# Site Audit Report

0503-1805

165 -169 Holden Street
Ashbury NSW

16 August 2019

54448/122753 (Rev 0)

JBS&G Australia Pty Ltd

www.jbsg.com.au

NSW Site Auditor Scheme

# Site Audit Statement

A site audit statement summarises the findings of a site audit. For full details of the site auditor's findings, evaluations and conclusions, refer to the associated site audit report.

This form was approved under the *Contaminated Land Management Act 1997* on 12 October 2017.

For information about completing this form, go to Part IV.

## Part I: Site audit identification

Site audit statement no. **0503-1805**

This site audit is a:

❑ statutory audit

☑ non-statutory audit

within the meaning of the *Contaminated Land Management Act 1997*.

### Site auditor details

(As accredited under the *Contaminated Land Management Act 1997*)

Name **Andrew Lau**

Company **JBS&G**

Address **Level 1, 50 Margaret Street**

Sydney **NSW** Postcode **2000**

Phone **02 8245 0300**

Email **alau@jbsg.com.au**

### Site details

Address **165 – 169 Holden Street**

**Ashbury NSW** Postcode **2193**

## Property description

(Attach a separate list if several properties are included in the site audit.)

**Part Lot 1 DP 115504 and part Lot 1 DP 911478 (proposed Lot 1 in subdivision plan of Lot 1 DP115504 and Lot 1 DP911478)**

Local government area **Canterbury Bankstown**

Area of site (include units, e.g. hectares) **2,934 m$^2$ (approximately)**

Current zoning **Zone SP2 – Infrastructure: Water Supply System**

## Regulation and notification

To the best of my knowledge:

☐ ~~**the site is** the subject of a declaration, order, agreement, proposal or notice under the *Contaminated Land Management Act 1997* or the *Environmentally Hazardous Chemicals Act 1985*, as follows: (provide the no. if applicable)~~

- ☐ ~~Declaration no.~~
- ☐ ~~Order no.~~
- ☐ ~~Proposal no.~~
- ☐ ~~Notice no.~~

☑ **the site is not** the subject of a declaration, order, proposal or notice under the *Contaminated Land Management Act 1997* or the *Environmentally Hazardous Chemicals Act 1985*.

To the best of my knowledge:

☐ ~~the site **has** been notified to the EPA under section 60 of the *Contaminated Land Management Act 1997*~~

☑ the site **has not** been notified to the EPA under section 60 of the *Contaminated Land Management Act 1997*.

## Site audit commissioned by

Name **Amy Dobson**

Company **Sydney Water Corporation**

Address **Level 13, 1 Smith Street**

**Parramatta NSW** Postcode **2150**

Phone **0411 306 656**

Email **amy.dobson@sydneywater.com.au**

**Contact details for contact person** (if different from above)

Name **As Above**

Phone

Email

**Nature of statutory requirements** (not applicable for non-statutory audits)

☐ Requirements under the *Contaminated Land Management Act* 1997 (e.g. management order; please specify, including date of issue)

☐ Requirements imposed by an environmental planning instrument (please specify, including date of issue)

☐ Development consent requirements under the *Environmental Planning and Assessment Act 1979* (please specify consent authority and date of issue)

☐ Requirements under other legislation (please specify, including date of issue)

## Purpose of site audit

❑ **A1** To determine land use suitability

Intended uses of the land:

OR

**A2** To determine land use suitability subject to compliance with either an active or passive environmental management plan

Intended uses of the land:

OR

(Tick all that apply)

☑ **B1** To determine the nature and extent of contamination

☑ **B2** To determine the appropriateness of:

- ☑ an investigation plan
- ❑ a remediation plan
- ❑ a management plan

❑ **B3** To determine the appropriateness of a **site testing plan** to determine if groundwater is safe and suitable for its intended use as required by the *Temporary Water Restrictions Order for the Botany Sands Groundwater Resource 2017*

❑ **B4** To determine the compliance with an approved:

- ❑ **voluntary management proposal** or
- ❑ **management order** under the *Contaminated Land Management Act 1997*

❑ **B5** To determine if the land can be made suitable for a particular use (or uses) if the site is remediated or managed in accordance with a specified plan.

Intended uses of the land:

## Information sources for site audit

Consultancies which conducted the site investigations and/or remediation:

**Progressive Risk Management Pty Ltd (PRM)**

Titles of reports reviewed:

- *Sampling, Analysis and Quality Plan, Ashbury Water Reservoir WS0003 165-169 Holden Street, Ashbury NSW*, P033725.003/C0151, August 2018. Rev 0, Final (Progressive Risk Management 2018c);
- *Hazardous Ground Gas and Groundwater Assessment, Ashbury Reservoir 165 – 169 Holden Street, Ashbury NSW*, P033725.004/C0151, February 2019. Version B Final. (Progressive Risk Management, 2019a);
- *Data Gap Analysis: Ashbury Reservoir, 165 – 169 Holden Street, Ashbury NSW*, P033725.001, 17/06/2019. Version 5 Final. (Progressive Risk Management 2019b);
- *Summary of Contamination Condition Part of Ashbury Reservoir, 165 – 169 Holden Street, Ashbury NSW*, P033725.005/C0151, 17/06/2019. Version B. (Progressive Risk Management 2019c).

Other information reviewed, including previous site audit reports and statements relating to the site:

- *Combined Stage 1 and 2 Detailed Site Investigation Sydney Water Ashfield Reservoir, 165 – 169 Holden Street, Ashbury, NSW*, 24 July 2015. 2201679B-CLM-RPT-1021 Rev C. (Parsons Brinckerhoff 2015);
- *Hazardous Building Material Pre-Demolition Audit, Ashbury Water Reservoir WS0003 165-169 Holden Street, Ashbury NSW*, P033623.001/C0151, November 2017. Revision 3: Final. (Progressive Risk Management 2017a);
- *Hazardous Building Materials Removal Plan, Ashbury Water Reservoir WS0003 165-169 Holden Street, Ashbury NSW*, P033623.002/C0151, February 2018. Revision 3: Final. (Progressive Risk Management 2018a).

## Site audit report details

Title **Site Audit Report 0503-1805, 165 – 169 Holden Street, Ashbury NSW**

Report no. **54448/122753 (Rev 0)** Date **16 August 2019**

# Part II: Auditor's findings

Please complete either Section A1, Section A2 or Section B, not more than one section. (Strike out the irrelevant sections.)

- Use **Section A1** where site investigation and/or remediation has been completed and a conclusion can be drawn on the suitability of land uses **without the implementation** of an environmental management plan.
- Use **Section A2** where site investigation and/or remediation has been completed and a conclusion can be drawn on the suitability of land uses **with the implementation** of an active or passive environmental management plan.
- Use **Section B** where the audit is to determine:
    - (B1) the nature and extent of contamination, and/or
    - (B2) the appropriateness of an investigation, remediation or management plan[1], and/or
    - (B3) the appropriateness of a site testing plan in accordance with the *Temporary Water Restrictions Order for the Botany Sands Groundwater Source 2017*, and/or
    - (B4) whether the terms of the approved voluntary management proposal or management order have been complied with, and/or
    - (B5) whether the site can be made suitable for a specified land use (or uses) if the site is remediated or managed in accordance with the implementation of a specified plan.

[1] For simplicity, this statement uses the term 'plan' to refer to both plans and reports.

## Section A1

**I certify that, in my opinion:**

The **site is suitable** for the following uses:

(Tick all appropriate uses and strike out those not applicable.)

