1.0	Soil	No			<0.05	<0.5	<0.5	<0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.5	<0.1	<0.5	<0.1	8	<0.4	14	46	12	0.1	4	4
27-Aug-18		C1b-BH04	2.0	Soil	-			<0.05	<0.5	<0.5	<0.5											<4	<0.4	2	17	8	<0.1	<1	2
27-Aug-18		C1b-BH04	3.0	~~Soil~~ Shale	-			<0.05	<0.5	<0.5	<0.5											<4	<0.4	2	23	9	<0.1	<1	2
27-Aug-18		C1b-BH04	3.7	~~Soil~~ Shale	-			<0.05	<0.5	<0.5	<0.5											<4	<0.4	5	73	11	<0.1	7	38
27-Aug-18		C1b-BH05	0.2	F ~~Soil~~	No			77	5.7	12.0	<0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.5	<0.1	<0.5	<0.1	5	1	17	53	470	0.1	12	250
27-Aug-18	C1b-QC01/QC02	C1b-BH05	0.5	Soil	No			99	8.2	11.0	<0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.5	<0.1	<0.5	<0.1	5	<0.4	18	26	35	<0.1	9	37
27-Aug-18		C1b-BH05	1.0	Soil	No			<0.05	<0.5	<0.5	<0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.5	<0.1	<0.5	<0.1	7	<0.4	20	6	17	<0.1	1	2
27-Aug-18		C1b-BH05	2.0	Soil	-			<0.05	<0.5	<0.5	<0.5											<4	<0.4	5	11	36	<0.1	<1	1
27-Aug-18		C1b-BH05	2.4	~~Soil~~ Shale	-			<0.05	<0.5	<0.5	<0.5											<4	<0.4	2	9	10	<0.1	<1	1

7-5

8-4

Checkpoint by LCS
8/3/19

Epic File: SY180065.04
Site: Muirs (C1b & C3b)
Client: LSBJV

Epic Environmental Pty Ltd
Level 8, 193 North Quay, Brisbane, QLD, 4000

Table T1: Soil Analytical Results - EILs and HILs

Sample Date	Sample Duplicate	Sample Number	Sample Depth (m)	Material Type	Asbestos	Physico-Chemical: pH	Physico-Chemical: Cation Exchange Capacity (meq/100g)	PAH: Total	PAH: Benzo (a) pyrene	PAH: Benzo (a) pyrene TEQ	Phenols: Phenol	PCB	Organics (mg/kg): Pesticides: DDT	Aldrin & Dieldrin	Chlordane	Endosulfan	Endrin	Heptachlor	HCB	Methoxychlor	Chlorpyrifos	Inorganics (mg/kg): Metals: As	Cd	Total Cr	Cu	Pb	Hg	Ni	Zn
Background Levels						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<4 - 56	<0.4 - 2	2 - 150	<1 - 650	2 - 1200	<0.1-0.7	1-400	2-1,900
NEPM EIL - Commercial and Industrial (mg/kg)						-	-	-	1.4 | 1.4[#]	-	-	-	640	-	-	-	-	-	-	-	-	160	-	310-660[^^]	85-1,200 (400)[^]	1,800[^]	-	55-860[^]	110-2,000[^]
NEPM HIL-D - Commercial/Industrial (mg/kg)						-	-	4,000	-	40	240,000	7	3,600	45	530	2,000	100	50	80	2,500	2,000	3,000	900	3,600	240,000	1,500	730	6,000	400,000
Lanfill Criteria - Maximum Values without TCLP - General Solid Waste						-	-	-	0.8	-	-	-	-	-	-	80	-	-	-	-	4	100	20	100 (VI)	-	100	4	40	-
Landfill Criteria - Maximum Values without TCLP - Restricted Solid Waste						-	-	-	3.2	-	-	-	-	-	-	240	-	-	-	-	15	400	80	400 (VI)	-	400	16	160	-
Laboratory Level of Reporting (mg/kg)						0.1	1	0.5	0.5	1.2	0.5	0.7	0.7	1	0.5	0.5	0.1	0.5	0.5	0.5	1	0.1	0.5	2	5	5	0.1	2	5
28-Aug-18		C1b-BH07	0.2	Soil	F No			<0.05	<0.5	<0.5	0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.1	<0.5	<0.1	<0.1	<4	<0.4	6	51	5	<0.1	90	31
28-Aug-18		C1b-BH07	0.5	Soil	No																								
28-Aug-18		C1b-BH07	1.0	Soil	No																								
28-Aug-18		C1b-BH07	2.0	Soil	-			<0.05	<0.5	<0.5																			
28-Aug-18		C1b-BH07	2.7	Soil	Shale -			<0.05	<0.5	<0.5												9	0.5	12	28	13	<0.1	<1	3
28-Aug-18		C1b-BH08	1.0	Soil	F No			11	1	1.4	0.5	0.1	<0.1	0.1	<0.5	0.1	<0.5	<0.1	<0.5	<0.1	<0.1	<4	<0.4	2	9	38	<0.1	<1	4
28-Aug-18		C1b-BH08	2.0	Soil	-			<0.05	<0.5	<0.5												<4	<0.4	8	22	200	0.1	4	230
28-Aug-18		C1b-BH08	3.0	Soil	-			<0.05	<0.5	<0.5												6	<0.4	5	14	10	<0.1	<1	2
28-Aug-18		C1b-BH08	4.0	Soil	-			<0.05	<0.5	<0.5												<4	<0.4	4	11	7	<0.1	<1	3
28-Aug-18		C1b-BH09	0.2	Soil	F No			2.2	0.2	<0.5	0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.1	<0.5	<0.1	<0.1	<4	<0.4	3	8	6	<0.1	<1	2
28-Aug-18		C1b-BH09	0.5	Soil	F No			0.1	<0.5	<0.5	0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.1	<0.5	<0.1	<0.1	5	<0.4	21	22	370	<0.1	9	35
28-Aug-18		C1b-BH09	1.0	Soil	No			<0.05	<0.5	<0.5	0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.1	<0.5	<0.1	<0.1	6	<0.4	21	4	18	<0.1	3	5
28-Aug-18		C1b-BH09	2.0	Soil	-			<0.05	<0.5	<0.5												6	1	16	15	19	0.1	<1	1
28-Aug-18		C1b-BH09	3.0	Soil	-			<0.05	<0.5	<0.5												26	<0.4	6	36	10	<0.1	<1	4
28-Aug-18		C1b-BH09	3.9	Soil	-			<0.05	<0.5	<0.5												<4	<0.4	2	10	7	<0.1	<1	7
28-Aug-18	C1b-QC03/QC04	C1b-BH10	0.2	Soil	F No			<0.05	<0.5	<0.5	0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.1	<0.5	<0.1	<0.1	<4	<0.4	6	120	14	<0.1	12	68
28-Aug-18		C1b-BH10	0.5	Soil	F No			<0.05	<0.5	<0.5	0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.1	<0.5	<0.1	<0.1	<4	<0.4	2	2	2	<0.1	<1	2
28-Aug-18		C1b-BH10	1.0	Soil	No			<0.05	<0.5	<0.5	0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.1	<0.5	<0.1	<0.1	<4	<0.4	7	24	26	<0.1	5	29
28-Aug-18		C1b-BH10	2.0	Soil	-			<0.05	<0.5	<0.5												7	<0.4	27	6	16	0.1	3	5
28-Aug-18		C1b-BH10	2.6	Soil	-			<0.05	<0.5	<0.5												<4	<0.4	3	5	5	<0.1	<1	1
28-Aug-18		C1b-BH11	1.0	Soil	F No			14	1.7	2.1	0.8	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.1	<0.5	<0.1	<0.1	<4	<0.4	5	14	10	<0.1	<1	2
28-Aug-18		C1b-BH11	2.0	Soil	-			<0.05	<0.5	<0.5												<4	<0.4	6	46	100	<0.1	6	110
28-Aug-18		C1b-BH11	2.6	Soil	-			<0.05	<0.5	<0.5												<4	<0.4	5	6	8	<0.1	<1	1
28-Aug-18		C1b-BH12	0.2	Soil	F Yes			<0.05	<0.5	<0.5	0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.1	<0.5	<0.1	<0.1	<4	<0.4	6	24	10	<0.1	1	9
28-Aug-18		C1b-BH12	0.5	Soil	F No			3.8	<0.5	0.5	0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.1	<0.5	<0.1	<0.1	56	2	5	38	160	<0.1	5	220
28-Aug-18		C1b-BH12	1.0	Soil	No			<0.05	<0.5	<0.5	0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.1	<0.5	<0.1	<0.1	6	<0.4	19	20	75	0.1	6	56
28-Aug-18		C1b-BH12	2.0	Soil	-			<0.05	<0.5	<0.5												8	<0.4	24	5	16	<0.1	3	5
28-Aug-18		C1b-BH12	2.6	Soil	-			<0.05	<0.5	<0.5												10	<0.4	22	8	12	<0.1	<1	2
28-Aug-18		C1b-BH13	0.2	Soil	F No			<0.05	<0.5	<0.5	0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.1	<0.5	<0.1	<0.1	5	<0.4	5	18	10	<0.1	1	1
28-Aug-18		C1b-BH13	0.5	Soil	F No			17	2.4	2.1	0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.1	<0.5	<0.1	<0.1	18	1	5	14	65	<0.1	3	200
28-Aug-18		C1b-BH13	1.0	Soil	F No			<0.05	<0.5	<0.5	0.5	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.1	<0.5	<0.1	<0.1	33	6	150	850	1200	0.7	90	1900
28-Aug-18		C1b-BH13	2.0	Soil	-			<0.05	<0.5	<0.5												16	2	29	21	60	<0.1	3	730
28-Aug-18		C1b-BH13	2.6	Soil	Shale -			<0.05	<0.5	<0.5												<4	<0.4	4	8	12	<0.1	<1	81
19-Nov-18		C1b-BH14	0.2	Soil	No																	<4	<0.4	5	12	17	<0.1	1	76
19-Nov-18		C1b-BH14	0.5	Soil	-																	<4	<0.4	11	17	25	<0.1	9	42
19-Nov-18		C1b-BH14	1.0	Soil	-																	10	<0.4	28	12	18	<0.1	2	6
19-Nov-18		C1b-BH14	2.0	Soil	-																	49	<0.4	21	25	20	<0.1	3	3
19-Nov-18		C1b-BH14	3.0	Soil	-																								
19-Nov-18		C1b-BH15	0.2	Soil	F No																	12	0.6	21	91	340	0.3	9	330
19-Nov-18		C1b-BH15	0.5	Soil	-																	9	<0.4	28	36	20	<0.1	2	6
19-Nov-18		C1b-BH15	1.0	Soil	-																	<4	<0.4	5	12	14	<0.1	<1	3
19-Nov-18		C1b-BH15	2.0	Soil	Rock -																								
19-Nov-18		C1b-BH15	3.2	Soil	Rock -																								
19-Nov-18		C1b-BH16	0.2	Soil	F No	7.5	8.4	3.6	0.3	0.5		<0.1	<0.1	<0.1	n.d	n.d	n.d	<0.1	<0.1	n.d	n.d	5	1	11	42	250	<0.1	20	110
19-Nov-18		C1b-BH16	0.5	Soil	F -			1.5	<0.05	<0.5												<4	<0.4	2	16	7	<0.1	8	15
19-Nov-18		C1b-BH16	1.0	Soil	-																								
19-Nov-18		C1b-BH16	2.0	Soil	-																								

Epic File: SY180065.04
Site: Muirs (C1b & C3b)
Client: LSBJV

Epic Environmental Pty Ltd
Level 6, 193 North Quay, Brisbane, QLD 4000

Table T1: Soil Analytical Results - EILs and HILs

Sample Date	Sample Duplicate	Sample Number	Sample Depth (m)	Material Type	Asbestos	Physico-Chemical		PAH			Phenols	PCB	Organics (mg/kg) Pesticides									Inorganics (mg/kg) Metals							
						pH	Cation Exhange Capacity (meq/100)	Total	Benzo (a) pyrene	Benzo (a) pyrene TEQ	Phenol		DDT	Aldrin & Dieldrin	Chlordane	Endosulfan	Endrin	Heptachlor	HCB	Methoxychlor	Chlorpyrifos	As	Cd	Total Cr[1]	Cu	Pb	Hg[1]	Ni	Zn
Background Levels						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<4 - 56	<0.4 - 2	2 - 150	<1 - 650	2 - 1200	<0.1-0.7	1-400	2-1,900
NEPM EIL - Commercial and Industrial (mg/kg)						-	-	-	1.4 | 1.4[#]	-	-	-	640	-	-	-	-	-	-	-	-	160	-	310-660^[^]	85-1,200 (400)[*]	1,800[*]	-	55-660[*]	110-2,000[*]
NEPM HIL-D - Commercial/Industrial (mg/kg)						-	-	4,000	-	40	240,000	7	3,600	45	530	2,000	100	50	80	2,500	2,000	3,000	900	3,600	240,000	1,500	730	6,000	400,000
Lanfill Criteria - Maximum Values without TCLP - General Solid Waste						-	-	-	0.8	-	-	-	-	-	-	80	-	-	-	-	4	100	20	100 (VI)	-	100	4	40	-
Landfill Criteria - Maximum Values without TCLP - Restricted Solid Waste						-	-	-	3.2	-	-	-	-	-	-	240	-	-	-	-	16	400	80	400 (VI)	-	400	16	160	-
Laboratory Level of Reporting (mg/kg)						0.1	1	0.5	0.5	1.2	0.5	0.7	0.7	1	0.5	0.5	0.1	0.5	0.5	0.5	1	0.1	0.5	2	5	5	0.1	2	5
19-Nov-18		C1b-BH17	0.2	~~Soil~~ F	No	7.7	12		5.1		<0.5	0.7	<0.1	<0.1	<0.5	<0.5	<0.5	<0.1	<0.1	<1.0	<0.1	7	<0.4	29	14	160	0.1	4	99
19-Nov-18		C1b-BH17	0.5	F ~~Soil~~	-																	6	0.4	24	27	280	0.2	6	380
19-Nov-18		C1b-BH17	1.0	~~Soil~~ F	-																								
19-Nov-18		C1b-BH17	2.0	Soil	-																								
19-Nov-18		C1b-BH17	3.0	~~Soil~~ Shale	-																								
19-Nov-18		C1b-BH18	0.2	F ~~Soil~~	No							<0.1	<0.1	<0.1	<0.5	nd	nd	<0.1	<0.1	nd	nd	5	<0.4	8	16	21	<0.1	5	21
19-Nov-18		C1b-BH18	0.5	~~Soil~~ F	-																	8	2	20	190	420	0.1	25	1700
19-Nov-18		C1b-BH18	1.0	Soil	-			0.1	nd	<0.5												7	<0.4	21	6	16	<0.1	3	6
19-Nov-18		C1b-BH18	2.0	Soil	-																								
19-Nov-18		C1b-BH18	3.0	Soil	-																								
19-Nov-18		C1b-BH19	0.2	F ~~Soil~~ F	No	8.8	34		1		<0.5	<0.1	<0.1	<0.1	<0.5	<0.5	<0.5	<0.1	<0.1	<1.0	<0.1	<4	1	25	54	290	<0.1	59	100
19-Nov-18		C1b-BH19	0.5	F ~~Soil~~	-																	18	<0.4	26	8	25	<0.1	4	18
19-Nov-18		C1b-BH19	1.0	~~Soil~~ F	-																								
19-Nov-18		C1b-BH19	2.0	Soil	-																								
19-Nov-18		C1b-BH19	3.0	Soil	-																								
C1b - QAQC																													
27-Aug-18	C1b-BH05-0.5	C1b-QC01		Soil				88	7.4	11.0	-	-	-	-	-	-	-	-	-	-	-	6	<0.4	19	20	31	<0.1	7	19
27-Aug-18	C1b-BH05-0.5	C1b-QC02	-	Soil	-	-	-	45.9	3.6	4.8	-	-	-	-	-	-	-	-	-	-	-	8	<1	22	11	29	<0.1	9	43
28-Aug-18	C1b-BH10-0.2	C1b-QC03		Soil				<0.5	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	<4	<0.4	2	<1	<1	<0.1	1	2
28-Aug-18	C1b-BH10-0.2	C1b-QC04	-	Soil	-	-	-	<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-	-	-	-	<5	<1	<2	<5	<5	<0.1	<2	<5
19-Nov-18	C1b-BH19-0.2	C1b-QA08		Soil																		43	<0.4	26	10	32	<0.1	5	7
19-Nov-18	C1b-BH19-0.2	C1b-QA08		Soil																		20	<0.4	36	11	39	0.2	5.5	33

NOTES:
- 1 — Analyte exceeds the generic EIL Guideline Criteria for Urban Residential and Public Open Space or Commercial and Industrial Land Use
- 1 — Analyte exceeds the HIL-A Guideline Criteria
- 1 — Analyte exceeds the HIL-B Guideline Criteria
- 1 — Analyte exceeds the HIL-D Guideline Criteria
- 1 — Adopted Clean Fill Criteria for unrestricted use of soils
- [1] — Inorganic Mercury
- [*] — Criteria for Cr (VI)
- [^] — Criteria for Cr (III)
- [#] — Ecological Screening Levels (ESLs) for benzo(a)pyrene for coarse | fine soils
- [*] — Generic Added Contaminant Level (ACL); ranges provided for ACLs dependent on physicochemical properties
- (190) — Adopted ACL based on typical physicochemical properties of soils in South-East Queensland
- [*] — Zero detection adopted as a suitable qualitative criteria for unrestricted use of soil materials
- NAD - OF — No asbestos detected (NAD), organic fibres detected (OF)
- - — Not analysed

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Site: Muirs (C1b & C3b)
Client: LSBJV

