# St George Community Housing

# Remedial Action Plan

9-11 Gibbons Street
Redfern NSW

14 December 2018

54877/116,840 (Rev 2)

JBS&G

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## Abbreviations

| Term | Definition |
|---|---|
| ACM | Asbestos Containing Material |
| AHD | Australian Height Datum |
| ASS | Acid Sulfate Soils |
| AF/FA | Asbestos Fines / Fibrous Asbestos |
| BF | Building Footprint |
| bgs | Below Ground Surface |
| BTEX | Benzene, Toluene, Ethylbenzene, Xylenes |
| CEC | Cation Exchange Capacity |
| COC | Chain of Custody |
| COPC | Contaminants of Potential Concern |
| CSM | Conceptual Site Model |
| DA | Development Application |
| DEC | Department of Environment and Conservation |
| DOH | Department of Health |
| DP | Deposited Plan |
| DPI | Department of Primary Industry |
| DQI | Data Quality Indicator |
| DQO | Data Quality Objective |
| EC | Electrical Conductivity |
| EIL | Ecological Investigation Levels |
| ENM | Excavated Natural Material |
| EPA | NSW Environmental Protection Authority |
| ESA | Environmental Site Assessment |
| ESL | Ecological Screening Levels |
| HIL | Health Investigation Levels |
| HSL | Health Screening Levels |
| JBS&G | JBS&G Australia Pty Ltd |
| LEP | Local Environmental Plan |
| LOR | Limit of Reporting |
| NATA | National Association of Testing Authorities |
| NEPC | National Environmental Protection Council |
| NEPM | National Environmental Protection Measure |
| OCP | Organochlorine Pesticides |
| OEH | Office of Environment and Heritage |
| PASS | Potential Acid Sulfate Soils |
| PAH | Polycyclic Aromatic Hydrocarbons |
| PARCCS | Precision, Accuracy, Representativeness, Comparability, Completeness and Sensitivity |
| PCB | Polychlorinated Biphenyls |
| pH | Potential of Hydrogen |
| PID | Photo-ionisation Detector |
| ppm | Parts Per Million |
| QA/QC | Quality Assurance / Quality Control |
| RAP | Remedial Action Plan |
| RL | Relative Level |
| RPD | Relative Percent Difference |
| SPOCAS | Suspension Peroxide Oxidation Combined Acidity and Sulfur |
| TCLP | Toxicity Characteristic Leaching Procedure |
| TPH | Total Petroleum Hydrocarbons |
| TRH | Total Recoverable Hydrocarbons |
| UCL | Upper Confidence Limit |
| VENM | Virgin Excavated Natural Material |
| WA | Western Australia |

# 1. Introduction

## 1.1 Background

JBS&G Australia Pty Ltd (JBS&G) was engaged by St George Community Housing Ltd (SGCH, the client) to prepare a Remedial Action Plan (RAP) for 9-11 Gibbons Street, Redfern NSW (the site). The site is legally identified as Lots 1 – 11 in Deposited Plan (DP) 4209 and occupies an area of approximately 1580 $m^2$. The site location and layout are shown on **Figures 1** and **2**, respectively.

The site has historically been used for commercial/industrial purposes including a storage depot by the City of Sydney Council (CoS) and is currently occupied by two commercial/workshop buildings and asphalt/concrete surfaced areas. It is understood that the site is proposed for redevelopment for community housing purposes.

As part of the proposed redevelopment, the site has been subject to a preliminary site investigation (PSI), a hazardous material survey (HMS) and a data gap assessment as documented in CES (2018[1]), Greencap (2018[2]) and JBS&G (2018[3]), respectively.

The previous investigations have identified site contamination issues associated with the presence of potential fuel infrastructure in the northern portion of the site and fill material as variously impacted with heavy metals, PAHs and TRH that will require remediation/management such that the site can be considered suitable of the proposed residential with minimal soil access land use scenario.

This RAP was developed in accordance with guidelines made or approved by the NSW Environment Protection Authority (EPA) and relevant Australian Standards.

## 1.2 Objectives

The objective of this RAP is to document the procedures and standards to be followed in order to address the contamination impacts at the site, ensuring the protection of human health and the surrounding environment, such that the impact is remediated/managed in a manner as to make the site suitable for the proposed land uses.

1 Preliminary Site Investigation Report, 9-11 Gibbons Street, Redfern NSW, Consulting Earth Scientists Pty Ltd, reference: CES180204-SGC-AD, 29 March 2018 (CES 2018).

2 Demolition/ Refurbishment Hazardous Material Risk Assessment, 9-11 Gibbons Street, Redfern NSW 2016, Greencap Pty Ltd, ref: C122647:J155653, 15 March 2018 (Greencap 2018).

3 Data Gap Investigation, 9-11 Gibbons Street, Redfern NSW, ref: 54877/116843 Rev 1, 24 July 2018, JBS&G (JBS&G, 2018)

# 2. Site Condition & Surrounding Environment

## 2.1 Site Identification

The site location is shown on **Figure 1**. The extent of the site and associated cadastral boundaries are shown on **Figure 2**. The site details are summarised in **Table 2.1** and described in detail in the following sections.

**Table 2.1 Summary Site Details**

| | |
|---|---|
| **Lot / DP** | Lots 1 – 11 in Deposited Plan (DP) 4209 |
| **Address** | 9-11 Gibbons Street, Redfern NSW |
| **Local Government Authority** | City of Sydney Council |
| **Approximate MGA Coordinates of Corners (MGA 56)** | Northeast: E 333514.47/ N 6248236.98<br>Northwest: E 333482.76/ N 6248241.24<br>Southeast: E 333495.83 / N 6248188.98<br>Southwest: E 333465.11/ N 6248193.14 |
| **Site Zoning** | (E) Business Zone – Commercial Core, SEPP (State Significant Precincts) 2005 |
| **Current Use** | Vacant Council Depot and Artist Workshop |
| **Previous Use** | Council Depot |
| **Proposed Use** | Mixed commercial and residential with minimal opportunities for soil access |
| **Site Area** | 1,556 $m^2$ |

## 2.2 Site Description

As at the time of the JBS&G site inspection on 11 May 2018, the site appeared similar to the site inspection completed by CES (2018). The site comprised a rectangular parcel of land with two distinct portions: The CoS depot area in the north (Northern Portion) including a two-storey brick/concrete building and asphalt/concrete paved car park area; and a tenanted workshop area in the south (Southern Portion). The north and south portions of the site were separated by a brick wall, approximately 4m in height. The site boundary was secured by a combination of building frontage and two points of gated access located on Gibbons Street and William Lane.

Northern Portion

The CoS depot area located in the northern portion of the site was vacant at the time of the inspection.

The car park was covered in asphaltic pavement which was generally in good condition with a crack observed in the central portion. Two areas of cut-out and replacement were observed on the asphaltic pavement in the north-eastern extent of the site. However, it is noted that the potential USTs identified during the previous GPR survey (CES 2018) are not in alignment with these cuttings.

The CoS building comprised 3 garage spaces, a toilet, storerooms and office space on the ground floor with a kitchen area, showers and storerooms on the first floor.

Room 4 appeared to be used for tool storage and equipment maintenance and comprised a workbench, caged area, metal shelves. The concrete slab was reported to be intact and peeling paint was observed on the ceiling corner.

Southern Portion

The southern portion was occupied by a two-storey brick/concrete structure over the majority of the footprint. The building was being utilised as an artist's workshop at the time of the inspection, with the balance of the area covered by concrete hardstand.

No surface water existed at the site at the time of the investigation. No evidence of mass storage of waste or storage tanks were observed at the site. No evidence of pesticide or herbicides was observed and no asbestos containing materials were observed on the ground surfaces.

## 2.3 Surrounding Land Use

The current land uses of adjacent properties or properties across adjacent roads are summarised below.

- North – Marian Street and high density mixed commercial/residential tower beyond;
- West – Gibbons Street and Gibbons Street Reserve beyond, after which is the Redfern Station and railway line;
- East – William Lane and commercial premises fronting Regent Street beyond (café, computer repair store, printing store and medical centre), and automotive garage to the east of Regent Street;
- South – High density residential tower, and Margaret Street beyond. BP branded service station is located 20m to the south east and the Australian Technology Park is located approximately 200m to the south west of the site.

Inspection of nearby properties did not indicate that any significantly contaminating activities were being undertaken which may affect the suitability of the site for the allowable land uses.

## 2.4 Topography

Review of topographic information obtained from the NearMap spatial information database indicated that the site has an elevation of approximately 27-29 m Australian Height Datum (AHD).

The site inspection identified the site was relatively flat and slightly sloped to the south, consistent with the general topography of the area. The site was generally level with its surrounds. The ground surface in the northern car park area was observed to be split along the middle and graded to the southeast and southwest.

## 2.5 Geology and Soils

A review of the 1:250 000 scale Sydney Geological Map[4] identified the site is located in an area of Triassic Bringelly Shale, Minchinbury Sandstone and Ashfield Shale, part of the Wianamatta Group comprising Shale with some Sandstone beds.

Reference to the online ESPADE 2.0 tool hosted by the NSW Office of Environment and Heritage (OEH) (2017[5]) indicates that the site is underlain by residual Tuggerah soils. Limitations of soils in the Tuggerah group include extreme wind erosion hazard, noncohesive, highly permeable soil, very low soil fertility, localised flooding and permanently high watertables.

The site appeared to have been subject to previous cut and fill activities to create existing ground surface levels. It is noted that previous reports identified fill materials with anthropogenic inclusions of concrete, glass, slag ranging to depths of 1.1-1.6 m bgs. underlying the concrete hardstand present at the site.

## 2.6 Hydrology

The nearest surface water receptor is Sheas Creek located approximately 1.4 km to the southwest. Sheas Creek has been converted to a concrete lined stormwater channel which flows to the southwest and eventually into Alexandra Canal, approximately 2 km from the site.

As discussed in **Section 2.2**, the site footprint comprises sealed asphaltic hardstands and building footprints with engineered stormwater drainage. As such, surface water generated during periods of rainfall is anticipated to migrate from the site via discharge into onsite stormwater infrastructure.

[4] Sydney 1:250 000 Geological Sheet SI/56-05, 3rd edition, Geological Survey of New South Wales, Sydney.
[5] 'ESAPDE 2.0', NSW Office of Environment and Heritage, Accessed 23 October 2017, OEH (2017

Surface water leaving the site is anticipated to enter the regional stormwater system and ultimately discharge to the Alexandra Canal before flowing into the Cooks River, further to the southwest of the site, and then into Botany Bay. The Alexandra Canal is a brackish surface water body, flowing into a marine environment.

### 2.7 Hydrogeology

The site is identified to be located on Botany Sands Aquifer Management Area 2, where extraction of groundwater is prohibited for human consumption, consumption by animals, domestic purposes and any other purpose. The Botany Sand Beds Aquifer is reported as often less than 1-2 metres below the natural ground surface in low-lying areas, with the level varying in relation to rainfall and evaporation.

Aquifers underlying the site are described as porous, extensive, and highly productive aquifers. It is expected that groundwater would flow towards Alexandra Canal.

Registered groundwater bore information was obtained from the NSW Department of Primary Industries groundwater mapping tools (NSW DPI 2017[6]) in JBS&G (2018). A review of the registered bore information indicated that there were 49 bores within a 1 km radius of the site.

All bores on the database within 1km of the site are currently licensed for use as monitoring wells. The monitoring wells are installed to depths of between 6.0 and 180.0 m, with standing water levels reported at depths of approximately 2.95 and 11.6 m below ground surface (m bgs). Where the geology encountered was reported, it consisted of clay, shale and sandstone.

Review of CES (2018) indicated that the standing water levels (SWL) at the site was reported between 1.3 and 7.9 m bgs. CES (2018) reported the following in relation to the large variance reported between the eastern and western extent of the site:

- At borehole BH01 (see **Figure 3**), silty clay was encountered from 2.5m to 8.5 m bgs, with no overlying more permeable deposits (sand) and as a result, the low permeability of the underlying geology is likely to have precluded the presence of shallow groundwater.
- At boreholes BH03 and BH04, silty clay was encountered at a greater depth (4.5 m bgs), with permeable sands overlying and as a result, groundwater is likely to be present in the more permeable sands overlying the clays, with groundwater perching on top of the silty clays.
- The groundwater encountered in BH01 is likely to be derived from water within the underlying silty clays, whereas the groundwater encountered in BH03 and BH04 is likely to be perched groundwater on top of the silty clays.

### 2.8 Acid Sulfate Soils

Review of the Acid Sulfate Soil Risk Map for Botany Bay[7] indicates that the subject site is located within an area of 'no known occurrence of Acid Sulfate Soils'. Acid sulfate soils (ASS) are not known or expected to occur in areas having this classification. This is consistent with the topographic and geological setting of the site.

No indicators of ASS were observed during intrusive soil investigations. On this basis, it is considered that there are no further requirements for assessment or management of ASS.

[6] NSW Department of Primary Industries, 2015. Groundwater Monitoring Overview Map. Http://allwaterdata.water.nsw.gov.au/water.stm. Accessed 30 May 2018.

[7] *'Acid Sulphate Soil Risk Map – Botany Bay, Edition 2',* 1997 1:25 000, NSW Department of Land and Water Conservation (DLWC), Ref 9130S3 (NSW DLWC)

# 3. Site History and Contamination Status

## 3.1 Preliminary Site Investigation (CES 2018)

Consulting Earth Scientists Pty Ltd (CES) was engaged by SGCH to conduct a preliminary site investigation at the site. The objectives of this assessment were to establish the environmental conditions at the site with respect to soil and groundwater, confirm the suitability of the soil and groundwater for the proposed high density residential development and provide a preliminary waste classification for site soils.

The scope of works included a desktop assessment and soil and groundwater investigation at the site, comprising advancement of 11 boreholes and installation/sampling of 3 groundwater monitoring wells. As discussed above in **Section 2.2**, the site was primarily covered in building floor slabs and/or concrete pavements. Fill material was encountered in all locations, to depths below pavement ranging from 0.2 to 1.3 m, to a maximum depth of 1.6 m bgs. Natural material encountered was generally comprised of silty sand and silty clay underlain by shale.

CES (2018) reported that anecdotal information indicated the potential presence of a UST within the southern building. A ground penetrating radar (GPR) investigation during CES (2018) did not identify USTs within the southern building, however, two anomalies consistent with USTs were identified in the northern portion of the car park (**Figure 2**).

Analysis of selected samples of surficial and sub-surface soils for a broad range of contaminants of potential concern (COPCs) including heavy metals, PAH, TRH, Benzene, Toluene, Ethylbenzene and Xylene (BTEX), Volatile Halogenated Compounds, (VHCs), Polychlorinated Biphenyls (PCBs), Organochlorine and Organophosphate Pesticides (OCP/OPP), Per-and polyfluoroalkyl substances (PFAS), phenols and asbestos was undertaken. A number of samples were reported to have concentrations of Contaminants of Potential Concern (COPCs) above the health based assessment criteria. Impacts were reported in the fill material (PAH, TRH and heavy metals) in various locations and in natural material (arsenic) at BH11 (see **Figure 3**). Asbestos containing material (ACM) were not observed at the site or detected during laboratory analysis.

Analysis of water samples for a range of COPCs including heavy metals, PAHs, TRHs, BTEX, VHCs, Phenols and PFAS was undertaken. Concentration of zinc was reported at BH1 (41 µg/L) and BH3 (85 µg/L) exceeding the adopted groundwater investigation level (GIL) of 15 µg/L. Further, fluoranthene and benzo(a)pyrene (B(a)P) concentrations were reported at BH4, marginally exceeding the adopted GIL of 1.4 µg/L and 0.2 µg/L respectively. JBS&G note that GILs adopted in CES 2018 for fluoranthene and B(a)P are considered as interim indicative working levels only.

PFAS was reported in soil and groundwater samples, albeit below the screening criteria adopted consistent with the PFAS National Management Plan (HEPA 2018), and therefore was not considered to pose an unacceptable risk to future site users.

Preliminary waste classification of site materials provided in CES (2018) is summarised as below:

- Fill material on-site is classified as General Solid Waste (GSW), with the exception of soils surrounding BH6 and BH10 which have a preliminary waste classification of Hazardous (HW) Waste, and the soils surrounding BH11 which have a preliminary waste classification of Restricted Solid Waste (RSW). The materials were further evaluated in the data gap assessment (See **Section 3.3**); and
- Natural soils underlying the site fill is Virgin Excavated Natural Material (VENM) with the exception of the natural soils surrounding BH11 which are preliminarily classified as Hazardous Waste on the basis of arsenic concentration.

Previous soil and groundwater analytical results presented in CES (2018) are included in **Appendix B**.

Based on the findings of the investigation, CES concluded that remediation/management of contamination issues was likely required to render the site suitable for the proposed use. A number of additional works were recommended to inform the remedial strategy including further delineation of the soil impacts and hazardous/restricted solid waste classified areas, completion of a hazardous building material survey, confirmation on the presence/absence of USTs at the site, further assessment of groundwater to infer flow regime and groundwater condition downgradient of the USTs.

### 3.2 Demolition/ Refurbishment Hazardous Material Risk Assessment (Greencap 2018)

Greencap was engaged by SGCH to undertake a hazardous building material survey to identify types of hazardous materials and their condition (including asbestos, synthetic mineral fibres (SMF), ozone depleting substances (ODS), PCB, lead paint and lead dust) in accessible areas of the site, to identify the likelihood of hazardous materials in inaccessible areas, to assess the risk posed by the materials, and to complete a hazardous and flammable/combustible materials register for the site in line with the proposed refurbishment/demolition works.

Based on the scope of works completed, field screening, laboratory testing and/or visual identification, hazardous building material was encountered, including asbestos, lead paint, ODS and SMF, as summarised in the hazardous material register provided in Greencap (2018).

The Greencap 2018 report further noted that potential tanks or voids were present beneath the floor slab of the 'Mowers Shed', in the southern area of the site, however were inaccessible at the time.

### 3.3 Data Gap Assessment (JBS&G, 2018)

JBS&G was engaged by SGCH to undertake a data gap assessment to enable conclusions to be drawn regarding the suitability of the land for future land uses, or make recommendations to enable such conclusions.

The scope of the investigation included: a review of previous investigation reports, preparation of a Sampling and Analysis Quality Plan (SAQP), development and documentation of a conceptual site model (CSM), implementation of the plan inclusive of field sampling of potentially impacted media and subsequently laboratory analysis of samples; evaluation of the resulting data against site specific health and ecological assessment criteria; and documentation of the resulting outcomes as this assessment report.

Based on the scope of works completed for this assessment JBS&G concluded the following with regard to the site conditions:

- Previous investigations (Greencap 2018) have identified the presence of hazardous building materials including asbestos, lead paint, ODS and SMF within existing site structures that require appropriate removal/management during proposed demolition works.
- Previous investigations (CES 2018) have identified the presence of potential fuel infrastructure in the northern portion of the site, considered to represent a potential contamination source and as such requiring management/removal pursuant to DECCW (2010).
- Fill material at the site has previously been identified as variously impacted with heavy metals, PAHs and TRH. Further characterisation of conditions within the site has identified contaminant levels generally consistent with CES (2018), with the following impacts identified as requiring management/remediation:
- Fill material across the site identified as impacted with B(a)P TEQ in exceedance of the adopted health based investigation criteria. The elevated B(a)P TEQ concentrations are interpreted to be associated with ash/metalliferous slag inclusions in the fill material. As

such, the fill material will require management to address the potential exposure risk with respect to B(a)P TEQ prior to utilization of the site for the proposed land use and during the proposed redevelopment.

- Naphthalene, total PAH and light to mid fraction TRH (>C10-C16 and >C16-C34), as well as B(a)P TEQ impacts identified in the shallow fill material at BH103 0.3-0.5 with respect to human health. This impact is interpreted to be associated with ash/metalliferous slag inclusions, with the TRH concentrations expected to be associated with the high PAH concentrations within the soils rather than a fuel or oil related hydrocarbon source. The material in the vicinity of BH103 0.3-0.5 (as well as adjacent CES location BH6 0.3-0.8) will require management to address the potential exposure risk prior to utilization of the area for the proposed land use and during the proposed redevelopment.
- Concentrations of copper, zinc, B(a)P and TRH >C16-C34 fractions were reported in various samples in exceedance of the adopted ecological criteria for the proposed landuse. As such, site won fill material are not considered suitable for utilisation as growing media. JBS&G notes that the shallow fill material at the site is unlikely to be used as a growing medium in the proposed development of the site. Therefore, JBS&G do not consider these impacts to constitute a risk to future plant growth or inhibit the future development of the site. JBS&G consider that the ecological impacts identified (where not concurrent with health-based impacts) do not warrant further assessment and/ or management.
- Groundwater conditions at the site are considered indicative of typical inner-Sydney industrial areas, with elevated concentrations of copper, zinc, lead and nickel in groundwater passing across the site. Low level petroleum hydrocarbon impacts and VOC compounds were also identified in inferred up-gradient locations, reported at concentrations below the adopted assessment criteria. There are no identified off-site migration issues relating to groundwater at the site.
- Assessment of potential soil vapour conditions did not identify unacceptable volatile contaminant risks associated with the site.
- Based on the available data set from past and present investigations (CES 2018 and JBS&G 2018), and observations made during the current investigation, fill material at the site is provisionally classified General Solid Waste (Non-putrescible). Previous investigations (CES 2018) have provisionally classified natural soils underlying the fill material as Virgin Excavated Natural Material (VENM) with the exception of the natural soils surrounding BH11 which have been provisionally classified as Hazardous Waste on the basis of the arsenic concentration.
- Subject to interim retention of existing site pavements (i.e. asphaltic/concrete hardstand and building concrete slabs within the site), there are considered to be no outstanding aesthetic concerns. Future management/remediation will be required to address the fuel infrastructure and anthropogenic inclusions identified within the fill glass, ceramic, brick fragments, ash, slag and coal in the absence of pavements.
- A RAP should be prepared to address the identified site contamination issues at the site via remediation/management such that the site can be considered suitable for the proposed residential with minimal soil access landuse scenario.
- Previous soil, groundwater and soil vapour analytical results presented in JBS&G (2018) are included in **Appendix B**.

### 3.4 Contamination Status

Based on previous assessment of the site contamination issues are primarily limited to the fill material with regard to heavy metals, TRH and PAHs in soil, arsenic in fill and natural soils and the potential for in-situ USTs.

Based on the extent of site investigation completed to date, significant groundwater or soil vapour impacts do not appear present at the site as a result of current or past features.

#### 3.4.1 Underground Storage Tanks and Associated Infrastructure

- Greencap (2018) reported that potential tanks or voids were present beneath the floor slab of the 'Mowers Shed' in the southern portion of the site.
- CES (2018) reported that anecdotal information indicated the potential presence of a UST within the southern building. A ground penetrating radar (GPR) investigation during CES (2018) did not identify any USTs within the southern building, however, two anomalies consistent with USTs were identified in the northern portion of the car park (**Figure 2**).
- Potential fuel infrastructure as outlined above is considered to represent a potential contamination source and as such requiring management/removal pursuant to DECCW (2010) or visual confirmation the infrastructure is not present.

#### 3.4.2 Hydrocarbon, Heavy Metals and Benzo(a)pyrene in Fill

The following impacts require management/remediation:

- Fill material across the site identified as impacted with B(a)P TEQ in exceedance of the adopted health based investigation criteria.
- Naphthalene, total PAH and light to mid fraction TRH (>C10-C16 and >C16-C34), as well as B(a)P TEQ impacts identified in the shallow fill material at BH103 0.3-0.5 (as well as adjacent CES location BH6 0.3-0.8) with respect to human health.
- Fill material across the site was identified to contain anthropogenic inclusions consisting of glass, ceramic, brick fragments, ash, slag and coal. In the absence of pavements management/remediation will be required to address this.
- JBS&G consider that the ecological impacts identified (where not concurrent with health-based impacts) do not warrant further assessment and/ or management.

#### 3.4.3 Arsenic Impacted Soils

Elevated levels of arsenic impact were identified to exceed the ecological and health based assessment criteria in the fill and natural soils at BH11 (0.3-0.7 and 1.3-1.6 m bgs) as reported in CES (2018). Arsenic impacts at BH11 will require management/remediation to address this. The lateral remediation extent has been estimated to be 3 m by 3 m, centred on the original borehole. The depth of remediation has been assumed as 2.0 m bgs.

### 3.5 Data Gaps

As discussed in **Section 3.4** above, there are uncertainties associated with understanding the location of potential historical USTs at the site as a result of incomplete historical records and the limitations associated with making inferences based on discrete intrusive borehole data and representative laboratory analysis. Additionally, due to access limitations at the time of intrusive sampling, there are uncertainties associated with the fill/natural material underlying the northern and southern building footprints.

For the purposes of development of this RAP, the following data gaps have been identified that will require to be considered in developing the proposed remedial/management strategy:

- The total number, location and condition of current, or former underground fuel storage infrastructure at the site;
- The lateral extent of petroleum impacted fill/natural soil material associated with the current/former fuel infrastructure; and
- The fill/natural material underlying building footprints.

# 4. Remediation Options

Previous characterisation of site contamination conditions as outlined in **Section 3** has indicated the presence of a number of site contamination issues that will require remediation/management to address potential risks to human health, such that the site may be considered site suitable for the proposed land uses.

## 4.1 Remediation Objectives

The remediation objectives are outlined as follows:

- Removal of potential contamination sources, including redundant fuel infrastructure;
- Management and/or removal of unacceptable risks to human health and the environment from the identified impacted (fill material and natural) soils such that the site is suitable for the propose use;
- Close out any data gaps; and
- Validation of the remedial/management works in accordance with the relevant NSW EPA Guidelines and with reference to the adopted site criteria to demonstrate the successful remediation of the site.

This RAP has been prepared with reference to the following guidelines and legislation:

- *Managing Land Contamination, Planning Guidelines, SEPP 55 – Remediation of Land.* Department of Urban Affairs and Planning. NSW Environment Protection Authority (DUAP 1998);
- *Contaminated Sites: Sampling Design Guidelines, September 1995*. NSW EPA (1995);
- *Guidelines for Consultants Reporting on Contaminated Sites.* Office of Environment and Heritage, 2011, OEH (2011);
- *Guidelines for the NSW Site Auditor Scheme (3rd Edition).* Environment Protection Authority, 2017, EPA (2017);
- *National Environment Protection (Assessment of Site Contamination Measure) Measure 1999 (as amended 2013).* National Environment Protection council NEPC (2013);
- *Work Health and Safety Act 2011*. NSW Government Legislation, *WHS Act (2011*);
- *How to Safely Remove Asbestos - Code of Practice*. NSW Government, Safe Work NSW, 2016, SWNSW (2016);
- *How to Manage and Control Asbestos in the Workplace - Code of Practice.* NSW Government Safe Work Australia, 2016, SWNSW (2016);
- *Management of Asbestos in the Non-occupational Environment*. enHealth Council, 2005, enHealth (2005);
- *Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia.* WA Department of Health, 2009, WA DoH (2009);
- *Guidelines for the Assessment and Management of Groundwater Contamination*. NSW DEC 2007 (DEC 2007); and
- *Technical Note: Investigation of Service Station Sites*. NSW EPA April 2014 (EPA 2014).

### 4.2 Extent of Remediation

As discussed in **Section 3**, removal/decommissioning of the UST(s) and remediation/management of hydrocarbon, heavy metals and benzo(a)pyrene impacted fill are required for the site to be considered suitable for the proposed land use.

The following areas have been identified as requiring remediation/management:

- Decommissioning/removal of potential USTs, any associated infrastructure, tank backfill material and any further, petroleum impacted soils. The initial estimates for lateral extent of UST areas are presented in **Figure 4.**
- Arsenic impacted soils at BH11 to a depth of 2.0 m bgs. The estimated remediation area is presented in **Figure 4**.
- Hydrocarbon, heavy metal and/or benzo(a)pyrene impacted fill across the site that is proposed to be retained as part of site redevelopment. The final extent of material capped in-situ will be dependent on conditions encountered during remediation and development works. It is noted that based on the current development plans (Appendix A) the entire site footprint is proposed to be paved. As such, for planning purposes, the anticipated maximum extent of retained fill material is considered to be the entire site development area.

### 4.3 EPA (2017) Guidance

The *Contaminated Land Management Guidelines for the NSW Auditor Scheme (3rd edition)* (EPA, 2017) lists the following order of preference for soil remediation and management:

1. On-site treatment of the soil so that the contaminant is either destroyed or the associated hazard is reduced to an acceptable level;
2. Off-site treatment of excavated soil so that the contaminant is either destroyed or the associated hazard is reduced to an acceptable level, after which the soil is returned to the site;
3. Removal of contaminated soil to an approved site or facility, followed where necessary by replacement with clean fill; and
4. Consolidation and isolation of the soil on-site by containment within a properly designed barrier.

In addition, it is also a requirement that remediation should not proceed in the event that it is likely to cause a greater adverse effect than leaving the site undisturbed. And, where there are large quantities of soil with low levels of contamination, alternative strategies are required to be considered or developed, EPA (2017).

With regard to management of the fuel infrastructure, consideration is also required with regard to the *Guidelines for Implementing the Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation 2008* and the requirements of the *Occupational Health and Safety (Dangerous Goods) Regulation 2001* in relation to the requirement to remove abandoned fuel storage infrastructure after 2 years.

### 4.4 Remedial Options

Consideration of each of the available options, as defined in EPA (2017) is presented in **Table 4.1**, taking into account the proposed future reuse of the site.

**Table 4.1: Remedial Options Matrix**

| Option of Treatment | Applicability | Assessment |
|---|---|---|
| Option 1: Onsite treatment of the soil so that the contaminant is either destroyed or the associated hazard is reduced to an acceptable level. | Heavy Metals<br>Metals are unable to be destroyed. However, there are a number of microencapsulation treatment technologies which can reduce the mobility of the identified inorganic contaminants of concern (e.g. cement stabilisation). | Heavy Metals<br>Not a suitable option.<br>Metals are unable to be destroyed, so this is not an option which is able to be considered. Microencapsulation is not considered necessary given the absence of identified groundwater impacts requiring remediation. |
| | Benzo(a)pyrene<br>Polycyclic aromatic hydrocarbons present in site soils are typically restricted to heavier non-volatile constituents. These can be remediated by thermal processes. However, this requires substantial investment in plant and equipment and substantial energy use. Similarly, for heavy metals, there are a number of microencapsulation treatment technologies which can reduce the mobility of the identified organic contaminants of concern (e.g., cement stabilisation). | Benzo(a)pyrene<br>Not the preferred option.<br>Remediation options are available for PAH contaminated fill contaminants, generally restricted to thermal treatment processes which are energy intensive.<br>Microencapsulation is not considered necessary given the absence of identified groundwater impacts requiring remediation. |
| | Potential Fuel Infrastructure and Petroleum Hydrocarbon Impacted Soils<br>Given that soil contaminants associated with petroleum storage there is a potential that they may be able to be remediated on site by a bioremediation style remediation method.<br>Bioremediation occurs where contaminants are chemically broken-down by the metabolic processes of micro-organisms into less toxic or non-toxic forms. Recent NSW EPA guidance requires bioremediation methods to demonstrate that pollutant emissions are not discharged to the atmosphere.<br>On this basis, the lateral extent of the bioremediation activity requires to be restricted to ensure that air emissions from remediation materials are able to be collected. | Potential Fuel Infrastructure and Petroleum Hydrocarbon Impacted Soils<br>Given the nature of soils, volume of material, restricted space and time it may take to remediate fill/soils to a level that they do not represent an unacceptable risk and/or contribute to groundwater impacts, this method is feasible but may not be practicable.<br>Not the preferred option, however bioremediation of natural site soils may be further considered, subject to evaluation of time and available space constraints given the comparably low cost when compared to off-site disposal and need for reinstatement of excavations to achieve development levels. |
| Option 2: Offsite treatment of excavated soil/infrastructure so that the contaminant is either destroyed or the associated hazard is reduced to an acceptable level, after which the soil is returned to the site. | Heavy Metals<br>Metals are unable to be destroyed. However, there are a number of microencapsulation treatment technologies which can reduce the mobility of the identified inorganic contaminants of concern (e.g. cement stabilisation). | Heavy Metals, Petroleum Hydrocarbons and Benzo(a)pyrene<br>Energy/resource use associated with the transport and return of materials is not considered to be ecologically sustainable.<br>Not a Suitable Option. |
| | Benzo(a)pyrene<br>PAHs present in site soils are typically restricted to heavier non-volatile constituents. These can be remediated by thermal processes. However, this requires substantial investment in plant and equipment and substantial energy use. Similarly, for heavy metals, there are a number of microencapsulation treatment technologies which can reduce the mobility of the identified organic contaminants of concern (e.g., cement stabilisation). | |

| | | |
|---|---|---|
| | Potential Fuel Infrastructure and Petroleum Hydrocarbon Impacted Soils<br>As above (Option 1), however, additional time, energy and costs are incurred to take soils off site and return them to the site, in addition to there being no currently licensed facilities in close proximity of the site to undertake soil treatment. | |
| Option 3: Removal of contaminated soil/infrastructure to an approved site or facility, followed where necessary by replacement with clean fill. | Fill Materials (TRH, PAHs and heavy metals)<br>There are currently suitably licensed waste facilities in the Sydney Metropolitan region capable of accepting the fill material based on a preliminary waste classification.<br>This option provides for the remediation of the site without ongoing concerns with regard to monitoring/management of residual impacts. These are generally located a significant distance from the site and there are significant costs are associated with disposal as a result of the NSW Waste Levy, cartage and landfill gate fees.<br>Dependent upon final development levels, where significant volumes of fill material require removal, suitable material may be required to be imported to site to reinstate resulting excavations.<br>Where fill material and/or natural soils identified as requiring off-site disposal to achieve the remedial objectives extend beyond surficial levels, further consideration of potential site excavation stability requirements will be required to achieve excavation and off-site disposal. | Fill Materials Impacted by Benzo(a)pyrene), some Heavy Metals<br>A potentially applicable option but inferior to on-site management (Option 4) for the majority of the impacted material.<br>Requirements to retain excavation stability during excavation works so as to remove impacted material at depth may be significant at the site.<br>Whilst this method is viable from a technical view point, because of disposal costs, resource consumption and waste generation volume considerations, this is not the most preferred remedial option available.<br>However, where materials are identified as not being environmentally suitable under Option 4, or material is identified as surplus to future development levels, then this will be the preferred option. |
| | | Arsenic Impacted Soils BH11<br>This is the preferred option for the management of the arsenic impacted natural soils at BH11.<br>Given the relatively elevated levels of arsenic reported in the natural soils at BH11 this material has been identified as not environmental suitable to remain onsite. |
| | | Potential Fuel Infrastructure and Petroleum Hydrocarbon Impacted Soils<br>Given the requirements for removal of the in-situ fuel infrastructure, space constraints associated with options to bioremediate soil on site, overall, this is considered the more favourable option with regard to hydrocarbon impacted soils present at concentrations unable to be retained on site as per Option 4.<br>Alternatively, consideration may be given to Option 1, dependent upon evaluation outcomes as discussed above. |
| 4. On-site in situ management of the soil by physical separation, and ongoing management. | Fill Materials Impacted by Benzo(a)pyrene and Heavy Metals<br>Fill materials, based on existing analytical data for the site, have been found to be largely free of constituents:<br>• That will pose a potential groundwater risk by the demonstrated low levels of leachable contaminants and the absence of significant groundwater impacts; and | Fill Materials Impacted by Benzo(a)pyrene) and Heavy Metals<br>This is the preferred option for the management of the majority of impacted fill material.<br>The retention of the impacted fill will reduce the waste generation and resource requirements of the remediation of the site and require time and waste disposal cost inputs.<br>Based on the preliminary site development plans, the site will be subject to significant areas of hardstand pavements which will provide physical |

| | | |
|---|---|---|
| | • That will pose a potential inhalation risk as demonstrated by the assessment of vapour impacts.<br>On this basis, the impacted fill materials are suitable for retention on site in areas where human/ecological exposures can be restricted. | separation between site users and retained fill materials. Additionally, where hardstand pavements are not proposed to be installed, it is considered feasible to install an alternative physical barrier (such as non-impacted soil). This option is of highest ranking as a result of the low waste volumes, time, cost and energy use. However, consideration of the practical implications of an ongoing site management plan is required prior to implementation to ensure there are suitable available mechanisms for ongoing management of the site. |
| | <u>Arsenic Impacted Soil BH11</u><br>The fill and natural soils at BH11 were reported to be impacted by elevated levels of arsenic exceeded the ecological and human health criteria adopted for the site. There is no leachate data available for BH11 at depth which was the sample with the highest arsenic impacts. | <u>Arsenic Impacted Soil BH11</u><br>On-site management of the arsenic impacted soils at BH11 is not the preferred option due to the potential for contribution to groundwater impacts. The leachability of arsenic impacts in soils at depth at BH11 are unknown. Although arsenic impacts were not identified in groundwater, if left onsite the elevated arsenic may contribute to groundwater impacts in the future. |
| | <u>Potential Fuel Infrastructure and Petroleum Hydrocarbon Impacted Soils</u><br>Aesthetic considerations in relation to odorous and/or discoloured soils would apply where material may be subject to exposure to future site users.<br>However, where removal of additional impacted soil at depth is identified as impracticable as a result of groundwater intrusions, excavation stability or similar, consideration will be given to on-site in-situ retention of petroleum impacted material. Given the former infrastructure and majority of the impacted soils are likely able to be removed and the current data supports an absence of unacceptable risks associated with soil vapour and groundwater, adoption of an ongoing containment strategy, supported by the current natural attenuation processes are feasible. | <u>Potential Fuel Infrastructure and Petroleum Hydrocarbon Impacted Soils</u><br>Whilst on-site in-situ management of petroleum hydrocarbon impacted soil is not preferred given the aesthetic considerations, potential for contribution to groundwater impacts, etc; consideration of the potential for in-situ retention will be considered where material extends beyond the practicable depth of excavation works at the site.<br>As for the fill material, further consideration of this option will be subject to identification of ongoing suitable management mechanisms. |

### 4.5 Preferred Remedial Strategy

Based upon the above assessment of available remedial/management options the preferred remedial strategy for the site is:

- Excavation and off-site disposal of potential petroleum infrastructure including the USTs, associated pipework and former bowser plinths;
- Excavation and off-site disposal of arsenic impacted soils at BH11 and (subsequent to stockpiling and characterisation in accordance with the requirements for off-site disposal), removal of the excavated material from the site to a lawful waste facility;
- Excavation of tank pit backfill and associated impacted soil to the extent practicable and (subsequent to stockpiling and characterisation in accordance with the requirements for off-site disposal), removal of the excavated material from the site to a lawful waste facility; and
- Excavation and off-site disposal of impacted fill material as required to achieve proposed development subgrade levels and enable implementation of a cap/cover remedial strategy based on physical separation, with implementation of on-going management plan.

Subject to design of the final development scheme review of the preferred strategy will be completed to confirm the appropriateness of the adopted strategy as is discussed in the following sections.

# 5. Remedial Plan

## 5.1 Approvals, licences and notifications

Prior to the commencement of remediation works, appropriate approvals and notifications as discussed below will be implemented by the Site owner's representative, or Remediation Contractor, as appropriate, consistent with the details presented in **Section 9.1**:

- It is anticipated that the works will comprise "Category 2" as per the definition outlined in the S*tate Environmental Planning Policy No. 55* (SEPP 55). As such, the consent authority (Council) requires notification 30 days prior to the commencement of "Category 2" remediation works.

However, it is noted there is potential for other planning policies relevant to the subject land that requires development consent for the works.

## 5.2 Site Establishment

The boundary of the extent of remediation will be defined by the Remediation Consultant. The Remediation Contractor (herein referred to as the "Contractor") shall secure these areas to ensure that all safety and environmental controls are implemented. These controls will include, but not be limited to:

- Locate and isolate all required utilities in the proximity of the works;
- Assess need for and implement any necessary traffic controls;
- Assess need for additional work area security fencing;
- Site signage and contact numbers;
- Stabilised site entry gate;
- Appropriate decontamination areas for personnel and plant;
- Sediment fencing (attached to security fencing) where necessary; and
- Stormwater runoff and sediment controls (e.g. silt fences) where necessary.

## 5.3 Remedial Works

### 5.3.1 Removal and Disposal of Petroleum Infrastructure

Petroleum infrastructure shall be removed by a contractor experienced in the decommissioning and removal of fuel infrastructure. The Remediation Consultant will provide oversight during the works with regard only to management of contamination concerns.

Petroleum infrastructure present at the site requiring removal may potentially include:

- Underground storage tanks (USTs);
- Remote fill points;
- Vent points and associated vent lines;
- Fuel dispenser/bowser plinths;
- Feed pipework; and
- Tank anchors.

The procedure for undertaking this activity will in accordance with Section 5 of *The Removal and Disposal of Underground Petroleum Storage Tanks – Australian Standard 4976-2008*, Standards Australia (2008[8]) as per DECCW (2009[9]). The general procedure is detailed below:

- Documentation of work instructions and relevant permits shall be prepared and issued prior to the commencement of decommissioning works;
- Any residual product shall be removed via the dip points or other suitable fittings, using air operator pumps, suitable for hazardous areas. Care shall be taken to ensure that the pump, via hose or spear, reaches the bottom of the tanks (where accessible). Residual product shall be transferred to sealed drums or designated liquid waste trucks;
- Break up and remove concrete/asphaltic hardstand pavements overlying infrastructure;
- Ground level connections to the tanks will be isolated and sealed. All electrical cables, product pipelines, and any other services infrastructure within the vicinity of the tanks will be located and isolated prior to excavation;
- All piping servicing the tanks shall be drained and disconnected. All internal tubes shall be removed and plugged;
- The tanks shall be purged of product vapours where present;
- Any remaining pipework shall be disconnected and all openings, including vents, shall be plugged. One plug in each tank shall have a 3 mm hole to act as a pressure equalizing vent;
- The tank and pipework backfill will be excavated to expose the total width and length of the tanks with subsequent removal of concrete anchors where present, ensuring care is taken not to strike the tank with excavating equipment;
- Prior to removal, lifting lugs shall be inspected to ensure they are in good condition, and the removal equipment shall be suitably powerful to overcome potential ground suction effects;
- Once the tanks are clear of the excavations, excess soil shall be removed to facilitate inspection of the base and sides. If any holes are present, they shall be cold patched or plugged prior to loading the tanks onto the transport vehicle;
- Where the removal works result in the exposure of natural sandy soil underlying the site, any excavated and/or exposed natural sandy soil will require management in accordance with **Section 5.4;**
- Work shall be planned such that when the tank is fully exposed, it is able to be immediately loaded to a transport vehicle and removed from the site to an approved disposal facility;
- After removal, the tanks shall be marked with warning labels as follows, with minimum letter height of 50 mm placed to ensure visibility from each side and both ends of the tanks during transport:
    - NOT GAS FREE: NO SMOKING
    - NO NAKED LIGHTS
    - TANK HAS CONTAINED PETROL/DIESEL NOT SUITABLE FOR STORAGE OF FOOD OR LIQUIDS INTENDED FOR HUMAN OR ANIMAL CONSUMPTION.

[8] 'The Removal and Disposal of Underground Petroleum Storage Tanks – Australian Standard 4976-2008', AS 4976-2008, 26 November 2008, Standards Australia (2008)

[9] Guidelines for Implementing the Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation 2008. NSW Department of Environment, Climate Change and Water (DECCW 2009)

- As per DECCW (2009), notification to WorkSafe NSW of the removal of the USTs will be completed within 7 days of removal from the site.

### 5.3.2 Data Gap Close Out

During/following removal of the fuel infrastructure and site structures, appropriate additional intrusive investigation is required to be completed to address data gaps as discussed in **Section 3.5**.

Confirm presence/absence of fuel Infrastructure

The extent of investigations to be completed will be subject to evaluation based upon visual inspection of the area following removal on site infrastructure. As such, the details will be developed at the time of the investigation with regard to the overall remedial objectives.

The outcomes of the above will guide application of the works as outlined in the following sections. However, should contaminant conditions be identified during implementation of the data gap close out that indicate significantly different conditions to those documented in **Section 3.4**, further consideration of remedial requirements will be undertaken via implementation of the **Section 6** contingency protocols inclusive of the Unexpected Finds Protocol (UFP).

Characterisation of soils underling building footprints

As part of the remediation/ validation works, the fill/natural soils underlying the northern and southern building footprint will be characterised prior to site redevelopment to confirm consistency with the subsurface profile encountered in other parts of the site. Two sample locations are proposed to be completed to the depth of natural material within the southern building footprint whilst an additional sample location is proposed to be placed within the western extent of the northern building footprint. Environmental data generated during the data gap investigations shall be assessed by comparison with site validation criteria established in **Section 7.5.**

### 5.3.3 Excavation and Disposal of Petroleum Impacted Soils

Following removal of the potential tank(s) and any associated infrastructure, the tank backfill material and further petroleum impacted soils (refer to **Section 3.4**) shall be 'chased' out to the extent practicable under the oversight of the Remediation Consultant with regard to the contamination aspects. The procedure for undertaking this excavation activity will be by:

- Excavation and stockpiling of surrounding and underlying backfill and apparent impacted natural soils using observations including odour, staining/discolouration and/or a photo-ionisation detector (PID).
- It is noted that excavation works will only extend to the site boundary, or a prior hold point as appropriate to ensure boundary stability (as evaluated by the Remediation Contractor or their nominated personnel). Validation sampling of the excavation face at the site boundary (or final extent) will be undertaken.
- Where hydrocarbon impacted groundwater/seepage is observed within the tankpit excavation, this shall be pumped out by a licensed liquid waste contractor. The pumped pit water shall be disposed of as 'liquid waste' as per EPA (2014a).
- Excavated soils will be stockpiled with like materials (fill material, natural sand, natural clay) within the site on existing pavements, durable plastic ground covers, placed in skip bins, or otherwise loaded directly onto a haulage vehicle. Representative characterisation samples will be collected from each material type to assess the material suitability for either on-site reuse, or alternatively provide a waste classification for off-site removal.
- Validation samples will be obtained from the base and walls of the excavation as outlined in **Section 7.5**. Other than at the site boundary, or practically achievable excavation extent,

where validation sample contaminant concentrations exceed the adopted validation criteria, the excavation will be extended until such time as the validation assessment is achieved.