☐ Residential, including substantial vegetable garden and poultry

☐ Residential, including substantial vegetable garden, excluding poultry

☐ Residential with accessible soil, including garden (minimal home-grown produce contributing less than 10% fruit and vegetable intake), excluding poultry

☐ Day care centre, preschool, primary school

☐ Residential with minimal opportunity for soil access, including units

☐ Secondary school

☐ Park, recreational open space, playing field

☐ Commercial/industrial

☐ Other (please specify):

_____

**OR**

☐ I certify that, in my opinion, the **site is not suitable** for any use due to the risk of harm from contamination.

Overall comments:

_____

_____

_____

_____

_____

## Section A2

### I certify that, in my opinion:

Subject to compliance with the **attached** environmental management plan[2] (EMP), the site is suitable for the following uses:

(Tick all appropriate uses and strike out those not applicable.)

☐ Residential, including substantial vegetable garden and poultry

☐ Residential, including substantial vegetable garden, excluding poultry

☐ Residential with accessible soil, including garden (minimal home-grown produce contributing less than 10% fruit and vegetable intake), excluding poultry

☐ Day care centre, preschool, primary school

☐ Residential with minimal opportunity for soil access, including units

☐ Secondary school

☐ Park, recreational open space, playing field

☐ Commercial/industrial

☐ Other (please specify):

_____

### EMP details

Title _____

Author _____

Date _____ No. of pages _____

### EMP summary

This EMP (attached) is required to be implemented to address residual contamination on the site.

The EMP: (Tick appropriate box and strike out the other option.)

☐ requires operation and/or maintenance of **active** control systems[3]

☐ requires maintenance of **passive** control systems only[3].

[2] Refer to Part IV for an explanation of an environmental management plan.
[3] Refer to Part IV for definitions of active and passive control systems.

~~Purpose of the EMP:~~

~~Description of the nature of the residual contamination:~~

~~Summary of the actions required by the EMP:~~

~~How the EMP can reasonably be made to be legally enforceable:~~

~~How there will be appropriate public notification:~~

~~Overall comments:~~

## Section B

Purpose of the plan[4] which is the subject of this audit:

Determine the contamination status of the site and assess suitability for proposed low density residential land use.

### I certify that, in my opinion:

(B1)

☑ The nature and extent of the contamination **has** been appropriately determined

☐ ~~The nature and extent of the contamination **has not** been appropriately determined~~

AND/OR (B2)

☑ The investigation, remediation or management plan **is** appropriate for the purpose stated above

☐ ~~The investigation, remediation or management plan **is not** appropriate for the purpose stated above~~

~~AND/OR (B3)~~

☐ ~~The site testing plan:~~

- ☐ ~~**is** appropriate to determine~~
- ☐ ~~**is not** appropriate to determine~~

~~if groundwater is safe and suitable for its intended use as required by the *Temporary Water Restrictions Order for the Botany Sands Groundwater Resource 2017*~~

~~AND/OR (B4)~~

☐ ~~The terms of the approved voluntary management proposal* or management order** (strike out as appropriate):~~

- ☐ ~~**have** been complied with~~
- ☐ ~~**have not** been complied with.~~

~~*voluntary management proposal no.~~

~~**management order no.~~

~~AND/OR (B5)~~

☐ ~~The site **can be made suitable** for the following uses:~~

~~(Tick all appropriate uses and strike out those not applicable.)~~

- ☐ ~~Residential, including substantial vegetable garden and poultry~~
- ☐ ~~Residential, including substantial vegetable garden, excluding poultry~~

[4] For simplicity, this statement uses the term 'plan' to refer to both plans and reports.

- ~~❑ Residential with accessible soil, including garden (minimal home-grown produce contributing less than 10% fruit and vegetable intake), excluding poultry~~
- ~~❑ Day care centre, preschool, primary school~~
- ~~❑ Residential with minimal opportunity for soil access, including units~~
- ~~❑ Secondary school~~
- ~~❑ Park, recreational open space, playing field~~
- ~~❑ Commercial/industrial~~
- ~~❑ Other (please specify):~~

~~IF the site is remediated/managed* in accordance with the following plan (**attached**):~~

~~*Strike out as appropriate~~

~~Plan title~~

~~Plan author~~

~~Plan date~~ ~~No. of pages~~

~~SUBJECT to compliance with the following condition(s):~~

Overall comments:

- The soil investigations identified concentrations of contaminants of potential concern (copper, zinc, TRH $C_{16}$-$_{34}$, benzo(a)pyrene, benzo(a)pyrene TEQ and total PAHs) in fill soils above the adopted site assessment criteria, which require remediation or management for residential with accessible soils/gardens land use.
- While not identified in the recent site investigations (PRM 2019a and PRM 2019b), asbestos has previously been identified at the site as ACM fragments. There is potential for additonal asbestos to be present in fill material at the site and consideration should be given to the presence of asbestos in any remediation and/or redevelopment plans for the site.
- While assessment of groundwater at the site identified concentrations of heavy metals above the adopted site assessment criteria, the detected concentrations were attributed to background groundwater quality. There are no complete source pathway receptor linkages identified.
- Hazardous ground gases at the site have been determined to pose very low risk and as such, no further action is required.
- Consideration of aesthetic issues including staining, odours, anthropogenic contaminants and presence of asbestos has been adequately addressed in the assessment of soils at the site.
- There is no evidence of migration of contaminants from the site which is likely to result in any unacceptable risks to surrounding human or ecological receptors.
- The site investigation works (PRM 2019a and PRM 2019b) are considered to have met the requirements of *the Contaminated Sites: Guidelines for the NSW Site Auditor Scheme (3rd Edition)* (EPA 2017). The nature and extent of contamination of soil, groundwater and ground gases at the site are considered to have been adequately assessed.

# Part III: Auditor's declaration

I am accredited as a site auditor by the NSW Environment Protection Authority (EPA) under the *Contaminated Land Management Act 1997.*

Accreditation no. **0503**

### I certify that:

- I have completed the site audit free of any conflicts of interest as defined in the *Contaminated Land Management Act 1997,* and
- with due regard to relevant laws and guidelines, I have examined and am familiar with the reports and information referred to in Part I of this site audit, and
- on the basis of inquiries I have made of those individuals immediately responsible for making those reports and obtaining the information referred to in this statement, those reports and that information are, to the best of my knowledge, true, accurate and complete, and
- this statement is, to the best of my knowledge, true, accurate and complete.

I am aware that there are penalties under the *Contaminated Land Management Act 1997* for wilfully making false or misleading statements.

Signed 

Date 16 August 2019

# Part IV: Explanatory notes

To be complete, a site audit statement form must be issued with all four parts.

## How to complete this form

### Part I

Part I identifies the auditor, the site, the purpose of the audit and the information used by the auditor in making the site audit findings.

### Part II

Part II contains the auditor's opinion of the suitability of the site for specified uses or of the appropriateness of an investigation, or remediation plan or management plan which may enable a particular use. It sets out succinct and definitive information to assist decision-making about the use or uses of the site or a plan or proposal to manage or remediate the site.

The auditor is to complete either Section A1 or Section A2 or Section B of Part II, **not** more than one section.

### Section A1

In Section A1 the auditor may conclude that the land is *suitable* for a specified use or uses OR *not suitable* for any beneficial use due to the risk of harm from contamination.

By certifying that the site is *suitable*, an auditor declares that, at the time of completion of the site audit, no further investigation or remediation or management of the site was needed to render the site fit for the specified use(s). **Conditions must not be** imposed on a Section A1 site audit statement. Auditors may include **comments** which are key observations in light of the audit which are not directly related to the suitability of the site for the use(s). These observations may cover aspects relating to the broader environmental context to aid decision-making in relation to the site.

### Section A2

In Section A2 the auditor may conclude that the land is *suitable* for a specified use(s) subject to a condition for implementation of an environmental management plan (EMP).