Epic Environmental Pty Ltd
Level 6, 193 North Quay, Brisbane, QLD, 4000

Table T2: Soil Analytical Results - EILs and HILs

Sample Date	Sample Duplicate	Sample Number	Sample Depth (m)	Material Type	Asbestos	Physico-Chemical: pH	Physico-Chemical: Cation Exchange Capacity (meq/100g)	Physico-Chemical: Electrical Conductivity (µS/cm)	PAH: Total	PAH: Benzo (a) pyrene	PAH: Benzo (a) pyrene TEQ	Phenols: Phenol	Phenols: Pentachloro phenol	Phenols: Cresols	Organics (mg/kg): PCB	Organics (mg/kg): Cyanide (free)	Pesticides: DDT	Pesticides: Aldrin & Dieldrin	Pesticides: Chlordane	Pesticides: Endosulfan	Pesticides: Endrin	Pesticides: Heptachlor	Pesticides: HCB	Pesticides: Methoxychlor	Pesticides: Chlorpyrifos	Inorganics (mg/kg) Metals: As	Cd	Total Cr	Cu	Pb	Hg	Ni	Zn
Background Levels						-		-	0.95-5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.2-30	0.04-2	0.5-110	1-190	<2-200	0.001-0.1	2-400	2-180
NEPM EIL - Commercial and Industrial (mg/kg)						-			-	1.4 | 1.4[#]	-	-	-	-	-	-	640	-	-	-	-	-	-	-	-	160	-	310-660^+^	85-1,200^	1,800^	-	85-960^	110-2,000^
NEPM HIL-D - Commercial/Industrial (mg/kg)						-		-	4,000	-	40	240,000	660	25,000	7	1,500	3,600	45	530	2,000	100	50	80	2,500	2,000	3,000	900	3,600	240,000	1,500	730	6,000	400,000
Landfill Criteria - Maximum Values without TCLP - General Solid Waste						-		-	-	0.8	-	-	-	4,000	-	320	-	-	-	60	-	-	-	-	4	100	20	100 (VB)	-	100	4	40	-
Landfill Criteria - Maximum Values without TCLP - Restricted Solid Waste						-		-	-	3.2	-	-	-	16,000	-	1,280	-	-	-	240	-	-	-	-	16	400	80	400 (VB)	-	400	16	160	-
Laboratory Level of Reporting (mg/kg)						0.1	1	1	0.5	0.5	1.2	0.5	1	1	0.7	1	0.7	0.5	0.5	0.5	0.1	0.5	0.5	0.5	1	0.1	0.5	2	5	5	0.1	2	5
C3b																																
29-Aug-18		C3b-BH20	0.2	F Soil F	No	-	-	-	<0.05	<0.5	<0.5	<0.5	-	-	<0.1	-	<0.1	<0.5	<0.5	<0.5	<0.1	-	<0.5	<0.1	<1	<0.1	6	<0.4	22	13	44	0.1	5	27
29-Aug-18		C3b-BH20	0.5	F Soil	No	-	-	-	0.09	<0.5	<0.5	<0.5	-	-	<0.1	-	<0.1	<0.5	<0.5	<0.5	<0.1	-	<0.5	<0.1	<1	<0.1	9	<0.4	21	8	17	<0.1	4	15
29-Aug-18		C3b-BH20	1.0	Soil	No	-	-	-	<0.05	<0.5	<0.5	<0.5	-	-	<0.1	-	<0.1	<0.5	<0.5	<0.5	<0.1	-	<0.5	<0.1	<1	<0.1	<4	<0.4	7	2	18	<0.1	<1	3
29-Aug-18		C3b-BH20	2.0	Soil	-	-	-	-	<0.05	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<4	<0.4	7	5	10	<0.1	<1	1
29-Aug-18		C3b-BH20	3.0	Soil	-	-	-	-	<0.05	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<4	<0.4	5	35	6	<0.1	1	8
29-Aug-18		C3b-BH20	4.0	Soil S/Stone	-	-	-	-	<0.05	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	<0.4	9	22	10	<0.1	<1	3
29-Aug-18		C3b-BH21	0.2	F Soil	No	-	-	-	<0.05	<0.5	<0.5	<0.5	-	-	<0.1	-	<0.1	<0.5	<0.5	<0.5	<0.1	-	<0.5	<0.1	<1	<0.1	6	<0.4	18	5	18	<0.1	3	4
29-Aug-18		C3b-BH21	0.5	Soil	No	-	-	-	<0.05	<0.5	<0.5	<0.5	-	-	<0.1	-	<0.1	<0.5	<0.5	<0.5	<0.1	-	<0.5	<0.1	<1	<0.1	7	<0.4	22	3	18	<0.1	1	2
29-Aug-18		C3b-BH21	1.0	Soil	No	-	-	-	<0.05	<0.5	<0.5	<0.5	-	-	<0.1	-	<0.1	<0.5	<0.5	<0.5	<0.1	-	<0.5	<0.1	<1	<0.1	6	<0.4	11	3	16	<0.1	<1	2
29-Aug-18		C3b-BH21	2.0	Soil	-	-	-	-	<0.05	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<4	<0.4	3	7	11	<0.1	<1	<1
29-Aug-18		C3b-BH21	3.0	Soil	-	-	-	-	<0.05	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<4	<0.4	2	6	7	<0.1	<1	1
29-Aug-18		C3b-BH21	4.0	Soil Shale	-	-	-	-	<0.05	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	<0.4	6	44	8	0.3	1	11
29-Aug-18		C3b-BH22	0.2	F Soil	No	-	-	-	4.4	0.6	0.8	<0.5	-	-	<0.1	-	<0.1	<0.5	0.8	<0.5	<0.1	-	0.6	<0.1	<1	<0.1	6	<0.4	19	200	70	0.5	6	100
29-Aug-18		C3b-BH22	0.5	Soil	No	-	-	-	<0.05	<0.5	<0.5	<0.5	-	-	<0.1	-	<0.1	<0.5	<0.5	<0.5	<0.1	-	<0.5	<0.1	<1	<0.1	7	<0.4	21	5	17	0.1	2	5
29-Aug-18	C3b-QC05/QC06	C3b-BH22	1.0	Soil	No	-	-	-	<0.05	<0.5	<0.5	<0.5	-	-	<0.1	-	<0.1	<0.5	<0.5	<0.5	<0.1	-	<0.5	<0.1	<1	<0.1	11	<0.4	25	5	16	0.2	1	6
29-Aug-18		C3b-BH22	2.0	Soil	-	-	-	-	<0.05	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<4	<0.4	5	6	10	<0.1	<1	1
29-Aug-18		C3b-BH22	3.0	S/S S/Stone	-	6.1	-	5.1	<0.05	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<4	<0.4	3	7	17	<0.1	<1	2
29-Aug-18		C3b-BH22	4.0	S/S Soil	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15	<0.4	7	38	12	<0.1	4	24
29-Aug-18		C3b-BH23	0.2	F Soil F	No	-	-	-	0.06	0.06	<0.5	<0.5	-	-	<0.1	-	<0.1	<0.5	<0.5	<0.5	<0.1	-	<0.5	<0.1	<1	<0.1	6	<0.4	15	13	41	0.1	5	71
29-Aug-18		C3b-BH23	0.5	Soil	No	-	-	-	<0.05	<0.5	<0.5	<0.5	-	-	<0.1	-	<0.1	<0.5	<0.5	<0.5	<0.1	-	<0.5	<0.1	<1	<0.1	8	<0.4	20	5	22	0.1	2	11
29-Aug-18		C3b-BH23	1.0	Soil	No	-	-	-	<0.05	<0.5	<0.5	<0.5	-	-	<0.1	-	<0.1	<0.5	<0.5	<0.5	<0.1	-	<0.5	<0.1	<1	<0.1	7	<0.4	19	6	13	<0.1	3	4
29-Aug-18		C3b-BH23	2.0	S/S Soil	-	-	-	-	<0.05	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	<0.4	5	8	9	<0.1	<1	1
29-Aug-18		C3b-BH23	3.0	Soil	-	-	-	-	<0.05	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<4	<0.4	6	14	12	<0.1	<1	4
29-Aug-18		C3b-BH23	4.0	Soil Shale	-	-	-	-	<0.05	-	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	<0.4	5	26	9	0.1	<1	9

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Table T2: Soil Analytical Results - EILs and HILs

Sample Date	Sample Duplicate	Sample Number	Sample Depth (m)	Material Type	Asbestos	Physico-Chemical			Organics (mg/kg)															Inorganics (mg/kg)							
									PAH			Phenols					Pesticides									Metals						
						pH	Cation Exchange Capacity (meq/100)	Electrical Conductivity (µS/cm)	Total	Benzo (a) pyrene	Benzo (a) pyrene TEQ	Phenol	Pentachloro phenol	Cresols	PCB	Cyanide (free)	DDT	Aldrin & Dieldrin	Chlordane	Endosulfan	Endrin	Heptachlor	HCB	Methoxychlor	Chlorpyrifos	As	Cd	Total Cr	Cu	Pb	Hg	Ni	Zn
Background Levels						-			0.95-5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.2-30	0.04-2	0.5-110	1-190	<2-200	0.001-0.1	2-400	2-180
NEPM EIL - Commercial and Industrial (mg/kg)						-			-	1.4 | 1.4[#]	-	-	-	-	-	640	-	-	-	-	-	-	-	160	-	310-660^	85-1,200^	1,800^	-	53-960^	110-2,000^
NEPM HIL-D - Commercial/Industrial (mg/kg)						-			4,000	-	40	240,000	660	25,000	7	1,500	3,600	45	530	2,000	100	50	80	2,500	2,000	3,000	900	3,600	240,000	1,500	730	6,000	400,000
Lanfill Criteria - Maximum Values without TCLP - General Solid Waste						-			-	0.8	-	-	-	4,000	-	320	-	-	-	60	-	-	-	-	4	100	20	100 (VI)	-	100	4	40	-
Landfill Criteria - Maximum Values without TCLP - Restricted Solid Waste						-			-	3.2	-	-	-	16,000	-	1,280	-	-	-	240	-	-	-	-	16	400	80	400 (VI)	-	400	16	160	-
Laboratory Level of Reporting (mg/kg)						0.1	1	1	0.5	0.5	1.2	0.5	1	1	0.7	1	0.7	0.5	0.5	0.5	0.1	0.5	0.5	0.5	1	0.1	0.5	2	5	5	0.1	2	5
30-Aug-18		C3b-BH24	0.2	Soil	No				<0.05	<0.05	<0.5	<0.5			<0.1		<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	11	<0.4	24	4	17	0.4	2	4
30-Aug-18		C3b-BH24	0.5	Soil	No				<0.05	<0.05	<0.5	<0.5			<0.1		<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	7	<0.4	19	5	17	<0.1	1	2
30-Aug-18		C3b-BH24	1.0	Soil	No				<0.05	<0.05	<0.5	<0.5			<0.1		<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	5	<0.4	10	8	16	<0.1	1	1
30-Aug-18		C3b-BH24	1.6	Soil	Shale				<0.05	<0.05	<0.5	<0.5			<0.1		<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<4	<0.4	2	4	9	<0.1	<1	<1
30-Aug-18		C3b-BH25	0.2	Soil	No				3.5	0.2	<0.5	<0.5			<0.1		<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	7	<0.4	20	8	18	<0.1	4	6
30-Aug-18		C3b-BH25	0.5	Soil	No				<0.05	<0.05	<0.5	<0.5			<0.1		<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	6	<0.4	24	7	19	<0.1	4	4
30-Aug-18		C3b-BH25	1.0	Soil	Shale				<0.05	<0.05	<0.5	<0.5			<0.1		<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	5	<0.4	6	6	14	<0.1	<1	1
30-Aug-18		C3b-BH25	1.7	Soil	-				<0.05	<0.05	<0.5	<0.5			<0.1		<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<4	<0.4	6	6	14	<0.1	<1	1
30-Aug-18		C3b-BH26	0.2	Soil	No				0.58	<0.05	<0.5	<0.5			<0.1		<0.1	1-2	0.6	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	18	<0.4	15	19	15	<0.1	<1	2
30-Aug-18		C3b-BH26	0.5	Soil	No				<0.05	<0.05	<0.5	<0.5			<0.1		<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	6	<0.4	14	13	110^	0.2	8	63
30-Aug-18		C3b-BH26	1.0	Soil	No				<0.05	<0.05	<0.5	<0.5			<0.1		<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	8	<0.4	24	3	18	<0.1	2	4
30-Aug-18		C3b-BH26	1.8	Soil	Shale				<0.05	<0.05	<0.5	<0.5			<0.1		<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	10	<0.4	20	3	15	<0.1	<1	1
30-Aug-18		C3b-BH27	0.2	Fill	No				1.1	0.08	<0.5	<0.5			<0.1		<0.1	1-7	0.8	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<4	<0.4	2	6	19	<0.1	<1	1
30-Aug-18		C3b-BH27	0.5	Fill	No				5.3	0.5	0.7	<0.5			<0.1		<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	5	1	14	19	110^	0.2	9	220
30-Aug-18		C3b-BH27	1.0	Soil	No				<0.05	<0.05	<0.5	<0.5			<0.1		<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	8	<0.4	23	25	160^	0.4	5	120
30-Aug-18		C3b-BH27	2.0	Soil	Shale				<0.05	<0.05	<0.5	<0.5			<0.1		<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	7	<0.4	9	5	14	<0.1	<1	5
30-Aug-18		C3b-BH28	0.2	Soil	No				0.83	0.09	<0.5	<0.5			0.7		<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<4	<0.4	4	7	13	<0.1	<1	2
30-Aug-18	C3b-QC07/QC08	C3b-BH28	0.5	Soil	No				<0.05	<0.05	<0.5	<0.5			<0.1		<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	7	<0.4	19	10	41	<0.1	9	22
30-Aug-18		C3b-BH28	1.0	Soil	No				<0.05	<0.05	<0.5	<0.5			<0.1		<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	5	<0.4	17	7	20	<0.1	4	5
30-Aug-18		C3b-BH28	1.8	Soil	Shale				<0.05	<0.05	<0.5	<0.5			<0.1		<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	9	<0.4	4	6	26	<0.1	<1	1
30-Aug-18		C3b-BH29	0.2	Soil	No				<0.05	<0.05	<0.5	<0.5			<0.1		<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	8	<0.4	7	8	5	<0.1	<1	2
30-Aug-18		C3b-BH29	0.5	Soil	No				<0.05	<0.05	<0.5	<0.5			<0.1		<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	7	<0.4	20	7	21	0.1	3	4
30-Aug-18		C3b-BH29	1.0	Soil	No				<0.05	<0.05	<0.5	<0.5			<0.1		<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	10	<0.4	23	9	23	0.1	2	3
30-Aug-18		C3b-BH29	1.2	Soil	Shale				<0.05	<0.05	<0.5	<0.5			<0.1		<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<4	<0.4	6	15	47	<0.1	<1	3
									<0.05	<0.05	<0.5	<0.5			<0.1		<0.1	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<4	<0.4	3	15	9	<0.1	<1	<1