- Any unexpected finds will be managed as per **Section 6**.

### 5.3.4 Excavation and Disposal of Arsenic Impacted Soils at BH11

Arsenic impacted soil identified at BH11 will be excavated to the extent outlined in **Section 3.4.3**. The arsenic impacted soils in the vicinity of BH11 shall be 'chased' out to the extent practicable under the oversight of the Remediation Consultant with regard to the contamination aspects. The procedure for undertaking this excavation activity will be by:

- Excavation and stockpiling of arsenic impacted fill and natural soils with guidance of the extent using an x-ray fluorescence (XRF) analyser.
- It is noted that excavation works will only extend to the site boundary, or a prior hold point as appropriate to ensure boundary stability (as evaluated by the Remediation Contractor or their nominated personnel). Validation sampling of the excavation face at the site boundary (or final extent) will be undertaken.
- Excavated soils will be stockpiled with like materials within the site on existing pavements, durable plastic ground covers, placed in skip bins, or otherwise loaded directly onto a haulage vehicle. Representative characterisation samples will be collected from each material type to provide a waste classification for off-site removal.
- Validation samples will be obtained from the base and walls of the excavation as outlined in **Section 7.5**. Other than at the site boundary, or practically achievable excavation extent, where validation sample contaminant concentrations exceed the adopted validation criteria, the excavation will be extended until such time as the validation assessment is achieved.
- Any unexpected finds will be managed as per **Section 6**.

### 5.3.5 Excavation and Off-site Removal of Fill Materials

It is anticipated that some excavation of site fill material will be required to reach the required construction sub-grade levels, particularly where in-situ capping of material is proposed to retain fill material on-site.

*Balance of the Site Fill Excavation*

Where excavation of fill material is required across the balance of the site to achieve construction sub-grade levels, for the installation of services, etc; this material is proposed to be managed via off-site removal to an appropriately licensed facility. Following identification of the location and extent of material to be removed, a review of the existing data will be completed to identify whether a waste classification based on existing available data may be prepared for the material, or alternatively additional sampling and laboratory analysis will be implemented to appropriately characterise the material prior to off-site disposal.

The material will be excavated under the supervision of the Remediation Consultant with the material stockpiled on hardstand/durable plastic, placed in a skip bin or alternatively directly loaded onto a haulage vehicle for off-site disposal. The material will be removed from site under a waste classification as per EPA (2014a) for disposal to a facility lawfully able to accept the material.

### 5.3.6 Physical Separation (Capping) of Retained Fill Materials Strategy

Where proposed sub-grade levels occur in fill material at the site and/or in areas where petroleum hydrocarbon impacted soil remains in-situ, it is proposed that remedial works will comprise implementation of a 'cap and containment' management protocol with the following minimum requirements:

- Permanent concrete ground slabs, asphalt surfaced pavement, mortared stone/concrete pavers or similar. Based on current development plans, the minimum thickness of permanently paved areas is understood to be 200mm. The pavement base course shall be underlain by a visual marker layer; or
- A minimum soil cover thickness of 500 mm is nominated as underlain by a 'marker layer' in areas of exposed site soil. Suitable backfill material may comprise one or a combination of imported virgin excavated natural material (VENM), material sourced from the site that has been validated as suitable for beneficial reuse within the site as discussed in **Section 7.5.3**, and/or imported material nominated via a beneficial reuse exemption as fit for the proposed purpose (eg ENM, drainage aggregate, growing media, etc); and/or
- Where underground services are required to be installed, excavation of impacted material from the services alignment will be required, followed by lining of the resulting trench with the visual marker layer, then service installation and backfilling with appropriate engineered material (typically VENM, imported recycled glass sand, aggregate or similar). Typically, the lined trench dimensions should be suitable to allow future maintenance workers space to work in non-impacted backfill material.

In vegetated/landscaped areas, the minimum soil cover depth of 500 mm is consisted appropriate for shallow rooted plants. For deep rooted plants including large shrubs and trees, a depth of growing media of up to 2 m below surrounding ground levels may be required, based upon arborist advice following consideration of individual species requirements, to facilitate a suitable zone depth for the plant(s). The underlying impacted material will be covered by a visual marker layer above which, suitable drainage/growing media will be placed within the root zone.

Material to be used above the marker layer must be demonstrated prior to placement as appropriate with respect to site contamination risks in addition to being fit for purpose for uses including growing media, engineered backfill or pavement subgrade material.

The purpose of the marker layer is to serve as a visual signal to those disturbing the capping system of the presence of potentially contaminated fill material at depth. The marker layer shall consist of a light coloured knitted HDPE constructed at least to a density greater than 300 grams per square metre (or equivalent). The marker layer should be of a distinctive bright colour such that future workers and/or site users will be alerted to conditions as documented in a site environmental management plan (EMP) prior to breaching the marker layer (see **Section 7.6.2** – Long term Environmental Management Plan).

The final extent of material capped in-situ will be dependent on conditions encountered during remediation and development works and as such, for planning purposes, the anticipated maximum extent of retained fill material is considered to be the entire site development area.

### 5.3.7 Off-site Disposal of Material

Any material requiring disposal shall be classified in accordance with *Waste Classification Guidelines* NSW EPA (2014a) and relevant waste regulations by the Remediation Consultant. Disposal of waste to licensed waste facilities in accordance with relevant waste regulations will be undertaken by the Contractor. All waste tracking documentation including disposal dockets must be maintained by the Contractor and must be provided to the Principal and the Remediation Consultant for inclusion in the validation report.

## 5.4 Validation

Validation of the remedial works will be conducted by the Remediation Consultant to demonstrate the remediation objectives have been achieved. Consideration to the requirements of the UPSS *Technical Notes: Site Validation Reporting* (DECCW 2010) will be considered in development of the validation program.

Details of the validation program are provided in **Section 7**.

### 5.5 Backfilling of Excavations

Upon confirmation of validation, excavations will be reinstated using validated excavated material sourced from within the site, or alternatively validated imported fill material. Imported fill material will require assessment prior to importation to confirm the material is consistent with Virgin Excavated Natural Material (VENM), Excavated Natural Material (ENM) as defined in EPA (2014b[10]) or any other suitable material, granted an applicable EPA waste exemption under the *Protection of the Environment Operations (Waste) Regulation 2015*.

### 5.6 Site Disestablishment

On completion of the remediation works all plant/equipment and safety/environmental controls shall be removed from the site by the Contractor. If encountered, equipment used during asbestos remediation works will need to be appropriately decontaminated or disposed of as asbestos waste by the Contractor, in accordance with SWA (2016a), EPA (2014a) and relevant waste regulations

[10] The excavated natural material exemption 2014. NSW EPA (2014b)

# 6. Contingency Plan

A review of remediation works has been undertaken to identify potential risks to meeting the specified site validation criteria. A number of potential risks have been identified. These are listed in **Section 6.2**, with contingencies that will be implemented to ensure that validation criteria are met.

Additionally, the associated remedial works health and environmental risks/hazards and their minimisation/mitigation are further discussed in **Sections 8** and **9**.

## 6.1 Unexpected Finds Protocol

It is acknowledged that previous investigations of the site have been undertaken to assess the identified contaminants of potential concern in selected parts of the site. However, ground conditions between sampling points may vary, and further hazards may arise from unexpected sources and/or in unexpected locations during remediation. The nature of any residual hazards which may be present at the site are generally detectable through visual or olfactory means, for example:

- The presence of significant aggregates of friable asbestos materials (visible) as opposed to minor occurrences of fragments or fibre bundles in soil;
- Bottles/containers of chemicals (visible);
- Excessive quantities of Construction/Demolition Waste (visible) in fill material;
- Drums, waste pits, former pipework or unrecorded USTs (visible);
- Tarry like impacted soil/fill material (visible/odorous);
- Chlorinated hydrocarbon impacted soils (sweet odour);
- Ash and/or slag contaminated soils/fill materials (visible).

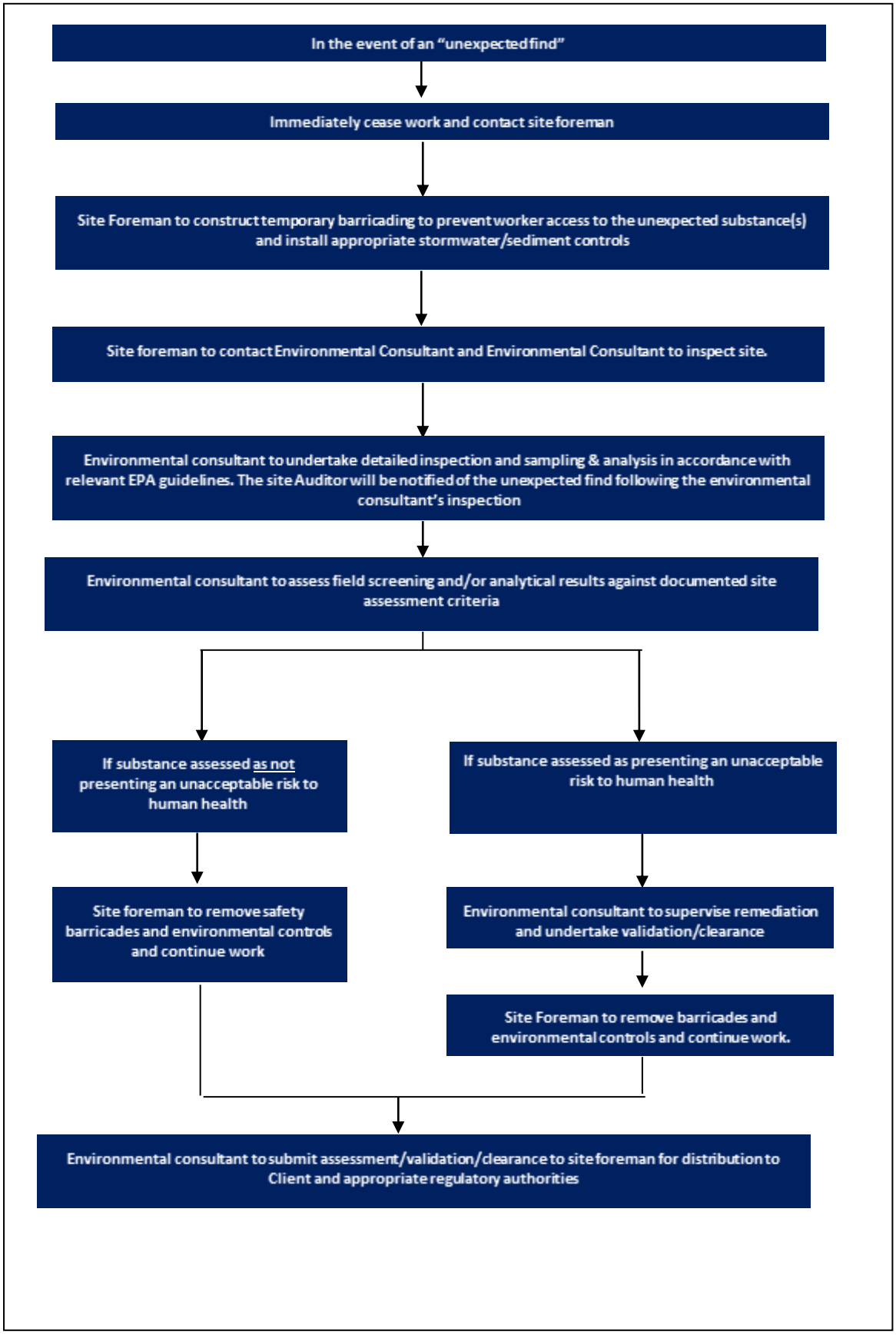
As a precautionary measure to ensure the protection of the workforce and surrounding community, should any of the abovementioned substances be identified (or any other unexpected potentially hazardous substance), the procedure summarised in **Flowchart 6.1** is to be followed.

An enlarged version of the unexpected finds protocol, suitable for use onsite, should be posted in the Site Office and referred to during the site-specific induction by the Contractor.

The sampling strategy for each “unexpected find” shall be designed by a suitably qualified environmental consultant. The strategy will, however, be aimed at determining the nature of the substance – that is, is it hazardous and, if so, is it at concentrations which pose an unacceptable risk to human health or the environment.

The sampling frequency of the identified substance/materials shall meet the minimum requirements outlined in EPA (1995), as well as those outlined in **Section 7.2.7**.

**Flowchart 6.1 – Unexpected Finds Protocol**



## 6.2 Contingency Scenarios

### 6.2.1 Remedial Strategy Constraints

In the event that the proposed remedial works do not meet the validation criteria, or if the selected remedial strategy is not able to proceed, the following actions will be considered to ensure, firstly, the safety and health of people and the environment and, secondly, that the overall project objectives are achieved:

- Reassessment of remedial and validation options for contaminated soils and anthropogenic impacted material; and
- Continued controlled excavation of impacted soils; or
- Alteration to the development and variation of the proposed long-term Environmental Management Plan (EMP) scope to manage any additional residual unacceptable contamination (if appropriate).

### 6.2.2 Tank Pit Excavation Validation Failure on Boundary

Given the location of the potential USTs close to the site boundary, there is a risk that remedial works to remove any associated impacted material will identified that contaminant impacts in soil exceed the site validation criteria at the boundary.

In this event, or where sampling cannot be undertaken to confirm the absence of impacted material on the boundary as a result of temporary shoring/excavation retention measures, a qualitative assessment of the potential for unacceptable risks to sensitive receptors will be initially completed, prior to issue of the site validation report. Where an unacceptable risk is identified, appropriate notification of conditions to the adjoining land owner and the NSW EPA will be initiated and a revised remediation strategy developed to address the unacceptable risks.

Reference should be made to the *Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997* (EPA 2015) at the completion of the remediation works to determine obligations on 'Duty to Report' contamination.

### 6.2.3 Identification of Additional Fuel Infrastructure

There is the potential, given the age of the fuel infrastructure that one or more additional USTs may be encountered during demolition of the pavements or subsequent earthworks. In the event of such an occurrence, the Unexpected Finds Protocol as discussed above (**Figure 6.1**) will be implemented and remedial actions defined with consideration to the requirements for known USTs.

### 6.2.4 Material Storage Breach

In the event any stockpiled materials escape (or have the potential to escape), then the management controls shall be rectified and investigations undertaken to review the adequacy of the controls and improvements implemented.

### 6.2.5 Identification of Oily or Tarry Materials

In the event that oily/tarry materials are encountered, the provisions outlined in the Unexpected Finds Protocol will be implemented, comprising inspection, testing and appropriate action as advised by the Remediation Consultant.

Any suspected oily/tarry materials must be segregated from other excavated materials and placed in a designated area with appropriate odour and sediment controls until such time as appropriate assessment is completed and a methodology is confirmed for their appropriate management.

In the event that the oily/tarry materials do not meet the Site Validation Criteria, then they shall be stored in a secure area for later treatment or classified and removed from the site for treatment and/or disposal at an appropriately licensed facility.

### 6.2.6 Identification of Chlorinated Hydrocarbon Impact

In the event that chlorinated hydrocarbon impacted materials are encountered (potentially as a result of the identification of sweet odours in soils), the provisions outlined in the Unexpected Finds Protocol will be implemented, comprising inspection, testing and appropriate action as advised by the Remediation Consultant.

Any suspected chlorinated hydrocarbon impacted materials must be segregated from other excavated materials and placed in a designated area with appropriate odour and sediment controls until such time as appropriate assessment is completed and a methodology is confirmed for their appropriate management. In the event that the materials do not meet the Site Validation Criteria, then they shall be stored in a secure area for later treatment or classified and removed from the site for treatment and/or disposal at an appropriately licensed facility.

### 6.2.7 Emissions Complaints

Due to the nature of the activities and type of contaminants identified at the site there is a potential for complaints to be received from members of the public relating to environmental emissions including:

- Dust emissions arising from contaminated soil excavation, material handling, transport, placement and capping;
- Offensive odours arising from the excavation and offsite disposal of petroleum impacted soils/infrastructure; and
- Noise and vibration from excavation.

Monitoring of all environmental emissions shall be undertaken as detailed in **Section 8** and appropriate actions taken to further control emissions following receipt of a complaint. Such additional controls may include the following actions:

- Increased application of odour screening/masking chemicals on odour materials;
- Disturbance of soils during meteorologically favourable periods only; and/or
- Increasing environmental controls including covering and/or wetting down soils which are generating dust.

### 6.2.8 Severe Weather

Weather will be monitored on a daily basis via checking an internet based weather service provider. Should severe weather be forecast, especially heavy rain and strong winds, works will stop until safe to re-commence. All site management controls will be implemented to the extent practicable as outlined in **Section 8** prior to any severe weather events.

# 7. Validation Plan

## 7.1 Overview

Validation data is required to be collected to verify the effectiveness of the remediation works and document the condition of the site as being suitable for the permissible land uses. Validation activities will be required for the following:

- Verification of the removal of petroleum infrastructure;
- Excavations formed by removal of petroleum impacted soils;
- Confirmation residual fill materials do not contain petroleum hydrocarbons representing an aesthetic issue;
- Excavations formed by removal of arsenic impacted soils at BH11;
- Waste materials (including soil and ground/seepage water) requiring off-site disposal was taken to a facility lawfully able to accept it; and
- Importation of materials to site (if required).

## 7.2 Data Quality Objectives

Data Quality Objectives (DQOs) were developed for the validation program, as discussed in the following sections.

### 7.2.1 State the Problem

The site, which has been used historically for a range of commercial/industrial uses, is proposed to be developed for commercial and residential land uses.

Previous assessment of site conditions has identified the presence of potential in-situ fuel infrastructure that will require removal in addition to soils impacted, to varying extents, by petroleum hydrocarbons, heavy metals and PAHs that will require management/remediation for the site to be considered suitable for future proposed land uses.

To appropriately demonstrate that the remedial/management works have been completed in accordance with this RAP, sufficient data in the form of observations, sample analytical data, material tracking records, survey data, disposal docket, etc. are required to be collected and assessed in a defensible manner.

### 7.2.2 Identify the Decision

The following decisions are required to be made during the validation works:

- Are risks to onsite or offsite receptors from any residual soil contamination, following the remedial works outlined in **Section 5.3** acceptable (subject to the proposed long term EMP)?
- If impacted materials are to remain on site, can any outstanding issues be appropriately managed by the adoption of a cap and containment strategy based on physical separation and an EMP?
- Have all aesthetic issues been addressed?
- Have excavated/sorted materials been classified and disposed of offsite to a facility licensed to accept the classified waste?
- Was imported material used as backfill suitable for the intended land use?
- Has the potential migration of contaminants from the site been mitigated?

- Have the works been completed in accordance with the RAP, or where variations to the works were required, have these met the objectives of the RAP?
- Is the site suitable for the proposed land use?

### 7.2.3 Identify Inputs to the Decision

The inputs to the decision are:

- Previous investigation data;
- Field observations, field test data, sampling and analytical data during remedial works;
- Field observations, sampling and analytical data for offsite disposal of waste materials;
- Documentation of appropriate classification of imported materials (if required);
- Assessment criteria for potentially impacted media; and
- Data quality indicators as assessed by quality assurance/quality control procedures (QA/QC).

### 7.2.4 Define the Study Boundaries

The lateral extent of the site for the purposes of the RAP comprises the lot/property boundaries as shown in **Figure 2**.

The vertical extent of the validation assessment will comprise the depth of impacted fill material and natural soil underlying the site. In practice the lateral and vertical extent shall be determined by validation samples that satisfy the adopted validation criteria.

Due to the nature of potential contaminants of concern at the site, seasonality and other temporal variables will not be assessed as part of this investigation. The temporary boundaries of the validation assessment will be limited to the period of field validation assessment activities.

### 7.2.5 Decision Rules

The decision rules adopted to answer the decisions identified in **Table 7.1** below.

**Table 7.1: Decision Rules**

| Decision Required to be Made | Decision Rule |
|---|---|
| 1. Following the remedial works outlined in **Section 5.3,** are risks to onsite or offsite receptors from residual soil contamination, acceptable (subject to the proposed long term EMP)? | Soil analytical data will be compared to EPA endorsed criteria as established in this RAP. For each of the validation data sets, where appropriate, statistical analysis of the data will be undertaken in accordance with relevant guidance documents to facilitate the decisions. The following statistical criteria will be adopted with respect to soils:<br>Either: the reported concentrations are all below the site criteria;<br>Or: the average site concentration for each analyte must be below the adopted site criterion; no single analyte concentration exceeds 250 % of the adopted site criterion; and the standard deviation of the results must be less than 50 % of the site criteria.<br>And: the 95 % upper confidence limit (UCL) of the average concentration for each analyte must be below the adopted site criterion.<br>If the statistical criteria stated above are satisfied, the decision is Yes.<br>If the statistical criteria are not satisfied, refer to Decision Rule 2. |
| 2. If impacted materials are to remain on site, can any outstanding issues be appropriately managed by the adoption of a cap and containment strategy based on physical separation and an EMP? | Validation/site characterisation sample contaminant data will be assessed by comparison with ANZECC (1999) and EPA endorsed documents as appropriate. |

| Decision Required to be Made | Decision Rule |
|---|---|
| | If the contaminants are considered to be appropriately managed via installation of a capping system based on physical separation, the answer to the decision is Yes.<br>If the contaminants are considered to still represent a potential risk in relation to future site users following installation of a physical separation layer, then the answer to the decision would be No. |
| 3. Have all aesthetic issues been addressed? | If there are any remaining unacceptable inclusions or soil discolouration, the answer to the decision will be No.<br>Otherwise, the answer to the decision will be Yes. |
| 4. Has all excess excavated soil been classified and disposed of offsite to a facility licensed to accept the classified waste? | Soil analytical data will be compared against presented criteria in EPA Waste Classification Guidelines (2014).<br>Statistical analyses of the data in accordance with relevant guidance documents will be undertaken, if appropriate, to facilitate the decisions (as detailed above). Appropriate waste classification and disposal documents to be obtained.<br>If the statistical criteria stated above are satisfied, the decision is Yes, and if receipts are provided recording the disposal of material to an offsite licensed facility, the decision is Yes. If criteria or statistical assessment are not satisfied, or no disposal receipts are provided, the answer is No. |
| 5. Where material is imported to generate final development levels, has the material been identified as suitable for the intended land use? | Soil analytical data will be compared against the regulatory requirements for importations in addition to site land use assessment criteria. Statistical analyses of the data in accordance with relevant guidance documents will be undertaken, if appropriate, to facilitate the decisions (as detailed above).<br>If both the regulatory requirements and the statistical criteria stated above are satisfied, or if supporting documentation from the source site is provided regarding suitability for use, the answer to the decision is Yes.<br>If the material doesn't meet the regulatory requirements, inclusive of soil analytical data exceeding the EPA endorsed criteria or documentation from source site is not provided, the answer is No. |
| 6. Has the potential migration of contaminants from the site been mitigated? | Where contaminants were to be retained on site, appropriate final characterisation data will be assessed in addition to existing groundwater contamination data to evaluate the potential impact on groundwater conditions at the site.<br>If the assessment indicates any unacceptable risk then the answer to the decision will be No.<br>Otherwise, the answer to the decision will be Yes. |
| 7. Have all remediation works been completed in accordance with the requirements of the RAP, or where variations were required, have these been appropriate to meet the RAP objectives? | Evaluation of the RAP requirements and completed scope of works will be completed on a qualitative basis. If the completed works are inconsistent with the RAP objectives, the answer will be No. In this instance, evaluation of the works will be undertaken with consideration to the RAP objectives. If the works are inconsistent with the stated objectives, the answer is No. Otherwise the answer to the decision is Yes. |
| 8. Is the site suitable for the proposed uses? | Is the answer to any of the above decisions No?<br>If No, can the outstanding issues be appropriately addressed by incorporation into the proposed EMP?<br>If the answer to the above is Yes, or if the issues can be appropriately addressed by incorporation into the proposed EMP, the answer to the above decision is Yes, subject to implementation of the EMP.<br>Otherwise, the answer to the decision is No. |

### 7.2.6 Specify Limits of Decision Error

This step seeks to establish the decision maker's tolerable limits on decision errors, which are used to establish performance goals for limiting inherent uncertainty in the data. Data generated during this project needs to robust and reliable to facilitate decisions to be made with confidence.

Specific limits for this project were adopted in accordance with the appropriate guidance from the NSW EPA, NEPC (2013), appropriate indicators of data quality indicators (DQIs) used to assess QA/QC and standard JBS&G procedures for field sampling and handling.

To assess the useability of the data prior to making decisions, the data were assessed against pre-determined DQIs to assess precision, accuracy, representativeness, comparability, completeness and sensitivity (PARCCS parameters). The acceptable limit on decision error was 95% compliance with DQIs.

The QA/QC program is documented in **Table 7.2**.

- **Precision** - measures the reproducibility of measurements under a given set of conditions. The precision of the laboratory data and sampling techniques is assessed by calculating the Relative Percent Difference (RPD) of duplicate samples for chemical COPCs. For asbestos precision is assessed by whether the identification results for duplicate samples were in agreement with the original sample.
- **Accuracy** - measures the bias in a measurement system. The accuracy of the laboratory data that are generated during this study is a measure of the closeness of the analytical results obtained by a method to the 'true' value. Accuracy is assessed by reference to the analytical results of laboratory control samples, laboratory spikes and analyses against reference standards. Note only applied to chemical COPC.
- **Representativeness** –expresses the degree which sample data accurately and precisely represent a characteristic of a population or an environmental condition. Representativeness is achieved by collecting samples on a representative basis across the site, and by using an adequate number of sample locations to characterise the site to the required accuracy.
- **Comparability** - expresses the confidence with which one data set can be compared with another. This is achieved through maintaining a level of consistency in techniques used to collect samples; and ensuring analysing laboratories use consistent analysis techniques; and reporting methods.
- **Completeness** – is defined as the percentage of measurements made which are judged to be valid measurements. The completeness goal is set at there being sufficient valid data generated during the study.
- **Sensitivity** – expresses the appropriateness of the chosen laboratory methods, including the limits of reporting, in producing reliable data in relation to the adopted site assessment criteria.

**Table 7.2 Summary of Data Quality Indicators for Soil Validation Program**

| Data Quality Indicators | Frequency | Data Quality Criteria |
|---|---|---|
| **Precision** | | |
| Split duplicates (intra laboratory) | 1 / 20 samples | <50% RPD[1] |
| Blind duplicates (inter laboratory) | 1 / 20 samples | <50% RPD[1] |
| Laboratory Duplicates | 1 / 20 samples | <50% RPD[1] |
| **Accuracy** | | |
| Surrogate spikes | All organic samples | 70-130% |
| Laboratory control samples | 1 per lab batch | 70-130% |
| Matrix spikes | 1 per lab batch | 70-130% |
| **Representativeness** | | |
| Sampling appropriate for media and analytes | All samples | -[2] |
| Samples extracted and analysed within holding times. | All samples | Soil: organics (14 days), inorganics (6 months)<br>Water: organics (7 days to extract and 14 days to analyses). Metals (6 months) |
| Laboratory Blanks | 1 per lab batch | <LOR |
| Trip spike | 1 per lab batch | 70-130% recovery |
| Storage blank | 1 per lab batch | <LOR |
| Rinsate sample | 1 per sampling event/media | <LOR |
| **Comparability** | | |
| Standard operating procedures for sample collection & handling | All Samples | All Samples |
| Standard analytical methods used for all analyses | All Samples extracted and analysed within holding times | NATA accreditation |
| Consistent field conditions, sampling staff and laboratory analysis | All Samples | All samples[2] |
| Limits of reporting appropriate and consistent | All Samples extracted and analysed within holding times | All samples[2] |
| **Completeness** | | |
| Sample description and COCs completed and appropriate | All Samples | All samples[2] |
| Appropriate documentation | All Samples | All samples[2] |
| Satisfactory frequency and result for QC samples | | 95% compliance |
| Data from critical samples is considered valid | - | Critical samples valid |
| **Sensitivity** | | |
| Analytical methods and limits of recovery appropriate for media and adopted Site assessment criteria | All samples | LOR<= Site assessment criteria |

[1] If the RPD between duplicates is greater than the pre-determined data quality indicator, a judgment will be made as to whether the excess is critical in relation to the validation of the data set or unacceptable sampling error is occurring in the field.

[2] A qualitative assessment of compliance with standard procedures and appropriate sample collection methods will be completed during the DQI compliance assessment.

### 7.2.7 Optimise the Design for Obtaining Data

The purpose of this step is to identify a resource-effective field investigation sampling design that generates data that are expected to satisfy the performance criteria, as specified in the preceding steps of the DQO Process.

For these works, following the removal of petroleum storage infrastructure and associated impacted soil, the resultant excavation walls and base will be inspected/sampled in accordance with **Table 7.3** with the results assessed against the adopted validation criteria as discussed in **Section 7.5**. The resulting excavated material will be characterised based on the waste classification criteria set out in EPA (2014a) *Waste Classification Guidelines*.

Where fill material from beyond the fuel infrastructure excavations is required to be excavated to achieve proposed development levels, the resulting material will be characterised for the purposes of either on-site reuse (above or below a capping profile) or alternatively for off-site disposal. Where fill material is to be retained in-situ, characterisation sampling will be collected to verify the material is suitable to be retained under a capping profile. Alternatively, where excavation works result in the removal of all potentially impacted fill/natural soil material, validation sampling will be undertaken to verify that capping of these site areas will not be required for site suitability.

Imported materials (where/if required) will also require validation to ensure their appropriateness (from a contamination perspective) for use on the site. General sampling densities are outlined in **Table 7.3**, to be confirmed based on the specific material types to be imported at the time of the remediation works.

**Table 7.3: Sampling Analytical Schedule**

| Item | Sampling Frequency | | | Analytes |
|---|---|---|---|---|
| | Excavation Base | Excavation Walls | Materials | |
| | | | (offsite disposal/on-site reuse suitability) | |
| Excavation formed by the removal of petroleum storage infrastructure | 1 sample per UST, or a minimum of 1/25 $m^2$ where one large excavation | 1 sample per wall per media, with minimum spacing of one per 5 linear metres | Sampling at 1/25 $m^3$, with analysis at 1/100 $m^3$ based on PID screening | TRH/BTEX<br>Lead<br>PAH |
| Excavation formed by the removal of arsenic impacted soils | 1/25 $m^2$ | one per 5 linear metres | See below | Arsenic |
| Characterisation of excavated materials from the balance of the site requiring off-site disposal | N/A | N/A | 1/100 $m^3$ with a minimum of 3 samples | Heavy Metals<br>TRH/BTEX<br>PAHs<br>OCPs/PCBs<br>Asbestos (500 mL)<br>TCLP Heavy Metals<br>TCLP PAHs |
| Imported VENM | N/A | N/A | Minimum of 5 samples per material types/source site | Heavy Metals<br>TRH/BTEX<br>PAHs<br>OCPs/PCBs<br>Asbestos (500 mL) |
| Material the subject of a resource recovery exemption | N/A | N/A | As per exemption requirements, plus minimum of 5 samples per material type/source site | Heavy Metals<br>TRH/BTEX<br>PAHs<br>Asbestos (500 mL)<br>In addition to suite as required by exemption |
| Tankpit/Excavation Water | N/A | N/A | One per excavation/ pump out event, minimum of 1/10 000L | Heavy metals,<br>TRH/BTEX<br>low level PAHs<br>EC and pH |

### 7.3 Soil Validation Methodology

The soil sampling method shall be determined by the Remedial Consultant as consistent with the observations of the site sub-surface and appropriate to generate representative samples. It is anticipated the sampling methods may include:

- test pits/grab samples using an excavator/backhoe bucket for in-situ material characterisation and validation of deep excavations (including the former tank pits, etc);
- Boreholes completed by hand or using rig mounted drilling equipment; and
- Stockpile sampling using a shovel, trowel, hand auger, excavator/backhoe bucket or similar.

The soil sampling method shall be consistent with the data quality indicators in **Section 7.2.6** with due consideration to the general requirements for sampling as outlined in NEPC (2013).

In all instances, care will be taken to minimise the disturbance of material prior to and during sampling such that volatile contaminant lost may be minimised during sampling activities.

Re-useable sampling equipment will be thoroughly decontaminated during sampling activities using phosphate free detergent and distilled water between each sampling location. Field instruments including PIDs will be calibrated on a daily basis during use with the results recorded on daily field forms.

#### 7.3.1 Soil Sample Containers

During the collection of soil samples, features such as seepage, discolouration, staining, odours and other indications of contamination shall be noted on field reporting sheets/field logs.

Collected soil samples shall be immediately transferred to sample containers of appropriate composition (glass jars for chemical analysis fitted with Teflon sealed lids). Where asbestos analysis is required, 500 mL samples (as per WA DOH 2009/NEPC 2013) shall be additionally collected and placed in new zip lock bags. Sample labels shall record sample identification number and date and time of sampling. Sample containers shall be transferred to a chilled ice box for sample preservation prior to and during shipment to the testing laboratory.

A chain-of-custody form shall be completed and forwarded with the samples to the testing laboratory, containing the following information:

- Sample identification;
- Signature of sampler;
- Date of collection;
- Type of sample;
- Number and type of container;
- Inclusive dates of possession; and
- Signature of receiver.

#### 7.3.2 Field PID Screening

Soil validation/characterisation samples will be screened on site during works using a PID to assess the presence of VOCs including petroleum hydrocarbons. Samples obtained for PID screening will be placed in a sealed plastic bag for a period of approximately 5 minutes to equilibrate prior to a PID being attached to the bag. Readings will then be monitored for a period of approximately 1 minute or until values stabilised and the stabilised/highest reading was recorded. PID reading will be recorded on field notes during each sampling event. The PID calibration will be checked prior to each sampling event and the outcome documented in field notes.

### 7.3.3 Field XRF Screening

Soil validation/characterisation samples will be screened on site during works using an XRF to assess the presence of arsenic. XRF readings will be recorded on field notes during the sampling event. The XRF calibration will be checked prior to each sampling event and the outcome documented in field notes.

## 7.4 Laboratory Analysis

NATA accredited laboratories shall be used for all analysis of samples. Appropriate methods and limits of reporting (LORs) are required for comparison to relevant criteria. Laboratory methods and LORs are presented in **Table 7.4** below.

**Table 7.4: Soil Laboratory Analysis Methods (all units in mg/kg unless stated)**

| Analyte | Limit of Reporting | Laboratory Method |
|---|---|---|
| Metals | | |
| Arsenic | 4.0 | ICP-AES (USEPA 200.7) |
| Cadmium | 1.0 | ICP-AES (USEPA 200.7) |
| Chromium (total) | 1.0 | ICP-AES (USEPA 200.7) |
| Chromium (VI) | 1.0 | Alkali leach colorimetric (APHA3500-Cr/USEAP3060A) |
| Copper | 1.0 | ICP-AES (USEPA 200.7) |
| Lead | 1.0 | ICP-AES (USEPA 200.7) |
| Nickel | 1.0 | ICP-AES (USEPA 200.7) |
| Zinc | 1.0 | ICP-AES (USEPA 200.7) |
| Mercury (inorganic) | 0.1 | Cold Vapour ASS (USEPA 7471A) |
| TRH | | |
| $C_6$ – $C_9$ Fraction | 25 | Purge Trap-GCMS (USEPA8260) |
| $C_{10}$ – $C_{36}$ Fraction | 250 | Purge Trap-GCFID (USEPA8000) |
| BTEX | | |
| Benzene | 1.0 | Purge Trap-GCMS (USEPA8260) |
| Toluene | 1.0 | Purge Trap-GCMS (USEPA8260) |
| Ethylbenzene | 1.0 | Purge Trap-GCMS (USEPA8260) |
| Total Xylenes | 3.0 | Purge Trap-GCMS (USEPA8260) |
| PAHs | | |
| Benzo(a)pyrene | 0.05 | GCMS (USEPA8270) |
| Total PAHs | 1.55 | GCMS (USEPA8270) |
| PCBs | | |
| PCBs (total) | 0.7 | GCECD (USEPA8140,8080) |
| OCPs | | |
| Aldrin + Dieldrin | 0.2 | GCECD (USEPA8140,8080) |
| Chlordane | 0.1 | GCECD (USEPA8140,8080) |
| DDT + DDD + DDE | 0.3 | GCECD (USEPA8140,8080) |
| Endosulfan | 0.3 | GCECD (USEPA8140,8080) |
| Endrin | 0.1 | GCECD (USEPA8140,8080) |
| Methoxychlor | 0.1 | GCECD (USEPA8140,8080) |
| Heptachlor | 0.1 | GCECD (USEPA8140,8080) |
| Other | | |
| Asbestos (off-site disposal) | Presence/ 0.1 g/kg | PLM / Dispersion Staining as per AS4964:2004 |
| Asbestos (site validation) | 0.001% w/w | Gravimetric procedures |
| Soil pH | 0.1 | 5:1 leach |

## 7.5 Validation of Capping Layer

### 7.5.1 Marker Layer Inspection and Survey

Visual inspection will be undertaken by the Remediation Consultant to verify the installation of the marker layer across all required areas of the site. Photographic records and a survey of the marker layer installation, including vertical and lateral extents by the Contractor will be retained for inclusion in the validation report.

### 7.5.2 Capping Layer Validation and Survey

Based on current development plans (**Appendix A**), it is anticipated that the site footprint will be entirely paved. However, if an alternative capping strategy as outlined in **Section 5.3.6** is required during future site development works, material to be used as a capping layer must be validated by the Remediation Consultant to be environmentally suitable, consisting of VENM, suitable on-site materials, and/or imported material nominated via a beneficial reuse exemption as fit for the proposed purpose. Additionally, any capping layer material must not exceed the adopted site validation criteria for soils.

The capping layer must be placed at the thicknesses specified for each capping scenario as detailed in **Section 5.3.6**. Photographic records and a survey of the capping layer installation, which details the final thicknesses of the capping layer, including the vertical and lateral extents by the Contractor will be retained for inclusion in the validation report.

## 7.6 Soil Validation Criteria

### 7.6.1 Site Characterisation Criteria

Based on the proposed land uses, and in accordance with the decision process for assessment of urban redevelopment sites (EPA, 2018), concentrations of contaminants in remediation areas (principally suspect USTs and arsenic impacted areas) shall be compared initially for the purposes of validation against adopted investigation/screening level criteria as presented in sourced from NEPC (2013). While decisions with respect to criteria have been developed conservatively with regards to the proposed end uses, interpretation of the data will be undertaken in the context of the proposed capping of the site and implementation of an EMP (see **Section 5**).

Specifically, assessment criteria will be derived from published criteria as presented in NEPC (2013) prior to the commencement of remediation works based on final land use/earthworks plans as appropriate for each contaminant based on:

- Table 1A(1) Health Investigation Levels for Soil Contaminants; and
- Table 1A(3) Soil Health Screening Levels for Vapour Intrusion;
- Ecological Screening Levels (ESLs) from Table 1B(6) ESLs for TPH Fractions F1-F4, BTEX and Benzo(a)pyrene in Soil under the recreation with minimal access to soils land use scenario;
- Management Limits for TPH Fractions F1-F4 in Soil under the recreation with minimal access to soils land use scenario from Table 1B(7);
- Soil Quality Guidelines (site specific ecological investigation levels) for Urban Residential/Public Open Space land uses – Schedule B5C, NEPC (2013); and
- Definition of asbestos contaminated soil as provided NEPC (2013)/ WA DoH (2009).

Given the adopted criteria will in some instances be dependent upon soil texture and depth below final ground level, final site criteria will only be defined at the time of data evaluation. For reference, relevant NEPC (2013) tables have been reproduced in **Appendix C**.

Where consideration of the potential ecological risk is required for validation of growing media from soils other than VENM or ENM, representative soil samples will be the subject of total organic carbon (TOC %), CEC and soil pH analysis to support the development of the assessment criteria, or where appropriate published background levels may be used. Representative samples are likely to comprise both natural soils of various types and the proposed materials to be used as growing media.

Where multiple soil validation criteria can be derived based on the above, as for example in the case for F4 TRH, the lowest of the possible applicable values will be adopted as the assessment criteria. Where sufficient data sets are available, statistical criteria as nominated following will apply:

- all contaminant concentrations were less than the adopted site assessment criteria,

Or:

- The upper 95% confidence limit on the average concentration for each analyte (calculated for samples collected from consistent soil horizons, stratigraphy or material types) was below the adopted criterion;
- No single analyte concentration exceeded 250% of the adopted criterion; and
- The standard deviation of the results was less than 50% of the criterion.

In addition to the numerical criteria, the following observations will also supplement the validation process:

- There shall be no visible asbestos in addition to laboratory analyses results; and
- Soils shall not emit recognisable odours, be discoloured as a result of contamination and/or have any significant additional aesthetic concerns with respect to future site users.

### 7.6.2 Material Importation

In accordance with current EPA policy, only material that does not represent an environmental or health risk at the receiving site may be considered for resource recovery. Imported materials will only be accepted to the site if they meet the restrictions placed on these materials and meet the definition of one or more of the following:

- Virgin Excavated Natural Material (VENM) as defined in the *Protection of the Environment Operations Act* (1997) Schedule 1;
- Excavated Natural Material (ENM) as defined in EPA (2014b); or
- Recycled materials as per an EPA exemption.

All material imported onto the site is required to be accompanied by appropriate documentation that has been verified by the appointed Remediation Consultant.

For recycled materials, sampling of materials as per an EPA exemption is required to be undertaken by the facility in accordance with the exemption. In addition, where materials are proposed to be imported to the site under a NSW EPA exemption the material will need to be further assessed by Remediation Consultant for land use suitability in accordance with the validation requirements nominated in **Section 7.2.7**.

### 7.6.3 Material Characterisation for Off-site Disposal

Materials shall be classified in accordance with EPA (2014a) *Waste Classification Guidelines* or an appropriate exemption as created under the *Protection of the Environment Operations (Waste) Regulation 2014*.

Material will require to be removed to a facility lawfully able to receive it.

## 7.7 Reporting

### 7.7.1 Validation Assessment Report

At the completion of remediation works, a validation report will be prepared in general accordance with EPA (2017) and OEH (2011) *Guidelines for Consultants Reporting on Contaminated Site*, documenting the works as completed.

This report will contain information including:

- Details of the remediation works conducted;

- Update relevant portions of the site description and CSM as relevant to the validation assessment footprint;
- Present all sampling field notes and laboratory data including calibration certificates for field monitoring equipment, environmental monitoring etc.;
- Undertake an assessment of QA/QC for analytical data generated by the works and identify data that is reliable for use in characterising site;
- Sort data into data sets as required by the decision rules;
- Assess whether sufficient data has been obtained to meet required limits on decision error;
- Undertake assessment to the decision rules and identify any environmental data which causes decision rules to be failed;
- Provide a summary of waste disposal activities and volumes of waste removed from the site including supply of all waste disposal dockets confirming final waste disposal/landfill destination;
- Provide a summary of material importation activities (general fill soil/crushed rock, growing media, earthworks aggregates, drainage backfill etc), including material source, type, assessment of suitability, approximate quantities, date of importation and final placement location;
- Document any variations to the strategy undertaken during the implementation of the remedial works;
- Results of all environmental monitoring undertaken during the course of the remedial works;
- Details of any environmental incidents occurring during the course of the remedial works and the actions undertaken in response to these incidents;
- Identify the requirements for the long term EMP (where appropriate) including inclusion of a survey clearly identifying the extent of the retained impacted material and associated capping;
- Provide a clear statement on the suitability of the site (or portions thereof) for the proposed use and requirements for any ongoing monitoring/management (where applicable).

The report will serve to document the remediation works for future reference.

### 7.7.2 Long Term Environmental Management Plan

In addition to the requirements of the validation plan, the proposed remediation strategy for the site will more than likely result in passive long term management requirements at the completion of the final development works.

To this end a long term EMP will be prepared to detail the ongoing management and monitoring requirements applicable to the site. The precise nature and extent of the management requirements will not be known until remediation/management works are conducted and the validation data obtained. It is anticipated that the long term EMP will be prepared for the relevant portions of the site following the completion of the validation report(s) such that the requirements may be reviewed and endorsed by the appointed Site Auditor in preparation of the Section A2 Site Audit Statement.

The long term EMP(s) are required to document the following elements:

- A statement of the objectives of the long term EMP – i.e., to ensure continued suitability of the site following remediation.

- Identification of residual environmental contamination issues at the site that require ongoing management/monitoring to meet the long term EMP objectives, including the type of contamination and location within the site (including a survey plan of final capping extent prepared by a registered surveyor).
- Documentation of environmental management measures which have been implemented to address the identified environmental issues at the site.
- Description of management controls to limit the exposure of site users to known impacted material to acceptable levels.
- Description of responsibilities for implementing various elements of the provisions contained in the long-term EMP.
- Timeframes for implementing the various control/monitoring, etc. elements outlined in the long-term EMP.
- Environmental monitoring and reporting requirements (if required) for the future management of environmental impact underlying the site including:
    - Appropriate monitoring locations and depth within and down-gradient of any residual contamination;
    - Relevant assessment criteria to be used in evaluating monitoring results;
    - Frequency of monitoring and reporting;
    - Process for reviewing monitoring data and how decisions will be made regarding the ongoing management strategy;
    - The length of time for which monitoring is expected to continue;
    - The regulatory authorities involved and the management inputs required from each;
    - The integration of environmental management and monitoring measures for soil;
    - Health and safety requirements for particular activities;
    - A program of review and audits;
    - The provisions in the long term EMP are feasible (i.e., able to be implemented) and able to be legally enforceable (i.e., a mechanism exists, such as development consent conditions, Section 88b instruments, etc to give the plan a basis in law); and
    - The relevant consent authority (where appropriate) is satisfied that the inclusion of a development consent condition relating to the implementation of the long term EMP is acceptable.
- Corrective action procedures to be implemented where long term EMP assessment criteria are breached.

# 8. Site Management Plan

Prior to the commencement of site works, it is anticipated that the appointed Principal Contractor will be responsible for the preparation of a site works Construction Environmental Management Plan (CEMP) to document the required management and monitoring measures, corrective actions and reporting requirements.