*Environmental management plan*

Within the context of contaminated sites management, an EMP (sometimes also called a 'site management plan') means a plan which addresses the integration of environmental mitigation and monitoring measures for soil, groundwater and/or hazardous ground gases throughout an existing or proposed land use. An EMP succinctly describes the nature and location of contamination remaining on site and states what the objectives of the plan are, how contaminants will be managed, who will be responsible for the plan's implementation and over what time frame actions specified in the plan will take place.

By certifying that the site is suitable subject to implementation of an EMP, an auditor declares that, at the time of completion of the site audit, there was sufficient information satisfying guidelines made or approved under the *Contaminated Land Management Act 1997*

(CLM Act) to determine that implementation of the EMP was feasible and would enable the specified use(s) of the site and no further investigation or remediation of the site was needed to render the site fit for the specified use(s).

Implementation of an EMP is required to ensure the site remains suitable for the specified use(s). The plan should be legally enforceable: for example, a requirement of a notice under the CLM Act or a development consent condition issued by a planning authority. There should also be appropriate public notification of the plan, e.g. on a certificate issued under s.149 of *the Environmental Planning and Assessment Act 1979*.

*Active or passive control systems*

Auditors must specify whether the EMP requires operation and/or maintenance of active control systems or requires maintenance of passive control systems only. Active management systems usually incorporate mechanical components and/or require monitoring and, because of this, regular maintenance and inspection are necessary. Most active management systems are applied at sites where if the systems are not implemented an unacceptable risk may occur. Passive management systems usually require minimal management and maintenance and do not usually incorporate mechanical components.

*Auditor's comments*

Auditors may also include **comments** which are key observations in light of the audit which are not directly related to the suitability of the site for the use(s). These observations may cover aspects relating to the broader environmental context to aid decision-making in relation to the site.

## Section B

In Section B the auditor draws conclusions on the nature and extent of contamination, and/or suitability of plans relating to the investigation, remediation or management of the land, and/or the appropriateness of a site testing plan in accordance with the *Temporary Water Restrictions Order for the Botany Sands Groundwater Source 2017*, and/or whether the terms of an approved voluntary management proposal or management order made under the CLM Act have been complied with, and/or whether the site can be made suitable for a specified land use or uses if the site is remediated or managed in accordance with the implementation of a specified plan.

By certifying that a site *can be made suitable* for a use or uses if remediated or managed in accordance with a specified plan, the auditor declares that, at the time the audit was completed, there was sufficient information satisfying guidelines made or approved under the CLM Act to determine that implementation of the plan was feasible and would enable the specified use(s) of the site in the future.

For a site that *can be made suitable*, any **conditions** specified by the auditor in Section B should be limited to minor modifications or additions to the specified plan. However, if the auditor considers that further audits of the site (e.g. to validate remediation) are required, the auditor must note this as a condition in the site audit statement. The condition must not specify an individual auditor, only that further audits are required.

Auditors may also include **comments** which are observations in light of the audit which provide a more complete understanding of the environmental context to aid decision-making in relation to the site.

### Part III

In **Part III** the auditor certifies their standing as an accredited auditor under the CLM Act and makes other relevant declarations.

## Where to send completed forms

In addition to furnishing a copy of the audit statement to the person(s) who commissioned the site audit, statutory site audit statements must be sent to

- the **NSW Environment Protection Authority**: nswauditors@epa.nsw.gov.au or as specified by the EPA

  AND

- the **local council** for the land which is the subject of the audit.

**SSM 137859 - SSM 137858**
177°43'12" 182.240 (MGA GROUND)
177°43'35" - 182.25 (SURVEY)

**SSM 137858 - SSM 137857**
186°35'40" 139.954 (MGA GROUND)
186°35'40" 139.95 (SURVEY)

**SSM 137857 - SSM 137856**
179°59'43" 120.962 (MGA GROUND)
179°59'20" 120.97 (SURVEY)

**SSM 137858 - CNR Ⓐ**
190°24'30" 113.385

**SSM 137857 - CNR Ⓑ**
186°41'30" 56.755

SURVEYING & SPATIAL INFORMATION REGULATION 2012:
CLAUSES 35(1)(b), 61(2) AND 62

| MARK | MGA CO-ORDINATES | | CLASS | ORDER |
|---|---|---|---|---|
| | EASTING | NORTHING | | |
| SSM 137856 | 326 618.795 | 6 247 352608 | B | 2 |
| SSM 137857 | 326 618.785 | 6 247 473.565 | B | 2 |
| SSM 137858 | 326 627.607 | 6 247 794.676 | B | 2 |
| SSM 137859 | 326 634.854 | 6 247 612.587 | B | 2 |
| COMBINED SCALE FACTOR: 0.999961, ZONE 56<br>ADOPTED FROM SCIMS 10/6/2017 | | | | |

(A) - EASEMENT FOR ELECTRICITY & OTHER PURPOSES 5.3 WIDE (DP1141436)

KAL - DENOTES KERB AS LAID

M.G.A.

30
DP 1198113
312°31' 5.74
(DP1198113)
20.53
20"
SSM 137859

TREVENAR STREET

2
DP 577760
16
17
8
D P 1 2 6 7 7
7
6
5
4
3
2
1
DP 566982
3
1
2
3
4
5
6
7
D P 1 2 6 7 7

ANGLE
180°19'40" (SURVEY)
180°19' (DP12677)
180.385 (PO)
180.355 (SURVEY)
118.91 (PO)
118.865 (SURVEY)
61.475 (PO)
61.49 (SURVEY)
30'
STREET
(ALIGNED 3.66 - 12.8 - 3.66)
(OCC-BEND)
14.415
1°
BEND
(0.1)
SSM 137858
(OCCS)
13.76
20"
(0.11)
20.065
(BDY-OCC)
PALING
FENCE
(OCCS)
13.64
(0.15)
96.775 (PO)
96.755 (SURVEY)
(OCCS)
13.83
(0.12)
27.45 (OCCS)
(CNR-OCC)
13.66
(0.01)
RM DH&W
283°25' 5.255
Easting 326614.3736
Northing 6247501.0695
5.25 KAL
(BDY-OCC)
20.045
FENCE 32.05
30'
LINE
Easting 326613.5315
Northing 6247469.0194
(0.13)
(0.22)
MESH
BRICK BUILDING
FENCED
58.325
(0.77)
(0.8)
BRICK BUILDING
RESERVOIR
RM DH&W
201°27' 14.805
45.72
271°31'20"
NOT FENCED
SEE
DIAG. 1
(0.13)
WIRE
51.84
(BDY-NAIL)
20.045
NAIL FD
(DP527092)
Easting 326612.1701
Northing 6247417.1994
(A)
19.9
(12.3)
(7.6)
Ⓑ
15.2 (SURV)
1°
KERB
BOLT FD AT BASE OF AS
(AS NOW GONE)
276°26' 3.7 TO CNR
SSM 137856
345°30'50" 30.24

Easting 326535.1566
Northing 6247503.3583
(0.1)
20"
50.535
(1.12)
Easting 326533.8293
Northing 6247452.8421
30'
271°15'
20.925
RET. WALL
(0.2)
1°
33.46
Easting 326532.9505
Northing 6247419.3917
1°30'20"
18.535
NOT FENCED
Easting 326555.2244
Northing 6247470.5513
1°39'20"
79.25
1
2934m²
Easting 326554.7375
Northing 6247452.0206
2
3719m²
NOT
271°30'20"
33.53
271°40'20"
NOT FENCED
62.88 (PO)
62.96 (OCC-CNR)
15.5
(OCC-CNR)
1 DP 103552
D DP 978435
SEC 5
25
26
DP 805+
1 DP 711077
2 DP711077
1 DP 964525
2 DP 979178
3
4
DP 306241
FIFTH
STREET
HOLDEN
1
2
DP572850