Epic File: SY180065.04
Site: Muirs (C1b & C3b)
Client: LSBJV

epic
Epic Environmental Pty Ltd
Level 6, 193 North Quay, Brisbane, Qld, 4000

Table T2: Soil Analytical Results - EILs and HILs

Sample Date	Sample Duplicate	Sample Number	Sample Depth (m)	Material Type	Asbestos	Physico-Chemical: pH	Physico-Chemical: Cation Exchange Capacity (meq/100)	Physico-Chemical: Electrical Conductivity (µS/cm)	PAH: Total	PAH: Benzo(a)pyrene	PAH: Benzo(a)pyrene TEQ	Phenols: Phenol	Phenols: Pentachloro phenol	Phenols: Cresols	PCB	Cyanide (free)	Organics (mg/kg): Pesticides: DDT	Pesticides: Aldrin & Dieldrin	Pesticides: Chlordane	Pesticides: Endosulfan	Pesticides: Endrin	Pesticides: Heptachlor	Pesticides: HCB	Pesticides: Methoxychlor	Pesticides: Chlorpyrifos	Inorganics (mg/kg): Arsenic: As	Cadmium: Cd	Chromium: Total Cr	Copper: Cu	Lead: Pb	Mercury: Hg*	Nickel: Ni	Zinc: Zn
Background Levels						-		-	0.95-5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.2-30	0.04-2	0.5-110	1-190	<2-200	0.001-0.1	2-400	2-180
NEPM EIL - Commercial and Industrial (mg/kg)						-		-	-	1.4 | 1.4[1]	-	-	-	-	-	-	640	-	-	-	-	-	-	-	-	160	-	310-660^*^	85-1,200^	1,800^	-	53-960^	110-2,000^
NEPM HIL-D - Commercial/Industrial (mg/kg)						-		-	4,000	-	40	240,000	680	25,000	7	1,500	3,600	45	530	2,000	100	50	80	2,500	2,000	3,000	900	3,600	240,000	1,500	730	6,000	400,000
Landfill Criteria - Maximum Values without TCLP - General Solid Waste						-		-	-	0.8	-	-	-	4,000	-	320	-	-	-	60	-	-	-	-	4	100	20	100 (VI)	-	100	4	40	-
Landfill Criteria - Maximum Values without TCLP - Restricted Solid Waste						-		-	-	3.2	-	-	-	16,000	-	1,280	-	-	-	240	-	-	-	-	16	400	80	400 (VI)	-	400	16	160	-
Laboratory Level of Reporting (mg/kg)						0.1	1	1	0.5	0.5	1.2	0.5	1	1	0.7	1	0.7	0.5	0.5	0.5	0.1	0.5	0.5	0.5	1	0.1	0.5	2	5	5	0.1	2	5
19-Nov-18		C3b-BH30	0.2	Soil	F																											
19-Nov-18		C3b-BH30	0.5	Soil	Shale	-																				8		7	26				
19-Nov-18		C3b-BH30	1.0	Soil		-																						3	5	8				
19-Nov-18		C3b-BH31	0.2	Soil		No											nd	nd	nd	nd	nd	nd	nd	nd	nd	8		20	37	130		33	59
19-Nov-18		C3b-BH31	0.5	Soil		-																				55		14	11	16			7
19-Nov-18		C3b-BH31	1.0	Soil		-	5.0	13																		10		7	15	19			7
19-Nov-18		C3b-BH32	0.2	Soil	F	No											nd	nd	nd	nd	nd	nd	nd	nd	nd	110		18	14	22		9	6
19-Nov-18		C3b-BH32	0.5	Soil	Shale	-																				31		28	11	20			7
19-Nov-18		C3b-BH32	1.0	Soil	Concrete	-																				35		16	19	34			7
19-Nov-18		C3b-BH33	0.2	Soil		No											nd	nd	nd	nd	nd	nd	nd	nd	nd	7		30	4	21		3	3
20-Nov-18		C3b-BH33	0.5	Soil		-																				8		24	3	17			2
20-Nov-18		C3b-BH33	1.0	Soil	Ironstone	-																						10	6	14			1
20-Nov-18		C3b-BH33	2.0	Soil	Shale	-																											
20-Nov-18		C3b-BH34	0.2	Soil	F	No	8.6	7.5									nd	nd	nd	nd	nd	nd	nd	nd	nd	9		3	3	8		2	11
20-Nov-18		C3b-BH34	0.5	Soil		-																				9		33	3	19		2	6
20-Nov-18		C3b-BH34	1.0	Soil		-	4.9	4.3																		5		20	3	16			3
20-Nov-18		C3b-BH34	2.0	Soil	Shale	-																											
20-Nov-18		C3b-BH35	0.2	Soil	F	No											nd	nd	nd	nd	nd	nd	nd	nd	nd	7		26	4	17		2	4
20-Nov-18		C3b-BH35	0.5	Soil		-																				8		31	3	17		1	4
20-Nov-18		C3b-BH35	1.0	Soil		-																				10		33	4	17			4
20-Nov-18		C3b-BH35	2.0	Soil	Shale	-																											
20-Nov-18		C3b-BH36	0.2	Soil	F	No	7.9	13									nd	nd	nd	nd	nd	nd	nd	nd	nd	10		38	7	51		4	29
20-Nov-18		C3b-BH36	0.5	Soil		-																				6		31	3	16		1	3
20-Nov-18		C3b-BH36	1.0	Soil		-																				5		18	5	13			3
20-Nov-18		C3b-BH36	2.0	Soil	Shale	-																											
C3b - QAQC																																	
29-Aug-18	C3b-BH22-0.5	C3b-QC05		Soil	-	-			nd	nd	nd															10		21	7	14	0.1	1	7
29-Aug-18	C3b-BH22-0.5	C3b-QC06		Soil	-	-																				10		22	8	20			7
30-Aug-18	C3b-BH29-0.5	C3b-QC07		Soil	-	-																				10		25	5	19		2	4
30-Aug-18	C3b-BH28-0.5	C3b-QC08		Soil	-	-																				10		30	6	25		4	6
19-Nov-18	C3b-BH35-0.2	C3b-QC09		Soil	-	-																				13		41	7	23		3	7
19-Nov-18		C3b-BH35-0.2		Soil	-	-																				7		28	3	15		2	6

NOTES:
1 Analyte exceeds the generic EIL Guideline Criteria for Urban Residential and Public Open Space or Commercial and Industrial Land Use
1 Analyte exceeds the HIL-A Guideline Criteria
1 Analyte exceeds the HIL-B Guideline Criteria
1 Analyte exceeds the HIL-D Guideline Criteria
1 Adopted Clean Fill Criteria for unrestricted use of soils
1 Inorganic Mercury
- Criteria for Cr (VI)
- Criteria for Cr (III)
1 Ecological Screening Levels (ESLs) for benzo(a)pyrene for coarse | fine soils
- Generic Added Contaminant Level (ACL) ranges provided for ACLs dependent on physicochemical properties
(150) Adopted ACL based on typical physicochemical properties of soils in South-East Queensland
Zero detection adopted as a suitable qualitative criteria for unrestricted use of soil materials
NAD - OF No asbestos detected (NAD), organic fibres detected (OF)
- Not analysed

DRUM# 1 - DRUM# L | v. low | low

Result not provided in lab certificates

Epic File: SY180065.04
Site: Muirs (C1b & C3b)
Client: LSBJV

Epic Environmental Pty Ltd
Level 6, 193 North Quay, Brisbane, QLD, 4000

Table T3: Soil Analytical Results - ESLs and HSLs

Sample Date	Sample Duplicate	Sample Number	Sample Depth (m)	Material Type	Organics (mg/kg)												
					TRH						BTEXN						
					C_6-C_{10} minus BTEX (F1)	C_6-C_{10}	>C_{10}-C_{16} minus naphthalene (F2)	>C_{10}-C_{16}	>C_{16}-C_{34}	>C_{34}	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene	Styrene
Soil Saturation Concentration (Csat) - Sand | Silt | Clay					950 | 910 | 850	950 | 910 | 850	560 | 570 | 560	560 | 570 | 560	-	-	360 | 440 | 430	560 | 640 | 630	64 | 69 | 68	300 | 330 | 330	9 | 10 | 10	
ESL (Commercial/Industrial) - Coarse | Fine					215 | 215	-	170 | 170	-	1,700 | 2,500	3,300 | 6,600	75 | 95	135 | 135	165 | 185	180 | 95	370^	
Management Limit (Commercial & Industrial) - Coarse Soil | Fine Soil					700 | 800	-	1,000 | 1,000	-	3,500 | 5,000	10,000 | 10,000	-	-	-	-	-	
HSL-D (Commercial/Industrial) Vapour Intrusion - 0m to <1m - Sand | Silt | Clay					260 | 250 | 310	-	NL | NL | NL	-	-	-	3 | 4 | 4	NL | NL | NL	NL | NL | NL	230 | NL | NL	NL | NL | NL	
HSL-D (Commercial/Industrial) Vapour Intrusion - 1m to <2m - Sand | Silt | Clay					370 | 360 | 480	-	NL | NL | NL	-	-	-	3 | 4 | 6	NL | NL | NL	NL | NL | NL	NL | NL | NL	NL | NL | NL	
HSL-D (Commercial/Industrial) Vapour Intrusion - 2m to <4m - Sand | Silt | Clay					630 | 590 | NL	-	NL | NL | NL	-	-	-	3 | 6 | 9	NL | NL | NL	NL | NL | NL	NL | NL | NL	NL | NL | NL	
HSL-D (Commercial/Industrial) Vapour Intrusion - 4m + - Sand | Silt | Clay					NL | NL | NL	-	NL | NL | NL	-	-	-	3 | 10 | 20	NL | NL | NL	NL | NL | NL	NL | NL | NL	NL | NL | NL	
~~Adopted Clean Fill Criteria~~					40	700	110	120	300	2,800	0.5	~~65~~	55	~~40~~	3	
Landfill Criteria - Maximum Values without TCLP - General Solid Waste					650	650	-	~~10,000~~	10,000	-	10	288	600	~~60~~ 1000	-	60
Landfill Criteria - Maximum Values without TCLP - Restricted Solid Waste					2,600	2,600	-	~~40,000~~	40,000	-	40	1,152	2,400	~~1,800~~ 4000	-	240
Laboratory Level of Reporting (mg/kg)					10	10	50	50	100	100	0.2	0.5	0.5	0.5	1	0.5
C1b																
27-Aug-18		C1b-BH01	0.2	~~Soil~~ FILL	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1
27-Aug-18		C1b-BH01	0.5	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1
27-Aug-18		C1b-BH01	1.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1
27-Aug-18		C1b-BH01	2.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1
27-Aug-18		C1b-BH01	3.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1
27-Aug-18		C1b-BH01	3.7	~~Soil~~ SHALE	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1
27-Aug-18		C1b-BH02	0.2	~~Soil~~ FILL	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1
27-Aug-18		C1b-BH02	0.5	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1
27-Aug-18		C1b-BH02	1.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1
27-Aug-18		C1b-BH02	2.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1
27-Aug-18		C1b-BH02	3.0	~~Soil~~ SHALE	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1
27-Aug-18		C1b-BH02	4.0	~~Soil~~ SHALE	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1
27-Aug-18		C1b-BH03	0.2	~~Soil~~ FILL	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1
27-Aug-18		C1b-BH03	0.5	Soil	57	57	420	420	970	140	<0.2	<0.5	<1	<1	<1	<1
27-Aug-18		C1b-BH03	1.0	Soil	<25	<25	140	140	1,200	240	<0.2	<0.5	<1	<1	<1	<1
27-Aug-18		C1b-BH03	2.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1
27-Aug-18		C1b-BH03	3.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1
27-Aug-18		C1b-BH03	~~3.7~~ 4.0	~~Soil~~ SHALE	<25	<25	<50	<50	130	<100	<0.2	<0.5	<1	<1	<1	<1
27-Aug-18		C1b-BH03	6.5	~~Soil~~ SHALE	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1
27-Aug-18		C1b-BH04	0.2	~~Soil~~ FILL	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1
27-Aug-18		C1b-BH04	0.5	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1
27-Aug-18		C1b-BH04	1.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1
27-Aug-18		C1b-BH04	2.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1
27-Aug-18		C1b-BH04	3.0	~~Soil~~ SHALE	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1
27-Aug-18		C1b-BH04	3.7	~~Soil~~ SHALE	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1
27-Aug-18		C1b-BH05	0.2	~~Soil~~ FILL	<25	<25	<50	<50	560	140	<0.2	<0.5	<1	<1	<1	<1
27-Aug-18	C1b-QC01/QC02	C1b-BH05	0.5	Soil	<25	<25	<50	<50	370	<100	<0.2	<0.5	<1	<1	<1	<1
27-Aug-18		C1b-BH05	1.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1
27-Aug-18		C1b-BH05	2.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1
27-Aug-18		C1b-BH05	2.4	~~Soil~~ SHALE	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1
28-Aug-18		C1b-BH07	0.2	~~Soil~~ FILL	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1
28-Aug-18		C1b-BH07	0.5	Soil												
28-Aug-18		C1b-BH07	1.0	Soil												
28-Aug-18		C1b-BH07	2.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1
28-Aug-18		C1b-BH07	2.7	~~Soil~~ SHALE	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1
28-Aug-18		C1b-BH08	1.0	~~Soil~~ FILL	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1
28-Aug-18		C1b-BH08	2.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1
28-Aug-18		C1b-BH08	3.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1
28-Aug-18		C1b-BH08	4.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1
28-Aug-18		C1b-BH09	0.2	~~Soil~~ FILL	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1
28-Aug-18		C1b-BH09	0.5	~~Soil~~ FILL	140	140	180	180	<100	<100	<0.2	<0.5	<1	<1	<1	<1
28-Aug-18		C1b-BH09	1.0	~~Soil~~ FILL	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1
28-Aug-18		C1b-BH09	2.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1
28-Aug-18		C1b-BH09	3.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1
28-Aug-18		C1b-BH09	~~3.8~~ 3.7	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1
28-Aug-18	C1b-QC03/QC04	C1b-BH10	0.2	~~Soil~~ FILL	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1
28-Aug-18		C1b-BH10	0.5	~~Soil~~ FILL	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1
28-Aug-18		C1b-BH10	1.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1
28-Aug-18		C1b-BH10	2.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1
28-Aug-18		C1b-BH10	2.6	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1
28-Aug-18		C1b-BH11	1.0	~~Soil~~ FILL	99	99	72	72	16,000	1,700	<0.2	<0.5	<1	<1	<1	<1
28-Aug-18		C1b-BH11	2.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1
28-Aug-18		C1b-BH11	2.6	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1
28-Aug-18		C1b-BH12	0.2	~~Soil~~ FILL	<25	<25	<50	<50	360	<100	<0.2	<0.5	<1	<1	<1	<1
28-Aug-18		C1b-BH12	0.5	~~Soil~~ FILL	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1
28-Aug-18		C1b-BH12	1.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1
28-Aug-18		C1b-BH12	2.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1
28-Aug-18		C1b-BH12	2.6	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1
28-Aug-18		C1b-BH13	0.2	~~Soil~~ FILL	<25	<25	<50	<50	160	<100	<0.2	<0.5	<1	<1	<1	<1
28-Aug-18		C1b-BH13	0.5	~~Soil~~ FILL	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1
28-Aug-18		C1b-BH13	1.0	~~Soil~~ FILL	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1
28-Aug-18		C1b-BH13	2.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1
28-Aug-18		C1b-BH13	2.6	~~Soil~~ SHALE	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1

ENM Criteria — Where did this come from?

VHCA

Epic File: SY180065.04
Site: Muirs (C1b & C3b)
Client: LSBJV

Epic Environmental Pty Ltd
Level 6, 193 North Quay, Brisbane, QLD, 4000

Table T3: Soil Analytical Results - ESLs and HSLs

Sample Date	Sample Duplicate	Sample Number	Sample Depth (m)	Material Type	Organics (mg/kg)												
					TRH						BTEXN						
					C_6-C_{10} minus BTEX (F1)	C_6-C_{10}	>C_{10}-C_{16} minus naphthalene (F2)	>C_{10}-C_{16}	>C_{16}-C_{34}	>C_{34}	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene	Styrene	
Soil Saturation Concentration (Csat) - Sand | Silt | Clay					950 | 910 | 850	950 | 910 | 850	560 | 570 | 560	560 | 570 | 560	-	-	360 | 440 | 430	560 | 640 | 630	64 | 69 | 68	300 | 330 | 330	9 | 10 | 10	
ESL (Commercial/Industrial) - Coarse | Fine					215 | 215	-	170 | 170	-	1,700 | 2,500	3,300 | 6,600	75 | 95	135 | 135	165 | 185	180 | 95	370^	
Management Limit (Commercial & Industrial) - Coarse Soil | Fine Soil					700 | 800	-	1,000 | 1,000	-	3,500 | 5,000	10,000 | 10,000	-	-	-	-	-	
HSL-D (Commercial/Industrial) Vapour Intrusion - 0m to <1m - Sand | Silt | Clay					260 | 250 | 310	-	NL | NL | NL	-	-	-	3 | 4 | 4	NL | NL | NL	NL | NL | NL	230 | NL | NL	NL | NL | NL	
HSL-D (Commercial/Industrial) Vapour Intrusion - 1m to <2m - Sand | Silt | Clay					370 | 360 | 480	-	NL | NL | NL	-	-	-	3 | 4 | 6	NL | NL | NL	NL | NL | NL	NL | NL | NL	NL | NL | NL	
HSL-D (Commercial/Industrial) Vapour Intrusion - 2m to <4m - Sand | Silt | Clay					630 | 590 | NL	-	NL | NL | NL	-	-	-	3 | 6 | 9	NL | NL | NL	NL | NL | NL	NL | NL | NL	NL | NL | NL	
HSL-D (Commercial/Industrial) Vapour Intrusion - 4m + - Sand | Silt | Clay					NL | NL | NL	-	NL | NL | NL	-	-	-	3 | 10 | 20	NL | NL | NL	NL | NL | NL	NL | NL | NL	NL | NL | NL	
Adopted Clean Fill Criteria					40	700	110	120	300	2,800	0.5	85	55	40	3		
Lanfill Criteria - Maximum Values without TCLP - General Solid Waste					-	-	-	10,000	10,000	-	10	288	600	50	-		
Landfill Criteria - Maximum Values without TCLP - Restricted Solid Waste					-	-	-	40,000	40,000	-	40	1,152	2,400	1,800	-		
Laboratory Level of Reporting (mg/kg)					10	10	50	50	100	100	0.2	0.5	0.5	0.5	1	0.5	
19-Nov-18		C1b-BH14	0.2	Soil													
19-Nov-18		C1b-BH14	0.5	Soil													
19-Nov-18		C1b-BH14	1.0	Soil													
19-Nov-18		C1b-BH14	2.0	Soil													
19-Nov-18		C1b-BH14	3.0	Soil													
19-Nov-18		C1b-BH15	0.2	Soil													
19-Nov-18		C1b-BH15	0.5	Soil													
19-Nov-18		C1b-BH15	1.0	Soil													
19-Nov-18		C1b-BH15	2.0	Soil													
19-Nov-18		C1b-BH15	3.2	Soil													
19-Nov-18		C1b-BH16	0.2	Soil	<25	<25	<50	<50	<100	<100	nd	nd	nd	<1	<1		
19-Nov-18		C1b-BH16	0.5	Soil	<25	<25	<50	<50	<100	100	nd	nd	nd	<1	<1		
19-Nov-18		C1b-BH16	1.0	Soil													
19-Nov-18		C1b-BH16	2.0	Soil													
19-Nov-18		C1b-BH17	0.2	Soil							<0.2	<0.5	<1	<1		<1	
19-Nov-18		C1b-BH17	0.5	Soil													
19-Nov-18		C1b-BH17	1.0	Soil													
19-Nov-18		C1b-BH17	2.0	Soil													
19-Nov-18		C1b-BH17	3.0	Soil													
19-Nov-18		C1b-BH18	0.2	Soil													
19-Nov-18		C1b-BH18	0.5	Soil													
19-Nov-18		C1b-BH18	1.0	Soil	<25	<25	<50	<50	<100	100	nd	nd	nd	<1	<1		
19-Nov-18		C1b-BH18	2.0	Soil													
19-Nov-18		C1b-BH18	3.0	Soil													
19-Nov-18		C1b-BH19	0.2	Soil							<0.2	<0.5	<1	<1		<1	
19-Nov-18		C1b-BH19	0.5	Soil													
19-Nov-18		C1b-BH19	1.0	Soil													
19-Nov-18		C1b-BH19	2.0	Soil													
19-Nov-18		C1b-BH19	3.0	Soil													
C1b - QAQC																	
27-Aug-18	C1b-BH05-0.5	C1b-QC01		Soil	<25	<25	<50	<50	**310**	<100	<0.2	<0.5	<0.5	<0.5	<1		
27-Aug-18	C1b-BH05-0.5	C1b-QC02		Soil	<10	<10	<50	<50	**200**	<100	<0.2	<0.5	<0.5	<0.5	<1		
28-Aug-18	C1b-BH10-0.2	C1b-QC03		Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<0.5	<0.5	<1		
28-Aug-18	C1b-BH10-0.2	C1b-QC04		Soil	<10	<10	<50	<50	<100	<100	<0.2	<0.5	<0.5	<0.5	<1		
19-Nov-18	C1b-BH19-0.2	C1b-QA08		Soil													
19-Nov-18	C1b-BH19-0.2	C1b-QA08		Soil													