In addition to the following issues identified below, consideration would also need to be given to any additional requirements as may be defined by a development consent/Review of Environmental Factors (REF) process, in addition to the controls nominated in:

- City of Sydney Contaminated Land Development Control Plan 2004. City of Sydney Council, June 2004.

## 8.1 Hours of Operation

All remediation works shall be conducted within the standard City of Sydney hours of construction and work, or as otherwise designated in the REF documentation.

## 8.2 Erosion and Sediment Control Policy

All works shall be conducted in general accordance with site specific soil and surface water management plan to be prepared prior to the commencement of works in general accordance with the *Soils and Construction Managing Urban Stormwater* (Landcom 2004) publication.

All installed erosion and sediment controls must be maintained in a functions conditions throughout the remediation works.

To prevent the migration of contaminated soil off-site, silt fences are required to be constructed at the down-gradient site boundaries. Any material which is collected behind the sediment control structures shall be removed offsite with the contaminated soil.

In the event of a significant storm/rainfall event, the sediment, surface water control measures shall be monitored and replaced and/or altered as necessary. Collected material shall be managed in accordance with the requirements of impacted material as discussed in the RAP.

## 8.3 Stockpile Management

All materials stockpiled onsite will be managed by the Contractor. Unique numbers should be provided for each stockpile, the source of the stockpile, its estimated volume, material characterisation and its location onsite should also be recorded in a site register.

The following procedures will be implemented by the Contractor:

- No stockpiles of soil or other materials shall be placed on footpaths or road reserves unless prior Council approval has been obtained;
- All stockpiles of soil or other materials shall be placed away from drainage lines, gutters or stormwater pits or inlets;
- All stockpiles of soil or other materials likely to generate dust or odours shall be covered (where practical); and
- All stockpiles of chemically contaminated soil shall be stored in a secure area and be covered if remaining more than 24 hours (where practical).

## 8.4 Site Access

During remediation works, site perimeter fencing must be maintained to restrict access to the site to only authorised and appropriated inducted persons.

The Remediation Contractor will be required to arrange appropriate traffic management plans to be implemented prior to commencement of site works.

All vehicle access to the site shall be stabilised to prevent the tracking of sediment onto the roads and footpaths. All materials must be removed from the roadway on a daily or as required basis.

### 8.5 Excavation Pump-out

Given the depth to groundwater at the site (between 3.3 to 6.7 m bgs), unless a significant rainfall event occurs during excavation, it is considered unlikely that excavation pump-out may be required.

However, if necessary the following is required:

Prior to the commencement of pump out, a sample of the excavation water should be assessed for potential petroleum impacts. Where the groundwater/seepage is identified either visually or via lab analysis as being impacted by hydrocarbons, the pump out will be required to be disposed of off-site as 'liquid waste'. Should the water not appear to be impacted with hydrocarbons, laboratory analysis of a sample for TRH/BTEX, total suspended solids (TSS), turbidity, heavy metals and pH would be required to demonstrate the water is of a suitable standard for discharge to the council stormwater system.

Based on the available information, it has been assumed that only a small volume of water will be required to be pumped from the excavation during remediation works. Therefore, it is not considered likely that a temporary dewatering licence would be required. However, should significant dewatering activities be required (in the order of days to weeks or more), consideration of regulatory thresholds in relation to a temporary dewatering licence is required. Such a licence would require the preparation of a Dewatering Management Plan (DMP) and associated application to the Department of Primary Industries, Office of Water.

### 8.6 Noise and Vibration

Remediation work shall not give rise to 'offensive noise' as defined in the *Protection of the Environment Operations* (POEO) Act 1997and its *Noise Control Regulations 2000*. All plant and site operations shall comply with the NSW EPA's *Environmental Noise Control Manual* for the control of noise from construction sites.

Noise and vibrations generated should be managed so as not to adversely impact the amenity or residents/business adjoining or nearby the site.

All machinery and equipment used on site should be in good working order and fitted with appropriate silencers when necessary.

### 8.7 Air Quality (Dust)

During site remediation works, including disturbance of fill and petroleum impacted soils, dust levels should be monitored and minimised by using water/mist sprays as necessary. Consideration may also be given to the application of temporary covers over exposed soils (either geofabric, a surface dust suppressant application or similar measures) in the event of high wind conditions, or site closure events (weekends, etc).

Dust shall also be controlled by ensuring vehicles leave via the designated (stabilised) site access point.

### 8.8 Transport of Material Offsite

Trucks should be loaded in designated areas. The Contractor shall ensure that there is no material tracked out onto the street and that the load is securely covered. In addition, all site vehicles must leave the site in a forward direction.

The Contractor shall also log truck movements and approximate volume, via registration number and consignment number (where applicable), into and out of the site. Truck load details should be included as part of the Validation Report.

All appropriate road rules shall be observed, and state roads will be selected as far as practicable over local roads when deciding on the transport route to the off-site material disposal location.

### 8.9 Odours

Should odours associated with impacted soils be detectable at the site boundary, appropriate actions will be required to reduce the odours, possible including the amount of covering of the excavation/stockpiled material, application of water/mist sprays with odour suppressants, etc.

Records of odour emission observations and any associated actions shall be kept within the site diary.

### 8.10 Hazardous Materials

Hazardous and/or intractable wastes arising from the remediation work shall be removed and disposed of in accordance with the requirements of NSW EPA, SafeWork NSW and the relevant regulations by the Contractor.

In particular, any hazardous wastes should be transported by a NSW EPA licensed transporter.

### 8.11 Disposal of Contaminated Soil

All soils should be classified, managed and disposed in accordance with the *Waste Classification Guidelines* (EPA 2014). Documentary evidence for all waste disposal, including the fuel infrastructure, shall be kept for inclusion in the Validation Report.

Additional requirements for offsite disposal of soils are presented in **Section 7**.

### 8.12 Imported Fill

Any materials imported on site by the Contractor to re-establish ground levels following remedial excavations must be validated, environmentally suitable material, consistent with the definition of VENM.

### 8.13 Site Signage and Contact Numbers

A sign/s shall be displayed adjacent to the site access point/s throughout the duration of the works with the contact details of the Contractor and project manager as provided and maintained by the Contractor.

### 8.14 Site Security

The remedial areas shall be secured against unauthorised access by means of an appropriate fence or barricade or other means by the Contractor. All persons working in asbestos remedial areas must be inducted, have undertaken required training and don appropriate PPE. The access gates to the site should be locked at all times when remedial works are not occurring.

### 8.15 Community Consultation

Owners and/or occupants of adjacent premises and across the road from the site should be notified at least seven days prior to the commencement of preparation for the remediation works. As a minimum, the notification shall include the details of an appropriate contact person.

### 8.16 Health and Safety Management

A Work Health & Safety Management Plan (WHSP) shall be prepared by the Contractor prior to commencement of remediation works on the site. The Plan shall contain procedures and requirements that are to be implemented as a minimum during the works.

The objectives of the WHSP are:

- Ensure all regulatory requirements for the proposed works are satisfied;
- To apply standard procedures that minimises risks resulting from the works;
- To ensure all employees are provided with appropriate training, equipment and support to consistently perform their duties in a safe manner; and
- To have procedures to protect other site workers and the general public.

These objectives will be achieved by:

- Assignment of responsibilities;
- An evaluation of hazards;
- Establishment of personal protection standards, mandatory safety practices and procedures;
- Monitoring of potential hazards and implementation of corrective measures; and
- Provision for contingencies that may arise while operations are being conducted at the site.

### 8.16.1 Additional Site-Specific Elements/Procedures

In addition to the normal construction-related matters, the WHSP shall address the following site-specific specific hazards associated with the works relating to the management of contaminated soil and groundwater:

- Under/aboveground services, specifically former petroleum infrastructure;
- Use of plant and machinery within confined spaces (i.e. excavations);
- Contact to asbestos contaminated soils;
- Contact with contaminated soil (heavy metals, TRH and PAHs), and potentially groundwater and vapours, including requirements for specific Personal Protective Equipment (PPE); and
- Heat/cold stress.

### 8.16.2 Additional Consideration of Chemical Contaminants

As a precautionary measure, the WHSP should include the requirement for the plan to be revised in the event of an unexpected find of contaminated material during remediation and/or construction.

When working with contaminated materials in general, care needs to be taken to ensure that the contamination is not introduced to the worker via ingestion, inhalation or absorption. The WHSP must detail the PPE and decontamination requirements to be followed to control the risks posed by potential exposure to chemical contaminants at the site.

# 9. Regulatory Approvals/Licensing

## 9.1 Environmental Planning and Assessment Act 1979 and State Environment Planning Policy Number 55 (SEPP55) Remediation of Land

The proposed remediation works are considered to be classified as 'Category 2' Remediation Works – i.e., not requiring consent. The notification requirements of SEPP 55 require the consent authority to be notified 30 days before 'Category 2' remediation works commence, providing the consent authority with the information needed to verify the work is not 'Category 1' by reference to the following criteria:

- The work is not designated development under schedule 3 of the *EPA&A Regulation* or under a planning instrument;
- The work proposed is not on land identified as critical habitat under the *Threatened Species Conservation Act 1995*;
- Consideration of s.5A of the *EP&A Act* indicates the remediation work is not likely to have a significant effect on threatened species, populations, ecological communities or their habitats;
- The work is not proposed in an area or zone identified in a planning instrument as being an area of environmental significance such as scenic areas or wetlands; and/or
- The work does not require consent under another SEPP or regional environmental plan.

In addition, the notification will also include relevant contact details and a proposed remediation schedule. Notice is also required to be given to the consent authority within 30 days of remediation works completion.

It is noted there may be other planning policies relevant to the subject land that requires development consent for the works.

## 9.2 Environmental Planning and Assessment Regulation 2000 – Schedule 3 Designated Development

The proposed remediation/validation activities are not considered to comprise designated development.

It is not anticipated that the proposed remediation works will incorporate any on-site treatment of soil. However, in the event that soil is required to be pre-treated prior to off-site disposal, an assessment of potential triggers for the works to be designated development as presented in Schedule 3 – Clause 15 will be required to be completed.

## 9.3 Protection of the Environment Operations Act 1997

All potential discharges from the site during remediation works will require to be maintained below applicable assessment criteria/threshold guidelines during the remediation works. This would apply to potential emissions in air, water and discharges to surface and groundwater. Levels of discharges are typically assessed at a site boundary.

The RAP prepared for the assessment area has provided a process to be followed during the remediation activities and subsequent development works to ensure that the beneficial re-use of materials does not cause pollution of groundwater and/or waters by reference to any applicable criteria as may be used to assess pollution under the POEO Act (including s120).

The proposed remediation/validation activities are not required to be licensed under *the Protection of the Environment Operation Act (1997)* since the works do not involve:

- Treat otherwise than by incineration and store more than 30 000 cubic metres of contaminated soil originating exclusively from the site, or
- Disturb more than an aggregate area of 3 hectares of contaminated soil originating exclusively from the site.

### 9.4 Waste Classification Guidelines (EPA 2014)

All wastes generated and proposed to be disposed offsite shall be assessed, classified and managed in accordance with this guideline. Where wastes require immobilisation prior to offsite disposal (to reduce waste classifications) an immobilisation approval shall be sought in accordance with Part 2 of this guideline. Immobilisations are only anticipated to be required with unexpected finds that cannot be retained on site and cannot be disposed directly offsite to a licensed facility.

### 9.5 Protection of the Environment Operations (Underground Storage Systems UPSS) Regulation 2014

The removal of potential USTs and associated infrastructure will be undertaken in accordance with WorkSafe NSW requirements and a validation report should be provided in accordance with the provisions of the *Protection of the Environment Operations (UPSS) Regulation 2014* as per guidance provided in DECCW (2009). The removal of underground petroleum storage infrastructure should be undertaken in accordance with *The Removal and Disposal of Underground Petroleum Storage Tanks – Australian Standard 4976-2008*.

The validation process detailed in this RAP and the unexpected finds protocol meets the requirements of the regulation.

### 9.6 City of Sydney (2004) 'Contaminated Land Development Control Plan'

The Council development control plan (DCP) provides a number of environmental and site management provisions required to be employed during remediation works.

### 9.7 Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997

It is not expected that implementation of the works presented in this RAP would result in a 'Duty to Report' as defined in the guidelines. Consistent with the scope of works, no works will be permitted within the validation footprint that will potentially cause levels of site constituents to be present at points of exposure and/or the site boundary that will cause any NSW EPA published or endorsed criteria to be exceeded.

At the completion of the remediation works, obligations on 'Duty to Report' contamination should be determined with reference to the *Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997* (EPA 2015).

### 9.8 Work Health and Safety Act 2011 No 10 and Work Health and Safety Regulation 2011

The information and data provided in this RAP should be considered by the Principal/Remediation Contractor in preparation of their health and safety plans for the remedial works.

# 10. Conclusions

Overall, it is considered that the proposed actions outlined in this RAP conform to the requirements of the *Contaminated Land Management Guidelines for the NSW Site Auditor Scheme (3rd Edition)* (EPA 2018) because they are: technically feasible; environmentally justifiable; and consistent with relevant laws policies and guidelines endorsed by NSW EPA.

Subject to the successful implementation of the measures described in this RAP and with consideration to the Limitations presented in Section 11, it is considered that the site can be made suitable for the intended uses and that the risks posed by contamination can be managed in such a way as to be adequately protective of human health and the environment.

# 11. Limitations

This report has been prepared for use by the client who has commissioned the works in accordance with the project brief only, and has been based in part on information obtained from the client and other parties.

The advice herein relates only to this project and all results conclusions and recommendations made should be reviewed by a competent person with experience in environmental investigations, before being used for any other purpose.

JBS&G accepts no liability for use or interpretation by any person or body other than the client who commissioned the works. This report should not be reproduced without prior approval by the client, or amended in any way without prior approval by JBS&G, and should not be relied upon by other parties, who should make their own enquires.

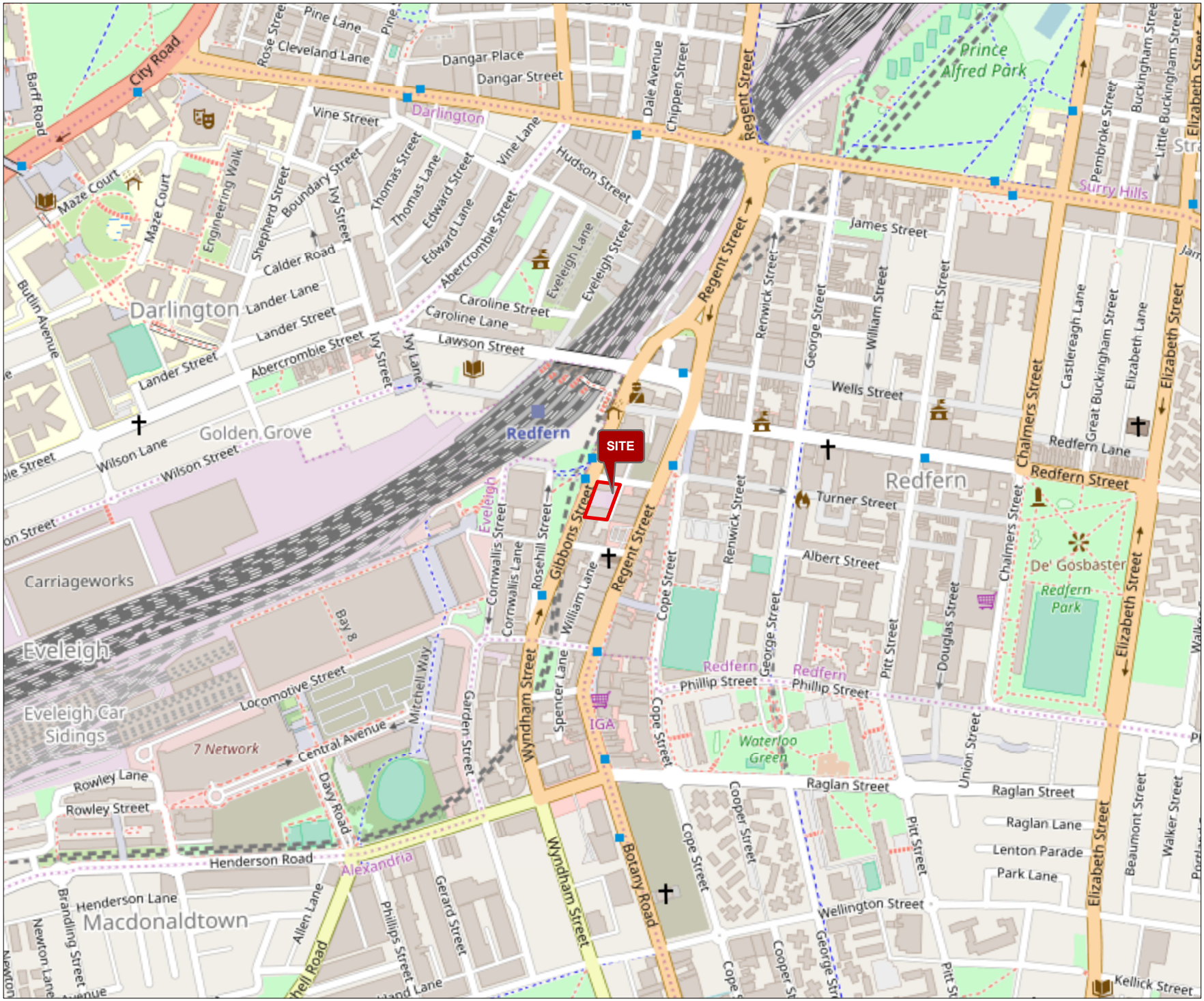
Sampling and chemical analysis of environmental media is based on appropriate guidance documents made and approved by the relevant regulatory authorities. Conclusions arising from the review and assessment of environmental data are based on the sampling and analysis considered appropriate based on the regulatory requirements.

Limited sampling and laboratory analyses were undertaken as part of the investigations undertaken, as described herein. Ground conditions between sampling locations and media may vary, and this should be considered when extrapolating between sampling points. Chemical analytes are based on the information detailed in the site history. Further chemicals or categories of chemicals may exist at the site, which were not identified in the site history and which may not be expected at the site.

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

This report does not provide a complete assessment of the environmental status of the site, and it is limited to the scope defined herein. Should information become available regarding conditions at the site including previously unknown sources of contamination, JBS&G reserves the right to review the report in the context of the additional information.

## Figures




**Legend:**

Approximate Site Location

JBS&G

Job No: 54877

Client: St George Housing

| Version: R02 Rev 1 | Date: 07-Dec-2018 |
|---|---|
| Drawn By: AV | Checked By: EH |

Scale 1:7,000

0 80 160

metres

Coor. Sys. GDA 1994 MGA Zone 56

**9-11 Gibbons Street**
**Redfern, NSW**

**SITE LOCATION**

**FIGURE 1**

File Name: N:\Projects\St George Community Housing\54877 Gibbons Street, Redfern Data Gap\GIS\Maps\R02 Rev 1\54877_01_SiteLoc.mxd
Reference: © OpenStreetMap (and) contributors, CC-BY-SA




**Legend:**

- Approximate Site Location
- City of Sydney Council Depot Area
- Tenanted Workshop Area
- Potential UST (CES 2018)

JBS&G

Job No: 54877

Client: St George Housing

| Version: R02 Rev 1 | Date: 07-Dec-2018 |
|---|---|
| Drawn By: AV | Checked By: EH |

Scale 1:500

0 6 12

metres

Coor. Sys. GDA 1994 MGA Zone 56

**9-11 Gibbons Street**
**Redfern, NSW**

**SITE LAYOUT**

**FIGURE 2**

File Name: N:\Projects\St George Community Housing\54877 Gibbons Street, Redfern Data Gap\GIS\Maps\R02 Rev 1\54877_02_SiteLay.mxd
Reference: www.nearmap.com - Imagery 20180411




**Legend:**

- Approximate Site Location
- City of Sydney Council Depot Area
- Tenanted Workshop Area
- Potential UST (CES 2018)

**CES Sample Locations**

- Borehole Location (CES 2018)
- Borehole/Groundwater Well Location (CES 2018)

**JBS&G Sample Locations**

- Borehole Location
- Borehole/ Groundwater Monitoring Well
- Soil Vapour Location

JBS&G

Job No: 54877

Client: St George Housing

| Version: R02 Rev 1 | Date: 07-Dec-2018 |
|---|---|
| Drawn By: AV | Checked By: SG |

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0 5 10
metres

Coor. Sys. GDA 1994 MGA Zone 56

**9-11 Gibbons Street**
**Redfern, NSW**

**SITE INVESTIGATION**
**SAMPLING LOCATIONS**

**FIGURE 3**

File Name: N:\Projects\St George Community Housing\54877 Gibbons Street, Redfern Data Gap\GIS\Maps\R02 Rev 1\54877_03_SampleLoc.mxd
Reference: www.nearmap.com - Imagery 20180411




**Legend:**

- Approximate Site Location
- City of Sydney Council Depot
- Tenanted Workshop

**Approximate Remedial Extents**

- BH11

**UST Investigation Areas**

- Potential Location of UST (Greencap 2018)
- Potential UST (CES 2018)

**CES Sample Locations**

- Borehole Location (CES 2018)
- Borehole/Groundwater Well Location (CES 2018)

**JBS&G Sample Locations**

- Borehole Location
- Borehole/ Groundwater Monitoring Well
- Soil Vapour Location

JBS&G

Job No: 54877

Client: St George Housing

| Version: R02 Rev 1 | Date: 07-Dec-2018 |
|---|---|
| Drawn By: AV | Checked By: EH |

Scale 1:500

0 6 12

metres

Coor. Sys. GDA 1994 MGA Zone 56

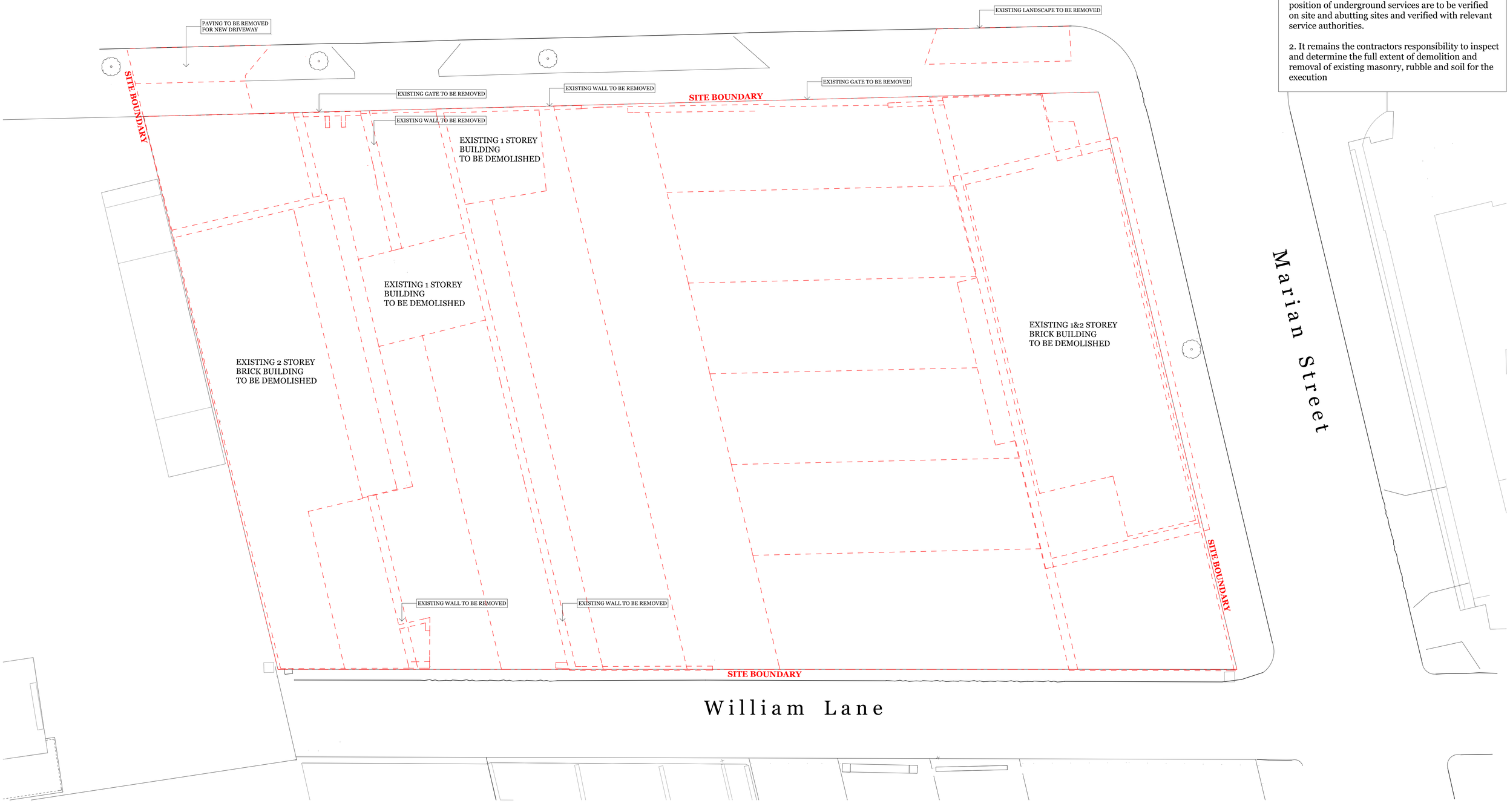
**9-11 Gibbons Street**
**Redfern, NSW**

**APPROXIMATE REMEDIAL EXTENT AND INVESTIGATION AREAS FOR POTENTIAL USTS**

**FIGURE 4**

File Name: N:\Projects\St George Community Housing\54877 Gibbons Street, Redfern Data Gap\GIS\Maps\R02 Rev 1\54877_04_RemedialExt.mxd
Reference: www.nearmap.com - Imagery 20180411

# Appendix A Development Plans




## Legend

Proposed areas of excavation and site clearing

**Demolish and Remove from site:**
All wall, floor, roof structures, footings, redundant pipework below natural ground level and vegetation

**Demolition Notes:**
1. Reference is to be made to service authority plans prior to commencement of demolition works. The position of underground services are to be verified on site and abutting sites and verified with relevant service authorities.

2. It remains the contractors responsibility to inspect and determine the full extent of demolition and removal of existing masonry, rubble and soil for the execution

Consultants

**Access - Morris Goding**
David Goding
david@mgac.com.au
0407 246 115

**Acoustic - Renzo Tonin**
Tony Wong
tony.wong@renzotonin.com.au
8218 0515

**Building Services - Arrow**
Brian Calcutt
bcalcutt@arrowce.com.au
0416 684 260

**Civil - ABC Consultants**
Ryan Campbell
ryan@abc-consultants.com.au
0402 343 139

**Communication - Straight Talk**
Jessica Stapleton
jessica@straight-talk.com.au
0433 522 069

**ESD - Northrop**
Amir Girgis
AGirgis@northrop.com.au

**Fire - Core Engineering**
Neil Campbell
neil@coreengineering.com.au
0410 610 928

**Flood - WMA Water**
Catherine Goonan
goonan@wmawater.com.au
9299 2855

**Geotechnical - CES**
Tristan Goodbody
8569 2200

**HAZMAT - Greencap**
James Stewart
james.stewart@greencap.com.au
0427 701 502

**Heritage - Artefact**
Sandra Wallace
Sandra.Wallace@artefact.net.au
0403 565 086

**Landscape - In View**
Isabel Lester
Isabel@inviewdesign.com.au
0416 110 058

**Surveyor - Norton Survey**
Andrew Whitfield
awhitfield@nspartners.com.au
0418 255 072

**Planner - Keylan**
Michael Woodland
michael@keylan.com.au
0448 726 214

**QS - WT Partnership**
Paul Elphick
pelphick@wtpartnership.com.au
0407 243 711

**Site Contamination - JBS&G**
Daniel Denaro
DDenaro@jbsg.com.au
0468 425 921

**Traffic - TTM**
Callum Hutcheson
CHutcheson@ttmgroup.com.au
0402 095 256

**Waste - TTM**
Arthur Stamatiou
astamatiou@ttmgroup.com.au
(07) 3327 9500

**Wind - Windtech**
Simon Ronald
simon@windtechglobal.com
9503 0308

St George Community Housing

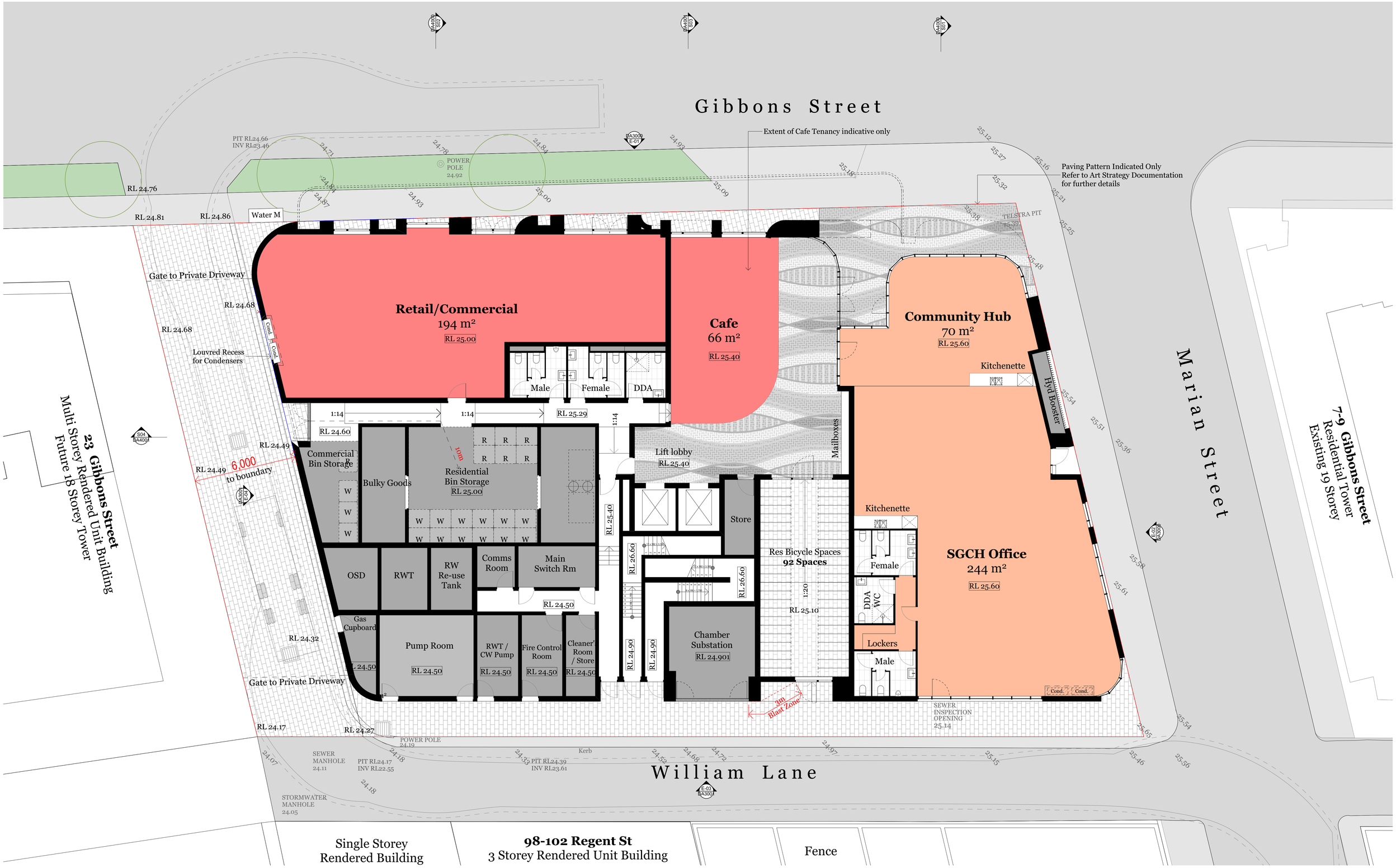
| Rev. | Date | By | Ckd | Description |
|---|---|---|---|---|
| P1 | 07/09/18 | RY | KL | Plans for Review |
| P2 | 18/09/18 | RY | SO | Arch Set for Review |
| A | 27/09/18 | RY | SO | Arch Set for DA Submission |

DKO Architecture (NSW) Pty Ltd
119 Redfern Street
Redfern, NSW 2016
T +61 2 8346 4500
info@DKO.com.au
www.DKO.com.au
ABN: 81956706590

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NSW: Nominated Architects
Koos de Keijzer 5767 | David Randerson 8542

DKO

| | |
|---|---|
| Project Name | 11 Gibbons street |
| Project Address | 11 Gibbons Street, Redfern, NSW 2016 |
| Client | SGCH |
| Project Number | 11929 |
| Drawing Name | Demolition Plan |
| Scale | 1:100@A1 |
| Date | September 2018 |
| | **Issue for Approval** |
| Drawing Number | **DA1007** |
| Revision | **A** |




Consultants

**Access - Morris Goding**
David Goding
david@mgac.com.au
0407 246 115

**Acoustic - Renzo Tonin**
Tony Wong
tony.wong@renzotonin.com.au
8218 0515

**Building Services - Arrowe**
Brian Calcutt
bcalcutt@arrowee.com.au
0416 084 260

**Civil - ABC Consultants**
Ryan Campbell
ryan@abc-consultants.com.au
0402 343 139

**Communication - Straight Talk**
Jessica Stapleton
jessica@straight-talk.com.au
0433 522 069

**ESD - Northrop**
Amir Girgis
AGirgis@northrop.com.au

**Fire - Core Engineering**
Neil Campbell
neil@coreengineering.com.au
0410 610 928

**Flood - WMA Water**
Catherine Goonan
goonan@wmawater.com.au
9299 2855

**Geotechnical - CES**
Tristan Goodbody
8569 2200

**HAZMAT - Greencap**
James Stewart
james.stewart@greencap.com.au
0427 701 502

**Heritage - Artefact**
Sandra Wallace
Sandra.Wallace@artefact.net.au
0403 565 086

**Landscape - In View**
Isabel Lester
Isabel@inviewdesign.com.au
0416 110 058

**Surveyor - Norton Survey**
Andrew Whitfield
awhitfield@nspartners.com.au
0418 255 072

**Planner - Keylan**
Michael Woodland
michael@keylan.com.au
0448 726 214

**QS - WT Partnership**
Paul Elphick
pelphick@wtpartnership.com.au
0407 243 711

**Site Contamination - JBS&G**
Daniel Denaro
DDenaro@jbsg.com.au
0468 425 921

**Traffic - TTM**
Callum Hutcheson
CHutcheson@ttmgroup.com.au
0402 095 356

**Waste - TTM**
Arthur Stamatiou
astamatiou@ttmgroup.com.au
(07) 3327 9500

**Wind - Windtech**
Simon Ronald
simon@windtechglobal.com
9593 0308

SGCH
St George Community Housing

| Rev. | Date | By | Ckd | Description |
|---|---|---|---|---|
| P1 | 07/09/18 | RY | KL | Plans for Review |
| P2 | 18/09/18 | RY | SO | Arch Set for Review |
| A | 27/09/18 | RY | SO | Arch Set for DA Submission |

DKO Architecture (NSW) Pty Ltd
119 Redfern Street
Redfern, NSW 2016
T +61 2 8346 4500
info@DKO.com.au
www.DKO.com.au
ABN: 81956706590

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NSW: Nominated Architects
Koos de Keijzer 5767 | David Randerson 8542

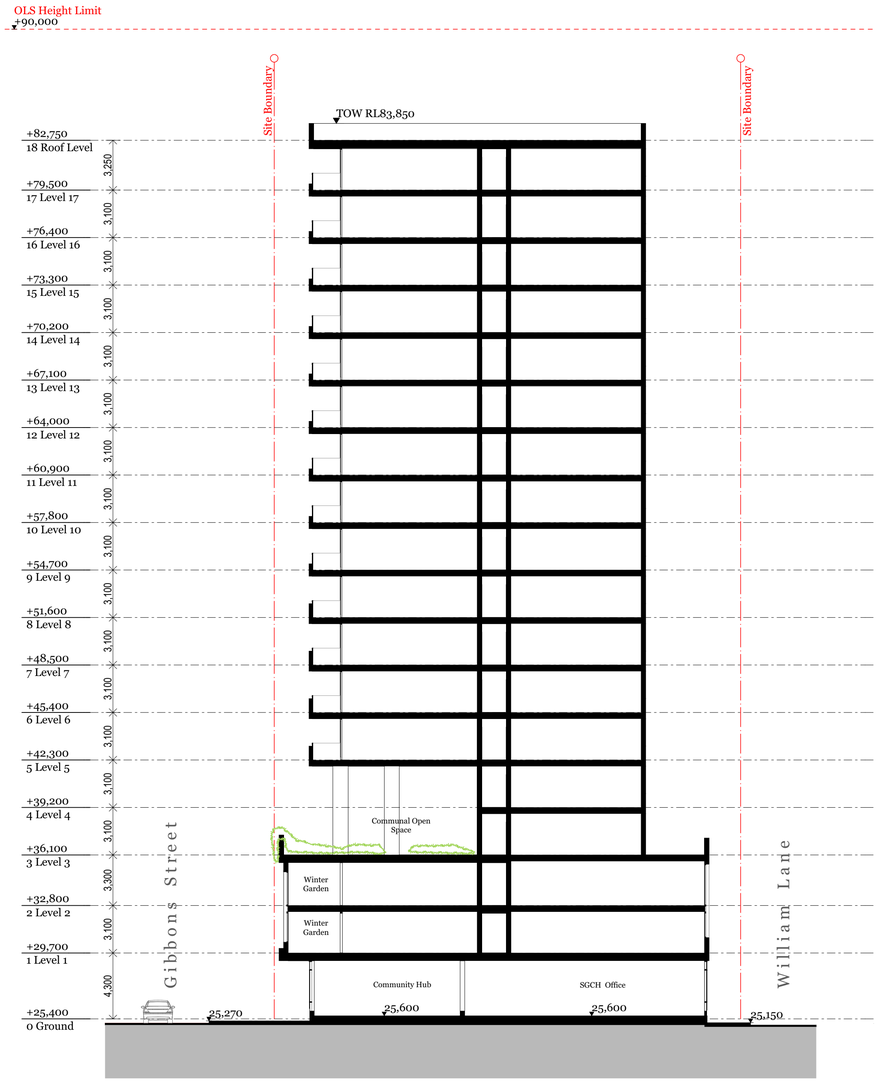
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| | |
|---|---|
| Project Name | 11 Gibbons street |
| Project Address | 11 Gibbons Street, Redfern, NSW 2016 |
| Client | SGCH |

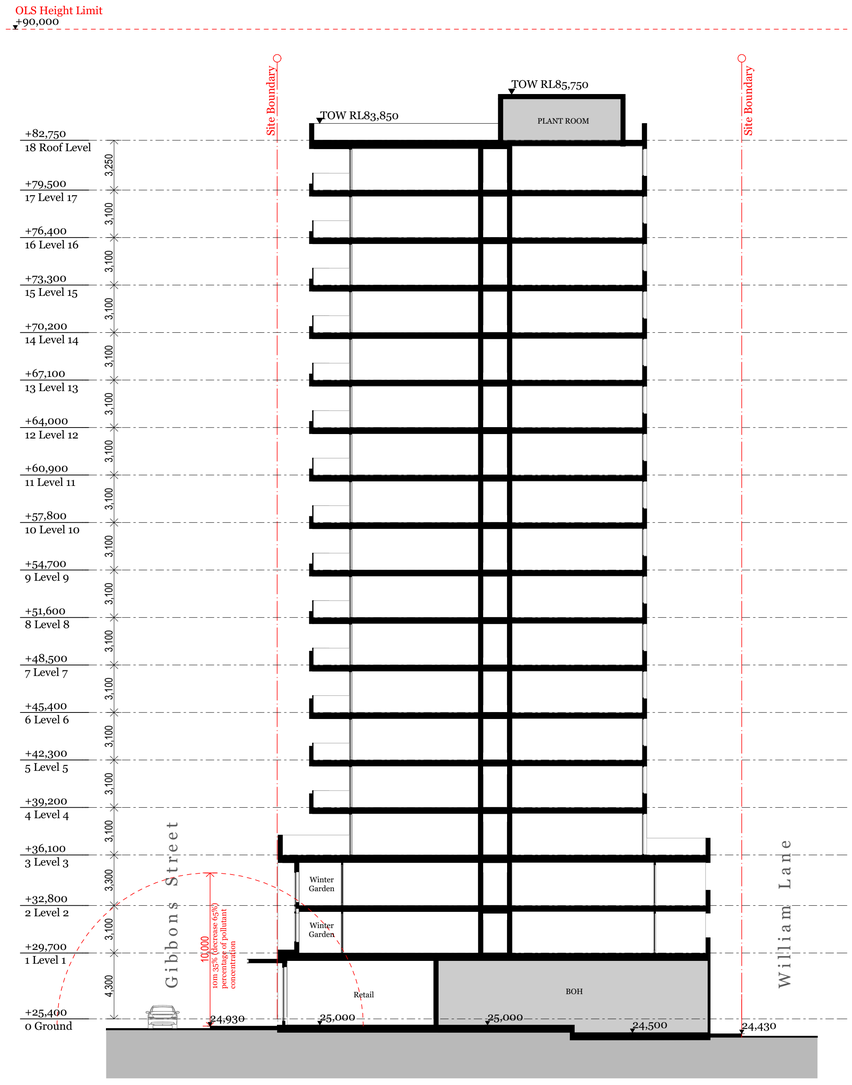
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|---|---|
| Project Number | 11929 |
| Drawing Name | Ground Level |
| Scale | 1:100@A1 |
| Date | September 2018 |

Issue for Approval

Drawing Number **DA2000**
Revision **A**




S01 Section 1 1:200




S02 Section 2 1:200


Consultants

**Access - Morris Goding**
David Goding
david@mgac.com.au
0407 246 115

**Acoustic - Renzo Tonin**
Tony Wong
tony.wong@renzotonin.com.au
8218 0515

**Building Services - Arrow**
Brian Calcutt
bcalcutt@arrowe.com.au
0416 084 260

**Civil - ABC Consultants**
Ryan Campbell
ryan@abc-consultants.com.au
0402 343 139

**Communication - Straight Talk**
Jessica Stapleton
jessica@straight-talk.com.au
0433 522 069

**ESD - Northrop**
Amir Girgis
AGirgis@northrop.com.au

**Fire - Core Engineering**
Neil Campbell
neil@coreengineering.com.au
0410 610 928

**Flood - WMA Water**
Catherine Goonan
goonan@wmawater.com.au
9299 2855

**Geotechnical - CES**
Tristan Goodbody
8569 2200

**HAZMAT - Greencap**
James Stewart
james.stewart@greencap.com.au
0427 701 502

**Heritage - Artefact**
Sandra Wallace
Sandra.Wallace@artefact.net.au
0403 595 086

**Landscape - In View**
Isabel Lester
Isabel@inviewdesign.com.au
0416 110 058

**Surveyor - Norton Survey**
Andrew Whitfield
awhitfield@nspartners.com.au
0418 255 072

**Planner - Keylan**
Michael Woodland
michael@keylan.com.au
0448 726 214

**QS - WT Partnership**
Paul Elphick
pelphick@wtpartnership.com.au
0407 243 711

**Site Contamination - JBS&G**
Daniel Denaro
DDenaro@jbsg.com.au
0468 425 921

**Traffic - TTM**
Callum Hutcheson
CHutcheson@ttmgroup.com.au
0402 095 356

**Waste - TTM**
Arthur Stamatiou
astamatiou@ttmgroup.com.au
(07) 3327 9500

**Wind - Windtech**
Simon Ronald
simon@windtechglobal.com
9593 0308

St George Community Housing


| Rev. | Date | By | Ckd | Description |
|---|---|---|---|---|
| P1 | 07/09/18 | RY | KL | Plans for Review |
| P2 | 18/09/18 | RY | SO | Arch Set for Review |
| A | 27/09/18 | RY | SO | Arch Set for DA Submission |


DKO Architecture (NSW) Pty Ltd
119 Redfern Street
Redfern, NSW 2016
T +61 2 8346 4500
info@DKO.com.au
www.DKO.com.au
ABN: 81956706590



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NSW: Nominated Architects
Koos de Keijzer 5767 | David Randerson 8542


| | |
|---|---|
| Project Name | 11 Gibbons street |
| Project Address | 11 Gibbons Street, Redfern, NSW 2016 |
| Client | SGCH |
| Project Number | 11929 |
| Drawing Name | Sections 1 & 2 |
| Scale | 1:200@A1 |
| Date | September 2018 |