2
1 DP 711077
2
DP 711077
(0.65)
(A)
51.85
20"
(0.1)
RM DH&W FD
291°18' 5.335 (SURVEY)
291°05' 5.375 (DP1141436)
(A)
Ⓑ
(7.6)
RM DH&W
201°27' 14.805
19.9
30'
(12.3)
RM DH&W FD
271°30' 5.02 (SURVEY)
271°27 5.05 (DP1141436)
RMS & WALL
INACCESSIBLE
(DP711077)
0.23
15.2 (SURV)
1°
RM DH&W FD
289°54' 1.825
(DP 711077)
DIAGRAM 1
(NOT TO SCALE)

| | | | | |
|---|---|---|---|---|
| SURVEYOR:<br>Name: MATTHEW WILLIAM CLEARY<br>Date : 29/5/2017<br>Reference : 118234504_02 | PLAN OF SUBDIVISION OF LOT 1 IN DP911478 AND LOT 1 IN DP115504 | L.G.A: CANTERBURY - BANKSTOWN<br>Locality : CANTERBURY<br>Reduction Ratio: 1 : 600<br>Lengths are in metres. | REGISTERED | DP OR SP NUMBER |

# Site Audit Report
0503-1805

165 -169 Holden Street
Ashbury NSW

16 August 2019

54448/122753 (Rev 0)
JBS&G Australia Pty Ltd

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## Appendices

# Abbreviations

| Term | Definition |
|---|---|
| As | Arsenic |
| Cd | Cadmium |
| Cr | Chromium |
| Cu | Copper |
| bgs | Below ground surface |
| BTEX | Benzene, Toluene, Ethylbenzene and Xylenes |
| B(a)P | Benzo(a) pyrene |
| CSM | Conceptual Site Model |
| DO | Dissolved oxygen |
| DP&E | NSW Department of Planning and Environment |
| DQO | Data Quality Objectives |
| EC | Electrical conductivity |
| EH | Redox potential |
| EIL | Ecological Investigation Level |
| EPA | New South Wales Environment Protection Authority |
| GSV | Ground Screening Value |
| HBM | Hazardous Building Materials |
| HGG | Hazardous Ground Gas |
| Hg | Mercury |
| HIL | Health Based Investigation Level |
| LOR | Limit of Reporting |
| MAH | Monocyclic Aromatic Hydrocarbon |
| NEPC | National Environment Protection Council |
| Ni | Nickel |
| OCP | Organochlorine Pesticide |
| OPP | Organophosphorus Pesticide |
| PAH | Polycyclic Aromatic Hydrocarbons |
| PARCC | Precision, accuracy, representativeness, comparability and completeness |
| Pb | Lead |
| PCB | Polychlorinated Biphenyls |
| PRM | Progressive Risk Management |
| QA/QC | Quality Assurance/Quality Control |
| RPD | Relative Percentage Difference |
| SAR | Site Audit Report |
| SAS | Site Audit Statement |
| TRH | Total Recoverable Hydrocarbons |
| Zn | Zinc |

# 1. Introduction

## 1.1 Introduction and Background

Andrew Lau of JBS&G Australia Pty Ltd (JBS&G) was engaged by Sydney Water Corporation (Sydney Water, the client) on 23 November 2017 to conduct a site audit for the property located at 165 – 169 Holden Street, Ashbury NSW ('the site'). The site is legally identified as part Lot 1 DP115504 and part Lot 1 DP 911478 (proposed Lot 1 in plan of subdivision of Lot 1 DP115504 and Lot 1 DP911478), occupying an area of approximately 2,934 $m^2$ (**Appendix C**).

The site was historically used as a depot associated with the adjoining Sydney Water reservoir located to the south. The site has been owned by Sydney Water since 1909. The audit relates to the proposed divestment of the site for low density residential land use. The site is proposed to form Lot 1 of the subdivision of the Sydney Water Reservoir property.

Andrew Lau is a Site Auditor accredited by the NSW Environment Protection Authority (EPA) under the *Contaminated Land Management Act 1997* (CLM Act 1997) (Accreditation Number 0503). The audit was completed with the assistance of Christine Louie, a JBS&G consultant trained and experienced in contaminated land assessment and auditing. The audit reference number is 0503-1805.

No previous Site Audit Statements (SAS) or Site Audit Reports (SAR) are known to exist for the site.

## 1.2 Objectives of the Site Audit

The objectives of this site audit were to:

- Independently review the environmental investigation reports as requested by the client; and
- Prepare a SAR and issue a SAS, providing an opinion on the appropriateness of the investigation to determine the nature and extent of contamination at the site.

In accordance with the requirements of the CLM Act 1997, the site audit was undertaken with consideration to:

- The provisions of the CLM Act, Regulations and subsequent amendments;
- The provisions of any environmental planning instruments applying to the site; and
- Relevant guidelines made or approved by the EPA (**Appendix A**).

## 1.3 Type of Audit

Since the site audit is not being undertaken in response to a legal requirement imposed by a consent authority or the EPA, the site audit has been conducted as a non-statutory audit. The audit reference number is 0503-1805.

## 1.4 Documents Reviewed

The following documentation was reviewed as part of the site audit:

- *Sampling, Analysis and Quality Plan, Ashbury Water Reservoir WS0003 165-169 Holden Street, Ashbury NSW*, P033725.003/C0151, August 2018. Rev 0, Final (Progressive Risk Management 2018c);
- *Hazardous Ground Gas and Groundwater Assessment, Ashbury Reservoir 165 – 169 Holden Street, Ashbury NSW*, P033725.004/C0151, February 2019. Version B Final. (Progressive Risk Management, 2019a);

- *Data Gap Analysis: Ashbury Reservoir, 165 – 169 Holden Street, Ashbury NSW*, P033725.001, 17/06/2019. Version 5 Final. (Progressive Risk Management 2019b); and
- *Summary of Contamination Condition Part of Ashbury Reservoir, 165 – 169 Holden Street, Ashbury NSW*, P033725.005/C0151, 17/06/2019. Version B. (Progressive Risk Management 2019c).

The following additional documents was also considered during the site audit:

- *Combined Stage 1 and 2 Detailed Site Investigation Sydney Water Ashfield Reservoir, 165 – 169 Holden Street, Ashbury, NSW*, 24 July 2015. 2201679B-CLM-RPT-1021 Rev C. (Parsons Brinckerhoff 2015);
- *Hazardous Building Material Pre-Demolition Audit, Ashbury Water Reservoir WS0003 165-169 Holden Street, Ashbury NSW*, P033623.001/C0151, November 2017. Revision 3: Final. (Progressive Risk Management 2017a); and
- *Hazardous Building Materials Removal Plan, Ashbury Water Reservoir WS0003 165-169 Holden Street, Ashbury NSW*, P033623.002/C0151, February 2018. Revision 3: Final. (Progressive Risk Management 2018a).

The auditor notes that the findings of this report were generally incorporated into the reports reviewed as part of the audit listed above and was therefore not reviewed individually. While this report does not form part of this audit, however, for consistency, relevant background information has been included in **Section 3.3** of this report.

A *Remediation Action Plan, Ashbury Reservoir 165 – 169 Holden Street, Ashbury NSW*, P033725.002/CO151, March 2018. Rev01 Draft. (Progressive Risk Management 2018b) was prepared following the issue of the draft Data Gap Analysis report in March 2018. Following auditor review of the draft Data Gap Analysis, additional investigations for hazardous ground gas and groundwater were identified as being required at the site. The draft Remediation Action Plan was not reviewed at that time and a revised document has not been issued following completion of intrusive site investigations.

Additional correspondence relating to the site audit is provided in **Appendix B**.

### 1.5 Site Inspections

The site was inspected on the date shown in **Table 1.1** below.