NOTES:

1	Analyte exceeds the ESL Criteria for Urban Residential and Public Open Space or Commercial and Industrial land use
1	Analyte exceeds reported Management Limits for hydrocarbons
1	Analyte exceeds HSL-A & HSL-B Criteria
1	Analyte exceeds the HSL-D criteria
1	Analyte exceeds the adopted Clean Fill Criteria
1	Adopted Clean Fill Criteria
1	Analyte exceeds the laboratory's limit of reporting (LOR)
-	Not analysed
NL	Not Limiting, for which the derived HSL exceeds the Csat, and cannot result in an unacceptable vapour risk for depth and soil type.
^	Generic Ecological Investigation Levels (EILs) for naphthalene, not dependent on soil type or soil physicochemical properties
*	Landfill criteria based on TPH fractions C_6-C_9, C_{10}-C_{14}, C_{15}-C_{28} and C_{29}-C_{36}

Epic File: SY180065.04
Site: Muirs (C1b & C3b)
Client: LSBJV

Epic Environmental Pty Ltd
Level 6, 193 North Quay, Brisbane, QLD, 4000

Table T4: Soil Analytical Results - ESLs and HSLs

Sample Date	Sample Duplicate	Sample Number	Sample Depth (m)	Material Type	Organics (mg/kg) TRH C_6-C_{10} minus BTEX (F1)	C_6-C_{10}	>C_{10}-C_{16} minus naphthalene (F2)	>C_{10}-C_{16}	>C_{16}-C_{34}	>C_{34}	BTEXN Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene	Styrene	Total MAH	VOCs / VHCs
Soil Saturation Concentration (Csat) - Sand | Silt | Clay					950 | 910 | 850	950 | 910 | 850	560 | 570 | 560	560 | 570 | 560	-	-	360 | 440 | 430	560 | 640 | 630	64 | 69 | 68	300 | 330 | 330	9 | 10 | 10			
ESL (Commercial/Industrial) - Coarse | Fine					215 | 215	-	170 | 170	-	1,700 | 2,500	3,300 | 6,600	75 | 95	135 | 135	165 | 185	180 | 95	370^			
HSL-D (Commercial/Industrial) Vapour Intrusion - 0m to <1m - Sand | Silt | Clay					260 | 250 | 310	-	NL | NL | NL	-	-	-	3 | 4 | 4	NL | NL | NL	NL | NL | NL	230 | NL | NL	NL | NL | NL			
HSL-D (Commercial/Industrial) Vapour Intrusion - 1m to <2m - Sand | Silt | Clay					370 | 360 | 480	-	NL | NL | NL	-	-	-	3 | 4 | 6	NL | NL | NL	NL | NL | NL	NL | NL | NL	NL | NL | NL			
HSL-D (Commercial/Industrial) Vapour Intrusion - 2m to <4m - Sand | Silt | Clay					630 | 590 | NL	-	NL | NL | NL	-	-	-	3 | 6 | 9	NL | NL | NL	NL | NL | NL	NL | NL | NL	NL | NL | NL			
HSL-D (Commercial/Industrial) Vapour Intrusion - 4m + - Sand | Silt | Clay					NL | NL | NL	-	NL | NL | NL	-	-	-	3 | 10 | 20	NL | NL | NL	NL | NL | NL	NL | NL | NL	NL | NL | NL			
Adopted Clean Fill Criteria					40	700	110	120	300	2,800	0.5	85	55	40	3			
Lanfill Criteria - Maximum Values without TCLP - General Solid Waste					-	-	-	10,000	10,000	-	10	288	600	50	-			
Landfill Criteria - Maximum Values without TCLP - Restricted Solid Waste					-	-	-	40,000	40,000	-	40	1,152	2,400	1,800	-			
Laboratory Level of Reporting (mg/kg)					10	10	50	50	100	100	0.2	0.5	0.5	0.5	1	0.5	0.5	
C1b																		
29-Aug-18		C3b-BH20	0.2	~~Soil~~ FILL	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1		
29-Aug-18		C3b-BH20	0.5	~~Soil~~ FILL	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1		nd
29-Aug-18		C3b-BH20	1.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1		
29-Aug-18		C3b-BH20	2.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	-		
29-Aug-18		C3b-BH20	3.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	-		
29-Aug-18		C3b-BH20	4.0	~~Soil~~ S/Stone	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	-		
29-Aug-18		C3b-BH21	0.2	~~Soil~~ FILL	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1		
29-Aug-18		C3b-BH21	0.5	~~Soil~~ FILL	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1		nd
29-Aug-18		C3b-BH21	1.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1		
29-Aug-18		C3b-BH21	2.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	-		
29-Aug-18		C3b-BH21	3.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	-		
29-Aug-18		C3b-BH21	4.0	~~Soil~~ SHALE	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	-		
29-Aug-18		C3b-BH22	0.2	~~Soil~~ FILL	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1		
29-Aug-18		C3b-BH22	0.5	~~Soil~~ FILL	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1		nd
29-Aug-18	C3b-QC05/QC06	C3b-BH22	1.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1		
29-Aug-18		C3b-BH22	2.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	-		
29-Aug-18		C3b-BH22	3.0	~~Soil~~ S/Stone	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	-		
29-Aug-18		C3b-BH22	4.0	~~Soil~~ S/Stone	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	-		
29-Aug-18		C3b-BH23	0.2	~~Soil~~ FILL	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1		
29-Aug-18		C3b-BH23	0.5	~~Soil~~ FILL	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1		nd
29-Aug-18		C3b-BH23	1.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1		
29-Aug-18		C3b-BH23	2.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	-		
29-Aug-18		C3b-BH23	3.0	~~Soil~~ S/S	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	-		
29-Aug-18		C3b-BH23	4.0	~~Soil~~ Shale	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	-		
30-Aug-18		C3b-BH24	0.2	~~Soil~~ FILL	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1		
30-Aug-18		C3b-BH24	0.5	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1		nd
30-Aug-18		C3b-BH24	1.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1		
30-Aug-18		C3b-BH24	1.6	~~Soil~~ Shale	<25	<25	<50	<50	<100	<100	nd	nd	nd	<1	<1	-		
30-Aug-18		C3b-BH25	0.2	~~Soil~~ FILL	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1		
30-Aug-18		C3b-BH25	0.5	~~Soil~~ FILL	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1		nd
30-Aug-18		C3b-BH25	1.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1		
30-Aug-18		C3b-BH25	1.7	~~Soil~~ SHALE	<25	<25	<50	<50	<100	<100	nd	nd	nd	<1	<1	-		
30-Aug-18		C3b-BH26	0.2	~~Soil~~ FILL	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1		
30-Aug-18		C3b-BH26	0.5	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1		nd
30-Aug-18		C3b-BH26	1.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1		
30-Aug-18		C3b-BH26	1.8	~~Soil~~ SHALE	<25	<25	<50	<50	<100	<100	nd	nd	nd	<1	<1	-		
30-Aug-18		C3b-BH27	0.2	~~Soil~~ FILL	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1		
30-Aug-18		C3b-BH27	0.5	~~Soil~~ FILL	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1		nd
30-Aug-18		C3b-BH27	1.0	~~Soil~~ FILL	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1		
30-Aug-18		C3b-BH27	2.0	~~Soil~~ SHALE	<25	<25	<50	<50	<100	<100	nd	nd	nd	<1	<1	-		
30-Aug-18		C3b-BH28	0.2	~~Soil~~ FILL	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1		
30-Aug-18	C3b-QC07/QC08	C3b-BH28	0.5	~~Soil~~ FILL	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1		nd
30-Aug-18		C3b-BH28	1.0	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1		
30-Aug-18		C3b-BH28	1.8	~~Soil~~ SHALE	<25	<25	<50	<50	<100	<100	nd	nd	nd	<1	<1	-		
30-Aug-18		C3b-BH29	0.2	~~Soil~~ FILL	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1		
30-Aug-18		C3b-BH29	0.5	Soil	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1		nd
30-Aug-18		C3b-BH29	1.0	~~Soil~~ SHALE	<25	<25	<50	<50	<100	<100	<0.2	<0.5	<1	<1	<1	<1		
30-Aug-18		C3b-BH29	1.2	~~Soil~~ SHALE	<25	<25	<50	<50	<100	<100	nd	nd	nd	<1	<1	-		

Epic File: SY180065.04
Site: Muirs (C1b & C3b)
Client: LSBJV

Epic Environmental Pty Ltd
Level 6, 193 North Quay, Brisbane, QLD, 4000

Table T4: Soil Analytical Results - ESLs and HSLs

Sample Date	Sample Duplicate	Sample Number	Sample Depth (m)	Material Type	Organics (mg/kg)												
					TRH						BTEXN						
					C_6-C_{10} minus BTEX (F1)	C_6-C_{10}	>C_{10}-C_{16} minus naphthalene (F2)	>C_{10}-C_{16}	>C_{16}-C_{34}	>C_{34}	Benzene	Toluene	Ethylbenzene	Xylenes	Naphthalene	Styrene	Total MAH
Soil Saturation Concentration (Csat) - Sand | Silt | Clay					950 | 910 | 850	950 | 910 | 850	560 | 570 | 560	560 | 570 | 560	-	-	360 | 440 | 430	560 | 640 | 630	64 | 69 | 68	300 | 330 | 330	9 | 10 | 10		
ESL (Commercial/Industrial) - Coarse | Fine					215 | 215	-	170 | 170	-	1,700 | 2,500	3,300 | 6,600	75 | 95	135 | 135	165 | 185	180 | 95	370^		
HSL-D (Commercial/Industrial) Vapour Intrusion - 0m to <1m - Sand | Silt | Clay					260 | 250 | 310	-	NL | NL | NL	-	-	-	3 | 4 | 4	NL | NL | NL	NL | NL | NL	230 | NL | NL	NL | NL | NL		
HSL-D (Commercial/Industrial) Vapour Intrusion - 1m to <2m - Sand | Silt | Clay					370 | 360 | 480	-	NL | NL | NL	-	-	-	3 | 4 | 6	NL | NL | NL	NL | NL | NL	NL | NL | NL	NL | NL | NL		
HSL-D (Commercial/Industrial) Vapour Intrusion - 2m to <4m - Sand | Silt | Clay					630 | 590 | NL	-	NL | NL | NL	-	-	-	3 | 6 | 9	NL | NL | NL	NL | NL | NL	NL | NL | NL	NL | NL | NL		
HSL-D (Commercial/Industrial) Vapour Intrusion - 4m + - Sand | Silt | Clay					NL | NL | NL	-	NL | NL | NL	-	-	-	3 | 10 | 20	NL | NL | NL	NL | NL | NL	NL | NL | NL	NL | NL | NL		
Adopted Clean Fill Criteria					40	700	110	120	300	2,800	0.5	85	55	40	3		
Lanfill Criteria - Maximum Values without TCLP - General Solid Waste					-	-	-	10,000	10,000	-	10	288	600	50	-		
Landfill Criteria - Maximum Values without TCLP - Restricted Solid Waste					-	-	-	40,000	40,000	-	40	1,152	2,400	1,800	-		
Laboratory Level of Reporting (mg/kg)					10	10	50	50	100	100	0.2	0.5	0.5	0.5	1	0.5	0.5
19-Nov-18		C3b-BH30	0.2	~~Soil~~ FILL	-	-	-	-	-	-	-	-	-	-	-	-	-
19-Nov-18		C3b-BH30	0.5	Soil	-	-	-	-	-	-	-	-	-	-	-	-	-
19-Nov-18		C3b-BH30	1.0	~~Soil~~ SHALE	-	-	-	-	-	-	-	-	-	-	-	-	-
19-Nov-18		C3b-BH31	0.2	Soil	-	-	-	-	-	-	-	-	-	-	-	-	-
19-Nov-18		C3b-BH31	0.5	Soil	-	-	-	-	-	-	-	-	-	-	-	-	-
19-Nov-18		C3b-BH31	1.0	Soil	-	-	-	-	-	-	-	-	-	-	-	-	-
19-Nov-18		C3b-BH32	0.2	~~Soil~~ FILL	-	-	-	-	-	-	-	-	-	-	-	-	-
19-Nov-18		C3b-BH32	0.5	Soil	-	-	-	-	-	-	-	-	-	-	-	-	-
19-Nov-18		C3b-BH32	1.0	~~Soil~~ SHALE	-	-	-	-	-	-	-	-	-	-	-	-	-
20-Nov-18		C3b-BH33	0.2	~~Soil~~ CONCRETE	<25	<25	<50	<50	<100	<100	nd	nd	nd	<1	<1	-	-
20-Nov-18		C3b-BH33	0.5	Soil	-	-	-	-	-	-	-	-	-	-	-	-	-
20-Nov-18		C3b-BH33	1.0	~~Soil~~ TRANSTONE	-	-	-	-	-	-	-	-	-	-	-	-	-
20-Nov-18		C3b-BH33	2.0	~~Soil~~ SHALE	-	-	-	-	-	-	-	-	-	-	-	-	-
20-Nov-18		C3b-BH34	0.2	~~Soil~~ FILL	-	-	-	-	-	-	-	-	-	-	-	-	-
20-Nov-18		C3b-BH34	0.5	Soil	-	-	-	-	-	-	-	-	-	-	-	-	-
20-Nov-18		C3b-BH34	1.0	Soil	-	-	-	-	-	-	-	-	-	-	-	-	-
20-Nov-18		C3b-BH34	2.0	~~Soil~~ SHALE	-	-	-	-	-	-	-	-	-	-	-	-	-
20-Nov-18		C3b-BH35	0.2	~~Soil~~ FILL	-	-	-	-	-	-	-	-	-	-	-	-	-
20-Nov-18		C3b-BH35	0.5	Soil	-	-	-	-	-	-	-	-	-	-	-	-	-
20-Nov-18		C3b-BH35	1.0	Soil	-	-	-	-	-	-	-	-	-	-	-	-	-
20-Nov-18		C3b-BH35	2.0	~~Soil~~ SHALE	-	-	-	-	-	-	-	-	-	-	-	-	-
20-Nov-18		C3b-BH36	0.2	~~Soil~~ FILL	-	-	-	-	-	-	-	-	-	-	-	-	-
20-Nov-18		C3b-BH36	0.5	Soil	-	-	-	-	-	-	-	-	-	-	-	-	-
20-Nov-18		C3b-BH36	1.0	Soil	-	-	-	-	-	-	-	-	-	-	-	-	-
20-Nov-18		C3b-BH36	2.0	~~Soil~~ SHALE	-	-	-	-	-	-	-	-	-	-	-	-	-
				-													
C1b - QAQC																	
29-Aug-18	C3b-BH22-0.5	C3b-QC05	-	Soil	<25	<25	<50	<50	<100	<100	nd	nd	nd	nd	nd	-	-
29-Aug-18	C3b-BH22-0.5	C3b-QC06	-	Soil	<10	<10	<50	<50	<100	<100	<0.2	<0.5	<0.5	<0.5	<1	-	-
30-Aug-18	C3b-BH28-0.5	C3b-QC07	-	Soil	<25	<25	<50	<50	<100	<100	nd	nd	nd	nd	<1	-	-
30-Aug-18	C3b-BH28-0.5	C3b-QC08	-	Soil	<10	<10	<50	<50	<100	<100	<0.2	<0.5	<0.5	<0.5	<0.5	-	-
19-Nov-18	C3b-BH35-0.2	C3b-QC09		Soil	-	-	-	-	-	-	-	-	-	-	-	-	-
20-Nov-18	C3b-BH35-0.2	C3b-QC10		Soil	-	-	-	-	-	-	-	-	-	-	-	-	-
				DRUM# 1 to DRUM# 4	-	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	

NOTES:

1	Analyte exceeds the ESL Criteria for Urban Residential and Public Open Space or Commercial and Industrial land use
1	Analyte exceeds reported Management Limits for hydrocarbons
1	Analyte exceeds HSL-A & HSL-B Criteria
1	Analyte exceeds the HSL-D criteria
1	Analyte exceeds the adopted Clean Fill Criteria
1	Adopted Clean Fill Criteria
1	Analyte exceeds the laboratory's limit of reporting (LOR)
-	Not analysed
NL	Not Limiting, for which the derived HSL exceeds the Csat, and cannot result in an unacceptable vapour risk for depth and soil type.
^	Generic Ecological Investigation Levels (EILs) for naphthalene, not dependent on soil type or soil physicochemical properties
*	Landfill criteria based on TPH fractions C_6-C_9, C_{10}-C_{14}, C_{15}-C_{28} and C_{29}-C_{36}

Epic File: SY180065.01
Site: WCX3A - Muirs: Ancillary Site C1b & C3b
Client: Lendlease Samsung Bouygues Joint Venture (LSBJV)