**Issue for Approval**

Drawing Number **DA4000**
Revision **A**

# Appendix B Sample Analysis Summary Tables

**Project: 9-11 Gibbons Street, Redfern**
**Client: St George Community Housing**
**CES Project Number: CES180204-SGC**
**Table 4: Soil Analytical Results - HIL/HSL, EIL/ESL Assessment**

| Parameters | Unit | PQL | EIL, Urban residential and public open space | ESL, Urban residential and public open space | Residential, Soil HIL B / HSL B | Recreational C, Soil HIL C/ HSL C | Sample Type | Sample ID | BH3_0.3-0.6 | BH3_1.2-1.5 | BH3_1.2-1.5 | BH2_0.3-0.6 | BH2_2.0-2.3 | BH1_0.4-0.8 | BH1_0.4-0.8 | QAQC1_BH1_0.4-0.8 | BH1_1.2-1.5 | BH4_0.3-0.8 | BH4_1.2-1.5 | BH4_1.2-1.5 | BH6_0.3-0.8 | BH6_0.3-0.8 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Depth (mbgl) | 0.3-0.6 | 1.2-1.5 | 1.2-1.5 | 0.3-0.6 | 2.0-2.3 | 0.4-0.8 | 0.4-0.8 | 0.4-0.8 | 1.2-1.5 | 0.3-0.8 | 1.2-1.5 | 1.2-1.5 | 0.3-0.8 | 0.3-0.8 |
| | | | | | | | | Date Sampled | 27/02/2018 | 27/02/2018 | 27/02/2018 | 27/02/2018 | 27/02/2018 | 28/02/2018 | 28/02/2018 | 28/02/2018 | 28/02/2018 | 01/03/2018 | 01/03/2018 | 01/03/2018 | 02/03/2018 | 02/03/2018 |
| | | | | | | | | Soil Unit | Fill | Natural | Natural | Fill | Natural | Fill | Fill | Fill | Natural | Fill | Natural | Natural | Fill | Fill |
| | | | | | | | | Laboratory report | 186116 | 186116 | 186116 | 186116 | 186116 | 186212 | 186212 | 186212 | 186212 | 186295 | 186295 | 186295 | 186376 | 186376 |
| | | | | | | | | Sample Type | Primary | Primary | Lab Duplicate | Primary | Primary | Primary | Lab Duplicate | Filed Duplicate | Primary | Primay | Primary | Lab Duplicate | Primary | Lab Duplicate |
| TRH C6 - C9 | mg/kg | 25 | | | | | | | <25 | <25 | | <25 | <25 | <25 | | <25 | <25 | <25 | | | <25 | <25 |
| TRH C6 - C10 | mg/kg | 25 | | | | | | | <25 | <25 | | <25 | <25 | <25 | | <25 | <25 | <25 | | | <25 | <25 |
| FRACTION 1 | mg/kg | 25 | | 180 | 45 | NL | | | <25 | <25 | | <25 | <25 | <25 | | <25 | <25 | <25 | | | <25 | <25 |
| Benzene | mg/kg | 0.2 | | 50 | 0.5 | NL | | | <0.2 | <0.2 | | <0.2 | <0.2 | <0.2 | | <0.2 | <0.2 | <0.2 | | | <0.2 | <0.2 |
| Toluene | mg/kg | 0.5 | | 85 | 160 | NL | | | <0.5 | <0.5 | | <0.5 | <0.5 | <0.5 | | <0.5 | <0.5 | <0.5 | | | <0.5 | <0.5 |
| Ethylbenzene | mg/kg | 1 | | 70 | 55 | NL | | | <1 | <1 | | <1 | <1 | <1 | | <1 | <1 | <1 | | | <1 | <1 |
| m+p-xylene | mg/kg | 2 | | | 40 | | | | <2 | <2 | | <2 | <2 | <2 | | <2 | <2 | <2 | | | <2 | <2 |
| o-Xylene | mg/kg | 1 | | | 40 | | | | <1 | <1 | | <1 | <1 | <1 | | <1 | <1 | <1 | | | <1 | <1 |
| Xylenes (total) | mg/kg | | | 105 | 40 | NL | | | <1 | <1 | | <1 | <1 | <1 | | <1 | <1 | <1 | | | <1 | <1 |
| Naphthalene | mg/kg | 1 | | | 3 | NL | | | <1 | <1 | | <1 | <1 | <1 | | <1 | <1 | <1 | | | 85 | 160 |
| Total Phenolics | mg/kg | 5 | | | | | | | | | | | | | | | | | | | | |
| TRH C10 - C14 | mg/kg | 50 | | | | | | | <50 | <50 | | <50 | <50 | <50 | | <50 | <50 | <50 | | | 150 | 66 |
| TRH C15 - C28 | mg/kg | 100 | | | | | | | <100 | <100 | | 280 | <100 | <100 | | <100 | <100 | <100 | | | 1000 | 390 |
| TRH C29 - C36 | mg/kg | 100 | | | | | | | <100 | <100 | | 160 | <100 | <100 | | <100 | <100 | <100 | | | 360 | 150 |
| TRH total C10 - C36 | mg/kg | 50 | | | | | | | | | | | | | | | | | | | | |
| TRH >C10-C16 | mg/kg | 50 | | | | | | | <50 | <50 | | <50 | <50 | <50 | | <50 | <50 | <50 | | | 270 | 110 |
| FRACTION 2 | mg/kg | 50 | | 120 | 110 | | | | <50 | <50 | | <50 | <50 | <50 | | <50 | <50 | <50 | | | 190 | <50 |
| TRH >C16-C34 | mg/kg | 100 | | | | | | | <100 | <100 | | 400 | <100 | <100 | | <100 | <100 | <100 | | | 1200 | 470 |
| TRH >C34-C40 | mg/kg | 100 | | | | | | | <100 | <100 | | <100 | <100 | <100 | | <100 | <100 | <100 | | | 140 | <100 |
| Total +ve TRH (>C10-C40) | mg/kg | | | | | | | | <50 | <50 | | 400 | <50 | <50 | | <50 | <50 | <50 | | | 1600 | 580 |
| Naphthalene | mg/kg | 0.1 | 170 | | 3 | | | | <0.1 | <0.1 | | 0.3 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | 200 | 28 |
| Acenaphthylene | mg/kg | 0.1 | | | | | | | <0.1 | <0.1 | | 2.3 | <0.1 | 0.1 | | <0.1 | <0.1 | <0.1 | | | 58 | 7.9 |
| Acenaphthene | mg/kg | 0.1 | | | | | | | <0.1 | <0.1 | | 0.2 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | 18 | 1.8 |
| Fluorene | mg/kg | 0.1 | | | | | | | <0.1 | <0.1 | | 0.8 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | 94 | 10 |
| Phenanthrene | mg/kg | 0.1 | | | | | | | 0.1 | <0.1 | | 10 | 0.1 | 0.7 | | <0.1 | 0.2 | 0.5 | | | 360 | 45 |
| Anthracene | mg/kg | 0.1 | | | | | | | <0.1 | <0.1 | | 2.6 | <0.1 | 0.2 | | <0.1 | <0.1 | 0.2 | | | 92 | 11 |
| Fluoranthene | mg/kg | 0.1 | | | | | | | 0.3 | <0.1 | | 18 | 0.3 | 1.5 | | 0.2 | 0.4 | 0.9 | | | 250 | 29 |
| Pyrene | mg/kg | 0.1 | | | | | | | 0.3 | <0.1 | | 20 | 0.4 | 1.7 | | 0.2 | 0.3 | 0.8 | | | 250 | 29 |
| Benzo(a)anthracene | mg/kg | 0.1 | | | | | | | 0.2 | <0.1 | | 9.7 | 0.2 | 0.8 | | 0.1 | 0.2 | 0.4 | | | 110 | 12 |
| Chrysene | mg/kg | 0.1 | | | | | | | 0.1 | <0.1 | | 6.9 | 0.2 | 1 | | 0.1 | 0.2 | 0.5 | | | 98 | 11 |
| Benzo(b+k)fluoranthene | mg/kg | 0.2 | | | | | | | 0.3 | <0.2 | | 11 | 0.3 | 3.6 | | 0.4 | 0.6 | 0.7 | | | 130 | 15 |
| Benzo(a)pyrene | mg/kg | 0.05 | | 33 (CRC-Care) | | | | | 0.2 | <0.05 | | 7.5 | 0.2 | 1.1 | | 0.1 | 0.2 | 0.4 | | | 98 | 11 |
| Indeno(1,2,3-c,d)pyrene | mg/kg | 0.1 | | | | | | | <0.1 | <0.1 | | 3.3 | <0.1 | 0.8 | | <0.1 | <0.1 | 0.3 | | | 37 | 4 |
| Dibenzo(a,h)anthracene | mg/kg | 0.1 | | | | | | | <0.1 | <0.1 | | 1.3 | <0.1 | 0.2 | | <0.1 | <0.1 | <0.1 | | | 12 | 1.1 |
| Benzo(g,h,i)perylene | mg/kg | 0.1 | | | | | | | <0.1 | <0.1 | | 4.1 | 0.1 | 0.9 | | <0.1 | <0.1 | 0.2 | | | 47 | 5.3 |
| Benzo(a)pyrene TEQ calc (zero) | mg/kg | 0.5 | | | | | | | <0.5 | <0.5 | | 11 | <0.5 | 1.8 | | <0.5 | <0.5 | 0.5 | | | 140 | 15 |
| Benzo(a)pyrene TEQ calc(half) | mg/kg | 0.5 | | | | | | | <0.5 | <0.5 | | 11 | <0.5 | 1.8 | | <0.5 | <0.5 | 0.6 | | | 140 | 15 |
| Benzo(a)pyrene TEQ | mg/kg | 0.5 | | | 4 | 3 | | | <0.5 | <0.5 | | 11 | <0.5 | 1.8 | | <0.5 | <0.5 | 0.6 | | | 140 | 15 |
| Total +ve | mg/kg | - | | | 400 | 300 | | | 1.4 | <0.05 | | 98 | 1.9 | 13 | | 1.2 | 2 | 4.7 | | | 1900 | 220 |
| Total PCB | mg/kg | 0.1 | | | 1 | 1 | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | 0.1 | | | <1 | <1 |
| Arsenic | mg/kg | 4 | 100 | | 500 | 300 | | | 5 | <4 | | 7 | <4 | 41 | 33 | 7 | 9 | 52 | | | 6 | 4 |
| Cadmium | mg/kg | 0.4 | | | 150 | 90 | | | <0.4 | <0.4 | | <0.4 | <0.4 | <0.4 | <0.4 | <0.4 | <0.4 | 0.5 | | | <0.4 | <0.4 |
| Chromium | mg/kg | 1 | | | | | | | 11 | <1 | | 9 | 13 | 5 | 8 | 4 | 4 | 6 | | | 11 | 8 |
| Copper | mg/kg | 1 | 100 | | 30000 | 17000 | | | 40 | <1 | | 53 | 21 | 24 | 33 | 8 | 10 | 18 | | | 150 | 120 |
| Lead | mg/kg | 1 | 1100 | | 1200 | 600 | | | 440 | 2 | | 220 | 43 | 100 | 130 | 31 | 32 | 190 | | | 330 | 300 |
| Mercury | mg/kg | 0.1 | | | 120 | 80 | | | 1 | <0.1 | | 0.9 | 0.2 | 0.9 | 1 | 0.2 | 0.2 | 0.9 | | | 0.5 | 0.5 |
| Nickel | mg/kg | 1 | 25 | | 1200 | 1200 | | | 6 | <1 | | 6 | 3 | 4 | 5 | 1 | 2 | 4 | | | 4 | 4 |
| Zinc | mg/kg | 1 | 320 | | 60000 | 30000 | | | 200 | 17 | | 120 | 32 | 170 | 180 | 28 | 28 | 410 | | | 150 | 150 |
| pH1:5 soil:water | pH Units | | | | | | | | | 8 | | | | | | | | | 7.8 | | | |
| Electrical Conductivity1:5 soil:water | µS/cm | | | | | | | | | | | | | | | | | | | | | |
| Perfluorohexanesulfonic acid (PFHxS) | µg/kg | 0.01 | | | 2000 | 1000 | | | | | | | | | | | | | | | <0.1 | <0.1 |
| Perfluorooctanesulfonic acid (PFOS) | µg/kg | 0.01 | 10 (*) | | 2000 | 1000 | | | | | | | | | | | | | | | <0.1 | <0.1 |
| Perfluorooctanoic acid (PFOA) | µg/kg | 0.01 | | | 20000 | 10000 | | | | | | | | | | | | | | | <0.1 | <0.1 |
| 6:2 FTS | µg/kg | 0.01 | | | | | | | | | | | | | | | | | | | <0.1 | <0.1 |
| 8:2 FTS | µg/kg | 0.01 | | | | | | | | | | | | | | | | | | | <0.1 | <0.1 |
| Exchangeable Ca | meq/100g | 0.1 | | | | | | | | 1.1 | 0.7 | | | | | | | | 3.4 | 3.2 | | |
| Exchangeable K | meq/100g | 0.1 | | | | | | | | <0.1 | <0.1 | | | | | | | | 0.3 | 0.3 | | |
| Exchangeable Mg | meq/100g | 0.1 | | | | | | | | 0.13 | <0.1 | | | | | | | | 0.35 | 0.33 | | |
| Exchangeable Na | meq/100g | 0.1 | | | | | | | | <0.1 | <0.1 | | | | | | | | <0.1 | <0.1 | | |
| Cation Exchange Capacity | meq/100g | 1 | | | | | | | | 1.3 | <1 | | | | | | | | 4.1 | 3.8 | | |
| Sample Mass Tested | g | | | | | | | | 1185.5 | | | 1428.97 | | 1426.8 | | | | 1007.93 | | | 909.85 | |
| Foreign Material | % | 0.05 | | | | | | | | | | | | | | | | | | | | |

**Project: 9-11 Gibbons Street, Redfern**
**Client: St George Community Housing**
**CES Project Number: CES180204-SGC**
**Table 4: Soil Analytical Results - HIL/HSL, EIL/ESL Assessment**

| Parameters | Unit | PQL | EIL, Urban residential and public open space | ESL, Urban residential and public open space | Residential, Soil HIL B / HSL B | Recreational C, Soil HIL C/ HSL C | Sample ID | BH3_0.3-0.6 | BH3_1.2-1.5 | BH3_1.2-1.5 | BH2_0.3-0.6 | BH2_2.0-2.3 | BH1_0.4-0.8 | BH1_0.4-0.8 | QAQC1_BH1_0.4-0.8 | BH1_1.2-1.5 | BH4_0.3-0.8 | BH4_1.2-1.5 | BH4_1.2-1.5 | BH6_0.3-0.8 | BH6_0.3-0.8 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Depth (mbgl) | 0.3-0.6 | 1.2-1.5 | 1.2-1.5 | 0.3-0.6 | 2.0-2.3 | 0.4-0.8 | 0.4-0.8 | 0.4-0.8 | 1.2-1.5 | 0.3-0.8 | 1.2-1.5 | 1.2-1.5 | 0.3-0.8 | 0.3-0.8 |
| | | | | | | | Date Sampled | 27/02/2018 | 27/02/2018 | 27/02/2018 | 27/02/2018 | 27/02/2018 | 28/02/2018 | 28/02/2018 | 28/02/2018 | 28/02/2018 | 01/03/2018 | 01/03/2018 | 01/03/2018 | 02/03/2018 | 02/03/2018 |
| | | | | | | | Soil Unit | Fill | Natural | Natural | Fill | Natural | Fill | Fill | Fill | Natural | Fill | Natural | Natural | Fill | Fill |
| | | | | | | | Laboratory report | 186116 | 186116 | 186116 | 186116 | 186116 | 186212 | 186212 | 186212 | 186212 | 186295 | 186295 | 186295 | 186376 | 186376 |
| | | | | | | | Sample Type | Primary | Primary | Lab Duplicate | Primary | Primary | Primary | Lab Duplicate | Filed Duplicate | Primary | Primay | Primary | Lab Duplicate | Primary | Lab Duplicate |
| HCB | mg/kg | 0.1 | | | 15 | 10 | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 |
| alpha-BHC | mg/kg | 0.1 | | | | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 |
| gamma-BHC | mg/kg | 0.1 | | | | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 |
| beta-BHC | mg/kg | 0.1 | | | | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 |
| Heptachlor | mg/kg | 0.1 | | | 10 | 10 | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 |
| delta-BHC | mg/kg | 0.1 | | | | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 |
| Aldrin | mg/kg | 0.1 | | | | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 |
| Heptachlor Epoxide | mg/kg | 0.1 | | | | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 |
| gamma-Chlordane | mg/kg | 0.1 | | | | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 |
| alpha-chlordane | mg/kg | 0.1 | | | | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 |
| Chlordane | mg/kg | 0.1 | | | 90 | 70 | | | | | | | | | | | | | | | |
| Endosulfan I | mg/kg | 0.1 | | | | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 |
| pp-DDE | mg/kg | 0.1 | | | | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 |
| Dieldrin | mg/kg | 0.1 | | | | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 |
| Aldrin and Dieldrin | mg/kg | 0.1 | | | 10 | 10 | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | | | | | |
| Endrin | mg/kg | 0.1 | | | 20 | 20 | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 |
| pp-DDD | mg/kg | 0.1 | | | | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 |
| Endosulfan II | mg/kg | 0.1 | | | | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 |
| Endosulfan | mg/kg | 0.1 | | | 400 | 340 | | | | | | | <0.1 | | <0.1 | <0.1 | | | | | |
| pp-DDT | mg/kg | 0.1 | | | | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 |
| DDT (Total) | mg/kg | 0.1 | 180 | | | | | | | | | | <0.1 | | <0.1 | <0.1 | | | | | |
| DDT+DDE+DDD | mg/kg | 0.1 | | | 600 | 400 | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 |
| Endrin Aldehyde | mg/kg | 0.1 | | | | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 |
| Endosulfan Sulphate | mg/kg | 0.1 | | | | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 |
| Methoxychlor | mg/kg | 0.1 | | | 500 | 400 | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 |
| Azinphos-methyl (Guthion) | mg/kg | 0.1 | | | | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 |
| Bromophos-ethyl | mg/kg | 0.1 | | | | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 |
| Chlorpyriphos | mg/kg | 0.1 | | | 340 | 250 | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 |
| Chlorpyriphos-methyl | mg/kg | 0.1 | | | | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 |
| Diazinon | mg/kg | 0.1 | | | | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 |
| Dichlorvos | mg/kg | 0.1 | | | | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 |
| Dimethoate | mg/kg | 0.1 | | | | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 |
| Ethion | mg/kg | 0.1 | | | | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 |
| Fenitrothion | mg/kg | 0.1 | | | | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 |
| Malathion | mg/kg | 0.1 | | | | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 |
| Parathion | mg/kg | 0.1 | | | | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 |
| Ronnel | mg/kg | 0.1 | | | | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 |
| Dichlorodifluoromethane | mg/kg | 1 | | | | | | | | | <1 | | <1 | | | | | | | | |
| Chloromethane | mg/kg | 1 | | | | | | | | | <1 | | <1 | | | | | | | | |
| Vinyl Chloride | mg/kg | 1 | | | | | | | | | <1 | | <1 | | | | | | | | |
| Bromomethane | mg/kg | 1 | | | | | | | | | <1 | | <1 | | | | | | | | |
| Chloroethane | mg/kg | 1 | | | | | | | | | <1 | | <1 | | | | | | | | |
| Trichlorofluoromethane | mg/kg | 1 | | | | | | | | | <1 | | <1 | | | | | | | | |
| 1,1-Dichloroethene | mg/kg | 1 | | | | | | | | | <1 | | <1 | | | | | | | | |
| trans-1,2-dichloroethene | mg/kg | 1 | | | | | | | | | <1 | | <1 | | | | | | | | |
| 1,1-dichloroethane | mg/kg | 1 | | | | | | | | | <1 | | <1 | | | | | | | | |
| cis-1,2-dichloroethene | mg/kg | 1 | | | | | | | | | <1 | | <1 | | | | | | | | |
| bromochloromethane | mg/kg | 1 | | | | | | | | | <1 | | <1 | | | | | | | | |
| chloroform | mg/kg | 1 | | | | | | | | | <1 | | <1 | | | | | | | | |
| 2,2-dichloropropane | mg/kg | 1 | | | | | | | | | <1 | | <1 | | | | | | | | |
| 1,2-dichloroethane | mg/kg | 1 | | | | | | | | | <1 | | <1 | | | | | | | | |
| 1,1,1-trichloroethane | mg/kg | 1 | | | | | | | | | <1 | | <1 | | | | | | | | |
| 1,1-dichloropropene | mg/kg | 1 | | | | | | | | | <1 | | <1 | | | | | | | | |
| carbon tetrachloride | mg/kg | 1 | | | | | | | | | <1 | | <1 | | | | | | | | |
| dibromomethane | mg/kg | 1 | | | | | | | | | <1 | | <1 | | | | | | | | |
| 1,2-dichloropropane | mg/kg | 1 | | | | | | | | | <1 | | <1 | | | | | | | | |
| trichloroethene | mg/kg | 1 | | | | | | | | | <1 | | <1 | | | | | | | | |
| bromodichloromethane | mg/kg | 1 | | | | | | | | | <1 | | <1 | | | | | | | | |
| trans-1,3-dichloropropene | mg/kg | 1 | | | | | | | | | <1 | | <1 | | | | | | | | |
| cis-1,3-dichloropropene | mg/kg | 1 | | | | | | | | | <1 | | <1 | | | | | | | | |
| 1,1,2-trichloroethane | mg/kg | 1 | | | | | | | | | <1 | | <1 | | | | | | | | |
| 1,3-dichloropropane | mg/kg | 1 | | | | | | | | | <1 | | <1 | | | | | | | | |
| dibromochloromethane | mg/kg | 1 | | | | | | | | | <1 | | <1 | | | | | | | | |
| 1,2-dibromoethane | mg/kg | 1 | | | | | | | | | <1 | | <1 | | | | | | | | |
| tetrachloroethene | mg/kg | 1 | | | | | | | | | <1 | | <1 | | | | | | | | |
| 1,1,1,2-tetrachloroethane | mg/kg | 1 | | | | | | | | | <1 | | <1 | | | | | | | | |
| chlorobenzene | mg/kg | 1 | | | | | | | | | <1 | | <1 | | | | | | | | |
| bromoform | mg/kg | 1 | | | | | | | | | <1 | | <1 | | | | | | | | |
| 1,1,2,2-tetrachloroethane | mg/kg | 1 | | | | | | | | | <1 | | <1 | | | | | | | | |
| 1,2,3-trichloropropane | mg/kg | 1 | | | | | | | | | <1 | | <1 | | | | | | | | |
| bromobenzene | mg/kg | 1 | | | | | | | | | <1 | | <1 | | | | | | | | |
| 2-chlorotoluene | mg/kg | 1 | | | | | | | | | <1 | | <1 | | | | | | | | |
| 4-chlorotoluene | mg/kg | 1 | | | | | | | | | <1 | | <1 | | | | | | | | |
| 1,3-dichlorobenzene | mg/kg | 1 | | | | | | | | | <1 | | <1 | | | | | | | | |
| 1,4-dichlorobenzene | mg/kg | 1 | | | | | | | | | <1 | | <1 | | | | | | | | |
| 1,2-dichlorobenzene | mg/kg | 1 | | | | | | | | | <1 | | <1 | | | | | | | | |
| 1,2-dibromo-3-chloropropane | mg/kg | 1 | | | | | | | | | <1 | | <1 | | | | | | | | |
| 1,2,4-trichlorobenzene | mg/kg | 1 | | | | | | | | | <1 | | <1 | | | | | | | | |
| hexachlorobutadiene | mg/kg | 1 | | | | | | | | | <1 | | <1 | | | | | | | | |
| 1,2,3-trichlorobenzene | mg/kg | 1 | | | | | | | | | <1 | | <1 | | | | | | | | |
| Asbestos ID in soil | | | | | | | | | | | | | | | | | | | | | |
| Trace Analysis | | | | | | | | | | | | | | | | | | | | | |
| Sample mass tested | g | | | | | | | 1185.5 | | | 1428.9 | | 1426.8 | | | | 1007.93 | | | 909.85 | |
| Sample Description | - | | | | | | | Brown coarse-grained soil & rocks | | | Brown coarse-grained soil & rocks | | Grey sandy soil & rocks | | | | Brown fine-grained soil & rocks | | | Brown coarse- grained soil & rocks | |
| Asbestos ID in soil (as per AS4964) | - | | | | | | | No asbestos detected at reporting limit of 0.1g/kg; Organic fibres detected | | | No asbestos detected at reporting limit of 0.1g/kg; Organic fibres detected | | No asbestos detected at reporting limit of 0.1g/kg; Organic fibres detected | | | | No asbestos detected at reporting limit of 0.1g/kg; Organic fibre detected | | | No asbestos detected at reporting limit of 0.1g/kg; Organic fibre detected | |
| Trace Analysis | - | | | | | | | No asbestos detected | | | No asbestos detected | | No asbestos detected | | | | No asbestos detected | | | No asbestos detected | |
| Total Asbestos | g/kg | <0.1 | | | | | | <0.1 | | | <0,1 | | <0.1 | | | | <0.1 | | | <0,1 | |
| Asbestos ID in soil <0.1g/kg | - | N/A | | | | | | No visible asbestos detected | | | No visible asbestos detected | | No visible asbestos detected | | | | No visible asbestos detected | | | No visible asbestos detected | |
| ACM >7mm Estimation | g | -- | | | 0.04% | 0.02% | | – | | | – | | – | | | | – | | | – | |
| FA and AF Estimation | g | -- | | | | | | – | | | – | | – | | | | – | | | – | |
| ACM >7mm Estimation | %(w/w) | <0.01 | | | | | | <0.01 | | | <0.01 | | <0.01 | | | | <0.01 | | | <0.01 | |
| FA and AF Estimation | %(w/w) | <0.001 | | | 0.001% | 0.001% | | <0.001 | | | <0.001 | | <0.001 | | | | <0.001 | | | <0.001 | |

**Notes:**

Benzo(a)pyrene - High reliability ecological guideline for fresh B(a)P, Urban residential and public open space, 85% level of protection, derived ecological guideline (95% confidence limit), Table 11, Technical Report No. 39, Risk based management and remedaition guidance for benzo(a)pyrene, CRC-CARE, January 2017
Ecological Investigation Levels - Exposure Setting - Urban Residential/Public Open Space; EIL for copper, nickel and zinc are based on CEC value for BH4_1.2-1.5 and this may be conservative for all soil/fill types.

Ecological Screening Levels - Exposure Setting - Urban Residential/Public Open Space - fine soil texture

(*)-PFOS value is interim soil- ecological indirect exposure for Residential and Parkland from PFAS National Enviormental Management Plan, January 2018

**Project: 9-11 Gibbons Street, Redfern**
**Client: St George Community Housing**
**CES Project Number: CES180204-SGC**
**Table 4: Soil Analytical Results - HIL/HSL, EIL/ESL Assessment**

| Parameters | Unit | PQL | EIL, Urban residential and public open space | ESL, Urban residential and public open space | Residential, Soil HIL B / HSL B | Recreational C, Soil HIL C/ HSL C | BH6_1.2-1.5 | BH5_0.3-0.9 | BH5_1.2-1.5 | BH7_0.3-0.9 | BH7_1.2-1.5 | BH8_0.3-0.9 | BH8_1.2-1.5 | BH9_0.3-0.9 | BH9_1.2-1.5 | BH8_1.2-1.5 | BH8_1.2-1.5 | BH10_0.3-0.9 | BH10_0.3-0.9 | BH10_1.2-1.5 | BH10_1.2-1.5 | BH11_0.3-0.7 | BH11_0.3-0.7 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 1.2-1.5 | 0.3-0.9 | 1.2-1.5 | 0.3-0.9 | 1.2-1.5 | 0.3-0.9 | 1.2-1.5 | 0.3-0.9 | 1.2-1.5 | 1.2-1.5 | 1.2-1.5 | 0.3-0.9 | 0.3-0.9 | 1.2-1.5 | 1.2-1.5 | 0.3-0.7 | 0.3-0.7 |
| | | | | | | | 02/03/2018 | 02/03/2018 | 02/03/2018 | 02/03/2018 | 02/03/2018 | 02/03/2018 | 02/03/2018 | 02/03/2018 | 02/03/2018 | 02/03/2018 | 02/03/2018 | 06/03/2018 | 06/03/2018 | 06/03/2018 | 06/03/2018 | 06/03/2018 | 06/03/2018 |
| | | | | | | | Natural | Fill | Natural | Fill | Natural | Fill | Natural | Fill | Natural | Natural | Natural | Fill | Fill | Natural | Natural | Fill | Fill |
| | | | | | | | 186376-B | 186376 | 186376 | 186376 | 186376-B | 186376 | 186376-B | 186376 | 186376-B | 186376-A | 186376-A | 186597 | 186597 | 186597 | 186597 | 186597 | 186597 |
| | | | | | | | Primary | Primary | Primary | Primary | Primary | Primary | Primary | Primary | Primary | Primary | Lab Duplicate | Primary | Lab Duplicate | Primary | Lab Duplicate | Primary | Lab Duplicate |
| TRH C6 - C9 | mg/kg | 25 | | | | | <25 | <25 | | <25 | | <25 | | <25 | | <25 | <25 | <25 | <25 | <25 | | <25 | |
| TRH C6 - C10 | mg/kg | 25 | | | | | <25 | <25 | | <25 | | <25 | | <25 | | <25 | <25 | <25 | <25 | <25 | | <25 | |
| FRACTION 1 | mg/kg | 25 | | 180 | 45 | NL | <25 | <25 | | <25 | | <25 | | <25 | | <25 | <25 | <25 | <25 | <25 | | <25 | |
| Benzene | mg/kg | 0.2 | | 50 | 0.5 | NL | <0.2 | <0.2 | | <0.2 | | <0.2 | | <0.2 | | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | | <0.2 | |
| Toluene | mg/kg | 0.5 | | 85 | 160 | NL | <0.5 | <0.5 | | <0.5 | | <0.5 | | <0.5 | | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | | <0.5 | |
| Ethylbenzene | mg/kg | 1 | | 70 | 55 | NL | <1 | <1 | | <1 | | <1 | | <1 | | <1 | <1 | <1 | <1 | <1 | | <1 | |
| m+p-xylene | mg/kg | 2 | | | 40 | | <2 | <2 | | <2 | | <2 | | <2 | | <2 | <2 | <2 | <2 | <2 | | <2 | |
| o-Xylene | mg/kg | 1 | | | 40 | | <1 | <1 | | <1 | | <1 | | <1 | | <1 | <1 | <1 | <1 | <1 | | <1 | |
| Xylenes (total) | mg/kg | | | 105 | 40 | NL | <1 | <1 | | <1 | | <1 | | <1 | | <1 | <1 | <1 | <1 | <1 | | <1 | |
| Naphthalene | mg/kg | 1 | | | 3 | NL | <1 | <1 | | <1 | | 5 | | <1 | | <1 | <1 | <1 | <1 | <1 | | <1 | |
| Total Phenolics | mg/kg | 5 | | | | | | | | | | | | | | | | | | | | | |
| TRH C10 - C14 | mg/kg | 50 | | | | | <50 | <50 | | <50 | | <50 | | <50 | | <50 | <50 | <50 | <50 | <50 | | <50 | |
| TRH C15 - C28 | mg/kg | 100 | | | | | <100 | <100 | | 450 | | 240 | | <100 | | <100 | <100 | 970 | 1200 | <100 | | 390 | |
| TRH C29 - C36 | mg/kg | 100 | | | | | <100 | <100 | | 260 | | 160 | | <100 | | <100 | <100 | 800 | 1100 | <100 | | 410 | |
| TRH total C10 - C36 | mg/kg | 50 | | | | | | | | | | | | | | | | | | | | | |
| TRH >C10-C16 | mg/kg | 50 | | | | | <50 | <50 | | <50 | | <50 | | <50 | | <50 | <50 | <50 | <50 | <50 | | <50 | |
| FRACTION 2 | mg/kg | 50 | | 120 | 110 | | <50 | <50 | | <50 | | <50 | | <50 | | <50 | <50 | <50 | <50 | <50 | | <50 | |
| TRH >C16-C34 | mg/kg | 100 | | | | | <100 | <100 | | 640 | | 360 | | <100 | | <100 | <100 | 1600 | 2000 | <100 | | 690 | |
| TRH >C34-C40 | mg/kg | 100 | | | | | <100 | <100 | | 200 | | 120 | | <100 | | <100 | <100 | 390 | 570 | <100 | | 190 | |
| Total +ve TRH (>C10-C40) | mg/kg | | | | | | <50 | <50 | | 830 | | 480 | | <50 | | <50 | <50 | 2000 | 2600 | <50 | | 880 | |
| Naphthalene | mg/kg | 0.1 | 170 | | 3 | | 0.6 | 0.2 | | 0.8 | <0.1 | 4 | 0.2 | 0.4 | <0.1 | 0.3 | 0.2 | 2.3 | 2.1 | <0.1 | | 0.4 | |
| Acenaphthylene | mg/kg | 0.1 | | | | | 0.2 | 0.2 | | 2.8 | <0.1 | 2 | 0.2 | 0.7 | 0.2 | 0.4 | 0.2 | 2.8 | 3.6 | <0.1 | | 1.7 | |
| Acenaphthene | mg/kg | 0.1 | | | | | <0.1 | <0.1 | | 0.5 | <0.1 | <0.1 | <0.1 | 0.1 | <0.1 | <0.1 | <0.1 | <1 | <1 | <0.1 | | <0.1 | |
| Fluorene | mg/kg | 0.1 | | | | | <0.1 | 0.1 | | 3.2 | <0.1 | 0.3 | 0.1 | 0.5 | <0.1 | 0.2 | 0.2 | 2.9 | 2.3 | <0.1 | | 0.2 | |
| Phenanthrene | mg/kg | 0.1 | | | | | 0.4 | 1.1 | | 22 | <0.1 | 5.2 | 1.1 | 4.3 | 0.6 | 2 | 1.2 | 28 | 25 | <0.1 | | 7.8 | |
| Anthracene | mg/kg | 0.1 | | | | | 0.2 | 0.3 | | 6.4 | <0.1 | 1.8 | 0.4 | 1.3 | 0.2 | 0.8 | 0.4 | 12 | 10 | <0.1 | | 2.4 | |
| Fluoranthene | mg/kg | 0.1 | | | | | 1.1 | 1.2 | | 24 | <0.1 | 14 | 1.5 | 6.2 | 1.2 | 3.1 | 1.8 | 61 | 70 | <0.1 | | 16 | |
| Pyrene | mg/kg | 0.1 | | | | | 1.2 | 1.1 | | 22 | <0.1 | 15 | 1.5 | 6.3 | 1.3 | 3 | 1.9 | 61 | 80 | <0.1 | | 17 | |
| Benzo(a)anthracene | mg/kg | 0.1 | | | | | 0.9 | 0.6 | | 12 | <0.1 | 8 | 0.8 | 3.3 | 0.7 | 1.7 | 1 | 28 | 35 | <0.1 | | 8.7 | |
| Chrysene | mg/kg | 0.1 | | | | | 0.8 | 0.5 | | 8.6 | <0.1 | 6.7 | 0.7 | 2.6 | 0.7 | 1.4 | 0.8 | 32 | 39 | <0.1 | | 8 | |
| Benzo(b+k)fluoranthene | mg/kg | 0.2 | | | | | 1 | 0.8 | | 15 | <0.2 | 10 | 0.8 | 4.5 | 0.8 | 2.5 | 1 | 53 | 63 | <0.2 | | 15 | |
| Benzo(a)pyrene | mg/kg | 0.05 | | 33 (CRC-Care) | | | 1 | 0.5 | | 10 | <0.05 | 7 | 0.76 | 3 | 0.73 | 1.8 | 0.98 | 37 | 44 | <0.05 | | 2.7 | |
| Indeno(1,2,3-c,d)pyrene | mg/kg | 0.1 | | | | | 0.6 | 0.2 | | 4.1 | <0.1 | 2.8 | 0.4 | 1.3 | 0.4 | 0.8 | 0.4 | 35 | 42 | <0.1 | | 6 | |
| Dibenzo(a,h)anthracene | mg/kg | 0.1 | | | | | 0.2 | <0.1 | | 1.4 | <0.1 | 1 | 0.1 | 0.5 | 0.1 | 0.3 | 0.1 | 6.3 | 7.4 | <0.1 | | 0.5 | |
| Benzo(g,h,i)perylene | mg/kg | 0.1 | | | | | 0.8 | 0.2 | | 4.9 | <0.1 | 3.5 | 0.5 | 1.5 | 0.5 | 1 | 0.5 | 35 | 43 | <0.1 | | 8.8 | |
| Benzo(a)pyrene TEQ calc (zero) | mg/kg | 0.5 | | | | | 1.4 | 0.6 | | 15 | <0.5 | 10 | 1.1 | 4.4 | 1.1 | 2.6 | 1.4 | 56 | 66 | <0.5 | | 6.3 | |
| Benzo(a)pyrene TEQ calc(half) | mg/kg | 0.5 | | | | | 1.4 | 0.7 | | 15 | <0.5 | 10 | 1.1 | 4.4 | 1.1 | 2.6 | 1.4 | 56 | 66 | <0.5 | | 6.3 | |
| Benzo(a)pyrene TEQ | mg/kg | 0.5 | | | 4 | 3 | 1.4 | 0.7 | | 15 | <0.5 | 10 | 1.1 | 4.4 | 1.1 | 2.6 | 1.4 | 56 | 66 | <0.5 | | 6.3 | |
| Total +ve | mg/kg | - | | | 400 | 300 | 9 | 7 | | 140 | <0.05 | 81 | 9.1 | 36 | 7.5 | 19 | 11 | 400 | 470 | <0.05 | | 95 | |
| Total PCB | mg/kg | 0.1 | | | 1 | 1 | | <0.1 | | <0.5 | | <0.5 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | | <0.5 | |
| Arsenic | mg/kg | 4 | 100 | | 500 | 300 | 4 | 10 | <4 | 5 | 8 | 7 | | 8 | | <4 | <4 | <4 | <4 | <4 | | 490 | |
| Cadmium | mg/kg | 0.4 | | | 150 | 90 | <0.4 | <0.4 | <0.4 | <0.4 | <0.4 | <0.4 | | <0.4 | | <0.4 | <0.4 | <0.4 | <0.4 | <0.4 | | 0.7 | |
| Chromium | mg/kg | 1 | | | | | 10 | 12 | 5 | 13 | 4 | 10 | | 12 | | 3 | 3 | 6 | 5 | <1 | | 12 | |
| Copper | mg/kg | 1 | 100 | | 30000 | 17000 | 110 | 750 | 10 | 90 | 8 | 73 | | 84 | | 8 | 10 | 47 | 48 | <1 | | 60 | |
| Lead | mg/kg | 1 | 1100 | | 1200 | 600 | 120 | 220 | 54 | 170 | 39 | 660 | | 240 | | 39 | 42 | 89 | 100 | 1 | | 280 | |
| Mercury | mg/kg | 0.1 | | | 120 | 80 | 1 | 1.5 | 0.3 | 0.5 | 0.2 | 0.5 | | 1.1 | | 0.3 | 0.4 | 0.3 | 0.4 | <0.1 | | 0.9 | |
| Nickel | mg/kg | 1 | 25 | | 1200 | 1200 | 22 | 5 | 1 | 8 | 6 | 17 | | 8 | | 3 | 3 | 6 | 5 | <1 | | 8 | |
| Zinc | mg/kg | 1 | 320 | | 60000 | 30000 | 140 | 340 | 24 | 330 | 27 | 160 | | 240 | | 47 | 48 | 110 | 130 | 9 | | 500 | |
| pH1:5 soil:water | pH Units | | | | | | | | | | | | | | | | | | | | | | |
| Electrical Conductivity1:5 soil:water | µS/cm | | | | | | | | | | | | | | | | | | | | | | |
| Perfluorohexanesulfonic acid (PFHxS) | µg/kg | 0.01 | | | 2000 | 1000 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | | | | | | | | |
| Perfluorooctanesulfonic acid (PFOS) | µg/kg | 0.01 | 10 (*) | | 2000 | 1000 | | <0.1 | | <0.1 | | 0.2 | | <0.1 | | | | | | | | | |
| Perfluorooctanoic acid (PFOA) | µg/kg | 0.01 | | | 20000 | 10000 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | | | | | | | | |
| 6:2 FTS | µg/kg | 0.01 | | | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | | | | | | | | |
| 8:2 FTS | µg/kg | 0.01 | | | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | | | | | | | | |
| Exchangeable Ca | meq/100g | 0.1 | | | | | | | | | | | | | | | | | | | | | |
| Exchangeable K | meq/100g | 0.1 | | | | | | | | | | | | | | | | | | | | | |
| Exchangeable Mg | meq/100g | 0.1 | | | | | | | | | | | | | | | | | | | | | |
| Exchangeable Na | meq/100g | 0.1 | | | | | | | | | | | | | | | | | | | | | |
| Cation Exchange Capacity | meq/100g | 1 | | | | | | | | | | | | | | | | | | | | | |
| Sample Mass Tested | g | | | | | | | 1122.91 | | 1185.08 | | 1290.67 | | 704.73 | | | | | | | | | |
| Foreign Material | % | 0.05 | | | | | | | | | | | | | | | | | | | | | |

**Project: 9-11 Gibbons Street, Redfern**
**Client: St George Community Housing**
**CES Project Number: CES180204-SGC**
**Table 4: Soil Analytical Results - HIL/HSL, EIL/ESL Assessment**

| Parameters | Unit | PQL | EIL, Urban residential and public open space | ESL, Urban residential and public open space | Residential, Soil HIL B / HSL B | Recreational C, Soil HIL C/ HSL C | BH6_1.2-1.5 | BH5_0.3-0.9 | BH5_1.2-1.5 | BH7_0.3-0.9 | BH7_1.2-1.5 | BH8_0.3-0.9 | BH8_1.2-1.5 | BH9_0.3-0.9 | BH9_1.2-1.5 | BH8_1.2-1.5 | BH8_1.2-1.5 | BH10_0.3-0.9 | BH10_0.3-0.9 | BH10_1.2-1.5 | BH10_1.2-1.5 | BH11_0.3-0.7 | BH11_0.3-0.7 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 1.2-1.5 | 0.3-0.9 | 1.2-1.5 | 0.3-0.9 | 1.2-1.5 | 0.3-0.9 | 1.2-1.5 | 0.3-0.9 | 1.2-1.5 | 1.2-1.5 | 1.2-1.5 | 0.3-0.9 | 0.3-0.9 | 1.2-1.5 | 1.2-1.5 | 0.3-0.7 | 0.3-0.7 |
| | | | | | | | 02/03/2018 | 02/03/2018 | 02/03/2018 | 02/03/2018 | 02/03/2018 | 02/03/2018 | 02/03/2018 | 02/03/2018 | 02/03/2018 | 02/03/2018 | 02/03/2018 | 06/03/2018 | 06/03/2018 | 06/03/2018 | 06/03/2018 | 06/03/2018 | 06/03/2018 |
| | | | | | | | Natural | Fill | Natural | Fill | Natural | Fill | Natural | Fill | Natural | Natural | Natural | Fill | Fill | Natural | Natural | Fill | Fill |
| | | | | | | | 186376-B | 186376 | 186376 | 186376 | 186376-B | 186376 | 186376-B | 186376 | 186376-B | 186376-A | 186376-A | 186597 | 186597 | 186597 | 186597 | 186597 | 186597 |
| | | | | | | | Primary | Primary | Primary | Primary | Primary | Primary | Primary | Primary | Primary | Primary | Lab Duplicate | Primary | Lab Duplicate | Primary | Lab Duplicate | Primary | Lab Duplicate |
| HCB | mg/kg | 0.1 | | | 15 | 10 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | | <0.1 | |
| alpha-BHC | mg/kg | 0.1 | | | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | | <0.1 | |
| gamma-BHC | mg/kg | 0.1 | | | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | | <0.1 | |
| beta-BHC | mg/kg | 0.1 | | | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | | <0.1 | |
| Heptachlor | mg/kg | 0.1 | | | 10 | 10 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | | <0.1 | |
| delta-BHC | mg/kg | 0.1 | | | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | | <0.1 | |
| Aldrin | mg/kg | 0.1 | | | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | | <0.1 | |
| Heptachlor Epoxide | mg/kg | 0.1 | | | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | | <0.1 | |
| gamma-Chlordane | mg/kg | 0.1 | | | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | | <0.1 | |
| alpha-chlordane | mg/kg | 0.1 | | | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | | <0.1 | |
| Chlordane | mg/kg | 0.1 | | | 90 | 70 | | | | | | | | | | | | | | | | | |
| Endosulfan I | mg/kg | 0.1 | | | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | | <0.1 | |
| pp-DDE | mg/kg | 0.1 | | | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | | <0.1 | |
| Dieldrin | mg/kg | 0.1 | | | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | | <0.1 | |
| Aldrin and Dieldrin | mg/kg | 0.1 | | | 10 | 10 | | | | | | | | | | | | | | | | | |
| Endrin | mg/kg | 0.1 | | | 20 | 20 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | | <0.1 | |
| pp-DDD | mg/kg | 0.1 | | | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | | <0.1 | |
| Endosulfan II | mg/kg | 0.1 | | | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | | <0.1 | |
| Endosulfan | mg/kg | 0.1 | | | 400 | 340 | | | | | | | | | | | | | | | | | |
| pp-DDT | mg/kg | 0.1 | | | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | | <0.1 | |
| DDT (Total) | mg/kg | 0.1 | 180 | | | | | | | | | | | | | | | | | | | | |
| DDT+DDE+DDD | mg/kg | 0.1 | | | 600 | 400 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | | <0.1 | |
| Endrin Aldehyde | mg/kg | 0.1 | | | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | | <0.1 | |
| Endosulfan Sulphate | mg/kg | 0.1 | | | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | | <0.1 | |
| Methoxychlor | mg/kg | 0.1 | | | 500 | 400 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | | <0.1 | |
| Azinphos-methyl (Guthion) | mg/kg | 0.1 | | | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | | <0.1 | |
| Bromophos-ethyl | mg/kg | 0.1 | | | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | | <0.1 | |
| Chlorpyriphos | mg/kg | 0.1 | | | 340 | 250 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | | <0.1 | |
| Chlorpyriphos-methyl | mg/kg | 0.1 | | | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | | <0.1 | |
| Diazinon | mg/kg | 0.1 | | | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | | <0.1 | |
| Dichlorvos | mg/kg | 0.1 | | | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | | <0.1 | |
| Dimethoate | mg/kg | 0.1 | | | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | | <0.1 | |
| Ethion | mg/kg | 0.1 | | | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | | <0.1 | |
| Fenitrothion | mg/kg | 0.1 | | | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | | <0.1 | |
| Malathion | mg/kg | 0.1 | | | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | | <0.1 | |
| Parathion | mg/kg | 0.1 | | | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | | <0.1 | |
| Ronnel | mg/kg | 0.1 | | | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | | <0.1 | |
| Dichlorodifluoromethane | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | | | | <1 | <1 |
| Chloromethane | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | | | | <1 | <1 |
| Vinyl Chloride | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | | | | <1 | <1 |
| Bromomethane | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | | | | <1 | <1 |
| Chloroethane | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | | | | <1 | <1 |
| Trichlorofluoromethane | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | | | | <1 | <1 |
| 1,1-Dichloroethene | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | | | | <1 | <1 |
| trans-1,2-dichloroethene | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | | | | <1 | <1 |
| 1,1-dichloroethane | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | | | | <1 | <1 |
| cis-1,2-dichloroethene | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | | | | <1 | <1 |
| bromochloromethane | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | | | | <1 | <1 |
| chloroform | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | | | | <1 | <1 |
| 2,2-dichloropropane | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | | | | <1 | <1 |
| 1,2-dichloroethane | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | | | | <1 | <1 |
| 1,1,1-trichloroethane | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | | | | <1 | <1 |
| 1,1-dichloropropene | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | | | | <1 | <1 |
| carbon tetrachloride | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | | | | <1 | <1 |
| dibromomethane | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | | | | <1 | <1 |
| 1,2-dichloropropane | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | | | | <1 | <1 |
| trichloroethene | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | | | | <1 | <1 |
| bromodichloromethane | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | | | | <1 | <1 |
| trans-1,3-dichloropropene | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | | | | <1 | <1 |
| cis-1,3-dichloropropene | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | | | | <1 | <1 |
| 1,1,2-trichloroethane | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | | | | <1 | <1 |
| 1,3-dichloropropane | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | | | | <1 | <1 |
| dibromochloromethane | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | | | | <1 | <1 |
| 1,2-dibromoethane | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | | | | <1 | <1 |
| tetrachloroethene | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | | | | <1 | <1 |
| 1,1,1,2-tetrachloroethane | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | | | | <1 | <1 |
| chlorobenzene | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | | | | <1 | <1 |
| bromoform | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | | | | <1 | <1 |
| 1,1,2,2-tetrachloroethane | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | | | | <1 | <1 |
| 1,2,3-trichloropropane | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | | | | <1 | <1 |
| bromobenzene | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | | | | <1 | <1 |
| 2-chlorotoluene | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | | | | <1 | <1 |
| 4-chlorotoluene | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | | | | <1 | <1 |
| 1,3-dichlorobenzene | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | | | | <1 | <1 |
| 1,4-dichlorobenzene | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | | | | <1 | <1 |
| 1,2-dichlorobenzene | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | | | | <1 | <1 |
| 1,2-dibromo-3-chloropropane | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | | | | <1 | <1 |
| 1,2,4-trichlorobenzene | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | | | | <1 | <1 |
| hexachlorobutadiene | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | | | | <1 | <1 |
| 1,2,3-trichlorobenzene | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | | | | <1 | <1 |
| Asbestos ID in soil | | | | | | | | | | | | | | | | | | | | | | | |
| Trace Analysis | | | | | | | | | | | | | | | | | | | | | | | |
| Sample mass tested | g | | | | | | | 1122.91 | | 1185.08 | | 1290.67 | | 704.73 | | | | 1588.3 | | | | 1041.99 | |
| Sample Description | - | | | | | | | Brown coarse- grained soil & rocks | | Brown coarse- grained soil & rocks | | Brown coarse- grained soil & rocks | | Brown coarse- grained soil & rocks | | | | Brown sandy soil & rocks | | | | Brown sandy soil & rocks | |
| Asbestos ID in soil (as per AS4964) | - | | | | | | | No asbestos detected at reporting limit of 0.1g/kg: Organic fibre detected | | No asbestos detected at reporting limit of 0.1g/kg: Organic fibre detected | | No asbestos detected at reporting limit of 0.1g/kg: Organic fibre detected | | No asbestos detected at reporting limit of 0.1g/kg: Organic fibre detected | | | | No asbestos detected at reporting limit of 0.1g/kg: Organic fibre detected | | | | No asbestos detected at reporting limit of 0.1g/kg: Organic fibre detected | |
| Trace Analysis | - | | | | | | | No asbestos detected | | No asbestos detected | | No asbestos detected | | No asbestos detected | | | | No asbestos detected | | | | No asbestos detected | |
| Total Asbestos | g/kg | <0.1 | | | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | | | <0.1 | | | | <0.1 | |
| Asbestos ID in soil <0.1g/kg | - | N/A | | | | | | No visible asbestos detected | | No visible asbestos detected | | No visible asbestos detected | | No visible asbestos detected | | | | No visible asbestos detected | | | | No visible asbestos detected | |
| ACM >7mm Estimation | g | -- | | | 0.04% | 0.02% | | – | | – | | – | | – | | | | – | | | | – | |
| FA and AF Estimation | g | -- | | | | | | – | | – | | – | | – | | | | – | | | | – | |
| ACM >7mm Estimation | %(w/w) | <0.01 | | | | | | <0.01 | | <0.01 | | <0.01 | | <0.01 | | | | <0.01 | | | | <0.01 | |
| FA and AF Estimation | %(w/w) | <0.001 | | | 0.001% | 0.001% | | <0.001 | | <0.001 | | <0.001 | | <0.001 | | | | <0.001 | | | | <0.001 | |