**Table 1.1: Summary of Audit Inspections**

| Date | Attendance | Purpose |
|---|---|---|
| 21 January 2018 | Site Auditor Assistant (Christine Louie) | Site inspection to observe site layout and condition, and field works conducted by the consultant. |

### 1.6 Chronology of Site Assessment Works

The process of the assessment and audits undertaken at the site has been chronologically listed in **Table 1.2**.

**Table 1.2: Summary of Investigation and Audit Works Undertaken at the Site**

| Date | Purpose |
|---|---|
| July 2015 | Combined Stage 1 and 2 Detailed Site Investigation was completed by Parsons Brinckerhoff (2015) to assess the contamination status of surplus land associated with the Sydney Water depot site. |
| October/November 2017 | A Hazardous Building Materials Audit was conducted by Progressive Risk Management (PRM) (2018a). |
| 23 November 2017 | Commencement of site audit (0503-1805). |
| December 2017 | A Hazardous Building Materials Removal Plan was prepared by PRM (2017) to outline the requirements for removal of hazardous building materials identified at the site. |

| Date | Purpose |
|---|---|
| February 2018 | Site intrusive works for data gap assessment and pre-demolition soil testing undertaken by PRM. The scope of works comprised the installation of seven testpits to delineate previously identified fill material and benzo(a)pyrene contamination and for in-situ waste classification. |
| July 2018 | Preparation of Sampling, Analysis and Quality Plan (SAQP) for additional data gaps identified following intrusive site investigations and to include groundwater and hazardous ground gas assessment (HGG). Based on comments provided by the site auditor, a final document was issued on 1 August 2018 (PRM 2018c). |
| August 2018 | Groundwater assessment and HGG intrusive investigations undertaken by PRM. Works comprised installation of three combined groundwater/HGG wells and six HGG wells. One groundwater monitoring round was undertaken during September 2018. Three rounds of spot monitoring and one round of continuous HGG monitoring (minimum of 14 days) were undertaken. |
| December 2018 | Hazardous Ground Gas and Groundwater Assessment report and revised Data Gap Analysis were prepared by PRM. Based on comments provided by the site auditor, a final Hazardous Ground Gas and Groundwater Assessment report (PRM 2019a) and Data Gap Analysis report (PRM 2019b) were issued in 2019. |
| March 2019 | Summary of Contamination Condition report prepared by PRM summarising soil, groundwater and ground gas conditions at the site. Based on comments provided by the site auditor, a final report (PRM 2019c) was issued in June 2019. |
| August 2019 | Preparation of a site audit statement (0503-1805) and accompanying site audit report (JBS&G 2019) confirming that the site investigations conducted by PRM have been conducted appropriately to determine the nature and extent of contamination at the site. |

# 2. Site Description

## 2.1 Site Identification

The site details have been summarised in **Table 2.1** and described in further detail in the following sections. A plan identifying the subject site has been presented in **Appendix C**.

**Table 2.1: Summary Site Details**

| | |
|---|---|
| **Street Address** | 165 – 169 Holden Street, Ashbury NSW |
| **Property Description** | Part Lot 1 DP115504 and part Lot 1 DP911478 (proposed Lot 1 of subdivision plan of Lot 1 DP115504 and Lot 1 DP911478) |
| **Parish** | Petersham |
| **County** | Cumberland |
| **Local Government Area** | Canterbury Bankstown |
| **Property Size** | Approximately 2,934 $m^2$ |
| **Zoning** | Zone SP2 – Infrastructure: Water Supply System |
| **Previous Use** | Sydney Water depot |
| **Current Use** | Disused depot |
| **Proposed Use** | Low to medium density residential |

## 2.2 Site Condition

At the time of the most recent site investigations, the consultant (PRM 2019a) reported that the site comprised of a disused portion of a former depot associated with the adjoining Sydney Water Ashbury Reservoir. The site is located within a low density residential land use setting with recreational open space (Peace Park) located to the west. The site is predominantly covered by hard stand with some grassed areas vegetated with trees and shrubs along the western, northern and eastern boundaries. Vegetation was not observed as being distressed at the time of reporting (Parsons Brinckerhoff 2015). Two vacant corrugated metal warehouse buildings/sheds are located along the western boundary of the site. A single-storey brick building is located along the southern boundary of the site and a chemical storage shed is located along the northern boundary.

The consultant stated that the site has been in use a depot since at least 1930. Peace Park located immediately to the west and northwest was previously the site of the South Ashfield Brickworks which manufactured brick tiles, drain pipe and other pottery wares.

## 2.3 Topography

The consultant (PRM 2019a) reported that the site is located at the highest point of the local government area and slopes towards the south and west.

## 2.4 Soils and Geology

Based on the 1:100,000 Geological Series Sheet 9130 (Edition 1) regional geological map (Department of Mineral Resources 1983), the consultant (PRM 2019a) identified that the site is underlain by Ashfield Shale comprising black to dark grey shale and laminite. Based on the 1:100,000 NSW Soils Landscape map, the site is identified as being underlain by Blacktown Soils comprising shallow to moderately deep red and brown podzolic soils.

The consultant reported (PRM 2019a) that fill encountered across the site during site investigations was described as gravelly clays with varying degrees of anthropogenic inclusions consisting of building rubble, coal, fly ash and slag. The depth of fill encountered varied across the site from 0.3 m to 2.3 m with fill generally located between 0.5 m and 1.0 m. Silty clays were encountered beneath fill in all borehole locations with the exception of one, with shale bedrock beneath.

## 2.5 Acid Sulphate Soils

Based on the CSIRO Australian Soil Resource Information System, the consultant (2019a) reported that soils underlying the site are mapped as having a low probability of occurrence of acid sulfate soils.

## 2.6 Hydrology

The consultant (PRM 2019a) reported that surface water is expected to flow to the south/southwest towards the Sydney Water Ashbury Reservoir and Peace Park, with little infiltration due to the hardstand surface across the majority of the site. The nearest surface water bodies are located 1.1 km southwest within Canterbury Racecourse and Cooks River, located approximately 1.3 kilometres to the southwest.

## 2.7 Hydrogeology

The consultant (PRM 2019a) reported that a search of the NSW Government Water Information website (undertaken by Parsons Brinckerhoff in 2015) did not identify any registered groundwater bores within a 500 m radius of the site. Groundwater flow was reported to be likely to flow to the west and southwest towards Cooks River. Groundwater was considered likely to be present within underlying bedrock beneath the site at depths greater than 3 to 4 metres below ground surface (bgs) as groundwater had not been encountered during previous site assessments to depths of 3 m bgs.

## 2.8 Surrounding Environment

The consultant (PRM 2019a) reported that the site is surrounded by the following:

- North – Low density residential properties
- East – Low density residential properties.
- South – Sydney Water Reservoir WS0003 and low-density residential properties.
- West – Peace Park recreational open space land.

## 2.9 Audit Opinion

The information provided by the consultant (PRM 2019a) in regard to the site condition and surrounding environment has been checked against and generally meets the requirements of OEH 2011. The information provided was also consistent with the observations made during a site inspection conducted by the site auditor's assistant on the date indicated in **Section 1.5**.

Overall, the information provided by the consultant (PRM 2019a), information supplemented by observations made during the site audit inspection and review of publicly available information in relation to the site condition and the surrounding environment is considered adequate for the purposes of the site audit, with the exception that details of climate (other than for the period when the HGG monitoring was undertaken) were not provided.

For completeness, the auditor conducted a review of Bureau of Meteorology (BOM) climate statistics for Canterbury Racecourse (Canterbury Racecourse AWS)[1] which indicates the following:

- Mean maximum temperatures ranging from 17.6° C in July to 27.9° C in January.
- Mean minimum temperatures ranging from 5.7° C in July to 18.5° C in January.
- Mean monthly rainfall ranging from 46.0 mm in September to 108.4 mm in June, with an average annual rainfall of 970.9 mm.