Table T6: Groundwater Analytical Results

Sample Date	Sample Location	Sample Duplicate	Sample Number	Depth to Groundwater (SWL mbgl)	Material Type	Aesthetic Parameters		Physico-Chemical Parameters		Alka	
						Sheen	Odour	pH	Electrical Conductivity (µS/cm)	Hydroxide Alkalinity as $CaCO_3$	Carbonate Alkalinity as $CaCO_3$
Solubility Limit											
~~NEPM Marine Waters~~[A] ANZ (2019) website							No visible films or odours	6.5-8.5		-	-
NEPM Drinking Water[B] NHMRC (August 2018)										-	-
Recreational Criteria (10 times drinking water criteria) except for aesthetic impacts.										-	-
ANZECC Water Quality Guidelines - Recreational Purposes							**No visible films or odours**	**6.5 - 8.5**		-	-
HSL-D (Commercial/Industrial) Vapour Intrusion - 2m to <4m - Sand | Silt | Clay										-	-
HSL-D (Commercial/Industrial) Vapour Intrusion - 4m to <8m - Sand | Silt | Clay										-	-
HSL-D (Commercial/Industrial) Vapour Intrusion - 8m+ - Sand | Silt | Clay										-	-
Laboratory Level of Reporting								1 to 14	5	1	1
GME 1 - 13 & 14 August 2018											
14-Aug-18			C1b-GW01	11.10	Groundwater	No Sheen	No Odour	-	-	-	-
14-Aug-18			C1b-GW07	3.96	Groundwater	No Sheen	Very Slight Hydrocarbon Odour	4.8	8300	<5	<5
14-Aug-18			C1b-GW08	9.00	Groundwater	No Sheen	Possible Hydrocarbon Odour	-	-	-	-
13-Aug-18			C3b-GW09	4.24	Groundwater	No Sheen	No Odour	4.4	950	<5	<5
13-Aug-18			C3b-GW10	5.94	Groundwater	No Sheen	No Odour	5	3800	<5	<5
13-Aug-18			C3b-GW11	2.99	Groundwater	No Sheen	No Odour	4.5	620	<5	<5
13-Aug-18		C3b-QC01-W	C3b-GW12	7.79	Groundwater	No Sheen	No Odour	7.9	3900	<5	<5
GME 2 - 19 & 20 November 2018											
20-Nov-18			C1b-GW01	10.37	Groundwater	No Sheen	No Odour	-	-	-	-
20-Nov-18			C1b-GW07	2.13	Groundwater	No Sheen	No Odour	-	-	-	-
20-Nov-18			C1b-GW08	9.00	Groundwater	No Sheen	Slight Hydrocarbon Odour	-	-	-	-
20-Nov-18			C3b-GW09	1.93	Groundwater	No Sheen	No Odour	-	-	-	-
20-Nov-18			C3b-GW10	4.85	Groundwater	No Sheen	No Odour	4	1400	<5	<5
20-Nov-18			C3b-GW11	2.10	Groundwater	No Sheen	No Odour	-	-	-	-
20-Nov-18		C3b-QC02 & QC03 - W	C3b-GW12	7.44	Groundwater	No Sheen	No Odour	-	-	-	-
20-Nov-18			C3b-GW13	3.58	Groundwater	No Sheen	Mild Hydrocarbon/ Sulphur Odour	-	-	-	-
20-Nov-18			C3b-GW14	4.49	Groundwater	No Sheen	Light Hydrocarbon Odour	-	-	-	-
20-Nov-18			C3b-GW15	3.13	Groundwater	No Sheen	No Odour	-	-	-	-
QAQC Samples											
14-Aug-18		C3b-GW12	C3b-QC01-W	-	Groundwater	-	-	-	-	-	-
8-Aug-18		-	TB	-	Trip Blank	-	-	-	-	-	-
20-Nov-18		C3b-GW12	C3b-QC02-W	-	Groundwater	-	-	-	-	-	-
20-Nov-18		C3b-GW12	C3b-QC03-W	-	Groundwater	-	-	-	-	-	-
21-Nov-18		-	Rinsate	-	-	-	-	-	-	-	-

NOTES:

1	Analyte exceeds the HSL-D criteria
1	Analyte exceeds the GIL Criteria for Marine Waters
1	Analyte exceeds the GIL Criteria for Drinking Water
1	Analyte exceeds the Recreational Criteria (based on 10 times the drinking water criteria or NEPM Water Quality Guidelines for Recreational Purposes)
-	Not analysed
NL	Not Limiting, for which the derived GIL exceeds the solubility limit, and cannot result in an unacceptable vapour risk for depth and soil type.
†	The Australian and New Zealand Environment Guidelines for Fresh and Marine Water Quality, 2000 (Trigger Values - 95% Protection)
A	Investigation levels apply to typical slightly-moderately disturbed systems. See ANZECC & ARMCANZ (2000) for guidance on applying these levels to different ecosystem conditions.
B	Investigation levels are taken from the health values of the Australian Drinking Water Guidelines (NHMRC 2011).
C	Figure may not protect key species from chronic toxicity, refer to ANZECC & ARMCANZ (2000) for further guidance.
D	Chemical for which possible bioaccumulation and secondary poisoning effects should be considered, refer to ANZECC & ARMCANZ (2000) for further guidance.
E	For changes in GIL with pH refer to ANZECC & ARMCANZ (2000) for further guidance.
F	Criteria for As (III) / As (V)
G	Criteria for Cr (III) / Cr (VI)
H	Values have been calculated using a hardness of 30 mg/L CaCO3 refer to ANZECC & ARMCANZ (2000) for further guidance on recalculating for site-specific hardness.
I	GIL of 30ug/L for each individual OR total trichlorobenzenes

Units mg/L.

linity		Major Anions		Major Cations				Ionic Balance	Organics (ug/L) PAH			TRH	
Bicarbonate Alkalinity as $CaCO_3$	Total Alkalinity as $CaCO_3$	SO_4^{2-}	Cl^-	Ca^{2+}	Mg^{2+}	Na^+	K^+	Ionic Balance (%)	Naphthalene	Benzo (a) pyrene	Total PAH	C_6-C_{10} minus BTEX	$>C_{10}$-C_{16} minus Naphthalene
									170	-	-	9,000	3,000
-	-	-	-	-	-	-	-	-	50[C]	0.0001	-	-	-
-	-	~~500~~ 250	~~250~~	-	-	-	-	-	-	0.01	-	-	-
-	-	~~5,000~~ 2500	2,500	-	-	-	-	-	-	0.10	-	-	-
-	-	400	400	-	-	300	-	-	-	0.01	-	-	-
-	-	-	-	-	-	-	-	-	NL | NL | NL	-	-	6,200 | NL | NL	NL | NL | NL
-	-	-	-	-	-	-	-	-	NL | NL | NL	-	-	6,300 | NL | NL	NL | NL | NL
-	-	-	-	-	-	-	-	-	NL | NL | NL	-	-	6,500 | NL | NL	NL | NL | NL
1	1	1	1	1	1	1	1	0.01	1	1.0	16	10	50
-	-	-	-	-	-	-	-	-	<1	-	-	Nd	Nd
9	9	750	2100	19	160	1400	18	0	<1	<1	<16	<10	<50
-	-	-	-	-	-	-	-	-	<1	-	-	Nd	Nd
<5	<5	270	80	1	4.4	170	2	-1	<1	<1	<16	<10	<50
12	12	150	1100	12	75	570	6.1	-3	<1	<1	<16	<10	<50
<5	<5	140	71	0.9	2.1	110	1.3	1	<1	<1	<16	<10	<50
330	330	270	860	40	50	600	13	-6	<1	<1	<16	<10	<50
-	-	-	-	-	-	-	-	-	<1	<2	<16	<10	320
-	-	-	-	19	160	1400	18	0	<1	<2	<16	<10	<50
-	-	-	-	1	4.4	170	2	-1	<1	<2	<16	<10	320
-	-	-	-	~~3.6~~ 12	~~33~~ 75	~~400~~ 570	~~2.8~~ 6.1	~~-22~~ -3	<1	<2	<16	<10	<50
<5	<5	120	380	0.9	2.1	110	1.3	1	<1	<2	<16	<10	<50
-	-	-	-	40	50	600	13	-6	<1	<2	<16	<10	<50
-	-	-	-	-	-	-	-	-	<1	<2	<16	<10	~~150~~ 150
-	-	-	-	-	-	-	-	-	<1	<2	<16	<10	~~150~~ 150
-	-	-	-	-	-	-	-	-	<1	<2	<16	<10	<50
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-

		MAH												
		BTEX												
>C_{16}-C_{34}	>C_{34}	Benzene	Toluene	Ethylbenzene	o-xylene	p-xylene	Xylenes (total)	Styrene	Isopropylbenzene	n-Propylbenzene	1,3,5-Trimethylbenzene	sec-Butylbenzene	1,2,4-Trimethylbenzene	tert-Butylbenzene
-	-	59,000	61,000	3,900	-	-	21,000	-	-	-	-	-	-	-
-	-	~~500^{C}~~ 700	180	5-	350	200	75-350	-	-	-	-	-	-	-
-	-	1	800	300 /3	-	-	600 /20	30	-	-	-	-	-	-
-	-	10	8,000	~~3,000~~ 30	-	-	~~6,000~~ 200	300	-	-	-	-	-	-
-	-				-	-		-	-	-	-	-	-	-
-	-	4,900 | 28,000 | 29,000	NL | NL | NL	NL | NL | NL	-	-	NL | NL | NL	-	-	-	-	-	-	-
-	-	5,100 | 28,000 | 30,000	NL | NL | NL	NL | NL | NL	-	-	NL | NL | NL	-	-	-	-	-	-	-
-	-	5,400 | 30,000 | 33,000	NL | NL | NL	NL | NL | NL	-	-	NL | NL | NL	-	-	-	-	-	-	-
100	100	1	1	1	1	2	3	1	1	1	1	1	1	1
nd	nd	<1	<1	<1	<1	<2	<3	<1	<1	<1	<1	<1	<1	<1
<100	<100	<1	<1	<1	<1	<2	<3	<1	<1	<1	<1	<1	<1	<1
nd	nd	<1	<1	<1	<1	<2	<3	<1	<1	<1	<1	<1	<1	<1
<100	<100	<1	<1	<1	<1	<2	<3	<1	<1	<1	<1	<1	<1	<1
<100	<100	<1	<1	<1	<1	<2	<3	<1	<1	<1	<1	<1	<1	<1
<100	<100	<1	<1	<1	<1	<2	<3	<1	<1	<1	<1	<1	<1	<1
<100	<100	<1	<1	<1	<1	<2	<3	<1	<1	<1	<1	<1	<1	<1
<100	<100	<1	<1	<1	<1	<2	<3	<1	<1	<1	<1	<1	<1	<1
<100	<100	<1	<1	<1	<1	<2	<3	<1	<1	<1	<1	<1	<1	<1
<100	<100	<1	<1	<1	<1	<2	<3	<1	<1	<1	<1	<1	<1	<1
<100	<100	<1	<1	<1	<1	<2	<3	<1	<1	<1	<1	<1	<1	<1
<100	<100	<1	<1	<1	<1	<2	<3	<1	<1	<1	<1	<1	<1	<1
<100	<100	<1	<1	<1	<1	<2	<3	<1	<1	<1	<1	<1	<1	<1
<100	<100	<1	<1	<1	<1	<2	<3	<1	<1	<1	<1	<1	<1	<1
<100	<100	<1	<1	<1	<1	<2	<3	<1	<1	<1	<1	<1	<1	<1
<100	<100	<1	<1	<1	<1	<2	<3	<1	<1	<1	<1	<1	<1	<1
<100	<100	<1	<1	<1	<1	<2	<3	<1	<1	<1	<1	<1	<1	<1
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	<1	<1	<1	<1	<2	<3	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

			Halogenated Aliphatic Compounds									
p-Isopropyltoluene	n-Butylbenzene	Fumigants	Trichloromethane (chloroform)	Tetrachloromethane (carbon tetrachloride)	1,2-Dichloroethane	1,1,2-Trichloroethane	Hexachloroethane	Chloroethene (vinyl chloride)	1,1-Dichloroethene	1,2-Dichoroethene	Tetrachloroethene (PCE)
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	1,900	-	-	700	-	70
-	-	-	~~3~~ 250	3	3	-	-	0.3	30	60	50
-	-	-	~~30~~ 2500	30	30	-	-	3.0	300	600	500
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
1	1	6	1	1	1	1	2	10	1	2	1
<1	<1	<6	<1	<1	<1	<1	-	<10	<1	<2	<1
<1	<1	<6	<1	<1	<1	<1	<2	<10	<1	<2	<1
<1	<1	<6	<1	<1	<1	<1	-	<10	<1	<2	<1
<1	<1	<6	<1	<1	<1	<1	<2	<10	<1	<2	<1
<1	<1	<6	<1	<1	<1	<1	<2	<10	<1	<2	<1
<1	<1	<6	<1	<1	<1	<1	<2	<10	<1	<2	<1
<1	<1	<6	<1	<1	<1	<1	<2	<10	<1	<2	<1
<1	<1	<6	<1	<1	<1	<1	<2	<10	<1	<1	<1
<1	<1	<6	<1	<1	<1	<1	<2	<10	<1	<1	<1
<1	<1	<6	<1	<1	<1	<1	<2	<10	<1	<1	<1
<1	<1	<6	<1	<1	<1	<1	<2	<10	<1	<1	<1
<1	<1	<6	<1	<1	<1	<1	<2	<10	<1	<1	<1
<1	<1	<6	<1	<1	<1	<1	<2	<10	<1	<1	<1
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<1	<1	<6	<1	<1	<1	<1	<2	<10	<1	<1	<1
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-

Chlorinated Benzenes						Phenols							P
Chlorobenzene	1,2-Dichlorobenzene	1,3-Dichlorobenzene	1,4-Dichlorobenzene	1,2,3-Trichlorobenzene	1,2,4-Trichlorobenzene	Phenol	2-Chlorophenol	2,4-Dichlorophenol	2,4,6-Trichlorophenol	2,3,4,6-Tetrachlorophenol	Pentachlorophenol	2,4-Dinitrophenol	Aroclor 1242
-	-	-	-	-	-	-	-	-	-	-	-	-	-
55 -	160 -	260 -	60 -	3 -	20^{D}	400	340 -	120 -	3 -	10 -	11^{D}	45 -	0.3 -
300 / 10	1,500 / 1	20 -	40 / 0.3	30^{1} / 5	30^{1} / 5 ✓	-	300 / 0.1	200 / 0.3	20 / 2	-	10	-	-
3,000	15,000	-	400	~~300~~ ✓	~~300~~ ✓	-	3,000	2,000	200	-	100	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
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-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	1	1	1	1	1	2	2	2	2	2	10	20	2
<1	<1	<1	<1	<1	<1	-	-	-	-	-	-	-	-
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<1	<1	<1	<1	<1	<1	-	-	-	-	-	-	-	-
<1	<1	<1	<1	<1	<1	<2	<2	<2	<2	<2	<10	<20	<2
<1	<1	<1	<1	<1	<1	<2	<2	<2	<2	<2	<10	<20	<2
<1	<1	<1	<1	<1	<1	<2	<2	<2	<2	<2	<10	<20	<2
<1	<1	<1	<1	<1	<1	<2	<2	<2	<2	<2	<10	<20	<2
<1	<2	<2	<2	<1	<2	<2	<2	<2	<2	<2	<10	<20	<2
<1	<2	<2	<2	<1	<2	<2	<2	<2	<2	<2	<10	<20	<2
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<1	<2	<2	<2	<1	<2	<2	<2	<2	<2	<2	<10	<20	<2
<1	<2	<2	<2	<1	<2	<2	<2	<2	<2	<2	<10	<20	<2
<1	<2	<2	<2	<1	<2	<2	<2	<2	<2	<2	<10	<20	<2
<1	<2	<2	<2	<1	<2	<2	<2	<2	<2	<2	<10	<20	<2
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-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-

PCB	Pesticides (OCPs)						Pesticides (OPPs)								
Aroclor 1254	DDT	Aldrin & Dieldrin	Chlordane	Endosulfan	Endrin	Heptachlor	Chlorpyrifos	Dichlorvos	Dimethoate	Diazinon	Ethion	Malathion	As	Cd[H]	Cr
-	-	-	-	-	-	-		-	-	-	-	-	-	-	-
0.01	0.0004	0.0003+0	0.001	0.005[D]	0.004[D]	0.00004	0.009		0.15	0.01	-	0.05	-	0.0007[D]	0.027 / 0.0044[G]
-	9	0.3	2	20	-	0.3	10	5	7	4	4	70	0.010	0.002	0.050
-	90	3.0	20	200	-	3	100	50	70	40	40	700	0.100	0.020	0.500
-	-	-	-	-	-	-	-	-	-	-	-	-	0.050	0.005	0.050
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	0.6	0.4	0.4	0.6	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.001	0.0001	0.001
-	-	-	-	-	-	-							-	-	-
<2	<0.6	<0.4	<0.4	<0.6	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.001	0.0003	<0.001
-	-	-	-	-	-	-							-	-	-
<2	<0.6	<0.4	<0.4	<0.6	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.001	<0.0001	<0.001
<2	<0.6	<0.4	<0.4	<0.6	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.001	0.001	<0.001
<2	<0.6	<0.4	<0.4	<0.6	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.001	<0.0001	<0.001
<2	<0.6	<0.4	<0.4	<0.6	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.002	<0.0001	<0.001
-	-	-	-	-	-	-							-	-	-
<2	<0.2	<2	<0.4	<0.6	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.001	0.001	<0.001
<2	<0.2	<2	<0.4	<0.6	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.001	<0.001	<0.001
<2	<0.2	<2	<0.4	<0.6	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.001	<0.001	<0.001
<2	<0.2	<2	<0.4	<0.6	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.001	<0.001	<0.001
<2	<0.2	<2	<0.4	<0.6	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.001	0.002	<0.001
<2	<0.2	<2	<0.4	<0.6	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.001	<0.001	<0.001
<2	<0.2	<2	<0.4	<0.6	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.006	<0.001	<0.001
<2	<0.2	<2	<0.4	<0.6	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.001	<0.001	<0.001
<2	<0.2	<2	<0.4	<0.6	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.001	<0.001	<0.001
<2	<0.2	<2	<0.4	<0.6	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.001	0.002	<0.001
-	-	-	-	-	-	-							0.002	<0.0001	<0.001
-	-	-	-	-	-	-							-	-	-
-	-	-	-	-	-	-	-	-	-	-	-	-	0.005	<0.0002	<0.001
-	-	-	-	-	-	-	-	-	-	-	-	-	0.005	<0.0001	<0.001
-	-	-	-	-	-	-	-	-	-	-	-	-	<0.001	<0.0001	<0.001