**Notes:**

Benzo(a)pyrene - High reliability ecological guideline for fresh B(a)P, Urban residential and public open space, 85% level of protection, derived ecological guideline (95% confidence limit)
Ecological Investigation Levels - Exposure Setting - Urban Residential/Public Open Space; EIL for copper, nickel and zinc are based on CEC value for BH4_1.2-1.5 and this may be conservative for all soil/fill types.
Ecological Screening Levels - Exposure Setting - Urban Residential/Public Open Space - fine soil texture
(*)-PFOS value is interim soil- ecological indirect exposure for Residential and Parkland from PFAS National Enviormental Management Plan, January 2018

**Project: 9-11 Gibbons Street, Redfern**
**Client: St George Community Housing**
**CES Project Number: CES180204-SGC**
**Table 4: Soil Analytical Results - HIL/HSL, EIL/ESL Assessment**

| Parameters | Unit | PQL | EIL, Urban residential and public open space | ESL, Urban residential and public open space | Residential, Soil HIL B / HSL B | Recreational C, Soil HIL C/ HSL C | BH11_1.3-1.6<br>1.3-1.6<br>06/03/2018<br>Natural<br>186597-A<br>Primary | BH11_1.3-1.6<br>1.3-1.6<br>06/03/2018<br>Natural<br>186597-A<br>Lab Duplicate | BH1_0.4-0.8<br>0.4-0.8<br>28/02/2018<br>Fill<br>1806508<br>Primary | QAQC1<br>0.4-0.8<br>28/02/2018<br>Fill<br>1806508<br>Field Duplicate of BH1_0.4-0.8 | QAQC2<br>0.4-0.8<br>28/02/2018<br>Fill<br>1806508<br>Field Triplicate of BH1_0.4-0.8 | BH2_1.2-1.5<br>1.2-1.5<br>28/02/2018<br>Natural<br>1806508 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TRH C6 - C9 | mg/kg | 25 | | | | | | | | | <10 | |
| TRH C6 - C10 | mg/kg | 25 | | | | | | | | | <10 | |
| FRACTION 1 | mg/kg | 25 | | 180 | 45 | NL | | | | | <10 | |
| Benzene | mg/kg | 0.2 | | 50 | 0.5 | NL | | | | | <0.2 | |
| Toluene | mg/kg | 0.5 | | 85 | 160 | NL | | | | | <0.5 | |
| Ethylbenzene | mg/kg | 1 | | 70 | 55 | NL | | | | | <0.5 | |
| m+p-xylene | mg/kg | 2 | | | 40 | | | | | | <0.5 | |
| o-Xylene | mg/kg | 1 | | | 40 | | | | | | <0.5 | |
| Xylenes (total) | mg/kg | | | 105 | 40 | NL | | | | | <0.5 | |
| Naphthalene | mg/kg | 1 | | | 3 | NL | | | | | <1 | |
| Total Phenolics | mg/kg | 5 | | | | | | | | | | |
| TRH C10 - C14 | mg/kg | 50 | | | | | | | | | <50 | |
| TRH C15 - C28 | mg/kg | 100 | | | | | | | | | <100 | |
| TRH C29 - C36 | mg/kg | 100 | | | | | | | | | <100 | |
| TRH total C10 - C36 | mg/kg | 50 | | | | | | | | | <50 | |
| TRH >C10-C16 | mg/kg | 50 | | | | | | | | | <50 | |
| FRACTION 2 | mg/kg | 50 | | 120 | 110 | | | | | | <50 | |
| TRH >C16-C34 | mg/kg | 100 | | | | | | | | | <100 | |
| TRH >C34-C40 | mg/kg | 100 | | | | | | | | | <100 | |
| Total +ve TRH (>C10-C40) | mg/kg | | | | | | | | | | <50 | |
| Naphthalene | mg/kg | 0.1 | 170 | | 3 | | <0.1 | | | | <0.5 | |
| Acenaphthylene | mg/kg | 0.1 | | | | | <0.1 | | | | <0.5 | |
| Acenaphthene | mg/kg | 0.1 | | | | | <0.1 | | | | <0.5 | |
| Fluorene | mg/kg | 0.1 | | | | | <0.1 | | | | <0.5 | |
| Phenanthrene | mg/kg | 0.1 | | | | | <0.1 | | | | <0.5 | |
| Anthracene | mg/kg | 0.1 | | | | | <0.1 | | | | <0.5 | |
| Fluoranthene | mg/kg | 0.1 | | | | | <0.1 | | | | <0.5 | |
| Pyrene | mg/kg | 0.1 | | | | | <0.1 | | | | <0.5 | |
| Benzo(a)anthracene | mg/kg | 0.1 | | | | | <0.1 | | | | <0.5 | |
| Chrysene | mg/kg | 0.1 | | | | | <0.1 | | | | <0.5 | |
| Benzo(b+k)fluoranthene | mg/kg | 0.2 | | | | | <0.2 | | | | | |
| Benzo(a)pyrene | mg/kg | 0.05 | | 33 (CRC-Care) | | | <0.05 | | | | <0.5 | |
| Indeno(1,2,3-c,d)pyrene | mg/kg | 0.1 | | | | | <0.1 | | | | <0.5 | |
| Dibenzo(a,h)anthracene | mg/kg | 0.1 | | | | | <0.1 | | | | <0.5 | |
| Benzo(g,h,i)perylene | mg/kg | 0.1 | | | | | <0.1 | | | | <0.5 | |
| Benzo(a)pyrene TEQ calc (zero) | mg/kg | 0.5 | | | | | <0.5 | | | | <0.5 | |
| Benzo(a)pyrene TEQ calc(half) | mg/kg | 0.5 | | | | | <0.5 | | | | 0.6 | |
| Benzo(a)pyrene TEQ | mg/kg | 0.5 | | | 4 | 3 | <0.5 | | | | 1.2 | |
| Total +ve | mg/kg | - | | | 400 | 300 | <0.05 | | | | | |
| Total PCB | mg/kg | 0.1 | | | 1 | 1 | | | | | <0.1 | |
| Arsenic | mg/kg | 4 | 100 | | 500 | 300 | 820 | 770 | | | <5 | |
| Cadmium | mg/kg | 0.4 | | | 150 | 90 | <0.4 | <0.4 | | | <1 | |
| Chromium | mg/kg | 1 | | | | | 11 | 11 | | | 3 | |
| Copper | mg/kg | 1 | 100 | | 30000 | 17000 | 2 | 2 | | | 6 | |
| Lead | mg/kg | 1 | 1100 | | 1200 | 600 | 14 | 12 | | | 23 | |
| Mercury | mg/kg | 0.1 | | | 120 | 80 | <0.1 | <0.1 | | | 0.1 | |
| Nickel | mg/kg | 1 | 25 | | 1200 | 1200 | 1 | 2 | | | 2 | |
| Zinc | mg/kg | 1 | 320 | | 60000 | 30000 | 46 | 40 | | | 19 | |
| pH1:5 soil:water | pH Units | | | | | | | | | | | |
| Electrical Conductivity1:5 soil:water | µS/cm | | | | | | | | | | | |
| Perfluorohexanesulfonic acid (PFHxS) | µg/kg | 0.01 | | | 2000 | 1000 | | | | | | |
| Perfluorooctanesulfonic acid (PFOS) | µg/kg | 0.01 | 10 (*) | | 2000 | 1000 | | | | | | |
| Perfluorooctanoic acid (PFOA) | µg/kg | 0.01 | | | 20000 | 10000 | | | | | | |
| 6:2 FTS | µg/kg | 0.01 | | | | | | | | | | |
| 8:2 FTS | µg/kg | 0.01 | | | | | | | | | | |
| Exchangeable Ca | meq/100g | 0.1 | | | | | | | | | | |
| Exchangeable K | meq/100g | 0.1 | | | | | | | | | | |
| Exchangeable Mg | meq/100g | 0.1 | | | | | | | | | | |
| Exchangeable Na | meq/100g | 0.1 | | | | | | | | | | |
| Cation Exchange Capacity | meq/100g | 1 | | | | | | | | | | |
| Sample Mass Tested | g | | | | | | | | | | | |
| Foreign Material | % | 0.05 | | | | | | | | | | |

**Project: 9-11 Gibbons Street, Redfern**
**Client: St George Community Housing**
**CES Project Number: CES180204-SGC**
**Table 4: Soil Analytical Results - HIL/HSL, EIL/ESL Assessment**

| Parameters | Unit | PQL | EIL, Urban residential and public open space | ESL, Urban residential and public open space | Residential, Soil HIL B / HSL B | Recreational C, Soil HIL C/ HSL C | BH11_1.3-1.6 | BH11_1.3-1.6 | BH1_0.4-0.8 | QAQC1 | QAQC2 | BH2_1.2-1.5 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 1.3-1.6 | 1.3-1.6 | 0.4-0.8 | 0.4-0.8 | 0.4-0.8 | 1.2-1.5 |
| | | | | | | | 06/03/2018 | 06/03/2018 | 28/02/2018 | 28/02/2018 | 28/02/2018 | 28/02/2018 |
| | | | | | | | Natural | Natural | Fill | Fill | Fill | Natural |
| | | | | | | | 186597-A | 186597-A | 1806508 | 1806508 | 1806508 | 1806508 |
| | | | | | | | Primary | Lab Duplicate | Primary | Field Duplicate of BH1_0.4-0.8 | Field Triplicate of BH1_0.4-0.8 | |
| HCB | mg/kg | 0.1 | | | 15 | 10 | | | | | <0.05 | |
| alpha-BHC | mg/kg | 0.1 | | | | | | | | | <0.05 | |
| gamma-BHC | mg/kg | 0.1 | | | | | | | | | <0.05 | |
| beta-BHC | mg/kg | 0.1 | | | | | | | | | <0.05 | |
| Heptachlor | mg/kg | 0.1 | | | 10 | 10 | | | | | <0.05 | |
| delta-BHC | mg/kg | 0.1 | | | | | | | | | <0.05 | |
| Aldrin | mg/kg | 0.1 | | | | | | | | | <0.05 | |
| Heptachlor Epoxide | mg/kg | 0.1 | | | | | | | | | <0.05 | |
| gamma-Chlordane | mg/kg | 0.1 | | | | | | | | | | |
| alpha-chlordane | mg/kg | 0.1 | | | | | | | | | | |
| Chlordane | mg/kg | 0.1 | | | 90 | 70 | | | | | | |
| Endosulfan I | mg/kg | 0.1 | | | | | | | | | <0.05 | |
| pp-DDE | mg/kg | 0.1 | | | | | | | | | | |
| Dieldrin | mg/kg | 0.1 | | | | | | | | | <0.05 | |
| Aldrin and Dieldrin | mg/kg | 0.1 | | | 10 | 10 | | | | | <0.05 | |
| Endrin | mg/kg | 0.1 | | | 20 | 20 | | | | | <0.05 | |
| pp-DDD | mg/kg | 0.1 | | | | | | | | | <0.05 | |
| Endosulfan II | mg/kg | 0.1 | | | | | | | | | | |
| Endosulfan | mg/kg | 0.1 | | | 400 | 340 | | | | | | |
| pp-DDT | mg/kg | 0.1 | | | | | | | | | <0.2 | |
| DDT (Total) | mg/kg | 0.1 | 180 | | | | | | | | | |
| DDT+DDE+DDD | mg/kg | 0.1 | | | 600 | 400 | | | | | <0.05 | |
| Endrin Aldehyde | mg/kg | 0.1 | | | | | | | | | <0.05 | |
| Endosulfan Sulphate | mg/kg | 0.1 | | | | | | | | | <0.05 | |
| Methoxychlor | mg/kg | 0.1 | | | 500 | 400 | | | | | <0.2 | |
| Azinphos-methyl (Guthion) | mg/kg | 0.1 | | | | | | | | | <0.05 | |
| Bromophos-ethyl | mg/kg | 0.1 | | | | | | | | | <0.05 | |
| Chlorpyriphos | mg/kg | 0.1 | | | 340 | 250 | | | | | <0.05 | |
| Chlorpyriphos-methyl | mg/kg | 0.1 | | | | | | | | | <0.05 | |
| Diazinon | mg/kg | 0.1 | | | | | | | | | <0.05 | |
| Dichlorvos | mg/kg | 0.1 | | | | | | | | | <0.05 | |
| Dimethoate | mg/kg | 0.1 | | | | | | | | | <0.05 | |
| Ethion | mg/kg | 0.1 | | | | | | | | | <0.05 | |
| Fenitrothion | mg/kg | 0.1 | | | | | | | | | | |
| Malathion | mg/kg | 0.1 | | | | | | | | | <0.05 | |
| Parathion | mg/kg | 0.1 | | | | | | | | | <0.2 | |
| Ronnel | mg/kg | 0.1 | | | | | | | | | | |
| Dichlorodifluoromethane | mg/kg | 1 | | | | | <1 | | | | | |
| Chloromethane | mg/kg | 1 | | | | | <1 | | | | | |
| Vinyl Chloride | mg/kg | 1 | | | | | <1 | | | | | |
| Bromomethane | mg/kg | 1 | | | | | <1 | | | | | |
| Chloroethane | mg/kg | 1 | | | | | <1 | | | | | |
| Trichlorofluoromethane | mg/kg | 1 | | | | | <1 | | | | | |
| 1,1-Dichloroethene | mg/kg | 1 | | | | | <1 | | | | | |
| trans-1,2-dichloroethene | mg/kg | 1 | | | | | <1 | | | | | |
| 1,1-dichloroethane | mg/kg | 1 | | | | | <1 | | | | | |
| cis-1,2-dichloroethene | mg/kg | 1 | | | | | <1 | | | | | |
| bromochloromethane | mg/kg | 1 | | | | | <1 | | | | | |
| chloroform | mg/kg | 1 | | | | | <1 | | | | | |
| 2,2-dichloropropane | mg/kg | 1 | | | | | <1 | | | | | |
| 1,2-dichloroethane | mg/kg | 1 | | | | | <1 | | | | | |
| 1,1,1-trichloroethane | mg/kg | 1 | | | | | <1 | | | | | |
| 1,1-dichloropropene | mg/kg | 1 | | | | | <1 | | | | | |
| carbon tetrachloride | mg/kg | 1 | | | | | <1 | | | | | |
| dibromomethane | mg/kg | 1 | | | | | <1 | | | | | |
| 1,2-dichloropropane | mg/kg | 1 | | | | | <1 | | | | | |
| trichloroethene | mg/kg | 1 | | | | | <1 | | | | | |
| bromodichloromethane | mg/kg | 1 | | | | | <1 | | | | | |
| trans-1,3-dichloropropene | mg/kg | 1 | | | | | <1 | | | | | |
| cis-1,3-dichloropropene | mg/kg | 1 | | | | | <1 | | | | | |
| 1,1,2-trichloroethane | mg/kg | 1 | | | | | <1 | | | | | |
| 1,3-dichloropropane | mg/kg | 1 | | | | | <1 | | | | | |
| dibromochloromethane | mg/kg | 1 | | | | | <1 | | | | | |
| 1,2-dibromoethane | mg/kg | 1 | | | | | <1 | | | | | |
| tetrachloroethene | mg/kg | 1 | | | | | <1 | | | | | |
| 1,1,1,2-tetrachloroethane | mg/kg | 1 | | | | | <1 | | | | | |
| chlorobenzene | mg/kg | 1 | | | | | <1 | | | | | |
| bromoform | mg/kg | 1 | | | | | <1 | | | | | |
| 1,1,2,2-tetrachloroethane | mg/kg | 1 | | | | | <1 | | | | | |
| 1,2,3-trichloropropane | mg/kg | 1 | | | | | <1 | | | | | |
| bromobenzene | mg/kg | 1 | | | | | <1 | | | | | |
| 2-chlorotoluene | mg/kg | 1 | | | | | <1 | | | | | |
| 4-chlorotoluene | mg/kg | 1 | | | | | <1 | | | | | |
| 1,3-dichlorobenzene | mg/kg | 1 | | | | | <1 | | | | | |
| 1,4-dichlorobenzene | mg/kg | 1 | | | | | <1 | | | | | |
| 1,2-dichlorobenzene | mg/kg | 1 | | | | | <1 | | | | | |
| 1,2-dibromo-3-chloropropane | mg/kg | 1 | | | | | <1 | | | | | |
| 1,2,4-trichlorobenzene | mg/kg | 1 | | | | | <1 | | | | | |
| hexachlorobutadiene | mg/kg | 1 | | | | | <1 | | | | | |
| 1,2,3-trichlorobenzene | mg/kg | 1 | | | | | <1 | | | | | |
| Asbestos ID in soil | | | | | | | | | | | | |
| Trace Analysis | | | | | | | | | | | | |
| Sample mass tested | g | | | | | | | | | | | |
| Sample Description | - | | | | | | | | | | | |
| Asbestos ID in soil (as per AS4964) | - | | | | | | | | | | | |
| Trace Analysis | - | | | | | | | | | | | |
| Total Asbestos | g/kg | <0.1 | | | | | | | | | | |
| Asbestos ID in soil <0.1g/kg | - | N/A | | | | | | | | | | |
| ACM >7mm Estimation | g | -- | | | 0.04% | 0.02% | | | | | | |
| FA and AF Estimation | g | -- | | | | | | | | | | |
| ACM >7mm Estimation | %(w/w) | <0.01 | | | | | | | | | | |
| FA and AF Estimation | %(w/w) | <0.001 | | | 0.001% | 0.001% | | | | | | |

**Notes:**

Benzo(a)pyrene - High reliability ecological guideline for fresh B(a)P, Urban residential and public open space, 85% level of protection, derived ecological guideline (95% confidence limit).
Ecological Investigation Levels - Exposure Setting - Urban Residential/Public Open Space; EIL for copper, nickel and zinc are based on CEC value for BH4_1.2-1.5 and this may be conservative for all soil/fill types.
Ecological Screening Levels - Exposure Setting - Urban Residential/Public Open Space - fine soil texture
(*)-PFOS value is interim soil- ecological indirect exposure for Residential and Parkland from PFAS National Enviormental Management Plan, January 2018

**Project: 9-11 Gibbons Street, Redfern**
**Client: St George Community Housing**
**CES Project Number: CES180204-SGC**
**Table 9: Groundwater Analytical Results**

| Parameter | HSL B - High Density Residential - SAND 2m- <4m | ANZECC 2000 Marine Aquatic Ecosystems 95% Level of Protection | AS 2159-2009 Piling - Design and installation: Exposure Classification for Concrete Piles - Piles in Soil (Table 6.5.2(B)) | | Sample ID | BH01 | BH01 | BH03 | BH04 | QAQC 1_BH4 | QAQC 2_BH4 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Date Sampled | 05/03/2018 | 05/03/2018 | 05/03/2018 | 05/03/2018 | 05/03/2018 | 5/03/2018 |
| | | | | | Laboratory Report | 186497 | 186497 | 186497 | 186497 | 186497 | ES1806886 |
| | | | | | Sample Type | Primary | Lab Duplicate | Primary | Primary | Field Duplicate for BH04 | Field Triplicate for BH04 |
| | | | | Units | **PQL** | | | | | | |
| TRH $C_6$ - $C_9$ | | | | ug/L | **10** | 19 | 23 | <10 | 210 | 200 | 160 |
| TRH $C_6$ - $C_{10}$ | | | | ug/L | **10** | 46 | 53 | <10 | 450 | 440 | 400 |
| TPH$C_6$-$C_{10}$ less BTEX (F1) | 1000 | | | ug/L | **10** | 33 | 40 | <10 | 320 | 310 | 290 |
| Benzene | 800 | 700 | | ug/L | **1** | <1 | <1 | <1 | <1 | <1 | <1 |
| Toluene | NL | 180 [1] | | ug/L | **1** | <1 | <1 | <1 | <1 | <1 | <2 |
| Ethylbenzene | NL | 80 [1] | | ug/L | **1** | <1 | <1 | <1 | 7 | 7 | 6 |
| m+p-xylene | | m-xylene - 75 [1]<br>p-xylene - 200 [1] | | ug/L | **2** | 8 | 8 | <2 | 84 | 82 | 70 |
| o-Xylene | | 350 | | ug/L | **1** | 5 | 5 | <1 | 40 | 39 | 35 |
| Xylenes total | NL | - | | ug/L | **3** | 13 | 13 | <PQL | 124 | 121 | 105 |
| naphthalene | NL | 70 | | ug/L | **1** | <1 | <1 | <1 | 4 | 4 | <5 |
| | | | | | | | | | | | |
| TRH C10 - C14 | | | | ug/L | **50** | 150 | 81 | <50 | 270 | 410 | 120 |
| TRH C15 - C28 | | | | ug/L | **100** | <100 | <100 | <100 | <100 | <100 | <100 |
| TRH C29 - C36 | | | | ug/L | **100** | <100 | <100 | <100 | <100 | <100 | <50 |
| C10-C36 Petroleum Hydrocarbons | | | | ug/L | **100** | | | | | | |
| TRH >C10-C16 | | | | ug/L | **50** | 120 | 66 | <50 | 170 | 260 | <100 |
| TRH >C10 - C16 less Naphthalene (F2) | 1000 | | | ug/L | **50** | 120 | [NT] | <50 | 170 | 250 | <100 |
| TRH >C16-C34 | | | | ug/L | **100** | <100 | <100 | <100 | <100 | <100 | <100 |
| TRH >C34-C40 | | | | ug/L | **100** | <100 | <100 | <100 | <100 | <100 | <100 |
| | | | | | | | | | | | |
| Naphthalene | | 70 | | ug/L | **1** | <1 | <1 | <1 | 3 | 4 | <1 |
| Acenaphthylene | | | | ug/L | **1** | <1 | <1 | <1 | <1 | <1 | <1 |
| Acenaphthene | | | | ug/L | **1** | <1 | <1 | <1 | <1 | <1 | <1 |
| Fluorene | | | | ug/L | **1** | <1 | <1 | <1 | <1 | <1 | <1 |
| Phenanthrene | | 2 [1] | | ug/L | **1** | <1 | <1 | <1 | <1 | <1 | <1 |
| Anthracene | | 0.4 [1] | | ug/L | **1** | <1 | <1 | <1 | <1 | <1 | <1 |
| Fluoranthene | | 1.4 [1] | | ug/L | **1** | <1 | <1 | <1 | <1 | 2 | <1 |
| Pyrene | | | | ug/L | **1** | <1 | <1 | <1 | <1 | 2 | <1 |
| Benzo(a)anthracene | | | | ug/L | **1** | <1 | <1 | <1 | <1 | <1 | <1 |
| Chrysene | | | | ug/L | **1** | <1 | <1 | <1 | <1 | <1 | <1 |
| Benzo(b,j+k)fluoranthene | | | | ug/L | **2** | <2 | <2 | <2 | <2 | <2 | |
| Benzo(a)pyrene | | 0.2 [1] | | ug/L | **1** | <1 | <1 | <1 | <1 | 1 | <0.5 |
| Indeno(1,2,3-c,d)pyrene | | | | ug/L | **1** | <1 | <1 | <1 | <1 | <1 | <1 |
| Dibenzo(a,h)anthracene | | | | ug/L | **1** | <1 | <1 | <1 | <1 | <1 | <1 |
| Benzo(g,h,i)perylene | | | | ug/L | **1** | <1 | <1 | <1 | <1 | <1 | <1 |
| Benzo(a)pyrene TEQ calc (zero) | | | | ug/L | **5** | | | | | | |
| Benzo(a)pyrene TEQ calc(half) | | | | ug/L | | | | | | | |
| Benzo(a)pyrene TEQ calc(PQL) | | | | ug/L | | | | | | | |
| Total Positive PAHs | | | | ug/L | **1** | NIL (+)VE | NIL (+)VE | NIL (+)VE | 3.4 | 8.6 | |
| | | | | | | | | | | | |
| Arsenic (Total) | | 2.3 [2] | | ug/L | **1** | <1 | | <1 | <1 | <1 | 29 * |
| Cadmium | | 5.5 | | ug/L | **0.1** | 0.1 | | 0.2 | <0.1 | <0.1 | 1.3 |
| Chromium (total) | | | | ug/L | **1** | <1 | | <1 | <1 | <1 | 442 |
| Copper | | 1.3 | | ug/L | **1** | <1 | | <1 | <1 | <1 | 499 * |
| Lead | | 4.4 | | ug/L | **1** | <1 | | <1 | <1 | <1 | 449 * |
| Nickel | | 70 | | ug/L | **1** | 10 | | 2 | 3 | 3 | 90 * |
| Zinc | | 15 | | ug/L | **1** | 41 | | 85 | 3 | <1 | 1080 * |
| | | | | | | | | | | | |
| Chloride | | | <1,000 | mg/L | **1** | 490 | | 33 | 44 | | |
| Sulphate | | | <5,000 | mg/L | **1** | 84 | | 67 | 95 | | |
| | | | | | | | | | | | |
| Dichlorodifluoromethane | | | | ug/L | **10** | <10 | <10 | <10 | <10 | <10 | <50 |
| Chloromethane | | | | ug/L | **10** | <10 | <10 | <10 | <10 | <10 | <50 |
| Vinyl Chloride | | | | ug/L | **10** | <10 | <10 | <10 | <10 | <10 | <50 |
| Methyl tert-butyl ether (MTBE) | | | | ug/L | **0.1** | | | | | | |
| Bromomethane | | | | ug/L | **10** | <10 | <10 | <10 | <10 | <10 | <50 |
| Chloroethane | | | | ug/L | **10** | | | | | | <50 |
| Trichlorofluoromethane | | | | ug/L | **10** | <10 | <10 | <10 | <10 | <10 | <50 |
| 1,1-Dichloroethene | | | | ug/L | **1** | <1 | <1 | <1 | <1 | <1 | <5 |
| Trans-1,2-dichloroethene | | | | ug/L | **1** | <1 | <1 | <1 | <1 | <1 | <5 |
| 1,1-dichloroethane | | | | ug/L | **1** | <1 | <1 | <1 | <1 | <1 | <5 |
| Cis-1,2-dichloroethene | | | | ug/L | **1** | <1 | <1 | <1 | <1 | <1 | <5 |
| Bromochloromethane | | | | ug/L | **1** | <1 | <1 | <1 | <1 | <1 | <5 |
| Chloroform | | 770 [1] | | ug/L | **1** | 2 | 2 | 4 | 7 | 7 | <5 |
| 2,2-dichloropropane | | | | ug/L | **1** | <1 | <1 | <1 | <1 | <1 | <5 |
| 1,2-dichloroethane | | 1900 [1] | | ug/L | **1** | <1 | <1 | <1 | <1 | <1 | <5 |
| 1,1,1-trichloroethane | | 270 [1] | | ug/L | **1** | <1 | <1 | <1 | <1 | <1 | <5 |
| 1,1-dichloropropene | | | | ug/L | **1** | <1 | <1 | <1 | <1 | <1 | <5 |
| Carbon tetrachloride | | 240 [1] | | ug/L | **1** | <1 | <1 | <1 | <1 | <1 | <5 |
| Benzene | | 700 | | ug/L | **1** | | | | | | <1 |
| Dibromomethane | | - | | ug/L | **1** | <1 | <1 | <1 | <1 | <1 | <5 |
| 1,2-dichloropropane | | 900 [1] | | ug/L | **1** | <1 | <1 | <1 | <1 | <1 | <5 |
| Trichloroethene | | | | ug/L | **1** | <1 | <1 | <1 | <1 | <1 | <5 |
| Bromodichloromethane | | | | ug/L | **1** | <1 | <1 | <1 | <1 | <1 | <5 |
| trans-1,3-dichloropropene | | | | ug/L | **1** | <1 | <1 | <1 | <1 | <1 | <5 |
| cis-1,3-dichloropropene | | | | ug/L | **1** | <1 | <1 | <1 | <1 | <1 | <5 |
| 1,1,2-trichloroethane | | 1900 | | ug/L | **1** | <1 | <1 | <1 | <1 | <1 | <5 |
| Toluene | | 180 [1] | | ug/L | **1** | | | | | | <2 |
| 1,3-dichloropropane | | 1100 [1] | | ug/L | **1** | <1 | <1 | <1 | <1 | <1 | <5 |
| Dibromochloromethane | | | | ug/L | **1** | <1 | <1 | <1 | <1 | <1 | <5 |
| 1,2-dibromoethane | | | | ug/L | **1** | <1 | <1 | <1 | <1 | <1 | <5 |
| Tetrachloroethene | | | | ug/L | **1** | <1 | <1 | <1 | <1 | <1 | <5 |
| trans-1,4-Dichloro-2-butene | | | | ug/L | **1** | | | | | | <5 |
| cis-1,4-Dichloro-2-butene | | | | ug/L | **1** | | | | | | <5 |
| 1,1,1,2-tetrachloroethane | | | | ug/L | **1** | <1 | <1 | <1 | <1 | <1 | <5 |
| Chlorobenzene | | | | ug/L | **1** | <1 | <1 | <1 | <1 | <1 | <5 |
| Ethylbenzene | | 80 [1] | | ug/L | **1** | | | | | | 6 |
| Iodomethane | | | | ug/L | **1** | | | | | | <5 |
| Bromoform | | | | ug/L | **1** | <1 | <1 | <1 | <1 | <1 | <5 |
| m+p-xylene | | m-xylene - 75 [1]<br>p-xylene - 200 [1] | | ug/L | **2** | 8 | 8 | <2 | 84 | 82 | 70 |
| 1,1,2,2-tetrachloroethane | | 400 [1] | | ug/L | **1** | <1 | <1 | <1 | <1 | <1 | <5 |
| o-xylene | | | | ug/L | **1** | 5 | 5 | <1 | 40 | 39 | 35 |
| 1,2,3-trichloropropane | | | | ug/L | **1** | <1 | <1 | <1 | <1 | <1 | <5 |
| Pentachloroethane | | | | ug/L | **1** | | | | | | <5 |
| Bromobenzene | | | | ug/L | **1** | <1 | <1 | <1 | <1 | <1 | <5 |
| 2-chlorotoluene | | | | ug/L | **1** | | | | | | <5 |
| 4-chlorotoluene | | | | ug/L | **1** | | | | | | <5 |
| 1,3-dichlorobenzene | | | | ug/L | **1** | <1 | <1 | <1 | <1 | <1 | |
| 1,4-dichlorobenzene | | 60 | | ug/L | **1** | <1 | <1 | <1 | <1 | <1 | |
| Vinyl acetate | | | | ug/L | **10** | <10 | <10 | <10 | <10 | <10 | |
| 1,2-dichlorobenzene | | 160 | | ug/L | **1** | <1 | <1 | <1 | <1 | <1 | |
| 1,2-dibromo-3-chloropropane | | | | ug/L | **1** | <1 | <1 | <1 | <1 | <1 | <5 |
| 1,2,4-trichlorobenzene | | 170 | | ug/L | **1** | <1 | <1 | <1 | <1 | <1 | <5 |
| Hexachlorobutadiene | | | | ug/L | **1** | <1 | <1 | <1 | <1 | <1 | <5 |
| 1,2,3-trichlorobenzene | | 10 | | ug/L | **1** | <1 | <1 | <1 | <1 | <1 | <5 |
| | | | | | | | | | | | |
| Phenol | | 320 | | ug/L | **1** | 0.07 | 0.06 | <0.05 | 0.09 | 0.1 | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Perfluorohexanesulfonic acid (PFHxS) | | | | µg/L | 0.01 | 0.001 | | 0.018 | 0.0078 | 0.0084 | 0.02 |
| Perfluorooctanesulfonic acid (PFOS) | | 0.13 | | µg/L | 0.01 | 0.001 | | 0.036 | 0.0054 | 0.0059 | 0.01 |
| Perfluorooctanoic acid (PFOA) | | 220 | | µg/L | 0.01 | 0.001 | | 0.01 | 0.0028 | 0.0033 | 0.01 |
| 6:2 FTS | | | | µg/L | 0.01 | <0.0004 | | 0.0005 | 0.001 | 0.001 | 0.05 |
| 8:2 FTS | | | | µg/L | 0.01 | <0.0004 | | <0.0004 | <0.0004 | <0.0004 | 0.05 |

* The metals results for QAQC2 BH4 are representative of Total Metals and not representative of dissolved metals. The elevated levels are a result of sediment in the sample.

[1] Low reliability trigger value; should only be used as indicative interim working level.

[2] Environmental Concern Level (ECL) for most toxic form of Arsenic (As), As (III), of 2.3 µg/L was applied for As (Total). NOTE the low reliability marine guideline trigger value for the less toxic form of As, As (V), is 4.5 µg/L. The ECL or the low reliability marine guideline trigger value should only be used as indicative interim working levels.

[3] Environmental Concern Level (ECL); should only be used as indicative interim working level.

**Project: 9-11 Gibbons Street, Redfern**
**Client: St George Community Housing**
**CES Project Number: CES180204-SGC**
**Table 11: Waste Classification**