In general, the climate of the site area is described as comprising warm summers and mild winters, rainfall was described as occurring throughout the year with wetter periods from January to June. This additional data does not alter the consultants' findings or conclusions and, hence, does not affect the outcome of the audit.

[1] Bureau of Meteorology Climate Statistics for Canterbury Racecourse, accessed 25/06/2019, http://www.bom.gov.au/climate/averages/tables/cw_066194.shtml

Overall, the information provided by the consultant (PRM 2019a) in relation to site condition and the surrounding environment is considered adequate for the purposes of assessing the contamination status of the site.

# 3. Site History

The consultant (PRM 2019a) reported that a review of previous site investigation reports was undertaken and a summary was presented in the Hazardous Ground Gas and Groundwater Assessment report.

## 3.1 Site History Information Sources

A summary of relevant historical information for the site was provided in the consultant's report (PRM 2019a) and is summarised as follows:

- The site has been owned by Sydney Water since 1909 and used as a depot since at least 1930.
- The site is located adjacent to the former South Ashfield Brickworks which may have been the source of fill material identified on-site.
- Historical aerial photographs indicate that there were previously a greater number of buildings within the investigation site area comprising of permanent structures (including those still remaining on-site) and demountable structures.
- NSW WorkCover licensing records for 1995-1996 indicate that up to 200 litres of petroleum and diesel fuel was stored in cabinets in warehouses located along the western boundary.

## 3.2 NSW EPA Records

The consultant (PRM 2019a) reported that a search of the NSW EPA contaminated land database was undertaken and that the site or land immediately adjoining the site (within a 500 metre radius) has not been notified to the EPA under Section 60 of the CLM Act; not listed on the public register maintained under Section 308 of the *Protection of the Environment Operations Act (POEO Act)* 1997; nor is on the list of sites that have been notified to the EPA under the CLM Act.

## 3.3 Previous and Other Investigations

Previous soil investigation undertaken at the site was summarised in the consultant's report (PRM 2019a) and an overview is as follows:

- Two distinct fill layers were observed with a shallow fill layer (generally 0.2 – 0.7 m) consisting of gravelly clays. A deeper sand fill layer was encountered in the southwest corner of the site (TP09 and TP15). A variety of anthropogenic inclusions were observed in both fill layers.
- Benzo(a)pyrene TEQ was detected exceeding the site assessment criteria (SAC) for human health for low density residential land use in four sample locations (TP03, TP09, TP12 and TP14) in the shallow fill layer with the exception of the location in the southwestern corner (TP09) where the exceedance was detected at 1.0 m bgs in the deeper fill layer. Benzo(a)pyrene was detected above the ecological SAC for urban residential and open public spaces in seven samples (TP01, TP03, TP09, TP12, TP13 and TP14) in the shallow fill layer with the exception of the location in the southwestern corner where the exceedance was detected at 1.0 m bgs.
- Lead was detected above the human health SAC in fill material at 0.5 – 0.6 m bgs at TP12.
- Zinc was detected above the ecological SAC at TP11 (0.0 – 0.1 m bgs) and TP 12 (0.5 – 0.6 m bgs) in gravelly clay fill. The exceedances were considered to be limited in nature and not pose significant risk to on-site ecological receptors.
- Asbestos containing material (ACM) in the form of fibre-cement sheet fragments were observed at two location (TP11 and TP14). All fragments tested positive for asbestos. The

calculated concentration of asbestos as ACM exceeded the SAC for residential land use for the sample collected at TP11 (0.0 – 0.1 m bgs). Asbestos was identified in soil in the 0.0 – 0.1 m bgs layer.

- Management and removal of identified asbestos, lead and PAH impacts to meet site criteria for potential future land use was recommended if the site is proposed for divestment.

The presence of hazardous building materials at the site was assessed and documented in PRM (2017) and PRM (2018a) as follows:

- A hazardous building materials (HBM) audit (PRM 2018a) was conducted at the site. HBMs assessed as part of the audit included ACM, lead containing paint/dust, synthetic mineral fibre (SMF) materials, PCBs containing capacitors in fluorescent light fittings, and ozone depleting substances (ODS) containing air conditioners/refrigerators. Of these, lead containing paint, PCBs, non-friable asbestos, bonded SMF and ODSs were identified as being present at the site. Priority risk ratings were assigned to each of the identified HBMs.
- A hazardous building materials removal plan (PRM 2017) was prepared to document the legislative requirements and methodology for removal of identified HBMs and any unidentified finds.

### 3.4 Audit Opinion

The site history information provided by the consultant (PRM 2019a) has been checked against, and generally meets, the requirements of the OEH 2011, with some exceptions as noted below.

The consultant did not undertake a search of relevant heritage databases. For completeness, the auditor undertook a search of the Australian and NSW Heritage databases on 25 and 26 June 2019 with the following findings (search records provided in **Appendix E**):

- The Australian Heritage Register did not identify any heritage items on-site. Two items (Andrews Avenue Urban Conservation Area and Ashbury Urban Conservation Area) were listed as indicative places located in proximity of the site.
- The NSW Heritage Register does not list any items on-site or in proximity of the site as Aboriginal Places under the *National Parks and Wildlife Act*.
- The NSW Heritage Register lists the Ashfield Reservoir, located immediately to the south of the site, as a heritage item by the Heritage Council of NSW, local council and Sydney Water. Eleven other items in proximity to the site were listed as heritage items by local council on the NSW Heritage Register.

The extent of the site history information presented by the consultant (PRM 2019a) is considered generally sufficient and comprehensive for the purposes of identifying contamination issues at the site as part of the site investigation process.

# 4. Conceptual Site Model

The National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) NEPC 2013) identifies a conceptual site model (CSM) as a representation of site related information regarding contamination sources, receptors, and exposure pathways between those sources and receptors. The development of a CSM is an essential part of all site assessments and remediation activities.

NEPC (2013) identified the essential elements of a CSM as including:

- Known and potential sources of contamination and contaminants of concern including the mechanism(s) of contamination;
- Potentially affected media (soil, sediment, groundwater, surface water, indoor and ambient air);
- Human and ecological receptors;
- Potential and complete exposure pathways; and
- Any potential preferential pathways for vapour migration (if potential for vapours identified).

Based on the known contamination, each of the elements of the CSM are discussed as follows.

## 4.1 Sources of Contamination

Based on a review of site history and previous site investigations, the consultant (PRM 2018c and PRM 2019a) identified the following areas of potential contamination as requiring assessment:

- Uncontrolled filling from unknown sources;
- ACM from former/current buildings and previously demolished structures;
- Potentially contaminated groundwater as a secondary source; and
- Uncontrolled filling from unknown sources at the former Ashfield Brickworks to the west potentially contaminated groundwater and HGG migrating onto the site.

Based on the identified sources of contamination, the consultant (PRM 2018c) identified the following contaminants of potential concern:

<u>Soil</u>

- Heavy metals (arsenic, cadmium, chromium, copper, lead, nickel, mercury and zinc)
- Total Recoverable Hydrocarbons (TRH)
- Benzene, Toluene, Ethylbenzene, Xylenes (BTEX)
- Polycyclic Aromatic Hydrocarbons (PAHs)
- Organochlorine and organophosphorus pesticides (OCPs/OPPs)
- Polychlorinated biphenyls (PCBs)
- Asbestos.

<u>Groundwater</u>

- Heavy metals (arsenic, cadmium, chromium, copper, lead, nickel, mercury and zinc).
- TRH
- BTEX

- PAHs
- VOCs
- Ammonia
- Dissolved methane.