Epic Environmental Pty Ltd
Level 6, 193 North Quay, Brisbane QLD 4000

Inorganics (mg/L)				
Heavy Metals				
Cu^{H}	Pb^{H}	Hg (total)	Ni^{H}	Zn^{H}
-	-	-	-	-
0.0013	0.0044	0.0001[D]	0.007	0.015[C]
2	0.010	0.001	0.020	3,000
20 10	0.100	0.010	0.200	3,000
1	0.050	0.001	0.100	5
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
0.001	0.001	0.00005	0.001	0.001
-	-	-	-	-
0.028	0.026	<0.00005	0.063	0.19
-	-	-	-	-
0.036	0.003	<0.00005	0.006	0.051
0.068	0.005	<0.00005	0.11	0.5
0.085	0.006	<0.00005	0.007	0.098
0.036	0.002	<0.00005	0.004	0.03
<0.001	<0.001	<0.00005	0.097	0.089
0.052	0.006	<0.00005	0.035	0.14
<0.001	<0.001	<0.00005	0.043	0.002
0.004	<0.001	<0.00005	0.003	0.016
0.01	<0.001	<0.00005	0.052	0.21
0.003	<0.001	<0.00005	0.001	0.012
<0.001	<0.001	<0.00005	0.005	0.002
0.11	0.009	<0.00005	0.007	0.091
0.055	0.004	<0.00005	0.005	0.057
0.049	0.006	<0.00005	0.011	0.084
0.002	<0.001	<0.00005	0.002	0.001
-	-	-	-	-
<0.001	<0.001	0.0005	0.004	<0.005
<0.001	<0.001	<0.00005	0.005	0.0001
<0.001	<0.001	<0.00005	<0.001	<0.001

0.001

Epic File: **SY180065.01**

Site: **WCX3A - Muirs: Ancillary Site C1b & C3b**

Client: **Lendlease Samsung Bouygues Joint Venture (LSBJV)**

Epic Environmental Pty Ltd
Level 6, 193 North Quay, Brisbane QLD 4000

Table T7: Groundwater Analytical Results - PFAS

Sample Date	Sample Location	Sample Duplicate	Sample Number	Depth to Groundwater	Material Type	Organics (µg/L) Per- and poly-fluorinated alkyl substances (PFAS)				
						Perfluoroalkyl Sulfonic Acids		Perfluoroalkyl Carboxylic Acids	Fluorotelomer Sulfonic Acids	
						PFOS	PFHxS	PFOA	6:2 FTS	8:2 FTS
Solubility Limit						-	-	-	-	-
PFAS NEMP Human Health - Drinking Water						0.07	0.07	0.56	-	-
PFAS NEMP Human Health - Recreational Water						0.7	0.70	5.60	-	-
PFAS NEMP 90% species protection interim marine						2	-	832	-	-
PFAS NEMP 80% species protection interim marine						31	-	1,824	-	-
Laboratory Level of Reporting						0.01	0.02	0.01	0.05	0.05
14/08/2018			C1b-GW01		Groundwater	-	-	-	-	-
14/08/2018			C1b-GW07		Groundwater	-	-	-	-	-
14/08/2018			C1b-GW08		Groundwater	-	-	-	-	-
13/08/2018			C3b-GW09		Groundwater	-	-	-	-	-
13/08/2018			C3b-GW10		Groundwater	-	-	-	-	-
14/08/2018			C3b-GW11		Groundwater	<0.01	<0.01	<0.01	<0.01	<0.01
14/08/2018			C3b-GW12		Groundwater	-	-	-	-	-
14/08/2018			C3b-QC01-W		Groundwater	-	-	-	-	-
08/08/2018			TB		Trip Blank	-	-	-	-	-

NOTES:

1	Analyte exceeds the PFAS NEMP Human Health - Drinking Water Criteria
1	Analyte exceeds the PFAS NEMP Human Health - Recreational Water Criteria
1	Analyte exceeds the PFAS NEMP 90% species protection in marine waters (interim values based on freshwater values) for highly disturbed systems
1	Analyte exceeds the PFAS NEMP 80% species protection in marine waters (interim values based on freshwater values) for highly disturbed systems
-	Not analysed

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Email: iswane@bigpond.com

Lendlease Samsung Bouygues Joint Venture
WestConnex M4-M5 Link Tunnels
Level 7, 189 O'Riordan Street
PO Box 63, MASCOT NSW 1460

Attention: [redacted]- Environmental Manager
(email:[redacted])

6/05/2019

SA278_190506_Interim advice#31
2018_WestConnexStage 3A

Dear[redacted]

INTERIM ADVICE #31 FOR STATUTORY SITE AUDIT No. 278 BY DR IAN SWANE
REVIEW OF EPIC ENVIRONMENTAL (15/03/19) REVISED DRAFT DSI FOR MAINLINE TUNNELS ANCILLARY SITES (MUIRS SITE), WESTCONNEX STAGE 3A PROJECT

This letter provides the Lendlease Samsung Bouygues Joint Venture (LSB_JV) with interim advice as part of Statutory Site Audit No. 278 being undertaken by Dr Ian Swane, a NSW EPA Site Auditor accredited under the Contaminated Land Management (CLM) Act. The advice forms part of a statutory site audit for the WestConnex Stage 3A Project.

The purpose of this interim advice report is to provide a review of an amended draft version of the Epic Environmental (15/03/19) '*M4-M5 Link Main Tunnel Works – Phase 2 ESA*' report that was revised in response to review comments provided by the Site Auditor in Interim Advice Report #28 issued on 8/03/19.

This interim advice report is considered to be consistent with NSW EPA guidelines and policy and does not pre-empt conclusions to be drawn at the end of the site audit process. This interim advice does not represent a site audit statement (SAS) or a site audit report (SAR). It is intended that a SAS / SAR will be prepared for the Muirs site towards the end of the WestConnex Stage 3A Project.

The Site Auditor considers the revised draft version of the DSI for the Muirs site dated 15/03/19 is likely to have addressed all review comments made by the Site Auditor, to be consistent with NSW EPA guidance, and to be suitable for use by the WestConnex Stage 3A Project provided a final version of the report is provided to the Site Auditor that includes figures and laboratory data summary tables that include the additional information and made the corrections suggested in my 8/03/19 interim advice report.

Also, in future investigations note the comments made in my 8/03/19 interim advice report regarding the need for quality borelog preparation and the streamlining and better targeting of laboratory testing programs.

Yours sincerely

Ian C Swane

Dr Ian C Swane (CPEng & CEnvP)
EPA Site Auditor NSW, WA & NT
Director, Ian Swane & Associates
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Lendlease Samsung Bouygues Joint Venture
WestConnex M4-M5 Link Tunnels
Level 7, 189 O'Riordan Street
PO Box 63, MASCOT NSW 1460

Attention: [redacted] - Environmental Manager
(email: [redacted])

06/09/2019

SA278_190906_Interim advice#40
2018_WestConnexStage 3A

Dear [redacted]

INTERIM ADVICE #40 FOR STATUTORY SITE AUDIT No. 278 BY DR IAN SWANE
REVIEW OF EPIC ENVIRONMENTAL (13/05/19) FINAL DSI FOR MAINLINE TUNNELS ANCILLARY SITES (MUIRS SITE), WESTCONNEX STAGE 3A PROJECT (3 pages)

This letter provides the Lendlease Samsung Bouygues Joint Venture (LSB_JV) with interim advice as part of Statutory Site Audit No. 278 being undertaken by Dr Ian Swane, a NSW EPA Site Auditor accredited under the Contaminated Land Management (CLM) Act. The advice forms part of a statutory site audit for the WestConnex Stage 3A Project.

The purpose of this interim advice report is to provide a review of a final version of the Epic Environmental (13/05/19) '*M4-M5 Link Main Tunnel Works – Phase 2 ESA*' report that was revised in response to review comments provided by the Site Auditor in Interim Advice Reports #28 and #31 issued on 8/03/19 and 6/05/19, respectively.

This interim advice report is considered to be consistent with NSW EPA guidelines and policy and does not pre-empt conclusions to be drawn at the end of the site audit process. This interim advice does not represent a site audit statement (SAS) or a site audit report (SAR). It is intended that a SAS / SAR will be prepared for the Muirs site towards the end of the WestConnex Stage 3A Project.

The Site Auditor considers the final version of the DSI for the Muirs site dated 13/05/19 has addressed most of the review comments made by the Site Auditor in earlier interim advice reports. Some minor errors / data gaps remain, which are summarised in **Attachment A**. These minor errors / data gaps are not considered to affect the conclusions and recommendations made by the report and have been addressed by the site audit identifying them and considering them in the assessment of contamination risks. For these reasons, a revised final version of the DSI is not considered necessary.

The Site Auditor therefore considers the final version of the DSI Muirs report dated 13/05/19 to be substantially consistent with NSW EPA guidance and suitable for use by the WestConnex Stage 3A Project.

Yours sincerely

Ian C Swane

Dr Ian C Swane (CPEng & CEnvP)
EPA Site Auditor NSW, WA & NT
Director, Ian Swane & Associates
Phone: 0418 867 112
Email: iswane@bigpond.com

IAN SWANE & ASSOCIATES P/L

ATTACHMENT A

ERRORS / DATA GAPS IN EPIC (13/05/19) DSI FOR M4-M5 LINK MAIN TUNNEL WORKS

1. Cover page: The incorrect report date was used.
2. Section 9.3: At the end of the section a reference was made to a comment on waste classification but no comments were provided.
3. Section 8: Site-specific background levels for metals in soils were not derived.
4. Figures:
   a) Figure F7: The fill thickness at BH18 should be 1.1m based in the borehole log data; and
   b) Figure F8: Boreholes BH6, BH14, BH15, BH30 – BH32, BH34 - BH365 should be labelled in the figure as not having been any soil samples tested at these locations for petroleum hydrocarbons (TRH and BTEX).
5. Tables:
   a) Table T1 & T2: Background levels for heavy metals need to be specified based on the results of a site-specific assessment. The concentrations specified for copper (280mg/kg), nickel (290 mg/kg) and zinc (620mg/kg) were not justified and exceed background values based on site data;
   b) Tables T1 T2, T4: The lab test results for samples Drum#01 to Drum#04 were not included (TRH / BTEX non-detect, total PAHs & BaP non-detect to low, heavy metals low);
   c) Tables T1 & T3: Sample C1b-BH02 3.0m is shale;
   d) Tables T1 & T3: Sample C1b-BH09 1.0m is fill;
   e) Table T2: Sample C3b-BH21 3.0m is soil;
   f) Table T3: Samples C1b-BH16 0.2m and 0.5m benzene, toluene & ethylbenzene = non-detect; sample C1b-QC01 C6-C10 = <25 mg/kg; sample C1b-QC03 C6-C10 = <25 mg/kg;
   g) Table T3: Sample C1b-BH18 1.0m benzene, toluene & ethylbenzene = non-detect;
   h) Table T3: Sample C1b-BH19 VOCs/VHCs = non-detect;
   i) Table T4: Sample C1b-BH21 3.0 is soil;
   j) Table T4: Sample C3b-BH25 0.5m = fill;
   k) Table T4: Samples C3b-BH24 1.6m, C3b-BH25 1.7m, C3b-BH26 1.8m, C3b-BH27 2.0m, C3b-BH28 1.8m, C3b-BH29 all measured non-detectible concentrations of benzene, toluene and ethylbenzene;
   l) Table T4: Sample C3b-BH33 0.2m measured non-detectible concentrations of benzene, toluene & ethylbenzene;
   m) Table T6, GME 2 – 19 & 20 November 2018: Sample C1b-GW07 measured Ca^{2+} at 19 mg/L;
   n) Table T6, GME 1 – 13 & 14 August 2018: Samples C1b-GW01 and C1b-GW08 measured non-detectible concentrations of C6-C10 minus BTEX and >C10-C16 minus naphthalene;
   o) Table T6, GME 1 – 13 & 14 August 2018: Samples C1b-GW01 and C1b-GW08 were not tested for BaP and total PAHs;
   p) Table T6: The NHMRC (2018) criteria for 2,4,6-trichlorophenol is 20 / 2 µg/L and for copper is 2 / 1 µg/L; and

q) Table T7: The PFAS NEMP 95% interim marine criteria for PFOS is 0.13 µg/L.

6. Appendix D: The following errors in the borehole logs remained:

a) BH12: Include a comment that ACM was observed in sample BH12-0.2 (as mentioned in Section 9.1.1); and

b) BH17: The soil layer between 0.3 and 1.3m should be labelled as fill, as shown on Epic Figure F7.

iswane@bigpond.com

From: iswane@bigpond.com
Sent: Wednesday, 26 October 2022 9:33 PM
To: [redacted]
Cc:
Subject: Interim audit advice for PREW Worksite - WestConnex Stage 3A Site Audit (SA278)

[redacted]

I have been reviewing the documentation ASBJV sent me on 7/10/21 and updating my SAR for the PREW site. Please provide me with additional data that addresses the following data gaps:

1. **Additional Investigations:**
    a) Sections 9.3 and 10 in the Epic (March 2019) DSI advised that there was potential for fill material at the site to contain bonded asbestos fragments that could not easily be detected by borehole investigations. It was not practical for test pits to be excavated for the DSI due to access restrictions posed by buildings and pavements that cover practically the whole site. The potential for bonded asbestos fragments to be present in fill at the site needed to be assessed following the demolition and removal of buildings and pavement and will involve a grid-based survey conducted in accordance with the NEPM (2013) Schedule B2 guidelines and possibly test pitting, if considered to be warranted. Provide a report prepared in accordance with EPA guidance that assessed the risk of asbestos contaminated soils remaining at the Site.
    b) Section 10.2 in the Epic (March 2019) DSI advised that ACM was observed in the garden bed along the western boundary of C1b, adjacent to the workshop area at 0.2 mbgl. It was recommended that this area of the site be inspected by a licensed asbestos contractor, and visible asbestos material be removed from the ground surface (if present). If excavation was proposed in this portion of the site, further delineation of asbestos impacts needed to be undertaken, and any ground disturbance activities needed to be managed in accordance with the Work Health and Safety Act 2011 and the ASBJV Unexpected Finds Protocol for the project. Provide information on this work.
    c) Section 10.2 in the Epic (March 2019) DSI advised that site capping in the central workshop area should be maintained based on reported concentrations of TRH exceeding the management limits. If excavation was proposed in this portion of the site, further delineation of impacts should be undertaken to determine remediation and/or management requirements. Provide information on the whether site capping was maintained vin this area, and if excavation work did occur, what additional investigations were undertaken.
2. **Demolition and Waste Disposal**: Provide information on:
    a) The period when the demolition of above ground structures occurred at the Site.
    b) Copies of tip dockets for the asbestos waste that was removed by the demolition contractor and disposed off-site.
    c) A plan showing the locations where the demolition work removed building / concrete pavements and exposed the underlying soils. Explain whether the exposed soils were inspected and whether they were capped with concrete/asphalt pavement.
3. **Removal of Buried Services**: Sections 9.3 and 10 in the Epic (March 2019) DSI recommended that ASBJV should review and assess all necessary data regarding the location and type of buried services across the site. Provide information on:
    a) The buried services that were present at the Site and which of these services had the potential to contain asbestos or other hazardous materials.
    b) The removal of any buried services that occurred at the Site and whether they contained asbestos or hazardous materials.
4. **Removal and Remediation of USTs and Associated Equipment**: Sections 9.3 and 10 in the Epic (March 2019) DSI recommended that ASBJV should have the nature and type of USTs present on the site investigated prior to the commencement of bulk earthworks at the site. Any liquid remining in the USTs

should be removed by a licensed liquid removal contractor and the USTs removed from the site in accordance with the requirements of AS4976-2008. Provide information on:

a) The location, size and condition of USTs removed from the PREW worksite. Confirm that all USTs identified by the Epic (March 2019) DSI were removed and provide information on any other USTs that were removed.
b) A copy of ASBJV site diary entries for all days that USTs were removed from the PREW worksite (only a site diary entry has been provided for 9/05/19).
c) A copy of liquid waste disposal certificates for liquid waste removed from the USTs. Section 10 of the Epic (March 2019) DSI advised that the USTs contained petroleum product
d) Copies of tank destruction certificates for all USTs that were removed from the PREW worksite (a certificate has only been provided for a tank removed on 14/03/19)
e) Explain why no validation samples were taken of the soils that remained in the UST excavation pits given that some of the waste classification reports indicate that some of the soils disposed off-site measured contaminant concentrations exceeding commercial/industrial D criteria.
f) Assess the risks posed by contaminated soils remaining on-site that exceed the commercial/industrial SILs.