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Sample ID | BH1_0.3-0.6 | BH1_1.2-1.5 | BH1_1.2-1.5 | BH2_0.3-0.6 | BH2_2.0-2.3 | BH1_0.4-0.8 | BH1_0.4-0.8 | QAQC1_BH1_0.4-0.8 | BH1_1.2-1.5 | BH4_0.3-0.8 | BH4_1.2-1.5 | BH4_1.2-1.5 | BH6_0.3-0.8 | BH6_0.3-0.8 | BH6_1.2-1.5 |
| | | | | Depth (mbgl) | 0.3-0.6 | 1.2-1.5 | 1.2-1.5 | 0.3-0.6 | 2.0-2.3 | 0.4-0.8 | 0.4-0.8 | 0.4-0.8 | 1.2-1.5 | 0.3-0.8 | 1.2-1.5 | 1.2-1.5 | 0.3-0.8 | 0.3-0.8 | 1.2-1.5 |
| | | | | Date Sampled | 27/02/2018 | 27/02/2018 | 27/02/2018 | 27/02/2018 | 27/02/2018 | 28/02/2018 | 28/02/2018 | 28/02/2018 | 28/02/2018 | 03/01/2018 | 03/01/2018 | 01/03/2018 | 02/03/2018 | 02/03/2018 | 02/03/2018 |
| | | | | Date Extracted | Fill | Natural | Natural | Fill | Natural | Fill | Fill | Fill | Natural | Fill | Natural | Natural | Fill | Fill | Natural |
| | | | | Soil Unit | 18611b | 18611b | 18611b | 18611b | 18611b | 18621z | 18621z | 18621z | 18621z | 18629S | 18629S | 18637k | 18637k | 18637k | 18637k-B |
| | | | | Lab report | Primary | Primary | Lab Duplicate | Primary | Primary | Primary | Lab Duplicate | Filed Duplicate | Primary | Primary | Primary | Lab Duplicate | Primary | Lab Duplicate | Primary |
| Parameters | Unit | PQL | Waste Classification Criteria CT1 * | Restricted Solid Waste CT2 * | | | | | | | | | | | | | | | |
| *** Refer to Table 3 for TCLP test results of shaded samples for additional waste classification.** | | | | | | | | | | | | | | | | | | | |
| TRH C6 - C9 | mg/kg | 25 | 650 | 2600 | <25 | <25 | | <25 | <25 | <25 | | <25 | <25 | <25 | | | <25 | <25 | <25 |
| TRH C6 - C10 | mg/kg | 25 | | | <25 | <25 | | <25 | <25 | <25 | | <25 | <25 | <25 | | | <25 | <25 | <25 |
| FRACTION 1 | mg/kg | 25 | | | <25 | <25 | | <25 | <25 | <25 | | <25 | <25 | <25 | | | <25 | <25 | <25 |
| Benzene | mg/kg | 0.2 | 10 | 40 | <0.2 | <0.2 | | <0.2 | <0.2 | <0.2 | | <0.2 | <0.2 | <0.2 | | | <0.2 | <0.2 | <0.2 |
| Toluene | mg/kg | 0.5 | 288 | 1152 | <0.5 | <0.5 | | <0.5 | <0.5 | <0.5 | | <0.5 | <0.5 | <0.5 | | | <0.5 | <0.5 | <0.5 |
| Ethylbenzene | mg/kg | 1 | 600 | 2400 | <1 | <1 | | <1 | <1 | <1 | | <1 | <1 | <1 | | | <1 | <1 | <1 |
| m+p-xylene | mg/kg | 2 | 1000 | 4000 | <2 | <2 | | <2 | <2 | <2 | | <2 | <2 | <2 | | | <2 | <2 | <2 |
| o-Xylene | mg/kg | 1 | 1000 | 4000 | <1 | <1 | | <1 | <1 | <1 | | <1 | <1 | <1 | | | <1 | <1 | <1 |
| Xylenes (total) | mg/kg | | 1000 | 4000 | <1 | <1 | | <1 | <1 | <1 | | <1 | <1 | <1 | | | <1 | <1 | <1 |
| Naphthalene | mg/kg | 1 | | | <1 | <1 | | <1 | <1 | <1 | | <1 | <1 | <1 | | | 85 | 160 | <1 |
| Total Phenolics | mg/kg | 5 | 288 | 1152 | | | | | | | | | | | | | | | |
| TRH C10 - C14 | mg/kg | 50 | | | <50 | <50 | | <50 | <50 | <50 | | <50 | <50 | <50 | | | 150 | 66 | <50 |
| TRH C15 - C28 | mg/kg | 100 | | | <100 | <100 | | 280 | <100 | <100 | | <100 | <100 | <100 | | | 1000 | 390 | <100 |
| TRH C29 - C36 | mg/kg | 100 | | | <100 | <100 | | 160 | <100 | <100 | | <100 | <100 | <100 | | | 360 | 150 | <100 |
| TRH total C10 - C36 | mg/kg | 50 | 10000** | 40000 | | | | | | | | | | | | | | | |
| TRH >C10-C16 | mg/kg | 50 | | | <50 | <50 | | <50 | <50 | <50 | | <50 | <50 | <50 | | | 270 | 110 | <50 |
| FRACTION 2 | mg/kg | 50 | | | <50 | <50 | | <50 | <50 | <50 | | <50 | <50 | <50 | | | 190 | <50 | <50 |
| TRH >C16-C34 | mg/kg | 100 | | | <100 | <100 | | 400 | <100 | <100 | | <100 | <100 | <100 | | | 1200 | 470 | <100 |
| TRH >C34-C40 | mg/kg | 100 | | | <100 | <100 | | <100 | <100 | <100 | | <100 | <100 | <100 | | | 140 | <100 | <100 |
| Total +ve TRH (>C10-C40) | mg/kg | | | | <50 | <50 | | 400 | <50 | <50 | | <50 | <50 | <50 | | | 1600 | 580 | <50 |
| Naphthalene | mg/kg | 0.1 | | | <0.1 | <0.1 | | 0.3 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | 200 | 28 | 0.6 |
| Acenaphthylene | mg/kg | 0.1 | | | <0.1 | <0.1 | | 2.3 | <0.1 | 0.1 | | <0.1 | <0.1 | <0.1 | | | 58 | 7.9 | 0.2 |
| Acenaphthene | mg/kg | 0.1 | | | <0.1 | <0.1 | | 0.2 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | 18 | 1.8 | <0.1 |
| Fluorene | mg/kg | 0.1 | | | <0.1 | <0.1 | | 0.8 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | 94 | 10 | <0.1 |
| Phenanthrene | mg/kg | 0.1 | | | 0.1 | <0.1 | | 10 | 0.1 | 0.7 | | <0.1 | 0.2 | 0.5 | | | 360 | 45 | 0.4 |
| Anthracene | mg/kg | 0.1 | | | <0.1 | <0.1 | | 2.6 | <0.1 | 0.2 | | <0.1 | <0.1 | 0.2 | | | 92 | 11 | 0.2 |
| Fluoranthene | mg/kg | 0.1 | | | 0.3 | <0.1 | | 18 | 0.3 | 1.5 | | 0.2 | 0.4 | 0.9 | | | 250 | 29 | 1.1 |
| Pyrene | mg/kg | 0.1 | | | 0.3 | <0.1 | | 20 | 0.4 | 1.7 | | 0.2 | 0.3 | 0.8 | | | 250 | 29 | 1.2 |
| Benzo(a)anthracene | mg/kg | 0.1 | | | 0.2 | <0.1 | | 9.7 | 0.2 | 0.8 | | 0.1 | 0.2 | 0.4 | | | 110 | 12 | 0.9 |
| Chrysene | mg/kg | 0.1 | | | 0.1 | <0.1 | | 6.9 | 0.2 | 1 | | 0.1 | 0.2 | 0.5 | | | 98 | 11 | 0.8 |
| Benzo(b+k)fluoranthene | mg/kg | 0.2 | | | 0.3 | <0.2 | | 11 | 0.3 | 3.6 | | 0.4 | 0.6 | 0.7 | | | 130 | 15 | 1 |
| Benzo(a)pyrene | mg/kg | 0.05 | 0.8 | 10 | 0.2 | <0.05 | | 7.5 | 0.2 | 3.1 | | 0.1 | 0.2 | 0.4 | | | 98 | 11 | 1 |
| Indeno(1,2,3-c,d)pyrene | mg/kg | 0.1 | | | <0.1 | <0.1 | | 3.3 | <0.1 | 0.8 | | <0.1 | <0.1 | 0.3 | | | 37 | 4 | 0.6 |
| Dibenz(a,h)anthracene | mg/kg | 0.1 | | | <0.1 | <0.1 | | 1.3 | <0.1 | 0.2 | | <0.1 | <0.1 | <0.1 | | | 12 | 1.1 | 0.2 |
| Benzo(g,h,i)perylene | mg/kg | 0.1 | | | <0.1 | <0.1 | | 4.1 | 0.1 | 0.9 | | <0.1 | <0.1 | 0.2 | | | 47 | 5.3 | 0.8 |
| Benzo(a)pyrene TEQ | mg/kg | 0.5 | | | <0.5 | <0.5 | | 11 | <0.5 | 1.8 | | <0.5 | <0.5 | 0.6 | | | 140 | 15 | 1.4 |
| Total +ve | mg/kg | | 200** | 800 | 1.4 | <0.05 | | 98 | 1.9 | 13 | | 1.2 | 2 | 4.7 | | | 1900 | 220 | 9 |
| Individual aroclors (PCB) | mg/kg | 0.1 | | 50 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | 0.1 | | | <1 | <1 | |
| Arsenic | mg/kg | 4 | 100 | 400 | 5 | <4 | | 7 | <4 | 41 | 33 | 7 | 9 | 52 | | | 6 | 4 | 4 |
| Cadmium | mg/kg | 0.4 | 20 | 80 | <0.4 | <0.4 | | <0.4 | <0.4 | <0.4 | <0.4 | <0.4 | <0.4 | 0.5 | | | <0.4 | <0.4 | <0.4 |
| Chromium | mg/kg | 1 | 100 | 400 | 11 | <1 | | 9 | 13 | 5 | 8 | 4 | 4 | 6 | | | 11 | 8 | 10 |
| Copper | mg/kg | 1 | - | - | 40 | <1 | | 53 | 21 | 24 | 33 | 8 | 10 | 18 | | | 150 | 120 | 110 |
| Lead | mg/kg | 1 | 100 | 400 | 440 | 2 | | 43 | 100 | 130 | 31 | 32 | 190 | 300 | | | 330 | 300 | 120 |
| Mercury | mg/kg | 0.1 | 4 | 16 | 1 | <0.1 | | 0.9 | 0.2 | 0.9 | 1 | 0.2 | 0.2 | 0.9 | | | 0.5 | 0.5 | 1 |
| Nickel | mg/kg | 1 | 40 | 160 | 6 | <1 | | 6 | 3 | 4 | 5 | 1 | 2 | 4 | | | 4 | 4 | 22 |
| Zinc | mg/kg | 1 | - | - | 200 | 17 | | 120 | 32 | 170 | 180 | 28 | 28 | 410 | | | 150 | 150 | 140 |
| Asbestos ID in soil | | | | | | | | | | | | | | | | | | | |
| Trace Analysis | | | | | | | | | | | | | | | | | | | |
| Exchangeable Ca | meq/100g | 0.1 | | | | 1.1 | 0.7 | | | | | | | | 3.4 | 3.2 | | | |
| Exchangeable K | meq/100g | 0.1 | | | | <0.1 | <0.1 | | | | | | | | 0.3 | 0.3 | | | |
| Exchangeable Mg | meq/100g | 0.1 | | | | 0.13 | <0.1 | | | | | | | | 0.35 | 0.33 | | | |
| Exchangeable Na | meq/100g | 0.1 | | | | <0.1 | <0.1 | | | | | | | | <0.1 | <0.1 | | | |
| Cation Exchange Capacity | meq/100g | 1 | | | | 1.3 | <1 | | | | | | | | 4.1 | 3.8 | | | |
| HCB | mg/kg | 0.1 | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 | |
| alpha-BHC | mg/kg | 0.1 | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 | |
| gamma-BHC | mg/kg | 0.1 | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 | |
| beta-BHC | mg/kg | 0.1 | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 | |
| Heptachlor | mg/kg | 0.1 | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 | |
| delta-BHC | mg/kg | 0.1 | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 | |
| Aldrin | mg/kg | 0.1 | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 | |
| Heptachlor Epoxide | mg/kg | 0.1 | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 | |
| gamma-Chlordane | mg/kg | 0.1 | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 | |
| alpha-chlordane | mg/kg | 0.1 | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 | |
| Chlordane | mg/kg | 0.1 | | | | | | | | | | | | | | | | | |
| Endosulfan I | mg/kg | 0.1 | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 | |
| pp-DDE | mg/kg | 0.1 | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 | |
| Dieldrin | mg/kg | 0.1 | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 | |
| Aldrin and Dieldrin | mg/kg | 0.1 | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | | | | | | |
| Endrin | mg/kg | 0.1 | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 | |
| pp-DDD | mg/kg | 0.1 | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 | |
| Endosulfan II | mg/kg | 0.1 | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 | |
| Endosulfan | mg/kg | 0.1 | | | | | | | | <0.1 | | <0.1 | <0.1 | | | | | | |
| pp-DDT | mg/kg | 0.1 | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 | |
| DDT (Total) | mg/kg | 0.1 | | | | | | | | <0.1 | | <0.1 | | | | | | | |
| DDT+DDE+DDD | mg/kg | 0.1 | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 | |
| Endrin Aldehyde | mg/kg | 0.1 | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 | |
| Endosulfan Sulphate | mg/kg | 0.1 | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 | |
| Methoxychlor | mg/kg | 0.1 | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 | |
| Azinphos-methyl (Guthion) | mg/kg | 0.1 | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 | |
| Bromophos-ethyl | mg/kg | 0.1 | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 | |
| Chlorpyriphos | mg/kg | 0.1 | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 | |
| Chlorpyriphos-methyl | mg/kg | 0.1 | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 | |
| Diazinon | mg/kg | 0.1 | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 | |
| Dichlorvos | mg/kg | 0.1 | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 | |
| Dimethoate | mg/kg | 0.1 | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 | |
| Ethion | mg/kg | 0.1 | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 | |
| Fenitrothion | mg/kg | 0.1 | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 | |
| Malathion | mg/kg | 0.1 | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 | |
| Parathion | mg/kg | 0.1 | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 | |
| Ronnel | mg/kg | 0.1 | | | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | <0.1 | <0.1 | <0.1 | | | <0.1 | <0.1 | |
| Dichlorodifluoromethane | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | |
| Chloroethane | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | |
| Vinyl Chloride | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | |
| Bromomethane | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | |
| Chloroethane | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | |
| Trichlorofluoromethane | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | |
| 1,1-Dichloroethene | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | |
| trans-1,2-dichloroethene | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | |
| 1,1-dichloroethane | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | |
| cis-1,2-dichloroethene | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | |
| bromochloromethane | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | |
| chloroform | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | |
| 2,2-dichloropropane | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | |
| 1,2-dichloroethane | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | |
| 1,1,1-trichloroethane | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | |
| 1,1-dichloropropene | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | |
| carbon tetrachloride | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | |
| dibromomethane | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | |
| 1,2-dichloropropane | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | |
| trichloroethene | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | |
| bromodichloromethane | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | |
| trans-1,3-dichloropropene | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | |
| cis-1,3-dichloropropene | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | |
| 1,1,2-trichloroethane | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | |
| 1,3-dichloropropane | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | |
| dibromochloromethane | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | |
| 1,2-dibromoethane | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | |
| tetrachloroethene | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | |
| 1,1,1,2-tetrachloroethane | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | |
| chlorobenzene | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | |
| bromoform | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | |
| 1,1,2,2-tetrachloroethane | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | |
| 1,2,3-trichloropropane | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | |
| bromobenzene | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | |
| 2-chlorotoluene | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | |
| 4-chlorotoluene | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | |
| 1,3-dichlorobenzene | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | |
| 1,4-dichlorobenzene | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | |
| 1,2-dichlorobenzene | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | |
| 1,2-dibromo-3-chloropropane | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | |
| 1,2,4-trichlorobenzene | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | |
| hexachlorobutadiene | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | |
| 1,2,3-trichlorobenzene | mg/kg | 1 | | | | | | <1 | | <1 | | | | | | | | | |
| Sample mass tested | g | | | | 1185.5 | | | 1428.9 | | 1426.8 | | | | 1007.93 | | | 909.85 | | |
| Sample Description | - | | | | Brown coarse-grained soil & rocks | | | Brown coarse-grained soil & rocks | | Grey sandy soil & rocks | | | | Brown fine-grained soil & rocks | | | Brown coarse- grained soil & rocks | | |
| Asbestos ID in soil (as per AS4964) | - | | | | No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected | | | No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected | | No asbestos detected at reporting limit of 0.1g/kg: Organic fibres detected | | | | No asbestos detected at reporting limit of 0.1g/kg: Organic fibre detected | | | No asbestos detected at reporting limit of 0.1g/kg: Organic fibre detected | | |
| Trace Analysis | - | | | | No asbestos detected | | | No asbestos detected | | No asbestos detected | | | | No asbestos detected | | | No asbestos detected | | |
| Total Asbestos#1 | g/kg | <0.1 | | | <0.1 | | | <0.1 | | <0.1 | | | | <0.1 | | | <0.1 | | |
| Asbestos ID in soil <0.1g/kg* | - | N/A | | | No visible asbestos detected | | | No visible asbestos detected | | No visible asbestos detected | | | | No visible asbestos detected | | | No visible asbestos detected | | |
| ACM >7mm Estimation* | g | - | | | - | | | - | | - | | | | - | | | - | | |
| FA and AF Estimation* | g | - | | | - | | | - | | - | | | | - | | | - | | |
| ACM >7mm Estimation* | %(w/w) | <0.01 | | | <0.01 | | | <0.01 | | <0.01 | | | | <0.01 | | | <0.01 | | |
| FA and AF Estimation*#2 | %(w/w) | <0.001 | | | <0.001 | | | <0.001 | | <0.001 | | | | <0.001 | | | <0.001 | | |

**Project: 9-11 Gibbons Street, Redfern**
**Client: St George Community Housing**
**CES Project Number: CES180204-SGC**
**Table 11: Waste Classification**

| Parameters | Unit | PQL | Waste Classification Criteria CT1 * | Restricted Solid Waste CT2 * | Sample ID | BH5_0.3-0.9 | BH5_1.2-1.5 | BH7_0.3-0.9 | BH7_1.2-1.5 | BH8_0.3-0.9 | BH8_1.2-1.5 | BH9_0.3-0.9 | BH9_1.2-1.5 | BH8_1.2-1.5 | BH8_1.2-1.5 | BH10_0.3-0.9 | BH10_0.3-0.9 | BH10_1.2-1.5 | BH10_1.2-1.5 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Depth (mbgl) | 0.3-0.9 | 1.2-1.5 | 0.3-0.9 | 1.2-1.5 | 0.3-0.9 | 1.2-1.5 | 0.3-0.9 | 1.2-1.5 | 1.2-1.5 | 1.2-1.5 | 0.3-0.9 | 0.3-0.9 | 1.2-1.5 | 1.2-1.5 |
| | | | | | Date Sampled | 02/03/2018 | 02/03/2018 | 02/03/2018 | 02/03/2018 | 02/03/2018 | 02/03/2018 | 02/03/2018 | 02/03/2018 | 02/03/2018 | 02/03/2018 | 06/03/2018 | 06/03/2018 | 06/03/2018 | 06/03/2018 |
| | | | | | Date Extracted | Fill | Natutal | Fill | Natutal | Fill | Natural | Fill | Natural | Natural | Natural | Fill | Fill | Natural | Natural |
| | | | | | Soil Unit | 18637S | 18637S | 18637S | 18637S-B | 18637S | 18637S | 18637S | 18637S | 18637S-A | 18637S-A | 18659T | 18659T | 18659T | 18659T |
| | | | | | Lab report | Primary | Primary | Primary | Primary | Primary | Primary | Primary | Primary | Primary | Lab Duplicate | Primary | Lab Duplicate | Primary | Lab Duplicate |
| *** Refer to Table 3 for TCLP test results** | | | | | | | | | | | | | | | | | | | |
| TRH C6 - C9 | mg/kg | 25 | 650 | 2600 | | <25 | | <25 | | <25 | | <25 | | <25 | <25 | <25 | <25 | <25 | |
| TRH C6 - C10 | mg/kg | 25 | | | | <25 | | <25 | | <25 | | <25 | | <25 | <25 | <25 | <25 | <25 | |
| FRACTION 1 | mg/kg | 25 | | | | <25 | | <25 | | <25 | | <25 | | <25 | <25 | <25 | <25 | <25 | |
| Benzene | mg/kg | 0.2 | 10 | 40 | | <0.2 | | <0.2 | | <0.2 | | <0.2 | | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | |
| Toluene | mg/kg | 0.5 | 288 | 1152 | | <0.5 | | <0.5 | | <0.5 | | <0.5 | | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | |
| Ethylbenzene | mg/kg | 1 | 600 | 2400 | | <1 | | <1 | | <1 | | <1 | | <1 | <1 | <1 | <1 | <1 | |
| m+p-xylene | mg/kg | 2 | 1000 | 4000 | | <2 | | <2 | | <2 | | <2 | | <2 | <2 | <2 | <2 | <2 | |
| o-Xylene | mg/kg | 1 | 1000 | 4000 | | <1 | | <1 | | <1 | | <1 | | <1 | <1 | <1 | <1 | <1 | |
| Xylenes (total) | mg/kg | | 1000 | 4000 | | <1 | | <1 | | <1 | | <1 | | <1 | <1 | <1 | <1 | <1 | |
| Naphthalene | mg/kg | 1 | | | | <1 | | <1 | | 5 | | <1 | | <1 | <1 | <1 | <1 | <1 | |
| Total Phenolics | mg/kg | 5 | 288 | 1152 | | | | | | | | | | | | | | | |
| TRH C10 - C14 | mg/kg | 50 | | | | <50 | | <50 | | <50 | | <50 | | <50 | <50 | <50 | <50 | <50 | |
| TRH C15 - C28 | mg/kg | 100 | | | | <100 | | 450 | | 240 | | <100 | | <100 | <100 | 970 | 1200 | <100 | |
| TRH C29 - C36 | mg/kg | 100 | | | | <100 | | 260 | | 160 | | <100 | | <100 | <100 | 800 | 1100 | <100 | |
| TRH total C10 - C36 | mg/kg | 50 | 10000** | 40000 | | | | | | | | | | | | | | | |
| TRH >C10-C16 | mg/kg | 50 | | | | <50 | | <50 | | <50 | | <50 | | <50 | <50 | <50 | <50 | <50 | |
| FRACTION 2 | mg/kg | 50 | | | | <50 | | <50 | | <50 | | <50 | | <50 | <50 | <50 | <50 | <50 | |
| TRH >C16-C34 | mg/kg | 100 | | | | <100 | | 640 | | 360 | | <100 | | <100 | <100 | 1600 | 2000 | <100 | |
| TRH >C34-C40 | mg/kg | 100 | | | | <100 | | 200 | | 120 | | <100 | | <100 | <100 | 390 | 570 | <100 | |
| Total +ve TRH (>C10-C40) | mg/kg | | | | | <50 | | 830 | | 480 | | <50 | | <50 | <50 | 2000 | 2600 | <50 | |
| Naphthalene | mg/kg | 0.1 | | | | 0.2 | | 0.8 | <0.1 | 4 | | 0.4 | | 0.3 | 0.2 | 2.3 | 2.1 | <0.1 | |
| Acenaphthylene | mg/kg | 0.1 | | | | 0.2 | | 2.8 | <0.1 | 2 | | 0.7 | | 0.4 | 0.2 | 2.8 | 3.6 | <0.1 | |
| Acenaphthene | mg/kg | 0.1 | | | | <0.1 | | 0.5 | <0.1 | <0.1 | | 0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | |
| Fluorene | mg/kg | 0.1 | | | | 0.1 | | 3.2 | <0.1 | 0.3 | | 0.5 | | 0.2 | 0.2 | 2.9 | 2.3 | <0.1 | |
| Phenanthrene | mg/kg | 0.1 | | | | 1.1 | | 22 | <0.1 | 5.2 | | 4.3 | | 2 | 1.2 | 28 | 25 | <0.1 | |
| Anthracene | mg/kg | 0.1 | | | | 0.3 | | 6.4 | <0.1 | 1.8 | | 1.3 | | 0.8 | 0.4 | 12 | 10 | <0.1 | |
| Fluoranthene | mg/kg | 0.1 | | | | 1.2 | | 24 | <0.1 | 14 | | 6.2 | | 3.1 | 1.8 | 61 | 70 | <0.1 | |
| Pyrene | mg/kg | 0.1 | | | | 1.1 | | 22 | <0.1 | 15 | | 6.3 | | 3 | 1.9 | 61 | 80 | <0.1 | |
| Benzo(a)anthracene | mg/kg | 0.1 | | | | 0.6 | | 12 | <0.1 | 8 | | 3.3 | | 1.7 | 1 | 28 | 35 | <0.1 | |
| Chrysene | mg/kg | 0.1 | | | | 0.5 | | 8.6 | <0.1 | 6.7 | | 2.6 | | 1.4 | 0.8 | 32 | 39 | <0.1 | |
| Benzo(b+k)fluoranthene | mg/kg | 0.2 | | | | 0.8 | | 15 | <0.2 | 10 | | 4.5 | | 2.5 | 1 | 53 | 63 | <0.2 | |
| Benzo(a)pyrene | mg/kg | 0.05 | 0.8 | 10 | | 0.5 | | 10 | <0.05 | 7 | | 3 | | 1.6 | 0.98 | 37 | 44 | <0.05 | |
| Indeno(1,2,3-c,d)pyrene | mg/kg | 0.1 | | | | 0.2 | | 4.1 | <0.1 | 2.8 | | 1.3 | | 0.8 | 0.4 | 35 | 42 | <0.1 | |
| Dibenz(a,h)anthracene | mg/kg | 0.1 | | | | <0.1 | | 1.4 | <0.1 | 1 | | 0.5 | | 0.3 | 0.1 | 6.3 | 7.4 | <0.1 | |
| Benzo(g,h,i)perylene | mg/kg | 0.1 | | | | 0.2 | | 4.9 | <0.1 | 3.5 | | 1.5 | | 1 | 0.5 | 35 | 43 | <0.1 | |
| Benzo(a)pyrene TEQ | mg/kg | 0.5 | | | | 0.7 | | 15 | <0.5 | 10 | | 4.4 | | 2.6 | 1.4 | 56 | 66 | <0.5 | |
| Total +ve | mg/kg | - | 200** | 800 | | 7 | | 140 | <0.05 | 81 | | 36 | | 19 | 11 | 600 | 670 | <0.05 | |
| Individual aroclors (PCB) | mg/kg | 0.1 | | 50 | | <0.1 | | <0.5 | | <0.5 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | |
| Arsenic | mg/kg | 4 | 100 | 400 | | 10 | | 5 | 8 | 7 | | 8 | | <4 | <4 | <4 | <4 | <4 | |
| Cadmium | mg/kg | 0.4 | 20 | 80 | | <0.4 | | <0.4 | <0.4 | <0.4 | | <0.4 | | <0.4 | <0.4 | <0.4 | <0.4 | <0.4 | |
| Chromium | mg/kg | 1 | 100 | 400 | | 12 | | 13 | 4 | 10 | | 12 | | 3 | 3 | 6 | 5 | <1 | |
| Copper | mg/kg | 1 | - | - | | 750 | | 90 | 8 | 73 | | 84 | | 8 | 10 | 47 | 48 | <1 | |
| Lead | mg/kg | 1 | 100 | 400 | | 220 | | 170 | 39 | 660 | | 240 | | 39 | 42 | 89 | 100 | 1 | |
| Mercury | mg/kg | 0.1 | 4 | 16 | | 1.5 | | 0.5 | 0.2 | 0.5 | | 1.1 | | 0.3 | 0.4 | 0.3 | 0.4 | <0.1 | |
| Nickel | mg/kg | 1 | 40 | 160 | | 5 | | 8 | 6 | 17 | | 8 | | 3 | 3 | 6 | 5 | <1 | |
| Zinc | mg/kg | 1 | | | | 340 | | 330 | 27 | 160 | | 240 | | 47 | 48 | 110 | 130 | 9 | |
| Asbestos ID in soil | | | | | | | | | | | | | | | | | | | |
| Trace Analysis | | | | | | | | | | | | | | | | | | | |
| Exchangeable Ca | meq/100g | 0.1 | | | | | | | | | | | | | | | | | |
| Exchangeable K | meq/100g | 0.1 | | | | | | | | | | | | | | | | | |
| Exchangeable Mg | meq/100g | 0.1 | | | | | | | | | | | | | | | | | |
| Exchangeable Na | meq/100g | 0.1 | | | | | | | | | | | | | | | | | |
| Cation Exchange Capacity | meq/100g | 1 | | | | | | | | | | | | | | | | | |
| HCB | mg/kg | 0.1 | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | |
| alpha-BHC | mg/kg | 0.1 | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | |
| gamma-BHC | mg/kg | 0.1 | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | |
| beta-BHC | mg/kg | 0.1 | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | |
| Heptachlor | mg/kg | 0.1 | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | |
| delta-BHC | mg/kg | 0.1 | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | |
| Aldrin | mg/kg | 0.1 | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | |
| Heptachlor Epoxide | mg/kg | 0.1 | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | |
| gamma-Chlordane | mg/kg | 0.1 | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | |
| alpha-chlordane | mg/kg | 0.1 | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | |
| Chlordane | mg/kg | 0.1 | | | | | | | | | | | | | | | | | |
| Endosulfan I | mg/kg | 0.1 | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | |
| pp-DDE | mg/kg | 0.1 | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | |
| Dieldrin | mg/kg | 0.1 | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | |
| Aldrin and Dieldrin | mg/kg | 0.1 | | | | | | | | | | | | | | | | | |
| Endrin | mg/kg | 0.1 | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | |
| pp-DDD | mg/kg | 0.1 | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | |
| Endosulfan II | mg/kg | 0.1 | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | |
| Endosulfan | mg/kg | 0.1 | | | | | | | | | | | | | | | | | |
| pp-DDT | mg/kg | 0.1 | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | |
| DDT (Total) | mg/kg | 0.1 | | | | | | | | | | | | | | | | | |
| DDT+DDE+DDD | mg/kg | 0.1 | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | |
| Endrin Aldehyde | mg/kg | 0.1 | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | |
| Endosulfan Sulphate | mg/kg | 0.1 | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | |
| Methoxychlor | mg/kg | 0.1 | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | |
| Azinphos-methyl (Guthion) | mg/kg | 0.1 | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | |
| Bromophos-ethyl | mg/kg | 0.1 | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | |
| Chlorpyriphos | mg/kg | 0.1 | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | |
| Chlorpyriphos-methyl | mg/kg | 0.1 | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | |
| Diazinon | mg/kg | 0.1 | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | |
| Dichlorvos | mg/kg | 0.1 | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | |
| Dimethoate | mg/kg | 0.1 | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | |
| Ethion | mg/kg | 0.1 | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | |
| Fenitrothion | mg/kg | 0.1 | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | |
| Malathion | mg/kg | 0.1 | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | |
| Parathion | mg/kg | 0.1 | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | |
| Ronnel | mg/kg | 0.1 | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | <0.1 | <0.1 | <1 | <1 | <0.1 | |
| Dichlorodifluoromethane | mg/kg | 1 | | | | <1 | | <1 | | | | | | | | | | | |
| Chloromethane | mg/kg | 1 | | | | <1 | | <1 | | | | | | | | | | | |
| Vinyl Chloride | mg/kg | 1 | | | | <1 | | <1 | | | | | | | | | | | |
| Bromomethane | mg/kg | 1 | | | | <1 | | <1 | | | | | | | | | | | |
| Chloroethane | mg/kg | 1 | | | | <1 | | <1 | | | | | | | | | | | |
| Trichlorofluoromethane | mg/kg | 1 | | | | <1 | | <1 | | | | | | | | | | | |
| 1,1-Dichloroethene | mg/kg | 1 | | | | <1 | | <1 | | | | | | | | | | | |
| trans-1,2-dichloroethene | mg/kg | 1 | | | | <1 | | <1 | | | | | | | | | | | |
| 1,1-dichloroethane | mg/kg | 1 | | | | <1 | | <1 | | | | | | | | | | | |
| cis-1,2-dichloroethene | mg/kg | 1 | | | | <1 | | <1 | | | | | | | | | | | |
| bromochloromethane | mg/kg | 1 | | | | <1 | | <1 | | | | | | | | | | | |
| chloroform | mg/kg | 1 | | | | <1 | | <1 | | | | | | | | | | | |
| 2,2-dichloropropane | mg/kg | 1 | | | | <1 | | <1 | | | | | | | | | | | |
| 1,2-dichloroethane | mg/kg | 1 | | | | <1 | | <1 | | | | | | | | | | | |
| 1,1,1-trichloroethane | mg/kg | 1 | | | | <1 | | <1 | | | | | | | | | | | |
| 1,1-dichloropropene | mg/kg | 1 | | | | <1 | | <1 | | | | | | | | | | | |
| carbon tetrachloride | mg/kg | 1 | | | | <1 | | <1 | | | | | | | | | | | |
| dibromomethane | mg/kg | 1 | | | | <1 | | <1 | | | | | | | | | | | |
| 1,2-dichloropropane | mg/kg | 1 | | | | <1 | | <1 | | | | | | | | | | | |
| trichloroethene | mg/kg | 1 | | | | <1 | | <1 | | | | | | | | | | | |
| bromodichloromethane | mg/kg | 1 | | | | <1 | | <1 | | | | | | | | | | | |
| trans-1,3-dichloropropene | mg/kg | 1 | | | | <1 | | <1 | | | | | | | | | | | |
| cis-1,3-dichloropropene | mg/kg | 1 | | | | <1 | | <1 | | | | | | | | | | | |
| 1,1,2-trichloroethane | mg/kg | 1 | | | | <1 | | <1 | | | | | | | | | | | |
| 1,3-dichloropropane | mg/kg | 1 | | | | <1 | | <1 | | | | | | | | | | | |
| dibromochloromethane | mg/kg | 1 | | | | <1 | | <1 | | | | | | | | | | | |
| 1,2-dibromoethane | mg/kg | 1 | | | | <1 | | <1 | | | | | | | | | | | |
| tetrachloroethene | mg/kg | 1 | | | | <1 | | <1 | | | | | | | | | | | |
| 1,1,1,2-tetrachloroethane | mg/kg | 1 | | | | <1 | | <1 | | | | | | | | | | | |
| chlorobenzene | mg/kg | 1 | | | | <1 | | <1 | | | | | | | | | | | |
| bromoform | mg/kg | 1 | | | | <1 | | <1 | | | | | | | | | | | |
| 1,1,2,2-tetrachloroethane | mg/kg | 1 | | | | <1 | | <1 | | | | | | | | | | | |
| 1,2,3-trichloropropane | mg/kg | 1 | | | | <1 | | <1 | | | | | | | | | | | |
| bromobenzene | mg/kg | 1 | | | | <1 | | <1 | | | | | | | | | | | |
| 2-chlorotoluene | mg/kg | 1 | | | | <1 | | <1 | | | | | | | | | | | |
| 4-chlorotoluene | mg/kg | 1 | | | | <1 | | <1 | | | | | | | | | | | |
| 1,3-dichlorobenzene | mg/kg | 1 | | | | <1 | | <1 | | | | | | | | | | | |
| 1,4-dichlorobenzene | mg/kg | 1 | | | | <1 | | <1 | | | | | | | | | | | |
| 1,2-dichlorobenzene | mg/kg | 1 | | | | <1 | | <1 | | | | | | | | | | | |
| 1,2-dibromo-3-chloropropane | mg/kg | 1 | | | | <1 | | <1 | | | | | | | | | | | |
| 1,2,4-trichlorobenzene | mg/kg | 1 | | | | <1 | | <1 | | | | | | | | | | | |
| hexachlorobutadiene | mg/kg | 1 | | | | <1 | | <1 | | | | | | | | | | | |
| 1,2,3-trichlorobenzene | mg/kg | 1 | | | | <1 | | <1 | | | | | | | | | | | |
| Sample mass tested | g | | | | | 1122.91 | | 1185.08 | | 1290.67 | | 704.73 | | | | 1588.3 | | | |
| Sample Description | - | | | | | Brown coarse- grained soil & rocks | | Brown coarse- grained soil & rocks | | Brown coarse- grained soil & rocks | | Brown coarse- grained soil & rocks | | | | Brown sandy soil & rocks | | | |
| Asbestos ID in soil (as per AS4964) | - | | | | | No asbestos detected at reporting limit of 0.1g/kg Organic fibre detected | | No asbestos detected at reporting limit of 0.1g/kg Organic fibre detected | | No asbestos detected at reporting limit of 0.1g/kg Organic fibre detected | | No asbestos detected at reporting limit of 0.1g/kg Organic fibre detected | | | | No asbestos detected at reporting limit of 0.1g/kg Organic fibre detected | | | |
| Trace Analysis | - | | | | | No asbestos detected | | No asbestos detected | | No asbestos detected | | No asbestos detected | | | | No asbestos detected | | | |
| Total Asbestos#1 | g/kg | <0.1 | | | | <0.1 | | <0.1 | | <0.1 | | <0.1 | | | | <0.1 | | | |
| Asbestos ID in soil <0.1g/kg* | - | N/A | | | | No visible asbestos detected | | No visible asbestos detected | | No visible asbestos detected | | No visible asbestos detected | | | | No visible asbestos detected | | | |
| ACM >7mm Estimation* | g | - | | | | - | | - | | - | | - | | | | - | | | |
| FA and AF Estimation* | g | - | | | | - | | - | | - | | - | | | | - | | | |
| ACM >7mm Estimation* | %(w/w) | <0.01 | | | | <0.01 | | <0.01 | | <0.01 | | <0.01 | | | | <0.01 | | | |
| FA and AF Estimation*#2 | %(w/w) | <0.001 | | | | <0.001 | | <0.001 | | <0.001 | | <0.001 | | | | <0.001 | | | |

**Project: 9-11 Gibbons Street, Redfern**
**Client: St George Community Housing**
**CES Project Number: CES180204-SGC**
**Table 11: Waste Classification**

| Parameters | Unit | PQL | Waste Classification Criteria CT1 * | Restricted Solid Waste CT2 * | Sample ID | BH11_0.3-0.7 | BH11_0.3-0.7 | BH11_1.3-1.6 | BH11_1.3-1.6 | BH1_0.4-0.8 | QAQC1 | QAQC2 | BH2_1.2-1.5 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Depth (mbgl) | 0.3-0.7 | 0.3-0.7 | 1.2-1.5 | 1.2-1.5 | 0.4-0.8 | 0.4-0.8 | 0.4-0.8 | 1.2-1.5 |
| | | | | | Date Sampled | 06/03/2018 | 06/03/2018 | 06/03/2018 | 06/03/2018 | 28/02/2018 | 28/02/2018 | 28/02/2018 | 28/02/2018 |
| | | | | | Date Extracted | Fill | Fill | Natural | Natural | Fill | Fill | Fill | Natural |
| | | | | | Soil Unit | 180297 | 180297 | 180297-A | 180297-A | 180650B | 180650B | 180650B | 180650B |
| | | | | | Lab report | Primary | Lab Duplicate | Primary | Lab Duplicate | Primary | Field Duplicate of BH1_0.4-0.8 | Field Triplicate of BH1_0.4-0.8 | |
| | | | *** Refer to Table 3 for TCLP test results** | | | | | | | | | | |
| TRH C6 - C9 | mg/kg | 25 | 650 | 2600 | <25 | | | | | | | <10 | |
| TRH C6 - C10 | mg/kg | 25 | | | <25 | | | | | | | <10 | |
| FRACTION 1 | mg/kg | 25 | | | <25 | | | | | | | <10 | |
| Benzene | mg/kg | 0.2 | 10 | 40 | <0.2 | | | | | | | <0.2 | |
| Toluene | mg/kg | 0.5 | 288 | 1152 | <0.5 | | | | | | | <0.5 | |
| Ethylbenzene | mg/kg | 1 | 600 | 2400 | <1 | | | | | | | <0.5 | |
| m+p-xylene | mg/kg | 2 | 1000 | 4000 | <2 | | | | | | | <0.5 | |
| o-Xylene | mg/kg | 1 | 1000 | 4000 | <1 | | | | | | | <0.5 | |
| Xylenes (total) | mg/kg | | 1000 | 4000 | <1 | | | | | | | <0.5 | |
| Naphthalene | mg/kg | 1 | | | <1 | | | | | | | <1 | |
| Total Phenolics | mg/kg | 5 | 288 | 1152 | | | | | | | | | |
| TRH C10 - C14 | mg/kg | 50 | | | <50 | | | | | | | <50 | |
| TRH C15 - C28 | mg/kg | 100 | | | 390 | | | | | | | <100 | |
| TRH C29 - C36 | mg/kg | 100 | | | 410 | | | | | | | <100 | |
| TRH total C10 - C36 | mg/kg | 50 | 10000** | 40000 | | | | | | | | <50 | |
| TRH >C10-C16 | mg/kg | 50 | | | <50 | | | | | | | <50 | |
| FRACTION 2 | mg/kg | 50 | | | <50 | | | | | | | <50 | |
| TRH >C16-C34 | mg/kg | 100 | | | 690 | | | | | | | <100 | |
| TRH >C34-C40 | mg/kg | 100 | | | 190 | | | | | | | <100 | |
| Total +ve TRH (>C10-C40) | mg/kg | | | | 880 | | | | | | | <50 | |
| Naphthalene | mg/kg | 0.1 | | | 0.4 | | <0.1 | | | | | <0.5 | |
| Acenaphthylene | mg/kg | 0.1 | | | 1.7 | | <0.1 | | | | | <0.5 | |
| Acenaphthene | mg/kg | 0.1 | | | <0.1 | | <0.1 | | | | | <0.5 | |
| Fluorene | mg/kg | 0.1 | | | 0.2 | | <0.1 | | | | | <0.5 | |
| Phenanthrene | mg/kg | 0.1 | | | 7.8 | | <0.1 | | | | | <0.5 | |
| Anthracene | mg/kg | 0.1 | | | 2.4 | | <0.1 | | | | | <0.5 | |
| Fluoranthene | mg/kg | 0.1 | | | 16 | | <0.1 | | | | | <0.5 | |
| Pyrene | mg/kg | 0.1 | | | 17 | | <0.1 | | | | | <0.5 | |
| Benzo(a)anthracene | mg/kg | 0.1 | | | 8.7 | | <0.1 | | | | | <0.5 | |
| Chrysene | mg/kg | 0.1 | | | 8 | | <0.1 | | | | | <0.5 | |
| Benzo(b+k)fluoranthene | mg/kg | 0.2 | | | 15 | | <0.2 | | | | | | |
| Benzo(a)pyrene | mg/kg | 0.05 | 0.8 | 10 | 2.7 | | <0.05 | | | | | <0.5 | |
| Indeno(1,2,3-c,d)pyrene | mg/kg | 0.1 | | | 6 | | <0.1 | | | | | <0.5 | |
| Dibenz(a,h)anthracene | mg/kg | 0.1 | | | 0.5 | | <0.1 | | | | | <0.5 | |
| Benzo(g,h,i)perylene | mg/kg | 0.1 | | | 8.8 | | <0.1 | | | | | <0.5 | |
| Benzo(a)pyreme TEQ | mg/kg | 0.5 | | | 6.3 | | <0.5 | | | | | 1.2 | |
| Total +ve | mg/kg | 1 | 200** | 800 | 95 | | <0.05 | | | | | | |
| Individual aroclors (PCB) | mg/kg | 0.1 | | 50 | <0.5 | | | | | | | <0.1 | |
| Arsenic | mg/kg | 4 | 100 | 400 | 490 | | 820 | 770 | | | | <5 | |
| Cadmium | mg/kg | 0.4 | 20 | 80 | 0.7 | | <0.4 | <0.4 | | | | <1 | |
| Chromium | mg/kg | 1 | 100 | 400 | 12 | | 11 | 11 | | | | 3 | |
| Copper | mg/kg | 1 | - | - | 60 | | 2 | 2 | | | | 6 | |
| Lead | mg/kg | 1 | 100 | 400 | 280 | | 14 | 12 | | | | 23 | |
| Mercury | mg/kg | 0.1 | 4 | 16 | 0.9 | | <0.1 | <0.1 | | | | 0.1 | |
| Nickel | mg/kg | 1 | 40 | 160 | 8 | | 1 | 2 | | | | 2 | |
| Zinc | mg/kg | 1 | | | 500 | | 46 | 48 | | | | 19 | |
| Asbestos ID in soil | | | | | | | | | | | | | |
| Trace Analysis | | | | | | | | | | | | | |
| Exchangeable Ca | meq/100g | 0.1 | | | | | | | | | | | |
| Exchangeable K | meq/100g | 0.1 | | | | | | | | | | | |
| Exchangeable Mg | meq/100g | 0.1 | | | | | | | | | | | |
| Exchangeable Na | meq/100g | 0.1 | | | | | | | | | | | |
| Cation Exchange Capacity | meq/100g | 1 | | | | | | | | | | | |
| HCB | mg/kg | 0.1 | | | <0.1 | | | | | | | | |
| alpha-BHC | mg/kg | 0.1 | | | <0.1 | | | | | | | | |
| gamma-BHC | mg/kg | 0.1 | | | <0.1 | | | | | | | | |
| beta-BHC | mg/kg | 0.1 | | | <0.1 | | | | | | | | |
| Heptachlor | mg/kg | 0.1 | | | <0.1 | | | | | | | | |
| delta-BHC | mg/kg | 0.1 | | | <0.1 | | | | | | | | |
| Aldrin | mg/kg | 0.1 | | | <0.1 | | | | | | | | |
| Heptachlor Epoxide | mg/kg | 0.1 | | | <0.1 | | | | | | | | |
| gamma- Chlordane | mg/kg | 0.1 | | | <0.1 | | | | | | | | |
| alpha-chlordane | mg/kg | 0.1 | | | <0.1 | | | | | | | | |
| Chlordane | mg/kg | 0.1 | | | | | | | | | | | |
| Endosulfan I | mg/kg | 0.1 | | | <0.1 | | | | | | | | |
| pp-DDE | mg/kg | 0.1 | | | <0.1 | | | | | | | | |
| Dieldrin | mg/kg | 0.1 | | | <0.1 | | | | | | | | |
| Aldrin and Dieldrin | mg/kg | 0.1 | | | | | | | | | | | |
| Endrin | mg/kg | 0.1 | | | <0.1 | | | | | | | | |
| pp-DDD | mg/kg | 0.1 | | | <0.1 | | | | | | | | |
| Endosulfan II | mg/kg | 0.1 | | | <0.1 | | | | | | | | |
| Endosulfan | mg/kg | 0.1 | | | | | | | | | | | |
| pp-DDT | mg/kg | 0.1 | | | <0.1 | | | | | | | | |
| DDT (Total) | mg/kg | 0.1 | | | | | | | | | | | |
| DDT+DDE+DDD | mg/kg | 0.1 | | | <0.1 | | | | | | | | |
| Endrin Aldehyde | mg/kg | 0.1 | | | <0.1 | | | | | | | | |
| Endosulfan Sulphate | mg/kg | 0.1 | | | <0.1 | | | | | | | | |
| Methoxychlor | mg/kg | 0.1 | | | <0.1 | | | | | | | | |
| Azinphos-methyl (Guthion) | mg/kg | 0.1 | | | <0.1 | | | | | | | | |
| Bromophos-ethyl | mg/kg | 0.1 | | | <0.1 | | | | | | | | |
| Chlorpyriphos | mg/kg | 0.1 | | | <0.1 | | | | | | | | |
| Chlorpyriphos-methyl | mg/kg | 0.1 | | | <0.1 | | | | | | | | |
| Diazinon | mg/kg | 0.1 | | | <0.1 | | | | | | | | |
| Dichlorvos | mg/kg | 0.1 | | | <0.1 | | | | | | | | |
| Dimethoate | mg/kg | 0.1 | | | <0.1 | | | | | | | | |
| Ethion | mg/kg | 0.1 | | | <0.1 | | | | | | | | |
| Fenitrothion | mg/kg | 0.1 | | | <0.1 | | | | | | | | |
| Malathion | mg/kg | 0.1 | | | <0.1 | | | | | | | | |
| Parathion | mg/kg | 0.1 | | | <0.1 | | | | | | | | |
| Ronnel | mg/kg | 0.1 | | | <0.1 | | | | | | | | |
| Dichlorodifluoromethane | mg/kg | 1 | | | <1 | | <1 | <1 | | | | | |
| Chloroethane | mg/kg | 1 | | | <1 | | <1 | <1 | | | | | |
| Vinyl Chloride | mg/kg | 1 | | | <1 | | <1 | <1 | | | | | |
| Bromomethane | mg/kg | 1 | | | <1 | | <1 | <1 | | | | | |
| Chloroethane | mg/kg | 1 | | | <1 | | <1 | <1 | | | | | |
| Trichlorofluoromethane | mg/kg | 1 | | | <1 | | <1 | <1 | | | | | |
| 1,1-Dichloroethene | mg/kg | 1 | | | <1 | | <1 | <1 | | | | | |
| trans-1,2-dichloroethene | mg/kg | 1 | | | <1 | | <1 | <1 | | | | | |
| 1,1-dichloroethane | mg/kg | 1 | | | <1 | | <1 | <1 | | | | | |
| cis-1,2-dichloroethene | mg/kg | 1 | | | <1 | | <1 | <1 | | | | | |
| bromochloromethane | mg/kg | 1 | | | <1 | | <1 | <1 | | | | | |
| chloroform | mg/kg | 1 | | | <1 | | <1 | <1 | | | | | |
| 2,2-dichloropropane | mg/kg | 1 | | | <1 | | <1 | <1 | | | | | |
| 1,2-dichloroethane | mg/kg | 1 | | | <1 | | <1 | <1 | | | | | |
| 1,1,1-trichloroethane | mg/kg | 1 | | | <1 | | <1 | <1 | | | | | |
| 1,1-dichloropropene | mg/kg | 1 | | | <1 | | <1 | <1 | | | | | |
| carbon tetrachloride | mg/kg | 1 | | | <1 | | <1 | <1 | | | | | |
| dibromomethane | mg/kg | 1 | | | <1 | | <1 | <1 | | | | | |
| 1,2-dichloropropane | mg/kg | 1 | | | <1 | | <1 | <1 | | | | | |
| trichloroethene | mg/kg | 1 | | | <1 | | <1 | <1 | | | | | |
| bromodichloromethane | mg/kg | 1 | | | <1 | | <1 | <1 | | | | | |
| trans-1,3-dichloropropene | mg/kg | 1 | | | <1 | | <1 | <1 | | | | | |
| cis-1,3-dichloropropene | mg/kg | 1 | | | <1 | | <1 | <1 | | | | | |
| 1,1,2-trichloroethane | mg/kg | 1 | | | <1 | | <1 | <1 | | | | | |
| 1,3-dichloropropane | mg/kg | 1 | | | <1 | | <1 | <1 | | | | | |
| dibromochloromethane | mg/kg | 1 | | | <1 | | <1 | <1 | | | | | |
| 1,2-dibromoethane | mg/kg | 1 | | | <1 | | <1 | <1 | | | | | |
| tetrachloroethene | mg/kg | 1 | | | <1 | | <1 | <1 | | | | | |
| 1,1,1,2-tetrachloroethane | mg/kg | 1 | | | <1 | | <1 | <1 | | | | | |
| chlorobenzene | mg/kg | 1 | | | <1 | | <1 | <1 | | | | | |
| bromoform | mg/kg | 1 | | | <1 | | <1 | <1 | | | | | |
| 1,1,2,2-tetrachloroethane | mg/kg | 1 | | | <1 | | <1 | <1 | | | | | |
| 1,2,3-trichloropropane | mg/kg | 1 | | | <1 | | <1 | <1 | | | | | |
| bromobenzene | mg/kg | 1 | | | <1 | | <1 | <1 | | | | | |
| 2-chlorotoluene | mg/kg | 1 | | | <1 | | <1 | <1 | | | | | |
| 4-chlorotoluene | mg/kg | 1 | | | <1 | | <1 | <1 | | | | | |
| 1,3-dichlorobenzene | mg/kg | 1 | | | <1 | | <1 | <1 | | | | | |
| 1,4-dichlorobenzene | mg/kg | 1 | | | <1 | | <1 | <1 | | | | | |
| 1,2-dichlorobenzene | mg/kg | 1 | | | <1 | | <1 | <1 | | | | | |
| 1,2-dibromo-3-chloropropane | mg/kg | 1 | | | <1 | | <1 | <1 | | | | | |
| 1,2,4-trichlorobenzene | mg/kg | 1 | | | <1 | | <1 | <1 | | | | | |
| hexachlorobutadiene | mg/kg | 1 | | | <1 | | <1 | <1 | | | | | |
| 1,2,3-trichlorobenzene | mg/kg | 1 | | | <1 | | <1 | <1 | | | | | |
| Sample mass tested | g | | | | 1041.99 | | | | | | | | |
| Sample Description | - | | | | Brown sandy soil & rocks | | | | | | | | |
| Asbestos ID in soil (as per AS4964) | - | | | | No asbestos detected at reporting limit of 0.1g/kg Organic fibre detected | | | | | | | | |
| Trace Analysis | - | | | | No asbestos detected | | | | | | | | |
| Total AsbestosFI | g/kg | <0.1 | | | <0.1 | | | | | | | | |
| Asbestos ID in soil <0.1g/kg* | - | NA | | | No visible asbestos detected | | | | | | | | |
| ACM >7mm Estimation* | g | -- | | | -- | | | | | | | | |
| FA and AF Estimation* | g | -- | | | -- | | | | | | | | |
| ACM >7mm Estimation* | %(w/w) | <0.01 | | | <0.01 | | | | | | | | |
| FA and AF Estimation*#2 | %(w/w) | <0.001 | | | <0.001 | | | | | | | | |