Ground Gas

- Methane
- Carbon dioxide/carbon monoxide
- Hydrogen sulphide.

### 4.2 Potentially Affected Media

Potentially contaminated media included soil, groundwater and HGG.

### 4.3 Potential Human and Ecological Receptors

Potential human receptors identified included the following:

- Construction workers involved in site development works;
- Maintenance workers involved in post development works;
- Future residential land users; and
- Off-site users of surrounding residential land.

Potential ecological receptors were identified as those which may be present in future vegetated areas of the site, groundwater dependent ecosystems and Cooks River.

### 4.4 Potential Exposure Pathways

Based on the identified COPCs and potential receptors, the following potential exposure pathways were identified for human receptors by the consultant (PRM 2018c and PRM 2019a):

- Dermal and oral contact with impacted fill material;
- Inhalation of fibres, vapours, gases or dust;
- Exposure to low oxygen or potentially explosive environments as a result of HGG; and
- Direct contact with groundwater.

### 4.5 Preferential Pathways

The consultant (PRM 2018c and PRM 2019a) provided limited consideration of potential preferential pathways for the site.

The consultant (PRM 2019a) considered that the geological profile comprising of silty clay lenses above shale bedrock was considered likely to significantly limit vertical migration via fractures in the bedrock, of potential HGG from the former brickworks to the site. Further, a lack of pressure driven gas flow in the gas monitoring well adjacent to the former brickworks and across the site indicates that HGG surface emission at the site does not present a significant risk to future human receptors.

### 4.6 Audit Opinion

The consultant had initially identified potential contamination issues based on site history review and previous site investigations (email via A. Dobson [Sydney Water] 2018, personal communication, 13 February). Following intrusive soil investigations at the site (PRM 2019b), HGG and groundwater quality were identified as data gaps for the site (PRM 2018). The combined list of potential contaminants for the data gap investigation, HGG and groundwater assessment, and associated

potentially contaminated media identified by the consultant are considered to have been suitably comprehensive noting the former use of the site as a depot and the adjacent site for brickworks. Taking into consideration the site history review and inspection conducted at the site, the auditor considers that the list of COPCs identified by the consultant was adequate in assessing the nature and extent of contamination across the site.

The consultant also considered both human and ecological receptors with partial consideration of potential exposure pathways.

The auditor notes that while a Hazardous Building Materials Pre-Demolition Audit (PRM 2018a) was conducted at the site which identified lead-based paint on external surfaces of two buildings/structures at the site, lead/zinc-based paints on buildings/structures had not been identified as a source of potential contamination for the site. Notwithstanding this omission, the soil and groundwater assessment programs included the analysis of lead and zinc as CoPCs. The auditor considers that the site investigations conducted have sufficiently addressed this potential contamination source for the site.

The auditor notes that the combined CSMs prepared by the consultant (PRM 2018c and PRM 2019a) were sufficiently detailed and generally meet the requirements of the NEPC 2013.

Overall, the auditor considers that the identified potential contamination issues and potentially contaminated media were appropriate for the purposes of assessing the contamination status of the site.

# 5. Sampling Analytical and Quality Program

## 5.1 Data Useability Assessment

An assessment of quality assurance and quality control (QA/QC) has been undertaken by the consultant (PRM 2019a and PRM 2019b) by developing data quality indicators (DQIs), broadly based on the seven-step process referred to in EPA 2017.

The auditor has undertaken a review of the field and laboratory QA/QC undertaken by the consultant, which has been summarised in **Tables 5.1** against the PARCC parameters (precision, accuracy, representativeness, comparability and completeness).

**Table 5.1 Data Usability Assessment (PRM 2019a and PRM 2019b)**

| Parameter | DQIs | Requirement | Auditor Assessment |
|---|---|---|---|
| **Field and Lab QA/QC** | | | |
| Precision | Intra-laboratory duplicates (blind) | Collected at a rate of 1 per 20 samples.<br>Analysed for primary contaminants of concern.<br>RPDs typically 30% (inorganics) -50% (organics) | Two intra-lab soil duplicates were collected and analysed for the main contaminants of concern (incl. heavy metals, PAHs, OCP/OPP, TRH/BTEX and PCBs) during the intrusive soil investigation. The frequency of collection equated to 12%, above the minimum requirement of 10%.<br>RPDs ranged from 0 to 40%, and no DQI exceedances were noted. |
| | | | One intra-lab groundwater duplicate was collected and analysed for the contaminants of concern (incl. heavy metals, PAHs, TRH/BTEX, VOCs, ammonia and methane) during the groundwater investigation. The frequency of collection equated to 33%.<br>RPDs ranged from 0 to 92%.<br>The RPD for ammonia analysis was outside the acceptance limit. As the concentrations of ammonia detected were below the GIL, the RPD exceedance is not considered to have impacted the dataset. |
| | Inter-laboratory duplicates (spilt) | Collected at a rate of 1 per 20 samples.<br>Analysed for primary contaminants of concern.<br>RPDs typically 30% (inorganics) -50% (organics) | No inter-lab soil duplicate was collected.<br>The absence of an inter-lab duplicate is not considered to be a significant non-conformance. Given that a significant proportion of the dataset comprised concentrations below the laboratory LOR and no DQIs were exceeded in relation to intra-laboratory duplicates, the auditor considers that the reliability of the dataset is not affected. |
| | | | One inter-lab groundwater duplicate was collected and analysed for the contaminants of concern (incl. heavy metals, PAHs, TRH/BTEX, VOCs, ammonia and methane) during the groundwater investigation. The frequency of collection equated to 33%.<br>RPDs ranged from 0 to 67%.<br>The RPD for ammonia and arsenic analyses were outside the acceptance limit. As the concentrations of ammonia and arsenic detected were below the adopted SAC (where available), the RPD exceedances are not considered to have impacted the dataset. |

| Parameter | DQIs | Requirement | Auditor Assessment |
|---|---|---|---|
| | Laboratory duplicates | One per batch.<br>RPDs less than 50%. | Laboratory duplicates were undertaken by the laboratories at a rate of one per batch. The reported RPDs were within laboratory acceptance limits with the exception of copper (50%) and chrysene (67%) for soil analysis. The RPD exceedances were attributed to the non-homogeneous nature of the soil samples. |
| Accuracy | Field rinsate blanks | Collected at a rate of 1 per piece of decontaminated sampling equipment.<br>Analysed for primary contaminants of concern. Laboratory results below the laboratory limit of reporting (LOR). | No field rinsate samples were collected during the soil sampling program as sampling involved the use of dedicated gloves at for each sample.<br>Two field rinsate samples were collected during the groundwater sampling program. The field rinsate samples were analysed for the primary contaminants of concern. All results were reported below the laboratory LORs with the exception of the detection of TRH $C_{10}$-$C_{16}$ and TRH $C_{15}$-$C_{28}$ slightly above the LOR in one field rinsate sample. Envirolab report 200446 stated that the positive result was due to a single peak with no hydrocarbon profile, consistent with plastic containers.<br>This non-conformance is not considered to affect the reliability of the data. |
| | Trip blanks | Collected at a rate of 1 per day of sampling where primary contaminants of concern include volatiles.<br>Analysed for volatiles of concern.<br>Laboratory results below laboratory LOR. | One laboratory prepared soil trip blanks and two water trip blanks were submitted by the consultant during the soil and groundwater investigations respectively, with all results reported below laboratory LORs indicating that cross contamination had not occurred during the transport of samples to the laboratory. |
| | Trip spike | Collected at a rate of 1 per batch where primary contaminants of concern include volatiles.<br>Laboratory results / recovery within 30 % of the spiked concentration. | One laboratory prepared soil trip spike and one water trip spike were analysed during the soil and groundwater investigations with laboratory recoveries reported between 96 - 111%, indicating that the loss of volatile compounds during transport was minimal. |
| | Laboratory surrogate spikes | Surrogate spikes to be performed as required by NATA accreditation, generally per sample analysed. | Surrogate recoveries were reported within the NATA accredited laboratory control limits. |
| | Laboratory method blanks | Laboratory method blanks to be performed as required by NATA accreditation, generally 1 blank per batch.<br>Results to be below laboratory LOR. | All laboratory method blanks were reported less than the LOR. |