5. **Additional Soil Vapour Investigation**: Section 10 of the Epic (March 2019) DSI advised that localised areas of soil vapour risk were likely to be present in the vicinity of USTs and associated petroleum infrastructure, which will require further assessment by ASBJV at the time the infrastructure is removed. If significant volatile petroleum hydrocarbons impacts were identified at the site, the NEPM soil vapour criteria may not be sufficiently protective of workers engaged in hard rock drilling or excavation works due to the potential for such work to generate higher vapour levels that normally exist in ambient subsurface conditions. In these circumstances the risks posed by such work would need to be further investigated and assessed by ASBJV. Provide a report prepared in accordance with EPA guidance that further assessed soil vapour risks that remained in the UST areas following UST removal.
6. **Other site works**: Provide information on:
    a) Any other excavations that occurred at the Site.
    b) Stockpiling of excavated material.
    c) Environmental control measures installed at the Site (e.g. wheel wash / truck grid, dust suppression, surface water controls, odour controls)
7. **Imported Fill**: Provide information on:
    a) The types and quantities of fill imported to the Site and what the fill was used for (e.g. backfill UST pits / buried pipelines).
    b) The waste classifications for these materials.
    c) The suppliers of imported fill and when the materials were supplied.
8. **Construction activities at Site**: Provide information on:
    a) The construction activities that occurred at the Site and whether these activities included the storage / use of chemicals.
    b) Assess the potential for these construction activities to have contaminated the site.
    c) Advise whether any environmental incidents occurred at the PREW site during the construction period (e.g. fuel/chemical spills/leaks, community complaints).
9. **Final site conditions:** Section 10.2 of the Epic (March 2019) DSI advised that existing site capping and surface coverings should be retained across the site. If existing capping/coverings were required to be removed, they should be replaced with suitable capping to minimise access to underlying fill and contaminated soils, if further disturbance by construction work was required further investigations and assessment should be completed by ASBJV. Provide information on:
    a) The final site conditions.
    b) Provide details on the nature, thickness and extent of soil capping that remains at the site in the form of concrete/asphalt pavements, compacted soils, etc.
    c) Provide a plan showing the location and extent of the different types of pavements at the site, building footprints, retaining walls and any areas where soils are exposed.

Please advise me when ASBJV expects to provide me with the requested information so I can plan the updating of the draft SAR / SAS.

Many thanks

Ian

Dr Ian C Swane (CPEng, CEnvP)
EPA Site Auditor
Ian Swane & Associates (mob: 0418 867 112)

Appendix D. Site Auditor Photographs

Site Inspection 2 June 2021

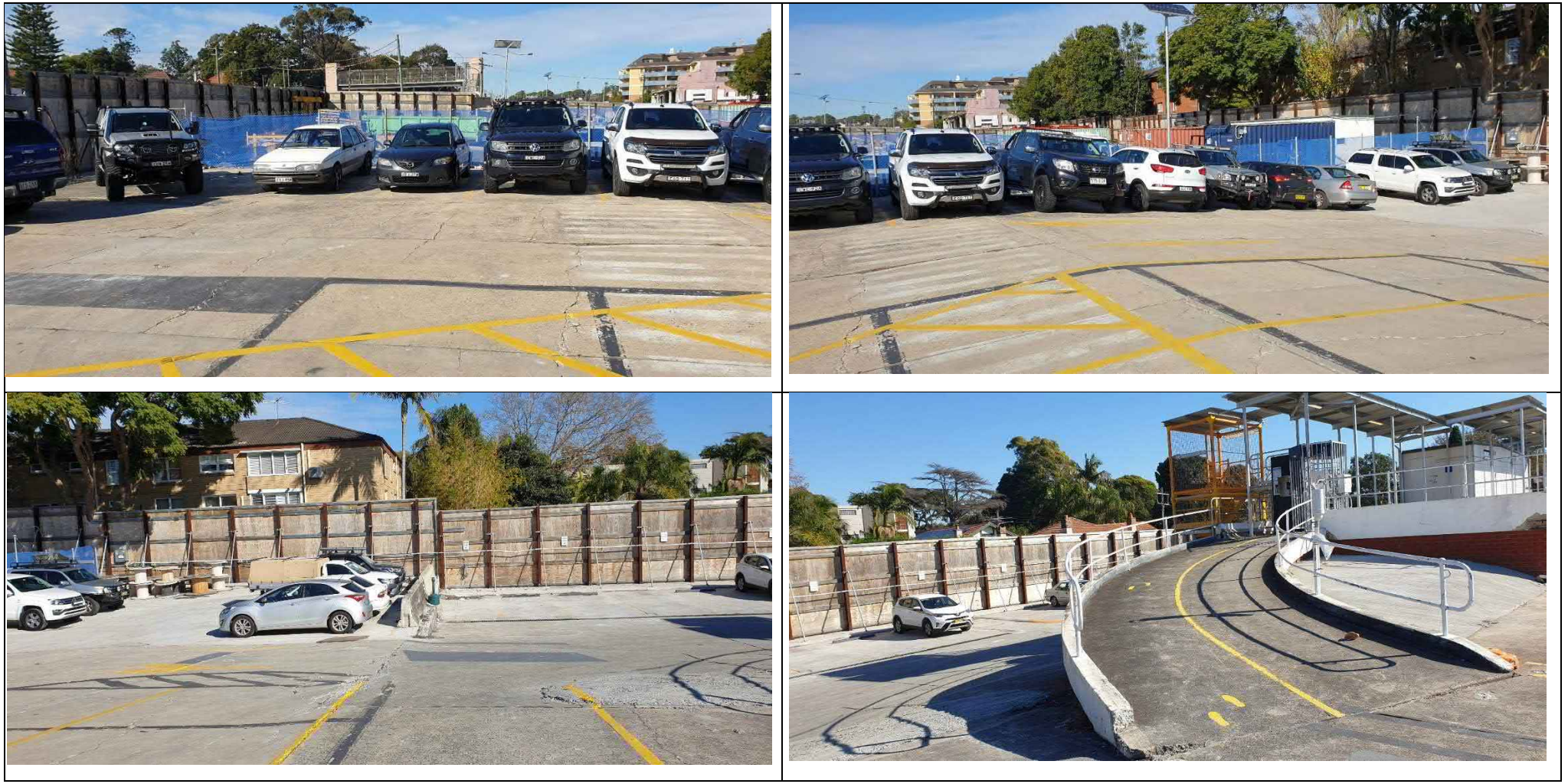

Photo 1: Northern end of C1b (western) area panorama looking south to north

Photo 1 (cont'd): Northern end of C1b (western) area panorama looking south to north showing car parking

Photo 2: UST fill point remaining in C1b (western) area

Photo 3: Southern end of C1b (western) area looking south to north showing car parking and material laydown area

Photo 4: View of C1b (western) area along Parramatta Road

Photo 5: C3b (eastern) area car parking

Site Inspection 4 November 2022

Photo 6: C1b (western) area showing area cleared of most materials and concrete pavement

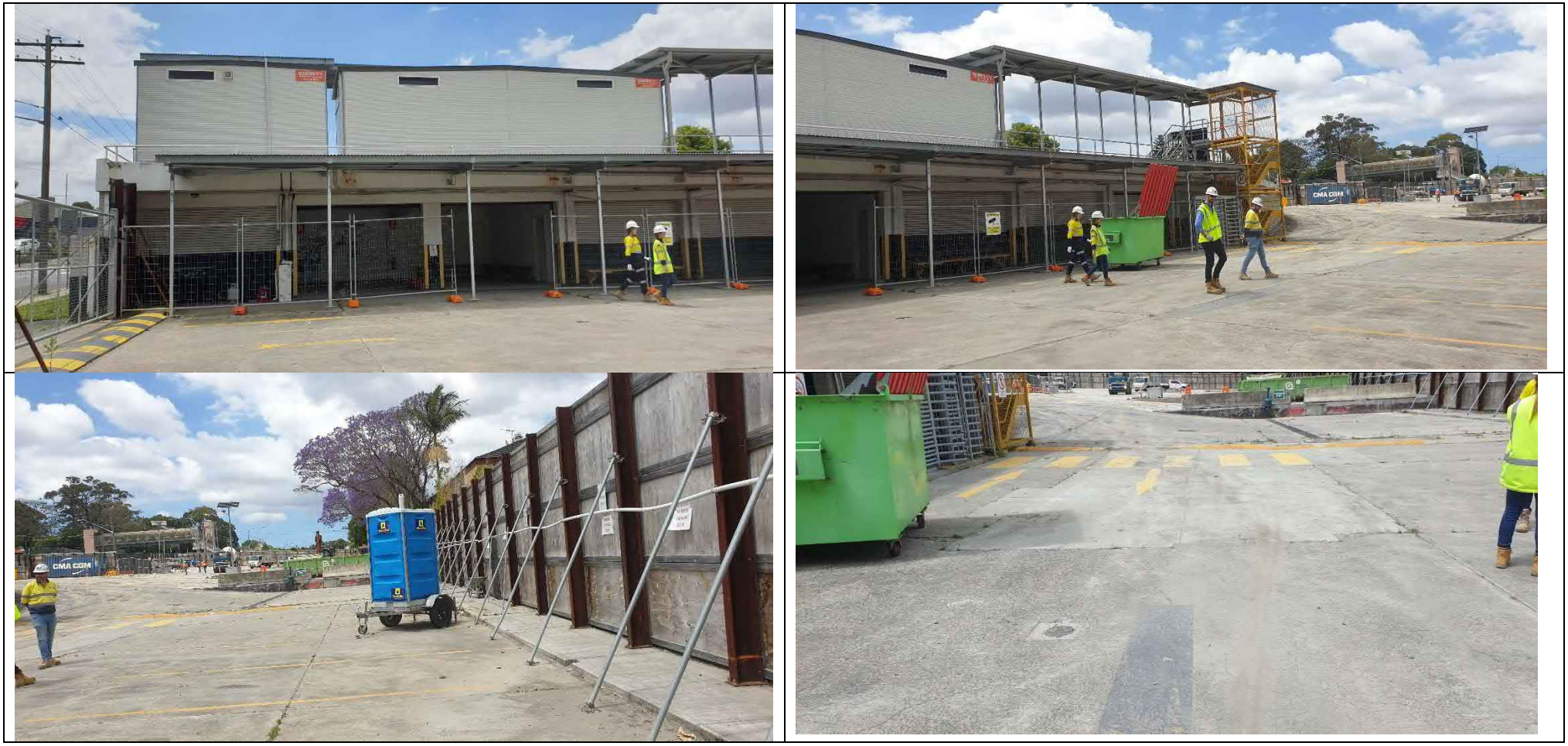

Photo 7: C1b (western) area showing former mechanical workshop that needed to be demolished & former UST area

Photo 8: View down Parramatta Road looking east showing C1b (western) and C3b (eastern) areas

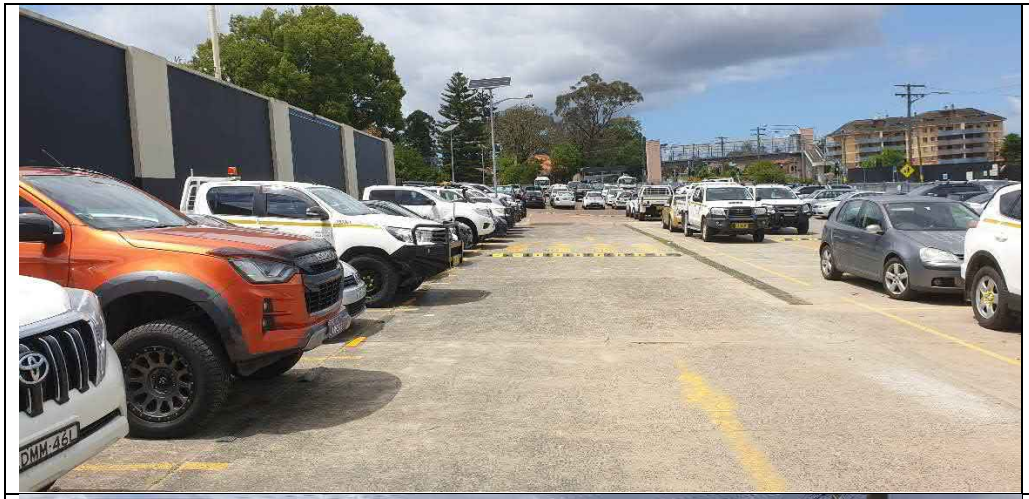

Photo 9: View of C3b (eastern) area showing car parking

Appendix E. Site Audit Statement and Interim Plan

NSW Site Auditor Scheme

Site Audit Statement

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

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

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

Part I: Site audit identification

Site audit statement no. **278_PREW**

This site audit is a:

☑ **statutory audit**

❑ ~~non-statutory audit~~

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

Site auditor details

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

Name	**Dr Ian C Swane**		
Company	**Ian Swane & Associates**		
Address	**PO Box 359, Mortdale NSW**	Postcode	**2223**
Phone	**0418 867 112**		
Email	**iswane@bigpond.com**		

Site details

Address **PREW worksite that was part of the WestConnex Stage 3A Project undertaken by the Acciona Samsung Bouygues Joint Venture (refer Figures 1 & 2). The compound consisted of two areas labelled C1b and C3b:**

- **Area C1b: 244 - 296 Parramatta Road, Ashfield (western side)**
- **Area C3b: 132A & 134 Bland Street; 197, 197A, 199 & 205 Parramatta Road, Ashfield (eastern side)** Postcode **2131**

Property description

(Attach a separate list if several properties are included in the site audit.) - **Refer Figure 3**

Area C1b: Lots 21 – 23 in DP1220552, Lots 10 – 14, 16 – 20 in DP1221218, Lot 1 in DP121314, Lots A - C in DP337062

Area C3b: Lots 50 & 52 in DP1220795, Lot 1 in DP171194, Lots 26 & 27 in DP4568, Lot 1 in DP900930, Lots 128 – 130 in DP131525, Lot 1 in DP944017

Local government area **Inner West Council**

Area of site (include units, e.g. hectares) **Total area 14,100 m^2 (1.41 ha) comprising: C1b 7,550 m^2 (0.775 ha); C3b 6,550 m^2 (0.655 ha)**

Current zoning **B6 – Enterprise Corridor**

Regulation and notification

To the best of my knowledge:

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

~~❑ Declaration no.~~

~~❑ Order no.~~

~~❑ Proposal no.~~

~~❑ Notice no.~~

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

To the best of my knowledge:

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

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

Site audit commissioned by

Name [redacted] **Environment & Sustainability Manager**

Company **Acciona Samsung Bouygues Joint Venture (ASBJV) formerly Lendlease Samsung Bouygues Joint Venture**

Address **185 O'Riordan Street, Mascot NSW**

Postcode **2020**

Phone [redacted]

Email [redacted]

Contact details for contact person (if different from above)

Name [redacted]

Phone [redacted]

Email [redacted]

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

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

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

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

Department of Planning and Environment (17 April 2018) "*Infrastructure Approval, Section 5.19 of the Environmental Planning & Assessment Act 1979, Application No: SSI 7485, Conditions of Approval for WestConnex M4-M5 Link SSI 7485*". 76 pages

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

NSW EPA (9 October 2018) "*Environmental Protection Licence Number 21149*". 30 pages (Ref [52])

Purpose of site audit

❑ ~~**A1** To determine land use suitability~~

~~Intended uses of the land:~~

~~OR~~

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

~~Intended uses of the land:~~

~~OR~~

(Tick all that apply)

❑ ~~B1 To determine the nature and extent of contamination~~

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

~~❑ an investigation plan~~

~~❑ a remediation plan~~

☑ **a management plan**

- ❑ ~~**B3** To determine the appropriateness of a **site testing plan** to determine if groundwater is safe and suitable for its intended use as required by the *Temporary Water Restrictions Order for the Botany Sands Groundwater Resource 2017*~~
- ❑ ~~**B4** To determine the compliance with an approved:~~
  - ~~❑ **voluntary management proposal** or~~
  - ~~❑ **management order** under the *Contaminated Land Management Act 1997*~~
- ☑ **B5 To determine if the land can be made suitable for a particular use (or uses) if the site is ~~remediated or~~ managed in accordance with a specified plan.**

  Intended uses of the land: Road construction worksite at the end of construction and prior to landscaping by Transport for NSW (TfNSW)

Information sources for site audit

Consultancies which conducted the site investigations and/or remediation:

Epic Environmental

Titles of reports reviewed:

1. Transport for NSW (August 2017) "*M4-M5 Link Environmental Impact Statement, WestConnex*"
2. Epic Environmental (15 August 2018) "*Phase 1 and Sampling and Analysis Plan – Ancillary Site C1b and C3b*". Document No: SY180065.04_rpt_LSBV_Muirs_14Aug18 _Rev04 prepared for LSBJV
3. Epic Environmental (15 March 2019) "*M4-M5 Link Main Tunnel Works – Phase 2 ESA, Muirs (C1b & C3b)".* Document No: SY180065.04_rpt_LSBV_Muirs(C1bC3b) prepared for LSBJV
4. ASBJV (7 October 2021) Email providing additional data on contamination management during construction
5. ASBJV (7 November 2022) Email providing additional data on contamination management during construction

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

50. Department of Planning and Environment (17 April 2018) "*Infrastructure Approval, Section 5.19 of the Environmental Planning & Assessment Act 1979, Application No: SSI 7485, Conditions of Approval for WestConnex M4-M5 Link SSI 7485*". 76 pages
51. Not used
52. NSW EPA (9 October 2018) '*Environmental Protection Licence Number 21149, WestConnex Stage 3A – M4-M5 Mainline Tunnels, WestConnex between M4 East at Haberfield and the New M5 at St Peters, Marrickville NSW 2204'*. 30 pages
53. LSBJV (10 October 2018) "*Site Establishment Management Plan, M4-M5 Link Mainline Tunnels*". Document No: M4M5-LSBJ-PRW-EN-MP01-PLN-0018-07

54. LSBJV (23 October 2018) "*Appendix B, Contaminated Land Management Sub-plan, M4-M5 Link Mainline Tunnels*". Document No: M4M5-LSBJ-PRW-EN-MP01-PLN-0021-01 Rev01

55. LSBJV (23 October 2018) "*Unexpected Contaminated Land and Asbestos Finds Procedure, M4-M5 Link Mainline Tunnels*". Appendix A of Ref [54]

56. LSBJV (31 October 2018) "*Parramatta Road East and West Civil Sites Waste Management Plan, M4-M5 Link Mainline Tunnels*". Document No: M4M5-LSBJ-MUI-EN-MP01-PLN-0002-A