**Project: 9-11 Gibbons Street, Redfern**
**Client: St George Community Housing**
**CES Project Number: CES180204-SGC**
**Table 12: TCLP Results**

| Parameter | Units | PQL | General Solid Waste leachable concentration (TCLP1) (mg/L) | General Solid Waste Specific Contaminant Concentration (mg/kg) | Restricted Solid Waste leachable concentration (TCLP2) (mg/L) | Restricted Solid Waste Specific Contaminant Concentration (mg/kg) | Investigation | 186116-A | | 186116-A | | 186212-A | | 186295-A | | 186597-A | | 186597-A | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Sample | BH3_0.3-0.6_metal | | BH2_0.3-0.6_PAH&lead | | BH1_0.4-0.8_PAH&lead | | BH4_0.3-0.8_metal | | BH10_0.3-0.9_PAHs | | BH11_0.3-0.7_PAH&,metals | |
| | | | | | | | Depth | 0.3-0.6 | | 0.3-0.6 | | 0.4-0.8 | | 0.3-0.8 | | 0.3-0.9 | | 0.3-0.7 | |
| | | | | | | | Date of Sample | 27/02/2018 | | 27/02/2018 | | 28/02/2018 | | 1/03/2018 | | 6/03/2018 | | 6/03/2018 | |
| | | | | | | | Material Unit | Fill | | Fill | | Fill | | Fill | | Fill | | Fill | |
| | | | | | | | | TCLP Concentration (mg/L) | CT Concentration (mg/kg) | TCLP Concentration (mg/L) | CT Concentration (mg/kg) | TCLP Concentration (mg/L) | CT Concentration (mg/kg) | TCLP Concentration (mg/L) | CT Concentration (mg/kg) | TCLP Concentration (mg/L) | CT Concentration (mg/kg) | TCLP Concentration (mg/L) | CT Concentration (mg/kg) |
| Naphthalene in TCLP | mg/L | 0.001 | | | | | | | | <0.001 | 0.3 | <0.001 | <0.1 | | | <0.001 | 2.3 | <0.001 | 0.4 |
| Acenaphthylene in TCLP | mg/L | 0.001 | | | | | | | | <0.001 | 2.3 | <0.001 | 0.1 | | | <0.001 | 2.8 | <0.001 | 1.7 |
| Acenaphthene in TCLP | mg/L | 0.001 | | | | | | | | <0.001 | 0.2 | <0.001 | <0.1 | | | <0.001 | <1 | <0.001 | <0.1 |
| Fluorene in TCLP | mg/L | 0.001 | | | | | | | | <0.001 | 0.8 | <0.001 | <0.1 | | | <0.001 | 2.9 | <0.001 | 0.2 |
| Phenanthrene in TCLP | mg/L | 0.001 | | | | | | | | <0.001 | 10 | <0.001 | 0.7 | | | 0.007 | 28 | <0.001 | 7.8 |
| Anthracene in TCLP | mg/L | 0.001 | | | | | | | | <0.001 | 2.6 | <0.001 | 0.2 | | | 0.002 | 12 | <0.001 | 2.4 |
| Fluoranthene in TCLP | mg/L | 0.001 | | | | | | | | <0.001 | 18 | <0.001 | 1.5 | | | 0.006 | 61 | <0.001 | 16 |
| Pyrene in TCLP | mg/L | 0.001 | | | | | | | | <0.001 | 20 | <0.001 | 1.7 | | | 0.005 | 61 | <0.001 | 17 |
| Benzo(a)anthracene in TCLP | mg/L | 0.001 | | | | | | | | <0.001 | 9.7 | <0.001 | 0.8 | | | <0.001 | 28 | <0.001 | 8.7 |
| Chrysene in TCLP | mg/L | 0.001 | | | | | | | | <0.001 | 6.9 | <0.001 | 1 | | | <0.001 | 32 | <0.001 | 8 |
| Benzo(bjk)fluoranthene in TCLP | mg/L | 0.002 | | | | | | | | <0.002 | 11 | <0.002 | 3.6 | | | <0.002 | 53 | <0.002 | 15 |
| Benzo(a)pyrene in TCLP | mg/L | 0.001 | 0.04 | 10 | 0.16 | 23 | | | | <0.001 | 7.5 | <0.001 | 1.1 | | | <0.001 | 37 | <0.001 | 2.7 |
| Indeno(1,2,3-c,d)pyrene - TCLP | mg/L | 0.001 | | | | | | | | <0.001 | 3.3 | <0.001 | 0.8 | | | <0.001 | 35 | <0.001 | 6 |
| Dibenzo(a,h)anthracene in TCLP | mg/L | 0.001 | | | | | | | | <0.001 | 1.3 | <0.001 | 0.2 | | | <0.001 | 6.3 | <0.001 | 0.5 |
| Benzo(g,h,i)perylene in TCLP | mg/L | 0.001 | | | | | | | | <0.001 | 4.1 | <0.001 | 0.9 | | | <0.001 | 35 | <0.001 | 8.8 |
| Total +ve PAH's | mg/L | | N/A | 200 | N/A | 800 | | | | NIL (+)VE | 98 | NIL (+)VE | 13 | | | 0.02 | 400 | NIL (+)VE | 95 |
| Surrogate p-Terphenyl-d14 | % | | | | | | | | | 114 | | 104 | | | | | | | |
| pH of soil for fluid# determ. | pH units | 0.1 | | | | | | 8.8 | | 8.8 | | 8.4 | | 8.6 | | 9.8 | | 9.4 | |
| pH of soil TCLP (after HCl) | pH units | 0.1 | | | | | | 1.8 | | 1.9 | | 1.9 | | 1.9 | | 2 | | 1.8 | |
| Extraction fluid used | - | 1 | | | | | | 1 | | 1 | | 1 | | 1 | | 1 | | 1 | |
| pH of final Leachate | pH units | 0.1 | | | | | | 5.1 | | 5.6 | | 5.1 | | 5 | | 5.2 | | 5.4 | |
| Arsenic in TCLP | mg/L | 0.05 | 5 | 500 | 20 | 2000 | | <0.05 | 5 | | | | | 0.3 | 52 | | | 2.8 | 490 |
| Cadmium in TCLP | mg/L | 0.01 | 1 | 100 | 4 | 400 | | <0.01 | <0.4 | | | | | <0.01 | 0.5 | | | <0.01 | 0.7 |
| Chromium in TCLP | mg/L | 0.01 | 5 | 1900 | 20 | 7600 | | 0.02 | 11 | | | | | <0.01 | 6 | | | <0.01 | 12 |
| Copper in TCLP | mg/L | 0.01 | | | | | | 0.01 | 40 | | | | | <0.01 | 18 | | | 0.05 | 60 |
| Lead in TCLP | mg/L | 0.03 | 5 | 1500 | 20 | 6000 | | 0.3 | 440 | 0.1 | 220 | 0.04 | 100 | 0.04 | 190 | | | 0.33 | 280 |
| Mercury in TCLP | mg/L | 0.0005 | 0.2 | 50 | 0.8 | 200 | | <0.0005 | 1 | | | | | <0.0005 | 0.9 | | | <0.0005 | 0.9 |
| Nickel in TCLP | mg/L | 0.02 | 2 | 1050 | 8 | 4200 | | <0.02 | 6 | | | | | <0.02 | 4 | | | 0.03 | 8 |
| Zinc in TCLP | mg/L | 0.02 | | | | | | 0.7 | 200 | | | | | 2.5 | 410 | | | 4.8 | 500 |
| (PFHxS)+ ( PFOS) | µg/kg | 0.01 | | | | | | | | | | | | | | | | | |
| | µg/kg | 0.01 | | | | | | | | | | | | | | | | | |
| Perfluorooctanoic acid (PFOA) | µg/kg | 0.01 | | | | | | | | | | | | | | | | | |
| 6:2 FTS | µg/kg | 0.01 | | | | | | | | | | | | | | | | | |
| 8:2 FTS | µg/kg | 0.01 | | | | | | | | | | | | | | | | | |

**Project: 9-11 Gibbons Street, Redfern**
**Client: St George Community Housing**
**CES Project Number: CES180204-SGC**
**Table 12: TCLP Results**

| Parameter | Units | PQL | General Soild Waste leachable concentration (TCLP1) (mg/L) | General Solid Waste Specific Contaminant Concentration (mg/kg) | Restricted Solid Waste leachable concentration (TCLP2) (mg/L) | Restricted Solid Waste Specific Contaminant Concentration (mg/kg) | Investigation | 186376-B | | 186376-B | | 186376-B | | 186376-B | | 186376-B | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Sample | BH6_0.3-0.8_Meatals & PAHs | | BH5_0.3-0.9_Metals | | BH7_0.3-0.9_Metals& PAHs | | BH8_0.3-0.9_Metals& PAHs&PFAS | | BH9_0.3-0.9_Metals& PAHs | |
| | | | | | | | Depth | 0.3-0.8 | | 0.3-0.9 | | 0.3-0.9 | | 0.3-0.9 | | 0.3-0.9 | |
| | | | | | | | Date of Sample | 2/03/2018 | | 2/03/2018 | | 2/03/2018 | | 2/03/2018 | | 2/03/2018 | |
| | | | | | | | Material Unit | Fill | | Fill | | Fill | | Fill | | Fill | |
| | | | | | | | | TCLP Concentration (mg/L) | CT Concentration (mg/kg) | TCLP Concentration (mg/L) | CT Concentration (mg/kg) | TCLP Concentration (mg/L) | CT Concentration (mg/kg) | TCLP Concentration (mg/L) | CT Concentration (mg/kg) | TCLP Concentration (mg/L) | CT Concentration (mg/kg) |
| Naphthalene in TCLP | mg/L | 0.001 | | | | | | 1.1 | 200 | | | 0.021 | 0.8 | 0.001 | 4 | 0.001 | 0.4 |
| Acenaphthylene in TCLP | mg/L | 0.001 | | | | | | 0.11 | 58 | | | 0.002 | 2.8 | <0.001 | 2 | <0.001 | 0.7 |
| Acenaphthene in TCLP | mg/L | 0.001 | | | | | | 0.028 | 18 | | | <0.001 | 0.5 | <0.001 | <0.1 | <0.001 | 0.1 |
| Fluorene in TCLP | mg/L | 0.001 | | | | | | 0.086 | 94 | | | 0.003 | 3.2 | <0.001 | 0.3 | <0.001 | 0.5 |
| Phenanthrene in TCLP | mg/L | 0.001 | | | | | | 0.12 | 360 | | | 0.007 | 22 | 0.001 | 5.2 | <0.001 | 4.3 |
| Anthracene in TCLP | mg/L | 0.001 | | | | | | 0.02 | 92 | | | 0.001 | 6.4 | <0.001 | 1.8 | <0.001 | 1.3 |
| Fluoranthene in TCLP | mg/L | 0.001 | | | | | | 0.017 | 250 | | | 0.001 | 24 | <0.001 | 14 | <0.001 | 6.2 |
| Pyrene in TCLP | mg/L | 0.001 | | | | | | 0.014 | 250 | | | <0.001 | 22 | <0.001 | 15 | <0.001 | 6.3 |
| Benzo(a)anthracene in TCLP | mg/L | 0.001 | | | | | | 0.002 | 110 | | | <0.001 | 12 | <0.001 | 8 | <0.001 | 3.3 |
| Chrysene in TCLP | mg/L | 0.001 | | | | | | 0.002 | 98 | | | <0.001 | 8.6 | <0.001 | 6.7 | <0.001 | 2.6 |
| Benzo(bjk)fluoranthene in TCLP | mg/L | 0.002 | | | | | | <0.002 | 130 | | | <0.002 | 15 | <0.002 | 10 | <0.002 | 4.5 |
| Benzo(a)pyrene in TCLP | mg/L | 0.001 | 0.04 | 10 | 0.16 | 23 | | 0.001 | 98 | | | <0.001 | 10 | <0.001 | 7 | <0.001 | 3 |
| Indeno(1,2,3-c,d)pyrene - TCLP | mg/L | 0.001 | | | | | | <0.001 | 37 | | | <0.001 | 4.1 | <0.001 | 2.8 | <0.001 | 1.3 |
| Dibenzo(a,h)anthracene in TCLP | mg/L | 0.001 | | | | | | <0.001 | 12 | | | <0.001 | 1.4 | <0.001 | 1 | <0.001 | 0.5 |
| Benzo(g,h,i)perylene in TCLP | mg/L | 0.001 | | | | | | <0.001 | 47 | | | <0.001 | 4.9 | <0.001 | 3.5 | <0.001 | 1.5 |
| Total +ve PAH's | mg/L | | N/A | 200 | N/A | 800 | | 1.5 | 1900 | | | 0.036 | 140 | 0.002 | 81 | 0.001 | 36 |
| Surrogate p-Terphenyl-d14 | % | | | | | | | | | | | | | | | | |
| pH of soil for fluid# determ. | pH units | 0.1 | | | | | | 9.2 | | 9.1 | | 8.9 | | 8.7 | | 9.3 | |
| pH of soil TCLP (after HCl) | pH units | 0.1 | | | | | | 2 | | 1.9 | | 1.8 | | 1.8 | | 1.8 | |
| Extraction fluid used | - | 1 | | | | | | 1 | | 1 | | 1 | | 1 | | 1 | |
| pH of final Leachate | pH units | 0.1 | | | | | | 5.6 | | 5.9 | | 5.1 | | 5.1 | | 5.1 | |
| Arsenic in TCLP | mg/L | 0.05 | 5 | 500 | 20 | 2000 | | <0.05 | 6 | <0.05 | 10 | <0.05 | 5 | <0.05 | 7 | <0.05 | 8 |
| Cadmium in TCLP | mg/L | 0.01 | 1 | 100 | 4 | 400 | | <0.01 | <0.4 | <0.01 | <0.4 | <0.01 | <0.4 | <0.01 | <0.4 | <0.01 | <0.4 |
| Chromium in TCLP | mg/L | 0.01 | 5 | 1900 | 20 | 7600 | | <0.01 | 11 | <0.01 | 12 | <0.01 | 13 | <0.01 | 10 | <0.01 | 12 |
| Copper in TCLP | mg/L | 0.01 | | | | | | 0.1 | 150 | 0.04 | 750 | 0.04 | 90 | 0.04 | 73 | 0.01 | 84 |
| Lead in TCLP | mg/L | 0.03 | 5 | 1500 | 20 | 6000 | | 0.5 | 330 | 0.2 | 220 | 0.04 | 170 | 0.34 | 660 | 0.04 | 240 |
| Mercury in TCLP | mg/L | 0.0005 | 0.2 | 50 | 0.8 | 200 | | <0.0005 | 0.5 | <0.0005 | 1.5 | <0.0005 | 0.5 | <0.0005 | 0.5 | <0.0005 | 1.1 |
| Nickel in TCLP | mg/L | 0.02 | 2 | 1050 | 8 | 4200 | | <0.02 | 4 | <0.02 | 5 | <0.02 | 8 | <0.02 | 17 | <0.02 | 8 |
| Zinc in TCLP | mg/L | 0.02 | | | | | | 0.5 | 150 | 0.6 | 340 | 0.9 | 330 | 1.1 | 160 | 1 | 240 |
| (PFHxS)+ ( PFOS) | µg/kg | 0.01 | | | | | | | | | | | | <0.01 | <0.1 | | |
| | µg/kg | 0.01 | | | | | | | | | | | | <0.01 | 0.2 | | |
| Perfluorooctanoic acid (PFOA) | µg/kg | 0.01 | | | | | | | | | | | | <0.01 | <0.1 | | |
| 6:2 FTS | µg/kg | 0.01 | | | | | | | | | | | | <0.01 | <0.1 | | |
| 8:2 FTS | µg/kg | 0.01 | | | | | | | | | | | | <0.01 | <0.1 | | |

Table A - Soil Analytical Results
Project Number: 54877
Project Name: Redfern Data Gap Assessment

| | Metals & Metalloids | | | | | | | | TPHs (NEPC 1999) | | | | | TPHs (NEPC 1999) - Silica Gel | | | | TRHs (NEPC 2013) | | | | | | Hs (NEPC 2013) - Silica G | | | BTEX | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Arsenic (Total) | Cadmium | Chromium (Total) | Copper | Lead | Mercury (Inorganic) | Nickel | Zinc | C6-C9 Fraction | C10-C14 Fraction | C15-C28 Fraction | C29-C36 Fraction | C10-C36 Fraction (Total) | C10-C14 Fraction (SG) | C15-C28 Fraction (SG) | C29-C36 Fraction (SG) | C10 - C36 Fraction (Total) (SG) | >C10-C16 Fraction | >C16-C34 Fraction | >C34-C40 Fraction | >C10-C40 Fraction (Total) | >C10-C16 less Naphthalene (F2) | C6-C10 Fraction | C6-C10 less BTEX (F1) | >C10-C16 Fraction (SG) | >C16-C34 Fraction (SG) | >C34-C40 Fraction (SG) | Benzene | Ethylbenzene | Toluene | Xylene (o) | Xylene (m & p) | Xylene (Total) |
| | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg |
| EQL | 2.00 | 0.40 | 1.00 | 1.00 | 1.00 | 0.10 | 1.00 | 1.00 | 20.00 | 20.00 | 50.00 | 50.00 | 50.00 | 20.00 | 50.00 | 50.00 | 50.00 | 50.00 | 100.00 | 100.00 | | 50.00 | 20.00 | 20.00 | 50.00 | 100.00 | 100.00 | 0.10 | 0.10 | 0.10 | 0.10 | 0.20 | 0.30 |
| NEPM 2013 EIL - Urban Residential (site specific) | 100 | | 190 | 100 | 1100 | | 25 | 320 | | | | | | | | | | | | | | | | | | | | | | | | | |
| NEPM 2013 ESL Urban Residential and Public Open Space, Coarse Soil | | | | | | | | | | | | | | | | | | | 300 | 2800 | | 120 | | 180 | | 300 | 2800 | 50 | 70 | 85 | | | 105 |
| NEPM 2013 Mgnt Limits - Residential, Parkland and Public Open Space, Coarse | | | | | | | | | | | | | | | | | | 1000 | 2500 | 10000 | | | 700 | | 1000 | 2500 | 10000 | | | | | | |
| NEPM 2013 Soil HIL B | 500 | 150 | 500 | 30000 | 1200 | 120 | 1200 | 60000 | | | | | | | | | | | | | | | | | | | | | | | | | |
| NEPM 2013 Soil HSL A & HSL B for Vapour Intrusion - Sand 0 to <1m | | | | | | | | | | | | | | | | | | | | | | 110 | | 45 | | | | 0.5 | 55 | 160 | | | 40 |
| **Field_ID** | **Sample_Depth_Range** | **Sampled_Date-Time** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH101 0.3-0.4 | 0.3-0.4 | 11/05/2018 | 8.1 | 0.4 | 13 | 240 | 390 | 0.6 | 11 | 710 | <20 | 36 | 480 | 280 | 796 | - | - | - | - | <50 | 610 | 190 | - | <50 | <20 | <20 | - | - | - | <0.1 | <0.1 | <0.1 | <0.1 | <0.2 | <0.3 |
| BH101 1.2-1.4 | 1.2-1.4 | 11/05/2018 | <2 | <0.4 | <5 | <5 | 9.7 | <0.1 | <5 | 110 | <20 | <20 | <50 | <50 | <50 | - | - | - | - | <50 | <100 | <100 | - | <50 | <20 | <20 | - | - | - | - | - | - | - | - | - |
| BH102 0.35-0.55 | 0.35-0.55 | 11/05/2018 | 10 | <0.4 | 8.1 | 180 | 400 | 0.4 | 10 | 180 | <20 | <20 | 200 | 110 | 310 | - | - | - | - | <50 | 240 | <100 | - | <50 | <20 | <20 | - | - | - | <0.1 | <0.1 | <0.1 | <0.1 | <0.2 | <0.3 |
| BH103 0.3-0.5 | 0.3-0.5 | 11/05/2018 | 4 | <0.4 | 7 | 130 | 110 | 0.2 | 5.8 | 91 | <100 | ~~3200~~ | ~~14,000~~ | ~~3900~~ | ~~21,100~~ | 170 | 400 | <50 | 570 | ~~2700~~ | ~~14,000~~ | ~~2300~~ | - | 2000 | <100 | <100 | 250 | 360 | <100 | <0.5 | 0.7 | <0.5 | 0.6 | <1 | <1.5 |
| BH103 1.8-2.0 | 1.8-2 | 11/05/2018 | 2.2 | <0.4 | 9.8 | <5 | 8.4 | <0.1 | <5 | <5 | <20 | <20 | <50 | <50 | <50 | - | - | - | - | <50 | <100 | <100 | - | <50 | <20 | <20 | - | - | - | - | - | - | - | - | - |
| BH104 0.65-0.75 | 0.65-0.75 | 11/05/2018 | 5.2 | 0.4 | 8.7 | 110 | 490 | 2.7 | 6 | 580 | <20 | <20 | 97 | 77 | 174 | - | - | - | - | <50 | 130 | <100 | - | <50 | <20 | <20 | - | - | - | <0.1 | <0.1 | <0.1 | <0.1 | <0.2 | <0.3 |
| BH105 0.3-0.5 | 0.3-0.5 | 11/05/2018 | 9.5 | <0.4 | 15 | 65 | 330 | 1.6 | 17 | 230 | <20 | 29 | 220 | 140 | 389 | - | - | - | - | <50 | 280 | 110 | - | <50 | <20 | <20 | - | - | - | <0.1 | <0.1 | <0.1 | <0.1 | <0.2 | <0.3 |
| BH107 0.3-0.5 | 0.3-0.5 | 11/05/2018 | 3.9 | <0.4 | 9 | 280 | 200 | 1.2 | 11 | 170 | <20 | 48 | 370 | 250 | 668 | - | - | - | - | <50 | 500 | 170 | - | <50 | <20 | <20 | - | - | - | 0.2 | <0.1 | <0.1 | <0.1 | <0.2 | <0.3 |
| BH107 0.8-1.0 | 0.8-1 | 11/05/2018 | 3.3 | <0.4 | 9.1 | 40 | 140 | 1.2 | 16 | 260 | <20 | <20 | 250 | 160 | 410 | - | - | - | - | <50 | 320 | 110 | - | <50 | <20 | <20 | - | - | - | 0.3 | <0.1 | 0.1 | <0.1 | <0.2 | <0.3 |
| QC01 | BH107 0.8-1.0 | 11/05/2018 | <2 | <0.4 | 5.2 | 9.7 | 64 | 0.3 | 15 | 290 | <20 | <20 | <50 | <50 | <50 | - | - | - | - | <50 | <100 | <100 | - | <50 | <20 | <20 | - | - | - | <0.1 | <0.1 | <0.1 | <0.1 | <0.2 | <0.3 |
| QC01A | BH107 0.8-1.0 | 11/05/2018 | <4 | <0.4 | 2 | 6 | 49 | <0.1 | 3 | 21 | <25 | <50 | <100 | <100 | - | - | - | - | - | <50 | <100 | <100 | <50 | <50 | <25 | <25 | - | - | - | <0.2 | <1 | <0.5 | <1 | <2 | <1 |

Table A - Soil Analytical Results
Project Number: 54877
Project Name: Redfern Data Gap Assessment

| | | | Polycyclic Aromatic Hydrocarbons | | | | | | | | | | | | | | | | | | | | | | | Chlorinated Benzenes | Polychlorinated Biphenyls | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Acenaphthene | Acenaphthylene | Anthracene | Benz(a)anthracene | Benzo(a)pyrene | Benzo(a)pyrene TEQ (lower bound)* | Benzo(a)pyrene TEQ (medium bound)* | Benzo(a)pyrene TEQ (upper bound)* | Benzo(b,j)fluoranthene | Benzo(g,h,i)perylene | Benzo(k)fluoranthene | Benzo(b,j+k)fluoranthene | Chrysene | Dibenz(a,h)anthracene | Fluoranthene | Fluorene | Indeno(1,2,3-c,d)pyrene | Naphthalene | Carcinogenic PAHs as B(a)P TEQ | Phenanthrene | Pyrene | PAHs (Total) | Total Positive PAHs | Hexachlorobenzene | Aroclor 1016 | Aroclor 1221 | Aroclor 1232 | Aroclor 1242 | Aroclor 1248 | Aroclor 1254 | Aroclor 1260 | PCBs (Total) |
| | | | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg |
| EQL | | | 0.10 | 0.10 | 0.10 | 0.10 | 0.05 | 0.50 | 0.50 | 0.50 | 0.50 | 0.10 | 0.50 | | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | | 0.10 | 0.10 | 0.50 | | 0.05 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| NEPM 2013 EIL - Urban Residential (site specific) | | | | | | | | | | | | | | | | | | | | 170 | | | | | | | | | | | | | | |
| NEPM 2013 ESL Urban Residential and Public Open Space, Coar | | | | | | | 0.7 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NEPM 2013 Mgnt Limits - Residential, Parkland and Public Oper | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NEPM 2013 Soil HIL B | | | | | | | | | | | | | | | | | | | | | 4 | | | 400 | | 15 | | | | | | | | 1 |
| NEPM 2013 Soil HSL A & HSL B for Vapour Intrusion - Sand 0 to | | | | | | | | | | | | | | | | | | | | 3 | | | | | | | | | | | | | | |
| **Field_ID** | **Sample_Depth_Range** | **Sampled_Date-Time** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH101 0.3-0.4 | 0.3-0.4 | 11/05/2018 | <0.5 | 1.7 | 2.3 | 11 | 11 | 17 | 17 | 17 | 5.9 | 7.2 | 5 | - | 9.6 | 2.9 | 27 | 0.7 | 7.2 | <0.5 | 16.98 | 6.1 | 29 | 126.6 | - | <0.05 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| BH101 1.2-1.4 | 1.2-1.4 | 11/05/2018 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | 0.6 | 1.2 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <1.21 | <0.5 | <0.5 | <0.5 | - | - | - | - | - | - | - | - | - | - |
| BH102 0.35-0.55 | 0.35-0.55 | 11/05/2018 | <0.5 | 0.9 | 1.8 | 4.2 | 4.1 | 7 | 7 | 7 | 3 | 2.8 | 2.7 | - | 3.5 | 1.6 | 9.5 | 0.8 | 2.7 | <0.5 | 7.023 | 5.2 | 9 | 51.8 | - | <0.05 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| BH103 0.3-0.5 | 0.3-0.5 | 11/05/2018 | 46 | 120 | 250 | 240 | 200 | 310 | 310 | 310 | 130 | 110 | 130 | - | 240 | 43 | 700 | 260 | 88 | 510 - 720 | 305.3 | 1200 | 700 | 4967 | - | <0.05 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| BH103 1.8-2.0 | 1.8-2 | 11/05/2018 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | 0.6 | 1.2 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <1.21 | <0.5 | <0.5 | <0.5 | - | - | - | - | - | - | - | - | - | - |
| BH104 0.65-0.75 | 0.65-0.75 | 11/05/2018 | <0.5 | <0.5 | <0.5 | 0.7 | 0.7 | 0.9 | 1.2 | 1.5 | 0.6 | <0.5 | <0.5 | - | 0.7 | <0.5 | 1.6 | <0.5 | 0.6 | <0.5 | 1.175 | 0.8 | 1.6 | 7.3 | - | <0.05 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| BH105 0.3-0.5 | 0.3-0.5 | 11/05/2018 | <0.5 | <0.5 | 0.7 | 2.6 | 2.5 | 3.3 | 3.5 | 3.8 | 1.4 | 1.9 | 2 | - | 2.4 | <0.5 | 4.5 | <0.5 | 1.3 | <0.5 | 3.523 | 2.7 | 4.9 | 26.9 | - | <0.05 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| BH107 0.3-0.5 | 0.3-0.5 | 11/05/2018 | <0.5 | 0.6 | 0.7 | 4.6 | 5.5 | 8.8 | 8.8 | 8.8 | 3.7 | 5.1 | 3.5 | - | 4.3 | 1.6 | 6 | <0.5 | 3.8 | <0.5 | 8.754 | 2.5 | 6.7 | 48.6 | - | <0.05 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| BH107 0.8-1.0 | 0.8-1 | 11/05/2018 | <0.5 | <0.5 | 0.9 | 3.8 | 3.3 | 5.3 | 5.3 | 5.3 | 2.4 | 2.5 | 2.5 | - | 3.2 | 0.9 | 6 | <0.5 | 1.8 | <0.5 | 5.307 | 3 | 6.3 | 36.6 | - | <0.05 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| QC01 | BH107 0.8-1.0 | 11/05/2018 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | 0.6 | 1.2 | <0.5 | <0.5 | <0.5 | - | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 | <1.21 | <0.5 | <0.5 | <0.5 | - | <0.05 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| QC01A | BH107 0.8-1.0 | 11/05/2018 | 0.1 | 0.2 | 1 | 4 | 3.2 | 4.6 | 4.6 | 4.6 | - | 1.6 | - | 4.9 | 3 | 0.3 | 7.4 | <0.1 | 1.6 | <0.1 | 4.106 | 2.6 | 8.2 | - | 38 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |

Table A - Soil Analytical Results
Project Number: 54877
Project Name: Redfern Data Gap Assessment

| | | | Asbestos | | | | | | | | | | Organochlorine Pesticides | | | | | | | | | | | | | | | | | | | | | | | | | | | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Approx. Sample Mass | Asbestos from ACM in Soil | Asbestos from FA & AF in Soil | Mass ACM | Mass Asbestos in ACM | Mass FA | Mass Asbestos in FA | Mass AF | Mass Asbestos in AF | Mass Asbestos in FA & AF | 4,4-DDE | Aldrin | Aldrin + Dieldrin (Sum of Total) | alpha-BHC | alpha-Chlordane | beta-BHC | Chlordane | Dieldrin | DDD | DDT | DDT+DDE+DDD (Sum of Total) | delta-BHC | Endosulfan alpha | Endosulfan beta | gamma-Chlordane | Endosulfan sulphate | Endrin | Endrin aldehyde | Endrin ketone | Heptachlor | Heptachlor Epoxide | Lindane | Methoxychlor | Toxaphene | % Moisture 103oC |
| | | | g | %w/w | %w/w | g | g | g | g | g | g | g | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | % |
| EQL | | | | | | | | | | | | | 0.05 | 0.05 | 0.05 | 0.05 | | 0.05 | 0.10 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 1.00 | 1.00 |
| NEPM 2013 EIL - Urban Residential (site specific) | | | | | | | | | | | | | | | | | | | | | | 180 | | | | | | | | | | | | | | | | |
| NEPM 2013 ESL Urban Residential and Public Open Space, Coar | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NEPM 2013 Mgnt Limits - Residential, Parkland and Public Oper | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NEPM 2013 Soil HIL B | | | | | | | | | | | | | | | 10 | | | | 90 | | | | 600 | | | | | | 20 | | | 10 | | | 500 | 30 | | |
| NEPM 2013 Soil HSL A & HSL B for Vapour Intrusion - Sand 0 to | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Field_ID** | **Sample_Depth_Range** | **Sampled_Date-Time** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH101 0.3-0.4 | 0.3-0.4 | 11/05/2018 | 253 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | <0.05 | <0.05 | <0.05 | <0.05 | - | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | - | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <1 | 9.5 |
| BH101 1.2-1.4 | 1.2-1.4 | 11/05/2018 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 8.1 |
| BH102 0.35-0.55 | 0.35-0.55 | 11/05/2018 | 327 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | <0.05 | <0.05 | <0.05 | <0.05 | - | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | - | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <1 | 12 |
| BH103 0.3-0.5 | 0.3-0.5 | 11/05/2018 | - | - | - | - | - | - | - | - | - | - | <0.05 | <0.05 | <0.05 | <0.05 | - | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | - | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <1 | 8.3 |
| BH103 1.8-2.0 | 1.8-2 | 11/05/2018 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 13 |
| BH104 0.65-0.75 | 0.65-0.75 | 11/05/2018 | - | - | - | - | - | - | - | - | - | - | <0.05 | <0.05 | <0.05 | <0.05 | - | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | - | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <1 | 6.7 |
| BH105 0.3-0.5 | 0.3-0.5 | 11/05/2018 | - | - | - | - | - | - | - | - | - | - | <0.05 | <0.05 | <0.05 | <0.05 | - | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | - | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <1 | 10 |
| BH107 0.3-0.5 | 0.3-0.5 | 11/05/2018 | - | - | - | - | - | - | - | - | - | - | <0.05 | <0.05 | <0.05 | <0.05 | - | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | - | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <1 | 11 |
| BH107 0.8-1.0 | 0.8-1 | 11/05/2018 | - | - | - | - | - | - | - | - | - | - | <0.05 | <0.05 | <0.05 | <0.05 | - | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | - | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <1 | 9.1 |
| QC01 | BH107 0.8-1.0 | 11/05/2018 | - | - | - | - | - | - | - | - | - | - | <0.05 | <0.05 | <0.05 | <0.05 | - | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | - | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <1 | 4.9 |
| QC01A | BH107 0.8-1.0 | 11/05/2018 | - | - | - | - | - | - | - | - | - | - | <0.1 | <0.1 | <0.2 | <0.1 | <0.1 | <0.1 | - | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | - | <0.1 | <0.1 | <0.1 | <0.1 | - | 7.9 |

Table B - Groundwater Analytical Results
Project Number: 54877
Project Name: Redfern Data Gap Assessment

| | Metals & Metalloids | | | | | | | | Chlorinated Alkanes | | | | | | | | | | | | | | | | | | Chlorinated Alkenes | | | | | | | | | | Trihalomethanes | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Arsenic (Total) (Filtered) | Cadmium (Filtered) | Chromium (Total) (Filtered) | Copper (Filtered) | Lead (Filtered) | Mercury (Inorganic) (Filtered) | Nickel (Filtered) | Zinc (Filtered) | 1,1,1,2-tetrachloroethane | 1,1,1-trichloroethane | 1,1,2,2-tetrachloroethane | 1,1,2-trichloroethane | 1,1-dichloroethane | 1,2,3-trichloropropane | 1,2-dibromo-3-chloropropane | 1,2-dichloroethane | 1,2-dichloropropane | 1,3-dichloropropane | 2,2-dichloropropane | Bromochloromethane | Carbon tetrachloride | Chloroethane | Chloromethane | Dichlorodifluoromethane | Dichloromethane | Trichlorofluoromethane | 1,1-dichloroethene | 1,1-dichloropropene | 2-chlorotoluene | 3-chloropropene | 4-chlorotoluene | cis-1,2-dichloroethene | cis-1,3-dichloropropene | Tetrachloroethene | trans-1,2-dichloroethene | trans-1,3-dichloropropene | Trichloroethene | Vinyl Chloride | Bromodichloromethane | Chloroform | Dibromochloromethane | Tribromomethane |
| | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| EQL | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | | 0.00 | 0.00 | 0.00 | | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | | | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| ANZG 2018 DGV - Marine Waters | | 0.0007 | | 0.0013 | 0.0044 | 0.0001 | 0.007 | 0.015 | | | | 1.9 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Recreational (10x Health Based Drinking Water Criteria) | 0.1 | 0.02 | | 20 | 0.1 | 0.01 | 0.2 | | | | | | | | | 0.03 | | | | | 0.03 | | | | 0.04 | | 0.3 | | | | | | 0.5 | | | | 0.2 | 0.003 | 2.5 | 2.5 | 2.5 | 2.5 |
| NEPM 2013 Groundwater HSL C for Vapour Intrusion - Sand | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Sample ID | Well ID | Date | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BH1 | BH1 | 18/05/2018 | <0.001 | <0.0002 | <0.001 | 0.019 | 0.001 | <0.0001 | 0.025 | 0.12 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | - | <0.001 | <0.001 | <0.001 | - | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | - | - | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.005 | <0.001 | <0.001 |
| BH106 | BH106 | 18/05/2018 | <0.001 | <0.0002 | <0.001 | 0.03 | 0.002 | <0.0001 | 0.006 | 0.14 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | - | <0.001 | <0.001 | <0.001 | - | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | - | - | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.005 | <0.001 | <0.001 |
| BH107 | BH107 | 18/05/2018 | <0.001 | <0.0002 | <0.001 | 0.06 | 0.004 | <0.0001 | 0.006 | 0.06 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | - | <0.001 | <0.001 | <0.001 | - | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | - | - | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.005 | <0.001 | <0.001 |
| BH3 | BH3 | 18/05/2018 | <0.001 | 0.0002 | <0.001 | 0.058 | 0.005 | <0.0001 | 0.006 | 0.16 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | - | <0.001 | <0.001 | <0.001 | - | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | - | - | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.005 | <0.001 | <0.001 |
| BH4 | BH4 | 18/05/2018 | <0.001 | <0.0002 | <0.001 | 0.001 | <0.001 | <0.0001 | 0.002 | 0.024 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | - | <0.002 | <0.002 | <0.002 | - | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | - | - | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.002 | <0.005 | <0.002 | <0.002 |
| QC01 | BH4 | 18/05/2018 | <0.001 | <0.0002 | 0.002 | <0.001 | <0.001 | <0.0001 | 0.003 | 0.023 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | - | <0.001 | <0.001 | <0.001 | - | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | - | - | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.005 | <0.001 | <0.001 |
| QC01A | BH4 | 18/05/2018 | <0.001 | <0.0001 | <0.001 | 0.013 | 0.002 | <0.00005 | 0.004 | 0.039 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.01 | <0.01 | <0.01 | - | <0.01 | <0.001 | <0.001 | <0.001 | - | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | 0.001 | <0.001 | <0.001 |

Table B - Groundwater Analytical Results
Project Number: 54877
Project Name: Redfern Data Gap Assessment

| | | | TPHs (NEPC 1999) | | | | | TRHs (NEPC 2013) | | | | | | BTEX | | | | | | Polycyclic Aromatic Hydrocarbons | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | C6-C9 Fraction | C10-C14 Fraction | C15-C28 Fraction | C29-C36 Fraction | C10-C36 Fraction (Total) | >C10-C16 Fraction | >C16-C34 Fraction | >C34-C40 Fraction | >C10-C16 less Naphthalene (F2) | C6-C10 Fraction | C6-C10 less BTEX (F1) | Benzene | Ethylbenzene | Toluene | Xylene (o) | Xylene (m & p) | Xylene (Total) | Acenaphthene | Acenaphthylene | Anthracene | Benz(a)anthracene | Benzo(a)pyrene | Benzo(a)pyrene TEQ (WHO) | Benzo(b,j)fluoranthene | Benzo(b,k)fluoranthene | Benzo(g,h,i)perylene | Benzo(k)fluoranthene | Chrysene | Dibenz(a,h)anthracene | Fluoranthene | Fluorene | Indeno(1,2,3-c,d)pyrene | Naphthalene | Phenanthrene | Pyrene | PAHs (Total) |
| | | | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L |
| EQL | | | 0.01 | 0.05 | 0.10 | 0.10 | 0.10 | 0.05 | 0.10 | 0.10 | 0.05 | 0.01 | 0.01 | 0.001 | 0.001 | 0.001 | 0.001 | 0.002 | 0.003 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | | 0.00 | | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| ANZG 2018 DGV - Marine Waters | | | | | | | | | | | | | | 0.5 | | | | | | | | | | | | | | | | | | | | | 0.05 | | | |
| Recreational (10x Health Based Drinking Water Criteria) | | | | | | | | | | | | | | 0.01 | 3 | 8 | | | 6 | | | | | 0.0001 | | | | | | | | | | | | | | |
| NEPM 2013 Groundwater HSL C for Vapour Intrusion - Sand | | | | | | | | | | | 1 | | 1 | 0.8 | NL | NL | | | NL | | | | | | | | | | | | | | | | NL | | | |
| **Sample ID** | **Well ID** | **Date** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH1 | BH1 | 18/05/2018 | <0.02 | <0.05 | 0.1 | <0.1 | 0.1 | 0.14 | <0.1 | <0.1 | 0.14 | <0.02 | <0.02 | <0.001 | <0.001 | <0.001 | <0.001 | <0.002 | <0.003 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | - | <0.00001 | - | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 |
| BH106 | BH106 | 18/05/2018 | <0.02 | <0.05 | <0.1 | <0.1 | <0.1 | <0.05 | <0.1 | <0.1 | <0.05 | <0.02 | <0.02 | <0.001 | <0.001 | <0.001 | <0.001 | <0.002 | <0.003 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | - | <0.00001 | - | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 |
| BH107 | BH107 | 18/05/2018 | - | - | - | - | - | - | - | - | - | <0.02 | - | <0.001 | <0.001 | <0.001 | <0.001 | <0.002 | <0.003 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| BH3 | BH3 | 18/05/2018 | <0.02 | <0.05 | <0.1 | <0.1 | <0.1 | <0.05 | <0.1 | <0.1 | <0.05 | <0.02 | <0.02 | <0.001 | <0.001 | <0.001 | <0.001 | <0.002 | <0.003 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | - | <0.00001 | - | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 |
| BH4 | BH4 | 18/05/2018 | <0.04 | <0.05 | <0.1 | <0.1 | <0.1 | <0.05 | <0.1 | <0.1 | <0.05 | <0.04 | <0.04 | <0.002 | <0.002 | <0.002 | <0.002 | <0.004 | <0.006 | <0.00001 | <0.00001 | <0.00001 | 0.00003 | 0.00003 | - | 0.00002 | - | 0.00004 | 0.00003 | 0.00005 | <0.00001 | 0.00009 | <0.00001 | 0.00003 | 0.01 - 0.0000 | 0.00004 | 0.00011 | 0.00048 |
| QC01 | BH4 | 18/05/2018 | <0.02 | <0.05 | <0.1 | <0.1 | <0.1 | <0.05 | <0.1 | <0.1 | <0.05 | 0.04 | 0.04 | <0.001 | <0.001 | <0.001 | <0.001 | <0.002 | <0.003 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | - | <0.00001 | - | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 | <0.00001 |
| QC01A | BH4 | 18/05/2018 | 0.01 | <0.05 | <0.1 | <0.1 | - | <0.05 | <0.1 | <0.1 | <0.05 | 0.025 | 0.025 | <0.001 | <0.001 | <0.001 | <0.001 | <0.002 | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0005 | - | <0.0002 | <0.0001 | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | 0 |

Table B - Groundwater Analytical Results
Project Number: 54877
Project Name: Redfern Data Gap Assessment

| | | | Monocyclic Aromatic Hydrocarbons | | | | | | | | | | Miscellaneous Hydrocarbons | | | | | | | Chlorinated Benzenes | | | | | | Solvents | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1,2,4-trimethyl benzene | 1,3,5-trimethyl benzene | 4-isopropyl toluene | Bromobenzene | Isopropylbenzene | n-butyl benzene | n-propyl benzene | sec-butyl benzene | Styrene | Tert-butyl benzene | 1,2-dibromoethane | 2-Butanone (MEK) | 4-Methyl-2-pentanone (MIBK) | Bromomethane | Cyclohexane | Dibromomethane | Iodomethane | 1,2,3-trichlorobenzene | 1,2,4-trichlorobenzene | 1,2-Dichlorobenzene | 1,3-dichlorobenzene | 1,4-dichlorobenzene | Chlorobenzene | 2-Propanone (Acetone) | Carbon disulfide | Hexachlorobutadiene |
| | | | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | µg/L | mg/L | mg/L |
| EQL | | | 0.00 | 0.00 | | 0.00 | 0.00 | | | | 0.00 | | 0.00 | 0.00 | 0.00 | 0.00 | | 0.00 | 0.00 | | | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 0.00 | |
| ANZG 2018 DGV - Marine Waters | | | | | | | | | | | | | | | | | | | | | 0.02 | | | | | | | |
| Recreational (10x Health Based Drinking Water Criteria) | | | | | | | | | | 0.3 | | | 0.01 | | | 0.01 | | | | | | 15 | | 0.4 | 3 | | | |
| NEPM 2013 Groundwater HSL C for Vapour Intrusion - Sand | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Sample ID** | **Well ID** | **Date** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH1 | BH1 | 18/05/2018 | <0.001 | <0.001 | - | <0.001 | <0.001 | - | - | - | <0.001 | - | <0.001 | <0.001 | <0.001 | <0.001 | - | <0.001 | <0.001 | - | - | <0.001 | <0.001 | <0.001 | <0.001 | <1 | <0.001 | - |
| BH106 | BH106 | 18/05/2018 | <0.001 | <0.001 | - | <0.001 | <0.001 | - | - | - | <0.001 | - | <0.001 | <0.001 | <0.001 | <0.001 | - | <0.001 | <0.001 | - | - | <0.001 | <0.001 | <0.001 | <0.001 | <1 | <0.001 | - |
| BH107 | BH107 | 18/05/2018 | <0.001 | <0.001 | - | <0.001 | <0.001 | - | - | - | <0.001 | - | <0.001 | <0.001 | <0.001 | <0.001 | - | <0.001 | <0.001 | - | - | <0.001 | <0.001 | <0.001 | <0.001 | <1 | <0.001 | - |
| BH3 | BH3 | 18/05/2018 | <0.001 | <0.001 | - | <0.001 | <0.001 | - | - | - | <0.001 | - | <0.001 | <0.001 | <0.001 | <0.001 | - | <0.001 | <0.001 | - | - | <0.001 | <0.001 | <0.001 | <0.001 | <1 | <0.001 | - |
| BH4 | BH4 | 18/05/2018 | <0.002 | <0.002 | - | <0.002 | <0.002 | - | - | - | <0.002 | - | <0.002 | <0.002 | <0.002 | <0.002 | - | <0.002 | <0.002 | - | - | <0.002 | <0.002 | <0.002 | <0.002 | <2 | <0.002 | - |
| QC01 | BH4 | 18/05/2018 | 0.009 | 0.004 | - | <0.001 | <0.001 | - | - | - | <0.001 | - | <0.001 | <0.001 | <0.001 | <0.001 | - | <0.001 | <0.001 | - | - | <0.001 | <0.001 | <0.001 | <0.001 | <1 | <0.001 | - |
| QC01A | BH4 | 18/05/2018 | 0.006 | 0.003 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | - | - | <0.01 | <0.001 | <0.001 | - | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | - | - | <0.001 |