57. LSBJV (17 April 2020) "*Appendix B5, Soil and Surface Water Management Sub-plan, M4-M5 Link Mainline Tunnels*". Document No: M4M5-LSBJ-PRW-EN-MP01-PLN-0005-09 Rev09

58. LSBJV (22 June 2020) "*Appendix B9, Waste Management Sub-plan, M4-M5 Link Mainline Tunnels"*. Document No: M4M5-LSBJ-PRW-EN-MP01-PLN-0009-07 Rev08

59. LSBJV (16 January 2019) "*Construction Work Method Statement, Demolition Works – Haberfield*". Document No: M4M5-LSBJ-MUI-CR-GE01-CWM-0001 Rev01

60. Safe Work & Environments (24 August 2019a) "*Hazardous Materials Survey & Management Plan, 132-134 Bland Street, Ashfield, NSW 2131; 197-199 Parramatta Road, Ashfield, NSW 2131; 201-205 Parramatta Road, Haberfield, NSW 2045*". Document No: S107408.2 provided for LSBJV

61. Safe Work & Environments (24 August 2019b) "*Hazardous Materials Survey & Management Plan, 244-246, 266 & 296 Parramatta Road, Ashfield, NSW 2131*". Document No: S107408.1 provided for LSBJV

62. JM Environments (10 January 2019) "*248 – 250 Parramatta Road Ashfield, Hazardous Building Material Survey*". Document No: JME18057-19 provided for LSBJV

63. LSBJV (16 January 2019) "*Construction Work Method Statement, Demolition Works - Haberfield*". Document No: M4M5-LSBJ-MUI-CR-GE01-CWM-0001 Rev01

Site audit report details

Title **Site Audit Report, Site Audit 278_PREW by Dr Ian Swane, WestConnex Stage 3A PREW Worksite (Areas C1b & C3b), Parramatta Road, Ashfield**

Report no**. 278_PREW** Date **22 November 2022**

Part II: Auditor's findings

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

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

~~Section A1~~

~~I certify that, in my opinion:~~

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

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

- ❑ ~~Residential, including substantial vegetable garden and poultry~~
- ❑ ~~Residential, including substantial vegetable garden, excluding poultry~~
- ❑ ~~Residential with accessible soil, including garden (minimal home-grown produce contributing less than 10% fruit and vegetable intake), excluding poultry~~
- ❑ ~~Day care centre, preschool, primary school~~
- ❑ ~~Residential with minimal opportunity for soil access, including units~~
- ❑ ~~Secondary school~~
- ❑ ~~Park, recreational open space, playing field~~
- ❑ ~~Commercial/industrial~~
- ❑ ~~Other (please specify):~~

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

OR

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

Overall comments:

Section A2

I certify that, in my opinion:

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

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

❑ Residential, including substantial vegetable garden and poultry

❑ Residential, including substantial vegetable garden, excluding poultry

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

❑ Day care centre, preschool, primary school

❑ Residential with minimal opportunity for soil access, including units

❑ Secondary school

❑ Park, recreational open space, playing field

❑ Commercial/industrial

❑ Other (please specify):

EMP details

Title

Author

Date No. of pages

EMP summary

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

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

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

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

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

~~Purpose of the EMP:~~

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

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

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

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

~~Overall comments:~~

Section B

Purpose of the plan[4] which is the subject of this audit:

To outline the additional work needing to be completed to allow a Section A2 site audit statement to be issued.

I certify that, in my opinion:

~~(B1)~~

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

~~AND/OR (B2)~~

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

~~AND/OR (B3)~~

- ❑ ~~The site testing plan:~~
  - ~~❑ **is** appropriate to determine~~
  - ~~❑ **is not** appropriate to determine~~

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

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

~~AND/OR (B4)~~

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

~~❑ **have** been complied with~~

~~❑ **have not** been complied with.~~

~~*voluntary management proposal no.~~

~~**management order no.~~

AND~~/OR (B5)~~

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

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

~~❑ Residential, including substantial vegetable garden and poultry~~

~~❑ Residential, including substantial vegetable garden, excluding poultry~~

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

~~❑ Day care centre, preschool, primary school~~

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

~~❑ Secondary school~~

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

~~❑ Commercial/industrial~~

☑ **Other (please specify): Road construction worksite at the end of construction period and prior to landscaping by TfNSW as approved by Department of Planning and Environment (17 April 2018) "*Infrastructure Approval, Section 5.19 of the Environmental Planning & Assessment Act 1979, Application No: SSI 7485, Conditions of Approval for WestConnex M4-M5 Link SSI 7485*" (Ref [50])**

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

*Strike out as appropriate

Plan title	**Interim Management Plan for Contamination at the PREW Worksite, WestConnex Stage 3 Project**
Plan author	**ASBJV**
Plan date	**22 November 2022** No. of pages **1**

SUBJECT to compliance with the following condition(s):

1. **The long-term environmental management plan (LTEMP) is prepared by a suitably qualified and experienced environmental consultant in accordance with EPA guidance.**

2. **The LTEMP is to manage the residual contamination risks that remain at the PREW site, as described in the site audit report.**
3. **ASBJV is to provide further information showing that petroleum contaminated soil removed from UST excavation pits was disposed to a suitably licensed waste facility.**
4. **ASBJV is to provide the Site Auditor with additional data demonstrating that the minor works had been completed and the final condition of the PREW site has been achieved.**
5. **Following completion of the minor work and after a written approval of the LTEMP has been issued by the Site Auditor and TfNSW, a Section A2 site audit statement is to be prepared and issued.**

Overall comments:

1. **The site auditor reviewed site environmental management plans that dealt with contamination at the PREW site and considered the plans met Condition C22 of the Planning Consent sufficient for the purpose of this site audit.**
2. **The site auditor reviewed contamination assessments for the PREW site and considered they met Condition E181 of the Planning Consent sufficient for the purpose of this site audit.**
3. **The site auditor reviewed reports on the management of contamination at the PREW site throughout the period construction activities occurred and considered that:**
   a) **No additional contamination was generated by the construction work;**
   b) **The land was maintained in a condition suitable for a road construction worksite and compliance was achieved with Conditions E182 to E185 of the Planning Consent sufficient for the purpose of this site audit;**
   c) **Waste generated by construction activities at the PREW site was likely to have been managed in general accordance with NSW EPA guidance and Conditions E202 to E204 of the Planning Consent sufficient for the purpose of this site audit; and**
   d) **The requirements of Conditions O5.10 and O5.11 of EPL 21149 were met sufficient for the purpose of this site audit.**

Part III: Auditor's declaration

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

Accreditation no. **9821**

I certify that:

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

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

Signed

Date **22 November 2022**

Part IV: Explanatory notes

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

How to complete this form

Part I

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

Part II

Part II contains the auditor's opinion of the suitability of the site for specified uses or of the appropriateness of an investigation, or remediation plan or management plan which may

enable a particular use. It sets out succinct and definitive information to assist decision-making about the use or uses of the site or a plan or proposal to manage or remediate the site.

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

Section A1

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

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

Section A2

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

Environmental management plan

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

By certifying that the site is suitable subject to implementation of an EMP, an auditor declares that, at the time of completion of the site audit, there was sufficient information satisfying guidelines made or approved under the *Contaminated Land Management Act 1997* (CLM Act) to determine that implementation of the EMP was feasible and would enable the specified use(s) of the site and no further investigation or remediation of the site was needed to render the site fit for the specified use(s).

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

Active or passive control systems

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

unacceptable risk may occur. Passive management systems usually require minimal management and maintenance and do not usually incorporate mechanical components.

Auditor's comments

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

Section B

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

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

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

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

Part III

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

Where to send completed forms

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

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

  AND

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

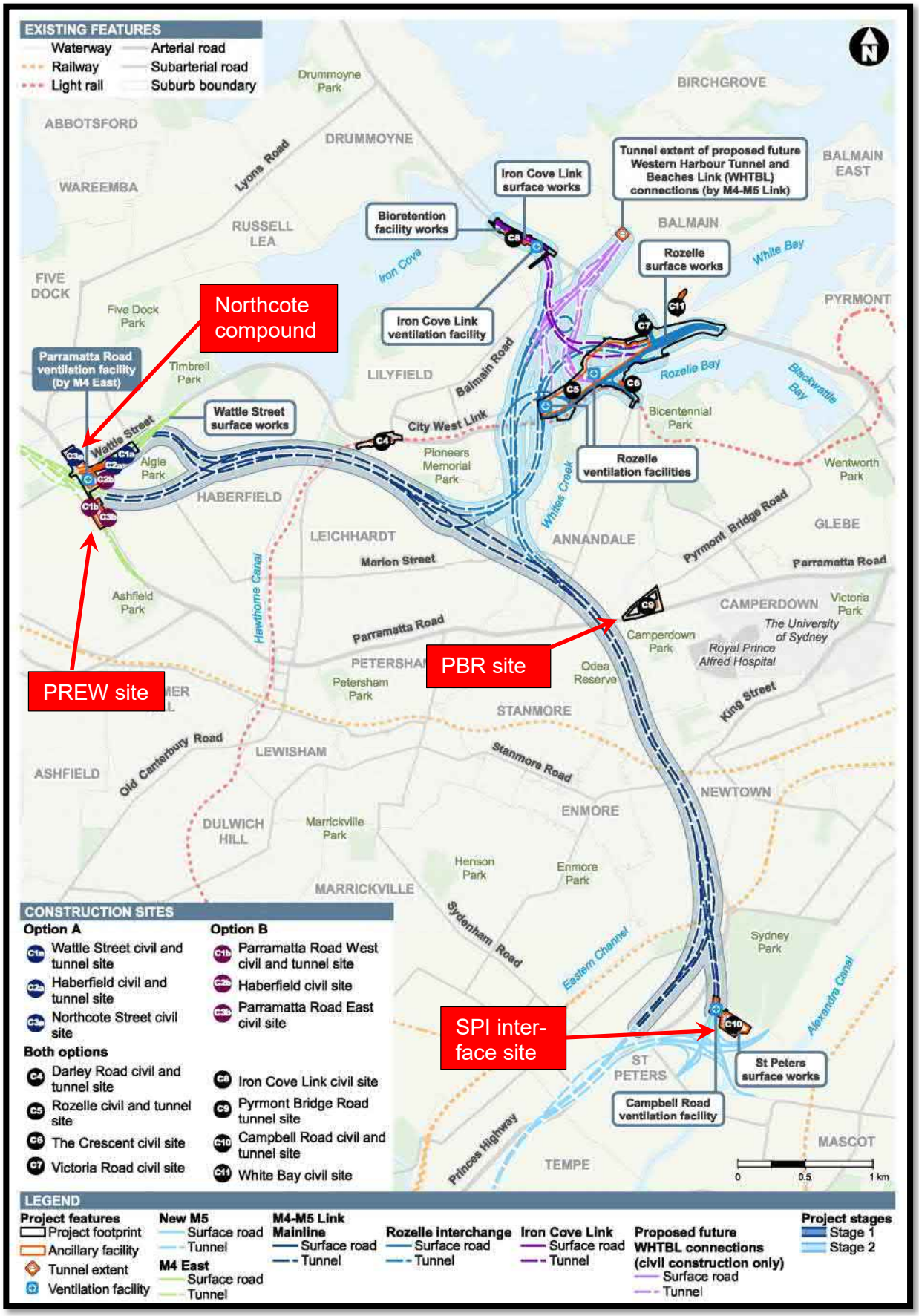

Figure 1 Overview of Project Footprint and Construction Ancillary Facilities (Source: Ref [50])

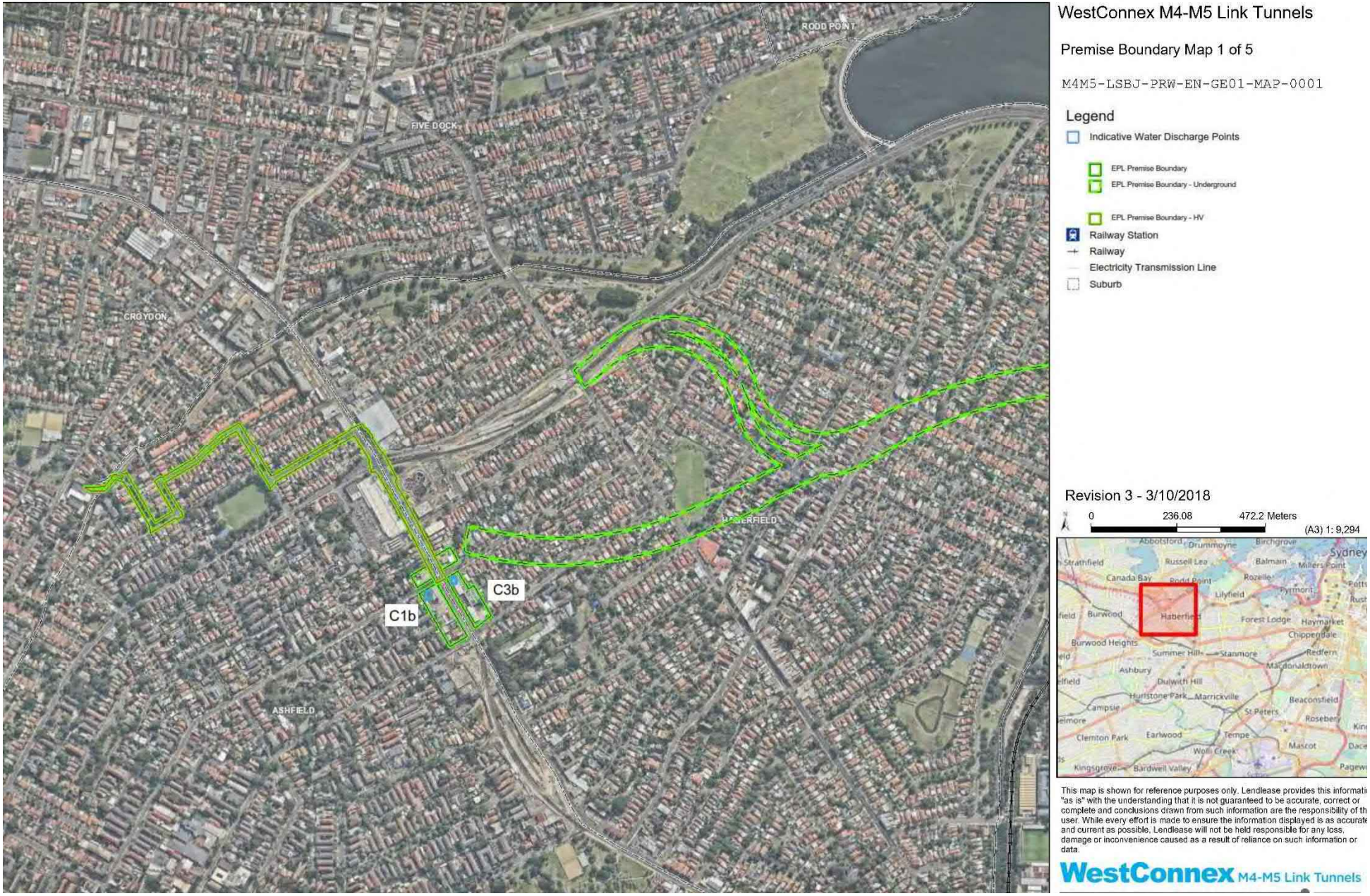

Figure 2 Location Plan for PREW Worksite Areas C1b and C3b (Source: Map 1, Ref [52])

Figure 3 Six Maps 2018 Subdivision Plan for PREW Worksite Areas C1b and C3b

Interim Management Plan for Contamination at the PREW Worksite, WestConnex Stage 3 Project

The Purpose of this Interim Management Plan is to outline the additional work that needs to be completed at PREW to allow a Section A2 Site Audit Statement (SAS) to be issued. This additional work consists of two parts.

Part 1: Long-term Environmental Management Plan (LTEMP)

An LTEMP is currently being prepared by a suitably qualified and experienced environmental consultant in accordance with EPA guidance; this will facilitate the management of any residual contamination risks that remain at the PREW site, as described in the site audit report, associated with the below items:

- Unknown bonded asbestos contamination remaining in fill;
- TRH contamination remaining at former UST areas;
- Unknown USTs remaining at the Site;
- Former pit locations at mechanical workshops and washdown areas; and
- Buried services.

Part 2: Remaining minor works

Prior to formal handover of the PREW site there are several minor works that need to be completed to reach the final condition required under the contract. Activities are described below with the risk of contamination to be managed in accordance with the existing environmental management plan.

Demolition and removal of garages in Area C1b (former transfer facility)

This work is planned to occur over the last four weeks of 2022 and be completed by the first quarter of 2023. It will start with the removal of an asbestos containing asphalt layer prior to the removal of the garage bays. Depending on the condition of the retaining wall assessed following garage removal, it may be left in place or removed and replaced with a concrete capped batter.

Reinstatement of damaged concrete hardstand areas (Area C3b)

Concrete repairs in Area C1b on the Ashfield side of Parramatta Road have already been completed with similar repairs to be undertaken in Area C3b on the Haberfield side by Q1 2023. This will involve saw cutting, removing small sections of concrete with minimal exposure and disturbance of the underlying ground followed by the immediate placement of reinforcement and concrete capping.

Perimeter Hoarding and Fencing Repairs (no impact on contamination)

Support bracing to perimeter hoarding that has been damaged over the last 4 years will be replaced. Several sections of hoarding will also be repainted, and signage removed from the outside surfaces.

Removal of Safety and Environment Controls (no impact on contamination)

Speed humps, geofabric, bollards and signage will continue be removed throughout December.

Demolition of Community Information Centre (CIC) in Area C3b

The CIC and adjacent workshop in Area C3b will be kept following the completion of construction for use throughout the 24-month defect liability period. Following this both buildings will be demolished and a hardstand for suitable site use returned to the client. Existing management documents such as the CEMP, HazMat surveys, PCLCA, will be retained for reference during demolition.