Table C - Soil Vapour Analytical Results
Project Number: 54877
Project Name: Redfern Data Gap Assessment

| | Organic Alcohols | Chlorinated Alkanes | | | | | | | | | | | | | | Chlorinated Alkenes | | | | | | | | | | Trihalomethanes | | | | TRHs (NEPC 2013 | | BTEX | | | | Polycyclic Aromatic Hydrocarbons | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Isopropyl alcohol | 1,1,1,2-tetrachloroethane | 1,1,1-trichloroethane | 1,1,2,2-tetrachloroethane | 1,1,2-trichloroethane | 1,1-dichloroethane | 1,2,3-trichloropropane | 1,2-dibromo-3-chloropropane | 1,2-dichloroethane | 1,2-dichloropropane | 1,3-dichloropropane | 2,2-dichloropropane | Bromochloromethane | Carbon tetrachloride | Trichlorofluoromethane | 1,1-dichloroethene | 1,1-dichloropropene | 2-chlorotoluene | 4-chlorotoluene | cis-1,2-dichloroethene | cis-1,3-dichloropropene | Tetrachloroethene | trans-1,3-dichloropropene | Trichloroethene | Vinyl Chloride | Bromodichloromethane | Chloroform | Dibromochloromethane | Tribromomethane | >C10-C16 Fraction | >C6-C10 Fraction | Benzene | Ethylbenzene | Toluene | Xylene (Total) | Naphthalene | 1,2,4-trimethyl benzene |
| | mg/m3 | mg/m3 | mg/m3 | mg/m3 | mg/m3 | mg/m3 | mg/m3 | mg/m3 | mg/m3 | mg/m3 | mg/m3 | mg/m3 | mg/m3 | mg/m3 | mg/m3 | mg/m3 | mg/m3 | mg/m3 | mg/m3 | mg/m3 | mg/m3 | mg/m3 | mg/m3 | mg/m3 | mg/m3 | mg/m3 | mg/m3 | mg/m3 | mg/m3 | mg/m3 | mg/m3 | mg/m3 | mg/m3 | mg/m3 | mg/m3 | mg/m3 | mg/m3 | mg/m3 |
| EQL | 1.67 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 1.67 | 1.67 | 0.08 | 0.08 | 0.08 | 0.25 | 0.08 | 0.08 |
| NEPM 2013 HIL Residential B Soil Vapour | | | 60 | | | | | | | | | | | | | | | | | 0.08 | | 2 | | 0.02 | 0.03 | | | | | | | | | | | | |
| NEPM 2013 Soil Vapour HSL A & HSL B - Sand 0 to <1m | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | 330 | 1300 | 220 | 0.8 | |
| **Field_ID** | **LocCode** | **WellCode** | **Sampled_Date-Time** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DUP1 | SV06 (FRONT) | SV06 | 14/05/2018 | <1.667 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <1.667 | <1.667 | <0.08335 | <0.08335 | <0.08335 | <0.2501 | <0.08335 | <0.08335 |
| SV02 | SV02 (FRONT) | SV02 | 14/05/2018 | <1.667 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <1.667 | <1.667 | <0.08335 | <0.08335 | <0.08335 | <0.2501 | <0.08335 | <0.08335 |
| SV05 | SV05 (FRONT) | SV05 | 14/05/2018 | <1.667 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <1.667 | <1.667 | <0.08335 | <0.08335 | <0.08335 | <0.2501 | <0.08335 | <0.08335 |
| SV06 | SV06 (FRONT) | SV06 | 14/05/2018 | <1.667 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <1.667 | <1.667 | <0.08335 | <0.08335 | <0.08335 | <0.2501 | <0.08335 | <0.08335 |
| SV07 | SV07 (FRONT) | SV07 | 14/05/2018 | <1.667 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <1.667 | <1.667 | <0.08335 | <0.08335 | <0.08335 | <0.2501 | <0.08335 | <0.08335 |
| SV09 | SV09 (FRONT) | SV09 | 14/05/2018 | <1.667 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <1.667 | <1.667 | 0.4834 | <0.08335 | <0.08335 | <0.2501 | <0.08335 | <0.08335 |
| **Statistical Summary** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Number of Results | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| Number of Detects | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| Minimum Concentration | <1.667 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <1.667 | <1.667 | <0.08335 | <0.08335 | <0.08335 | <0.2501 | <0.08335 | <0.08335 |
| Minimum Detect | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.4834 | ND | ND | ND | ND | ND |
| Maximum Concentration | <1.667 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <1.667 | <1.667 | 0.4834 | <0.08335 | <0.08335 | <0.2501 | <0.08335 | <0.08335 |
| Maximum Detect | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 0.4834 | ND | ND | ND | ND | ND |
| Average Concentration | 0.83 | 0.042 | 0.042 | 0.042 | 0.042 | 0.042 | 0.042 | 0.042 | 0.042 | 0.042 | 0.042 | 0.042 | 0.042 | 0.042 | 0.042 | 0.042 | 0.042 | 0.042 | 0.042 | 0.042 | 0.042 | 0.042 | 0.042 | 0.042 | 0.042 | 0.042 | 0.042 | 0.042 | 0.042 | 0.83 | 0.83 | 0.12 | 0.042 | 0.042 | 0.13 | 0.042 | 0.042 |
| Median Concentration | 0.8335 | 0.041675 | 0.041675 | 0.041675 | 0.041675 | 0.041675 | 0.041675 | 0.041675 | 0.041675 | 0.041675 | 0.041675 | 0.041675 | 0.041675 | 0.041675 | 0.041675 | 0.041675 | 0.041675 | 0.041675 | 0.041675 | 0.041675 | 0.041675 | 0.041675 | 0.041675 | 0.041675 | 0.041675 | 0.041675 | 0.041675 | 0.041675 | 0.041675 | 0.041675 | 0.8335 | 0.8335 | 0.041675 | 0.041675 | 0.041675 | 0.12505 | 0.041675 | 0.041675 |
| Standard Deviation | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.18 | 0 | 0 | 0 | 0 | 0 |
| Number of Guideline Exceedances | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 0 | 0 | 0 | 6 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Number of Guideline Exceedances(Detects Only) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Table C - Soil Vapour Analytical Results
Project Number: 54877
Project Name: Redfern Data Gap Assessment

| | | | | Monocyclic Aromatic Hydrocarbons | | | | | | | | cellaneous Hydrocarb | | Chlorinated Benzenes | | | | | | Miscellaneous Industrial Chemicals |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 1,3,5-trimethyl benzene | 4-isopropyl toluene | isopropylbenzene | n-butyl benzene | n-propyl benzene | sec-butyl benzene | Styrene | Tert-butyl benzene | 1,2-dibromoethane | Dibromomethane | 1,2,3-trichlorobenzene | 1,2,4-trichlorobenzene | 1,2-Dichlorobenzene | 1,3-dichlorobenzene | 1,4-dichlorobenzene | Chlorobenzene | Hexachlorobutadiene |
| | | | | mg/m3 | mg/m3 | mg/m3 | mg/m3 | mg/m3 | mg/m3 | mg/m3 | mg/m3 | mg/m3 | mg/m3 | mg/m3 | mg/m3 | mg/m3 | mg/m3 | mg/m3 | mg/m3 | mg/m3 |
| EQL | | | | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.83 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 |
| NEPM 2013 HIL Residential B Soil Vapour | | | | | | | | | | | | | | | | | | | | |
| NEPM 2013 Soil Vapour HSL A & HSL B - Sand 0 to <1m | | | | | | | | | | | | | | | | | | | | |
| **Field_ID** | **LocCode** | **WellCode** | **Sampled_Date-Time** | | | | | | | | | | | | | | | | | |
| DUP1 | SV06 (FRONT) | SV06 | 14/05/2018 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.8335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 |
| SV02 | SV02 (FRONT) | SV02 | 14/05/2018 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.8335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 |
| SV05 | SV05 (FRONT) | SV05 | 14/05/2018 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.8335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 |
| SV06 | SV06 (FRONT) | SV06 | 14/05/2018 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.8335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 |
| SV07 | SV07 (FRONT) | SV07 | 14/05/2018 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.8335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 |
| SV09 | SV09 (FRONT) | SV09 | 14/05/2018 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.8335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 |
| **Statistical Summary** | | | | | | | | | | | | | | | | | | | | |
| Number of Results | | | | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| Number of Detects | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Minimum Concentration | | | | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.8335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 |
| Minimum Detect | | | | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Maximum Concentration | | | | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.8335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 | <0.08335 |
| Maximum Detect | | | | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| Average Concentration | | | | 0.042 | 0.042 | 0.042 | 0.042 | 0.042 | 0.042 | 0.42 | 0.042 | 0.042 | 0.042 | 0.042 | 0.042 | 0.042 | 0.042 | 0.042 | 0.042 | 0.042 |
| Median Concentration | | | | 0.041675 | 0.041675 | 0.041675 | 0.041675 | 0.041675 | 0.041675 | 0.41675 | 0.041675 | 0.041675 | 0.041675 | 0.041675 | 0.041675 | 0.041675 | 0.041675 | 0.041675 | 0.041675 | 0.041675 |
| Standard Deviation | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Number of Guideline Exceedances | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Number of Guideline Exceedances(Detects Only) | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Table D - Soil Waste Classification
Project Number: 54877
Project Name: Redfern Data Gap Assessment

| | VIC IWRG621 | | PAHs in Soil | Metals & Metalloids | | | | | | | | TPHs (NEPC 1999) | | | | | TPHs (NEPC 1999) - Silica Gel | | | | TRHs (NEPC 2013) | | | | | | Is (NEPC 2013) - Silica | | | BTEX | | | | | | Polycyclic Aromatic Hydrocarbons | | | | | | | |

Table D - Soil Waste Classification
Project Number: 54877
Project Name: Redfern Data Gap Assessment

| | | | | | | Chlorinated Benzenes | Polychlorinated Biphenyls | | | | | | | | Organochlorine Pesticides | | | | | | | | | | | | | | | | | | | | | | | | | | Asbestos | | | | | | | | | | Asbestos | Asbestos - Trace Analysis | | | | | | | Other | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Hexachlorobenzene | Aroclor 1016 | Aroclor 1221 | Aroclor 1232 | Aroclor 1242 | Aroclor 1248 | Aroclor 1254 | Aroclor 1260 | PCBs (Total) | 4,4-DDE | Aldrin | Aldrin + Dieldrin (Sum of Total) | alpha-BHC | alpha-Chlordane | beta-BHC | Chlordane | Dieldrin | DDD | DDT | DDT+DDE+DDD (Sum of Total) | delta-BHC | Endosulfan alpha | Endosulfan beta | gamma-Chlordane | Endosulfan sulphate | Endrin | Endrin aldehyde | Endrin ketone | Heptachlor | Heptachlor Epoxide | Lindane | Methoxychlor | Toxaphene | Approx. Sample Mass | Asbestos from ACM in Soil | Asbestos from FA & AF in Soil | Mass ACM | Mass Asbestos in ACM | Mass FA | Mass Asbestos in FA | Mass AF | Mass Asbestos in AF | Mass Asbestos in FA & AF | Asbestos Reported Result | ACM - Comment | AF - Comment | FA - Comment | Organic Fibres - Comment | Respirable Fibres - Comment | Synthetic Fibres - Comment | % Moisture 103oC | Moisture |
| | | | | | | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | g | %w/w | %w/w | g | g | g | g | g | g | g | Comment | Comment | Comment | Comment | Comment | Comment | Comment | % | % |
| EQL | | | | | | 0.05 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.05 | 0.05 | 0.05 | 0.05 | | 0.05 | 0.10 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 1.00 | | | | | | | | | | | | | | | | | | | 1.00 | |
| NSW EPA 2014 General Solid Waste (No Leaching) | | | | | | | | | | | | | | 50-0 | | | | | | | | | | | | 60 | 60 | | 60 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| NSW EPA 2014 Restricted Solid Waste (No Leaching) | | | | | | | | | | | | | | 50-0 | | | | | | | | | | | | 240 | 240 | | 240 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Field_ID | LocCode | Sample_Depth_Range | Sampled_Date-Time | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BH101 0.3-0.4 | BH101 | 0.3-0.4 | 11/05/2018 | | | <0.05 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | - | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | - | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <1 | 253 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 9.5 | - |
| BH101 1.2-1.4 | BH101 | 1.2-1.4 | 11/05/2018 | | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 8.1 | - |
| BH102 0.35-0.55 | BH102 | 0.35-0.55 | 11/05/2018 | | | <0.05 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | - | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | - | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <1 | 327 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 12 | - |
| BH103 0.3-0.5 | BH103 | 0.3-0.5 | 11/05/2018 | | | <0.05 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | - | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | - | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 8.3 | - |
| BH103 1.8-2.0 | BH103 | 1.8-2 | 11/05/2018 | | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 13 | - |
| BH104 0.65-0.75 | BH104 | 0.65-0.75 | 11/05/2018 | | | <0.05 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | - | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | - | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 6.7 | - |
| BH105 0.3-0.5 | BH105 | 0.3-0.5 | 11/05/2018 | | | <0.05 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | - | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | - | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 10 | - |
| BH107 0.3-0.5 | BH107 | 0.3-0.5 | 11/05/2018 | | | <0.05 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | - | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | - | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 11 | - |
| BH107 0.8-1.0 | BH107 | 0.8-1 | 11/05/2018 | | | <0.05 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | - | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | - | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 9.1 | - |
| QC01 | BH107 0.8-1.0 | | 11/05/2018 | | | <0.05 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | - | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | - | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 4.9 | - |
| QC01A | QC01A | | 11/05/2018 | | | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.2 | <0.1 | <0.1 | <0.1 | - | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | - | <0.1 | <0.1 | <0.1 | <0.1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 7.9 |
| **Statistical Summary** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Number of Results | | | | | | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 1 | 9 | 8 | 9 | 9 | 9 | 9 | 9 | 9 | 1 | 9 | 9 | 9 | 8 | 9 | 9 | 9 | 9 | 8 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 10 | 1 |
| Number of Detects | | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 10 | 1 |
| Minimum Concentration | | | | | | <0.05 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.1 | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.1 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <1 | 253 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 4.9 | 7.9 |
| Minimum Detect | | | | | | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 253 | ND | ND | ND | ND | ND | ND | ND | ND | ND | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 4.9 | 7.9 |
| Maximum Concentration | | | | | | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.2 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <0.05 | <0.1 | <0.1 | <0.1 | <0.1 | <1 | 327 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 13 | 7.9 |
| Maximum Detect | | | | | | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | ND | 327 | ND | ND | ND | ND | ND | ND | ND | ND | ND | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 13 | 7.9 |
| Average Concentration | | | | | | 0.028 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.028 | 0.028 | 0.033 | 0.028 | | 0.028 | 0.05 | 0.028 | 0.028 | 0.028 | 0.028 | 0.028 | 0.028 | | 0.028 | 0.028 | 0.028 | 0.025 | 0.028 | 0.028 | 0.028 | 0.028 | 0.5 | | | | | | | | | | | | | | | | | | | 9.3 | |
| Median Concentration | | | | | | 0.025 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.025 | 0.025 | 0.025 | 0.025 | 0.05 | 0.025 | 0.05 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.05 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.5 | 290 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 9.3 | 7.9 |
| Standard Deviation | | | | | | 0.0083 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0083 | 0.0083 | 0.025 | 0.0083 | | 0.0083 | 0 | 0.0083 | 0.0083 | 0.0083 | 0.0083 | 0.0083 | 0.0083 | | 0.0083 | 0.0083 | 0.0083 | 0 | 0.0083 | 0.0083 | 0.0083 | 0.0083 | 0 | | | | | | | | | | | | | | | | | | | 2.4 | |
| Number of Guideline Exceedances | | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Number of Guideline Exceedances(Detects Only) | | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Table D - Soil Waste Classification
Project Number: 54877
Project Name: Redfern Data Gap Assessment

| |
|---|
| EQL |
| NSW EPA 2014 General Solid Waste (No Leaching) |
| NSW EPA 2014 Restricted Solid Waste (No Leaching) |

| Field_ID | LocCode | Sample_Depth_Range | Sampled_Date-Time |
|---|---|---|---|
| BH101 0.3-0.4 | BH101 | 0.3-0.4 | 11/05/2018 |
| BH101 1.2-1.4 | BH101 | 1.2-1.4 | 11/05/2018 |
| BH102 0.35-0.55 | BH102 | 0.35-0.55 | 11/05/2018 |
| BH103 0.3-0.5 | BH103 | 0.3-0.5 | 11/05/2018 |
| BH103 1.8-2.0 | BH103 | 1.8-2 | 11/05/2018 |
| BH104 0.65-0.75 | BH104 | 0.65-0.75 | 11/05/2018 |
| BH105 0.3-0.5 | BH105 | 0.3-0.5 | 11/05/2018 |
| BH107 0.3-0.5 | BH107 | 0.3-0.5 | 11/05/2018 |
| BH107 0.8-1.0 | BH107 | 0.8-1 | 11/05/2018 |
| QC01 | BH107 0.8-1.0 | | 11/05/2018 |
| QC01A | QC01A | | 11/05/2018 |

| Statistical Summary |
|---|
| Number of Results |
| Number of Detects |
| Minimum Concentration |
| Minimum Detect |
| Maximum Concentration |
| Maximum Detect |
| Average Concentration |
| Median Concentration |
| Standard Deviation |
| Number of Guideline Exceedances |
| Number of Guideline Exceedances(Detects Only) |

Table D - Soil Waste Classification - PAH TCLP
Project Number: 54877
Project Name: Redfern Data Gap Assessment

| | Polycyclic Aromatic Hydrocarbons | | | | | | | | | | | | | | | | | Ionic Balance | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Acenaphthene | Acenaphthylene | Anthracene | Benz(a)anthracene | Benzo(a)pyrene | Benzo(b,j)fluoranthene | Benzo(g,h,i)perylene | Benzo(k)fluoranthene | Chrysene | Dibenz(a,h)anthracene | Fluoranthene | Fluorene | Indeno(1,2,3-c,d)pyrene | Naphthalene | Phenanthrene | Pyrene | PAHs (Total) | pH (TCLP - HCl addition) | pH (TCLP - initial) | pH (TCLP - off) | pH (Leachate fluid) |
| | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | mg/L | ph Units | ph Units | ph Units | ph Units |
| EQL | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.10 | 0.10 | 0.10 | 0.10 |
| NSW EPA 2014 General Solid Waste (leached) | | | | | 0.04 | | | | | | | | | | | | | | | | |
| NSW EPA 2014 Restricted Solid Waste (leached) | | | | | 0.16 | | | | | | | | | | | | | | | | |
| **Field_ID** **LocCode** **Sample_Depth_Range** **Sampled_Date-Time** **Matrix_Description** | | | | | | | | | | | | | | | | | | | | | |
| BH101 0.3-0.4 BH101 0.3-0.4 11/05/2018 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | 2 | 8.6 | 7.8 | 5.1 |
| BH103 0.3-0.5 BH103 0.3-0.5 11/05/2018 | 0.037 | 0.084 | 0.017 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | 0.007 | 0.085 | <0.001 | 1.5 | 0.087 | 0.006 | 1.823 | 1.8 | 8.4 | 7.3 | 5.1 |
| BH107 0.3-0.5 BH107 0.3-0.5 11/05/2018 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | 1.9 | 8.4 | 5.6 | 5.1 |
| **Statistical Summary** | | | | | | | | | | | | | | | | | | | | | |
| Number of Results | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| Number of Detects | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 3 | 3 | 3 | 3 |
| Minimum Concentration | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | 1.8 | 8.4 | 5.6 | 5.1 |
| Minimum Detect | 0.037 | 0.084 | 0.017 | ND | ND | ND | ND | ND | ND | ND | 0.007 | 0.085 | ND | 1.5 | 0.087 | 0.006 | 1.823 | 1.8 | 8.4 | 5.6 | 5.1 |
| Maximum Concentration | 0.037 | 0.084 | 0.017 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | 0.007 | 0.085 | <0.001 | 1.5 | 0.087 | 0.006 | 1.823 | 2 | 8.6 | 7.8 | 5.1 |
| Maximum Detect | 0.037 | 0.084 | 0.017 | ND | ND | ND | ND | ND | ND | ND | 0.007 | 0.085 | ND | 1.5 | 0.087 | 0.006 | 1.823 | 2 | 8.6 | 7.8 | 5.1 |
| Average Concentration | 0.013 | 0.028 | 0.006 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0027 | 0.029 | 0.0005 | 0.5 | 0.029 | 0.0023 | 0.61 | 1.9 | 8.5 | 6.9 | 5.1 |
| Median Concentration | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 0.0005 | 1.9 | 8.4 | 7.3 | 5.1 |
| Standard Deviation | 0.021 | 0.048 | 0.0095 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0038 | 0.049 | 0 | 0.87 | 0.05 | 0.0032 | 1.1 | 0.1 | 0.12 | 1.2 | 0 |
| Number of Guideline Exceedances | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Number of Guideline Exceedances(Detects Only) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

# Appendix C NEPC 2013 Tables

**Table 1A(1) Health investigation levels for soil contaminants**

| Chemical | Health-based investigation levels (mg/kg) | | | |
|---|---|---|---|---|
| | Residential[1] A | Residential[1] B | Recreational[1] C | Commercial/ industrial[1] D |
| **Metals and Inorganics** | | | | |
| Arsenic[2] | 100 | 500 | 300 | 3 000 |
| Beryllium | 60 | 90 | 90 | 500 |
| Boron | 4500 | 40 000 | 20 000 | 300 000 |
| Cadmium | 20 | 150 | 90 | 900 |
| Chromium (VI) | 100 | 500 | 300 | 3600 |
| Cobalt | 100 | 600 | 300 | 4000 |
| Copper | 6000 | 30 000 | 17 000 | 240 000 |
| Lead[3] | 300 | 1200 | 600 | 1 500 |
| Manganese | 3800 | 14 000 | 19 000 | 60 000 |
| Mercury (inorganic)[5] | 40 | 120 | 80 | 730 |
| Methyl mercury[4] | 10 | 30 | 13 | 180 |
| Nickel | 400 | 1200 | 1200 | 6 000 |
| Selenium | 200 | 1400 | 700 | 10 000 |
| Zinc | 7400 | 60 000 | 30 000 | 400 000 |
| Cyanide (free) | 250 | 300 | 240 | 1 500 |
| **Polycyclic Aromatic Hydrocarbons (PAHs)** | | | | |
| Carcinogenic PAHs (as BaP TEQ)[6] | 3 | 4 | 3 | 40 |
| Total PAHs[7] | 300 | 400 | 300 | 4000 |
| **Phenols** | | | | |
| Phenol | 3000 | 45 000 | 40 000 | 240 000 |
| Pentachlorophenol | 100 | 130 | 120 | 660 |
| Cresols | 400 | 4 700 | 4 000 | 25 000 |
| **Organochlorine Pesticides** | | | | |
| DDT+DDE+DDD | 240 | 600 | 400 | 3600 |
| Aldrin and dieldrin | 6 | 10 | 10 | 45 |
| Chlordane | 50 | 90 | 70 | 530 |
| Endosulfan | 270 | 400 | 340 | 2000 |
| Endrin | 10 | 20 | 20 | 100 |
| Heptachlor | 6 | 10 | 10 | 50 |
| HCB | 10 | 15 | 10 | 80 |
| Methoxychlor | 300 | 500 | 400 | 2500 |
| Mirex | 10 | 20 | 20 | 100 |
| Toxaphene | 20 | 30 | 30 | 160 |
| **Herbicides** | | | | |
| 2,4,5-T | 600 | 900 | 800 | 5000 |
| 2,4-D | 900 | 1600 | 1300 | 9000 |
| MCPA | 600 | 900 | 800 | 5000 |

| Chemical | Health-based investigation levels (mg/kg) | | | |
|---|---|---|---|---|
| | Residential[1] A | Residential[1] B | Recreational[1] C | Commercial/ industrial[1] D |
| MCPB | 600 | 900 | 800 | 5000 |
| Mecoprop | 600 | 900 | 800 | 5000 |
| Picloram | 4500 | 6600 | 5700 | 35000 |
| **Other Pesticides** | | | | |
| Atrazine | 320 | 470 | 400 | 2500 |
| Chlorpyrifos | 160 | 340 | 250 | 2000 |
| Bifenthrin | 600 | 840 | 730 | 4500 |
| **Other Organics** | | | | |
| PCBs[8] | 1 | 1 | 1 | 7 |
| PBDE Flame Retardants (Br1–Br9) | 1 | 2 | 2 | 10 |

**Notes:**

(1) Generic land uses are described in detail in Schedule B7 Section 3

HIL A – Residential with garden/accessible soil (home grown produce <10% fruit and vegetable intake (no poultry), also includes childcare centres, preschools and primary schools.

HIL B – Residential with minimal opportunities for soil access; includes dwellings with fully and permanently paved yard space such as high-rise buildings and apartments.

HIL C – Public open space such as parks, playgrounds, playing fields (e.g. ovals), secondary schools and footpaths. This does not include undeveloped public open space where the potential for exposure is lower and where a site-specific assessment may be more appropriate.

HIL D – Commercial/industrial, includes premises such as shops, offices, factories and industrial sites.

(2) Arsenic: HIL assumes 70% oral bioavailability. Site-specific bioavailability may be important and should be considered where appropriate (refer Schedule B7).

(3) Lead: HIL is based on blood lead models (IEUBK for HILs A, B and C and adult lead model for HIL D where 50% oral bioavailability has been considered. Site-specific bioavailability may be important and should be considered where appropriate.

(4) Methyl mercury: assessment of methyl mercury should only occur where there is evidence of its potential source. It may be associated with inorganic mercury and anaerobic microorganism activity in aquatic environments. In addition the reliability and quality of sampling/analysis should be considered.

(5) Elemental mercury: HIL does not address elemental mercury. A site-specific assessment should be considered if elemental mercury is present, or suspected to be present,

(6) Carcinogenic PAHs: HIL is based on the 8 carcinogenic PAHs and their TEFs (potency relative to B(a)P) adopted by CCME 2008 (refer Schedule B7). The B(a)P TEQ is calculated by multiplying the concentration of each carcinogenic PAH in the sample by its B(a)P TEF, given below, and summing these products.

| PAH species | TEF | PAH species | TEF |
|---|---|---|---|
| Benzo(a)anthracene | 0.1 | Benzo(g,h,i)perylene | 0.01 |
| Benzo(a)pyrene | 1 | Chrysene | 0.01 |
| Benzo(b+j)fluoranthene | 0.1 | Dibenz(a,h)anthracene | 1 |
| Benzo(k)fluoranthene | 0.1 | Indeno(1,2,3-c,d)pyrene | 0.1 |

Where the B(a)P occurs in bitumen fragments it is relatively immobile and does not represent a significant health risk.

(7) Total PAHs: HIL is based on the sum of the 16 PAHs most commonly reported for contaminated sites (WHO 1998). The application of the total PAH HIL should consider the presence of carcinogenic PAHs and naphthalene (the most volatile PAH). Carcinogenic PAHs reported in the total PAHs should meet the B(a)P TEQ HIL. Naphthalene reported in the total PAHs should meet the relevant HSL.

(8) PCBs: HIL relates to non-dioxin-like PCBs only. Where a PCB source is known, or suspected, to be present at a site, a site-specific assessment of exposure to all PCBs (including dioxin-like PCBs) should be undertaken.

## Table 1A(2) Interim soil vapour health investigation levels for volatile organic chlorinated compounds

| Chemical | Interim soil vapour HIL (mg/m$^3$) | | | |
|---|---|---|---|---|
| | Residential[1] A | Residential[1] B | Recreational[1] C | Commercial / Industrial[1] D |
| TCE | 0.02 | 0.02 | 0.4 | 0.08 |
| 1,1,1-TCA | 60 | 60 | 1200 | 230 |
| PCE | 2 | 2 | 40 | 8 |
| cis-1,2-dichloroethene | 0.08 | 0.08 | 2 | 0.3 |
| Vinyl chloride | 0.03 | 0.03 | 0.5 | 0.1 |

**Notes:**

1. Land use settings are equivalent to those described in Table 1A(1) Footnote 1 and Schedule B7, though secondary school buildings should be assessed using residential 'A/B' for vapour intrusion purposes.
2. Interim HILs for VOCCs are conservative soil vapour concentrations that can be adopted for the purpose of screening sites where further investigation is required on a site-specific basis. They are based on the potential for vapour intrusion using an indoor air-to-soil vapour attenuation factor of 0.1 and an outdoor air-to-soil vapour attenuation factor of 0.05.
3. Application of the interim HILs is based on a measurement of shallow (to 1 m depth) soil vapour (or deeper where the values are to be applied to a future building with a basement) or sub-slab soil vapour.
4. The applicability of the interim HILs needs to be further considered when used for other building types such as homes with a crawl-space and no slab, which may require site-specific assessment.
5. Use of the interim HILs requires comparison with data that has been collected using appropriate methods and meets appropriate data quality requirements.
6. Oral and dermal exposure should be considered on a site-specific basis where direct contact exposure is likely to occur.

**Table 1A(3) Soil HSLs for vapour intrusion (mg/kg)**

| | HSL A & HSL B Low – high density residential | | | | HSL C recreational / open space | | | | HSL D Commercial / Industrial | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CHEMICAL** | **0 m to <1 m** | **1 m to <2 m** | **2 m to <4m** | **4 m+** | **0 m to <1 m** | **1 m to <2 m** | **2 m to <4 m** | **4 m+** | **0 m to <1 m** | **1 m to <2 m** | **2 m to <4 m** | **4 m+** | **Soil saturation concentration (Csat)** |
| **SAND** | | | | | | | | | | | | | |
| **Toluene** | 160 | 220 | 310 | 540 | NL | NL | NL | NL | NL | NL | NL | NL | 560 |
| **Ethylbenzene** | 55 | NL | NL | NL | NL | NL | NL | NL | NL | NL | NL | NL | 64 |
| **Xylenes** | 40 | 60 | 95 | 170 | NL | NL | NL | NL | 230 | NL | NL | NL | 300 |
| **Naphthalene** | 3 | NL | NL | NL | NL | NL | NL | NL | NL | NL | NL | NL | 9 |
| **Benzene** | 0.5 | 0.5 | 0.5 | 0.5 | NL | NL | NL | NL | 3 | 3 | 3 | 3 | 360 |
| **F1**[9] | 45 | 70 | 110 | 200 | NL | NL | NL | NL | 260 | 370 | 630 | NL | 950 |
| **F2**[10] | 110 | 240 | 440 | NL | NL | NL | NL | NL | NL | NL | NL | NL | 560 |
| **SILT** | | | | | | | | | | | | | |
| **Toluene** | 390 | NL | NL | NL | NL | NL | NL | NL | NL | NL | NL | NL | 640 |
| **Ethylbenzene** | NL | NL | NL | NL | NL | NL | NL | NL | NL | NL | NL | NL | 69 |
| **Xylenes** | 95 | 210 | NL | NL | NL | NL | NL | NL | NL | NL | NL | NL | 330 |

| | HSL A & HSL B Low – high density residential | | | | HSL C recreational / open space | | | | HSL D Commercial / Industrial | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Naphthalene** | 4 | NL | NL | NL | NL | NL | NL | NL | NL | NL | NL | NL | 10 |
| **Benzene** | 0.6 | 0.7 | 1 | 2 | NL | NL | NL | NL | 4 | 4 | 6 | 10 | 440 |
| **F1**[9] | 40 | 65 | 100 | 190 | NL | NL | NL | NL | 250 | 360 | 590 | NL | 910 |
| **F2**[10] | 230 | NL | NL | NL | NL | NL | NL | NL | NL | NL | NL | NL | 570 |
| **CLAY** | | | | | | | | | | | | | |
| **Toluene** | 480 | NL | NL | NL | NL | NL | NL | NL | NL | NL | NL | NL | 630 |
| **Ethylbenzene** | NL | NL | NL | NL | NL | NL | NL | NL | NL | NL | NL | NL | 68 |
| **Xylenes** | 110 | 310 | NL | NL | NL | NL | NL | NL | NL | NL | NL | NL | 330 |
| **Naphthalene** | 5 | NL | NL | NL | NL | NL | NL | NL | NL | NL | NL | NL | 10 |
| **Benzene** | 0.7 | 1 | 2 | 3 | NL | NL | NL | NL | 4 | 6 | 9 | 20 | 430 |
| **F1**[9] | 50 | 90 | 150 | 290 | NL | NL | NL | NL | 310 | 480 | NL | NL | 850 |
| **F2**[10] | 280 | NL | NL | NL | NL | NL | NL | NL | NL | NL | NL | NL | 560 |

**Notes:**

(1) Land use settings are equivalent to those described in Table 1A(1) Footnote 1 and Schedule B7. HSLs for vapour intrusion for high density residential assume residential occupation of the ground floor. If communal car parks or commercial properties occupy the ground floor, HSL D should be used,

(2) The key limitations of the HSLs should be referred to prior to application and are presented in Friebel and Nadebaum (2011b and 2011d).

(3) Detailed assumptions in the derivation of the HSLs and information on how to apply the HSLs are presented in Friebel and Nadebaum (2011a and 2011b).

(4) Soil HSLs for vapour inhalation incorporate an adjustment factor of 10 applied to the vapour phase partitioning to reflect the differences observed between theoretical estimates of soil vapour partitioning and field measurements. Refer Friebel & Nadebaum (2011a) for further information.

(5) The soil saturation concentration (Csat) is defined as the soil concentration at which the porewater phase cannot dissolve any more of an individual chemical. The soil vapour that is in equilibrium with the porewater will be at its maximum. If the derived soil HSL exceeds Csat, a soil vapour source concentration for a petroleum mixture could not exceed a level that would result in the maximum allowable vapour risk for the given scenario. For these scenarios, no HSL is presented for these chemicals and the HSL is shown as 'not limiting' or 'NL'.

(6) The HSLs for TPH $C_6$-$C_{10}$ in sandy soil are based on a finite source that depletes in less than seven years, and therefore consideration has been given to use of sub-chronic toxicity values. The >$C_8$-$C_{10}$ aliphatic toxicity has been adjusted to represent sub-chronic exposure, resulting in higher HSLs than if based on chronic toxicity. For further information refer to Section 8.2 and Appendix J in Friebel and Nadebaum (2011a).

(7) The figures in the above table may be multiplied by a factor to account for biodegradation of vapour. A factor of 10 may apply for source depths from 2 m to <4 m or a factor of 100 for source depths of 4 m and deeper. To apply the attenuation factor for vapour degradation, a number of conditions must be satisfied. Firstly the maximum length of the shorter side of the concrete slab and surrounding pavement cannot exceed 15 m, as this would prevent oxygen penetrating to the centre of the slab. Secondly, measurement of oxygen in the subsurface is required to determine the potential for biodegradation. Oxygen must be confirmed to be present at >5% to use these factors.

(8) For soil texture classification undertaken in accord with AS 1726, the classifications of sand, silt and clay may be applied as coarse, fine with liquid limit <50% and fine with liquid limit>50% respectively, as the underlying properties to develop the HSLs may reasonably be selected to be similar. Where there is uncertainty, either a conservative approach may be adopted or laboratory analysis should be carried out.

(9) To obtain F1 subtract the sum of BTEX concentrations from the $C_6$-$C_{10}$ fraction.

(10) To obtain F2 subtract naphthalene from the >$C_{10}$-$C_{16}$ fraction.

**Table 1A(4) Groundwater HSLs for vapour intrusion (mg/L)**

| | HSL A & HSL B Low – high density residential | | | HSL C recreational / open space | | | HSL D Commercial / industrial | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **CHEMICAL** | **2 m to <4 m** | **4 m to <8 m** | **8 m+** | **2 m to <4 m** | **4 m to <8 m** | **8 m+** | **2 m to <4 m** | **4 m to <8 m** | **8 m+** | **Solubility limit** |
| SAND | | | | | | | | | | |
| **Toluene** | NL | NL | NL | NL | NL | NL | NL | NL | NL | 61 |
| **Ethylbenzene** | NL | NL | NL | NL | NL | NL | NL | NL | NL | 3.9 |
| **Xylenes** | NL | NL | NL | NL | NL | NL | NL | NL | NL | 21 |
| **Naphthalene** | NL | NL | NL | NL | NL | NL | NL | NL | NL | 0.17 |
| **Benzene** | 0.8 | 0.8 | 0.9 | NL | NL | NL | 5 | 5 | 5 | 59 |
| **F1**[7] | 1 | 1 | 1 | NL | NL | NL | 6 | 6 | 7 | 9.0 |
| **F2**[8] | 1 | 1 | 1 | NL | NL | NL | NL | NL | NL | 3.0 |
| **SILT** | | | | | | | | | | |
| **Toluene** | NL | NL | NL | NL | NL | NL | NL | NL | NL | 61 |
| **Ethylbenzene** | NL | NL | NL | NL | NL | NL | NL | NL | NL | 3.9 |
| **Xylenes** | NL | NL | NL | NL | NL | NL | NL | NL | NL | 21 |
| **Naphthalene** | NL | NL | NL | NL | NL | NL | NL | NL | NL | 0.17 |

| | HSL A & HSL B Low – high density residential | | | HSL C recreational / open space | | | HSL D Commercial / industrial | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Benzene** | 4 | 5 | 5 | NL | NL | NL | 30 | 30 | 30 | 59 |
| **F1**[7] | 6 | 6 | 6 | NL | NL | NL | NL | NL | NL | 9.0 |
| **F2**[8] | NL | NL | NL | NL | NL | NL | NL | NL | NL | 3.0 |
| **CLAY** | | | | | | | | | | |
| **Toluene** | NL | NL | NL | NL | NL | NL | NL | NL | NL | 61 |
| **Ethylbenzene** | NL | NL | NL | NL | NL | NL | NL | NL | NL | 3.9 |
| **Xylenes** | NL | NL | NL | NL | NL | NL | NL | NL | NL | 21 |
| **Naphthalene** | NL | NL | NL | NL | NL | NL | NL | NL | NL | 0.17 |
| **Benzene** | 5 | 5 | 5 | NL | NL | NL | 30 | 30 | 35 | 59 |
| **F1**[7] | NL | NL | NL | NL | NL | NL | NL | NL | NL | 9.0 |
| **F2**[8] | NL | NL | NL | NL | NL | NL | NL | NL | NL | 3.0 |

**Notes:**

(1) Land use settings are equivalent to those described in Table 1A(1) Footnote 1 and Schedule B7. HSLs for vapour intrusion for high density residential assume residential occupation of the ground floor. If communal car parks or commercial properties occupy the ground floor, HSL D should be used,

(2) The key limitations of the HSLs are presented in Friebel and Nadebaum (2011d) and should be referred to prior to application.

(3) Detailed assumptions in the derivation of the HSLs and information on the application of the HSLs are presented in Friebel and Nadebaum (2011a and 2011b).

(4) The solubility limit is defined as the groundwater concentration at which the water cannot dissolve any more of an individual chemical based on a petroleum mixture. The soil vapour that is in equilibrium with the groundwater will be at its maximum. If the derived groundwater HSL exceeds the water solubility limit, a soil vapour source concentration for a petroleum mixture could not exceed a level that would result in the maximum allowable vapour risk for the given scenario. For these scenarios, no HSL is presented for these chemicals and the HSL is shown as 'not limiting' or 'NL'.

(5) The figures in the above table may be multiplied by a factor to account for biodegradation of vapour. A factor of 10 may apply for source depths from 2 m to <4 m or a factor of 100 for source depths of 4 m and deeper. To apply the attenuation factor for vapour degradation, a number of conditions must be satisfied. Firstly, the maximum length of the shorter side of the concrete slab and surrounding pavement cannot exceed 15 m, as this would prevent oxygen penetrating to the centre of the slab. Secondly, measurement of oxygen in the subsurface is required to determine the potential for biodegradation. Oxygen must be confirmed to be present at >5% to use these factors.

(6) For soil texture classification undertaken in accord with AS 1726, the classifications of sand, silt and clay may be applied as coarse, fine with liquid limit <50% and fine with liquid limit >50% respectively, as the underlying properties to develop the HSLs may reasonably be selected to be similar. Where there is uncertainty, either a conservative approach may be adopted or laboratory analysis should be carried out.

(7) To obtain F1 subtract the sum of BTEX concentrations from the $C_6$-$C_{10}$ fraction.

(8) To obtain F2 subtract naphthalene from the >$C_{10}$-$C_{16}$ fraction.

**Table 1A(5) Soil vapour HSLs for vapour intrusion (mg/m³)**

| | HSL A & HSL B Low – high density residential | | | | | HSL C recreational / open space | | | | | HSL D Commercial / Industrial | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CHEMICAL** | **0 m to <1 m** | **1 m to <2 m** | **2 m to <4 m** | **4 m to <8 m** | **8 m+** | **0 m to <1 m** | **1 m to <2 m** | **2 m to <4 m** | **4 m to <8 m** | **8 m+** | **0 m to <1 m** | **1 m to <2 m** | **2 m to <4 m** | **4 m to <8 m** | **8 m+** |
| **SAND** | | | | | | | | | | | | | | | |
| **Toluene** | 1300 | 3800 | 7300 | 15 000 | 29 000 | NL | NL | NL | NL | NL | 4800 | 16 000 | 39 000 | 84 000 | NL |
| **Ethylbenzene** | 330 | 1100 | 2200 | 4300 | 8700 | NL | NL | NL | NL | NL | 1300 | 4600 | 11 000 | 25 000 | 53 000 |
| **Xylenes** | 220 | 750 | 1500 | 3000 | 6100 | NL | NL | NL | NL | NL | 840 | 3,200 | 8000 | 18 000 | 37 000 |
| **Naphthalene** | 0.8 | 3 | 6 | 10 | 25 | 410 | NL | NL | NL | NL | 3 | 15 | 35 | 75 | 150 |
| **Benzene** | 1 | 3 | 6 | 10 | 20 | 360 | 2400 | 4700 | 9500 | 19 000 | 4 | 10 | 30 | 65 | 130 |
| **F1**[8] | 180 | 640 | 1,300 | 2600 | 5300 | 86 000 | NL | NL | NL | NL | 680 | 2800 | 7000 | 15 000 | 32 000 |
| **F2**[9] | 130 | 560 | 1200 | 2400 | 4800 | NL | NL | NL | NL | NL | 500 | 2400 | NL | NL | NL |
| **SILT** | | | | | | | | | | | | | | | |
| **Toluene** | 1400 | 14 000 | 32 000 | 69 000 | 140 000 | NL | NL | NL | NL | NL | 5700 | 63 000 | NL | NL | NL |
| **Ethylbenzene** | 380 | 4200 | 9700 | 21 000 | 43 000 | NL | NL | NL | NL | NL | 1500 | 19 000 | 54 000 | NL | NL |
| **Xylenes** | 260 | 2900 | 6800 | 15 000 | 30 000 | NL | NL | NL | NL | NL | 1000 | 13 000 | 38 000 | NL | NL |
| **Naphthalene** | 0.9 | 10 | 25 | 60 | 120 | NL | NL | NL | NL | NL | 4 | 50 | 150 | 350 | 750 |
| **Benzene** | 1 | 10 | 25 | 55 | 110 | 1800 | 12 000 | 24 000 | 48 000 | 97 000 | 4 | 50 | 140 | 320 | 670 |
| **F1**[8] | 210 | 2600 | 6000 | 13 000 | 26 000 | NL | NL | NL | NL | NL | 850 | 11 000 | 33 000 | 77 000 | 160 000 |

| | HSL A & HSL B Low – high density residential | | | | | HSL C recreational / open space | | | | | HSL D Commercial / Industrial | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **F2**[9] | 160 | 2300 | 5400 | NL | NL | NL | NL | NL | NL | NL | 670 | NL | NL | NL | NL |
| **CLAY** | | | | | | | | | | | | | | | |
| **Toluene** | 1600 | 23 000 | 53 000 | 110 000 | NL | NL | NL | NL | NL | NL | 6500 | 100 000 | NL | NL | NL |
| **Ethylbenzene** | 420 | 6800 | 16 000 | 35 000 | NL | NL | NL | NL | NL | NL | 1800 | 31 000 | NL | NL | NL |
| **Xylenes** | 280 | 4800 | 11 000 | 24 000 | 50 000 | NL | NL | NL | NL | NL | 1200 | 21 000 | NL | NL | NL |
| **Naphthalene** | 1 | 20 | 45 | 95 | 200 | NL | NL | NL | NL | NL | 4 | 85 | 240 | 560 | 1200 |
| **Benzene** | 1 | 15 | 40 | 90 | 180 | 3000 | 20 000 | 40 000 | 81 000 | 160 000 | 5 | 80 | 230 | 530 | 1100 |
| **F1**[8] | 230 | 4200 | 9900 | 21 000 | 44 000 | NL | NL | NL | NL | NL | 1000 | 19 000 | 55 000 | 130 000 | 270 000 |
| **F2**[9] | 180 | 3,800 | NL | NL | NL | NL | NL | NL | NL | NL | 800 | NL | NL | NL | NL |

1. Land use settings are equivalent to those described in Table 1A(1) Footnote 1 and Schedule B7. HSLs for vapour intrusion for high density residential assume residential occupation of the ground floor. If communal car parks or commercial properties occupy the ground floor, HSL D should be used,
2. The key limitations of the HSLs should be referred to prior to application and are presented in Friebel and Nadebaum (2011b and 2011d).
3. Detailed assumptions in the derivation of the HSLs and information on how to apply the HSLs are presented in Friebel and Nadebaum (2011a and 2011b).
4. The maximum possible soil vapour concentrations have been calculated based on vapour pressures of the pure chemicals. Where soil vapour HSLs exceed these values a soil-specific source concentration for a petroleum mixture could not exceed a level that would result in the maximum allowable vapour risk for the given scenario. For these scenarios, no HSL is presented for these chemicals and the HSL is shown as 'not limiting' or 'NL'.
5. Soil vapour HSLs should be compared with measurements taken as laterally close as possible to the soil or groundwater sources of vapour (i.e. within or above vapour sources). Consideration is required of where the sample is taken, the current condition of the site and the likely future condition of the site. Shallow gas measurements in open space (1ess than 1 m below ground surface) may be subject to influences of weather conditions and moisture.
6. The figures in the above table may be multiplied by a factor to account for biodegradation of vapour. A factor of 10 may apply for source depths from 2 m to <4 m or a factor of 100 for source depths of 4 m and deeper. To apply the attenuation factor for vapour degradation, a number of conditions must be satisfied. Firstly, the maximum length of the shorter side of the concrete slab and surrounding pavement cannot exceed 15 m, as this would prevent oxygen penetrating to the centre of the slab. Secondly, measurement of oxygen in the subsurface is required to determine the potential for biodegradation. Oxygen must be confirmed to be present at >5% to use these factors.
7. For soil texture classification undertaken in accord with AS 1726, the classifications of sand, silt and clay may be applied as coarse, fine with liquid limit <50% and fine with liquid limit >50% respectively as the underlying properties to develop the HSLs may reasonably be selected to be similar. Where there is uncertainty, either a conservative approach may be adopted or laboratory analysis should be carried out.
8. To obtain F1 subtract the sum of BTEX concentrations from the $C_6$-$C_{10}$ fraction.

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