| Parameter | DQIs | Requirement | Auditor Assessment |
|---|---|---|---|
| Accuracy | Laboratory control samples (LCS) | LCS to be performed as required by NATA accreditation, generally one per 20 samples per batch. | LCS recoveries were reported to be within laboratory control limits. |
| | Laboratory matrix spikes (MS) | MS to be performed as required as NATA accreditation, generally one per 20 samples per batch.<br>Recoveries to be within 70-130 % or 30-130 % (phenols only). | Matrix spike recoveries were reported within laboratory control limits. |
| **Sampling and Analytical Schedule and Sampling Methodology** | | | |
| Representativeness | Soil sampling locations | Samples to be collected on a representative basis consistent with the CSM. | Nine systematic/targeted locations were placed across the site via test pit. The sample locations were placed to provide site coverage and delineate previously identified (Parsons Brinckerhoff 2015) areas of concern at TP03, TP09 and TP13.<br>The auditor considers that the number of soil sampling locations and the rationale adopted by the consultant provided adequate coverage of the site and are consistent with the requirements of Table A of NSW EPA (1995), noting the potential areas of concern and associated COPCs identified as part of the site history review.<br>However, the auditor notes that additional sampling will be required to be undertaken following demolition of existing buildings. |
| | Soil sampling depths and intervals | Soil sampling depths should be consistent with the anticipated distribution of contamination as detailed in the consultant's CSM. | Test pits were excavated to a maximum depth of 1.2 m bgs, with samples collected at near surface and every 0.5 m or change in lithology. Two samples were selected from each location and submitted for laboratory analysis. With the exception of TP108 and TP109, all test pit locations extended into underlying natural clays or shale bedrock. TP108 and TP109 were undertaken as surface scrapes to delineate previously identified asbestos as ACM impact.<br>The collection of near surface or samples collected at less than 0.5 m bgs and submission for analysis of heavy metals from each test pit is considered appropriate to adequately assess potential impacts from lead/zinc-based paints on buildings/structures. The soil sampling depths and intervals at each of the sampling locations were appropriate given the identified potential contamination sources and site geology. The auditor considers the sampling depths are considered appropriate to assess the vertical extent of contamination at the site. |

| Parameter | DQIs | Requirement | Auditor Assessment |
|---|---|---|---|
| Representativeness | Soil sampling methodology | Soil samples to be collected using a methodology which is appropriate for the primary contaminants of concern. | Soil samples were collected either directly from the hand auger or excavator bucket. Each soil sample was collected using fresh nitrile gloves and placed into laboratory supplied 250 mL Teflon-lined jars and clip-lock bags, each with a unique sample ID.<br>Collected samples were immediately stored on ice in an esky and sent to NATA-accredited analytical laboratories under chain of custody conditions for analysis.<br>Samples collected for asbestos analysis were sieved and submitted to the laboratory as bulk soil samples.<br>The auditor considers that the sampling methods adopted by the consultant are considered appropriate and are not likely to affect the representativeness of the soil data. |
| | Groundwater sampling locations | Groundwater sampling locations to assess areas of concern, allow for lateral delineation of contamination and assess the groundwater flow direction. | Three ground gas monitoring wells were installed as combined hazardous ground gas/groundwater monitoring wells. The monitoring wells were located in the northern western, eastern and southern portions of the site.<br>The number and location of monitoring wells installed are considered sufficient to provide as assessment of groundwater quality at the site. |
| | Groundwater well construction | Wells to be constructed in accordance with the current version of the Minimum Constructions Requirements for Water Bores in Australia, and screened to target the likely contaminated portion of the water column. | The consultant reported that the combined hazardous ground gas/groundwater monitoring wells were installed to a maximum depth of 15 m bgs in shale. The monitoring wells were drilled using solid flight auger and rotary hammer.<br>Groundwater seepage was not observed within the wells during drilling. However, standing water levels (SWLs) were reported at depths of 13.95 m bgs (GW01), 10.14 m bgs (GW03) and 5.50 m bgs (GW08) during sampling.<br>The monitoring wells were constructed using 50 mm diameter Class 18 PVC casing and machine slotted screen intervals. Wells were backfilled with a gravel pack followed by an annular seal of granular bentonite pellets. The wells were finished with airtight well caps and quick connect fitting valves for gas sampling with standpipes and concrete plugs at the surface. The top of the well was sealed with a steel gatic cover/road box for GW08.<br>A copy of the borelogs was provided by the consultant (PRM 2019a) with a summary also provided in the report and which provides sufficient detail on the construction of the monitoring wells.<br>The Auditor considers that the monitoring wells were suitably installed in accordance with relevant guidelines and were suitable to assess groundwater conditions at the site. |

| Parameter | DQIs | Requirement | Auditor Assessment |
|---|---|---|---|
| Representativeness | Groundwater sampling methodology | Groundwater samples to be collected approximately 7 days after well installation and development. Groundwater samples to be collected using low flow methods (where it can be demonstrated that this is appropriate), or by purging at least 3 well volumes, until field parameters have adequately stabilised. | Following installation, the monitoring wells were purged dry following the removal of three bore volumes of groundwater. Purging was undertaken using a peristaltic pump.<br>Field parameters, including pH, temperature, conductivity, redox potential and dissolved oxygen were measured following purging and prior to sampling using a water quality meter. A summary table of the field parameters were provided in the consultant's report (PRM 2019a). No PSH was noted in the wells. Field sampling sheets including details of purging and sampling of the groundwater wells were also provided. The consultant reported (PRM 2019a) that steady state had not been reached for field parameters in GW08 although the auditor notes that the sampling sheets confirm that the field parameters had adequately stabilised at the time of sampling for all three monitoring wells.<br>Groundwater samples were collected using a low flow pump approximately 11 days after well installation.<br>The auditor considers that the groundwater sampling method adopted by the consultant was generally considered appropriate and not likely to affect the representativeness of the data. |
| | Hazardous ground gas sampling locations | Ground gas sampling locations to assess areas of concern at relevant depths. | Nine HGG monitoring wells were installed across the site targeting the north-western and western portion of the site adjacent to the former brick pit. The wells were installed to approximately 3.0 to 3.45 m bgs (HGG monitoring) or 15 m bgs (combined HGG/groundwater monitoring).<br>The auditor considers the locations and depths of the wells installed to be appropriate to assess ground gas conditions at the site. |
| | Hazardous ground gas well construction | Wells to be constructed in accordance with NSW EPA (2012) | The consultant reported that the HGG bores were installed using solid flight auger with rotary hammer used within the shale bedrock for the combined HGG/groundwater wells. The monitoring wells were constructed using 50 mm diameter Class 18 PVC casing and machine slotted screen intervals. Wells were backfilled with a gravel pack followed by an annular seal of granular bentonite pellets. The wells were finished with airtight well caps and quick connect fitting valves for gas sampling with standpipes and concrete plugs at the surface. The top of the well was sealed with a steel gatic cover/road box for HGG08.<br>A copy of the borelogs was provided by the consultant (PRM 2019a) with a summary also provided in the report and which provides sufficient detail on the construction of the monitoring wells.<br>The Auditor considers that the monitoring wells were suitably installed in accordance with relevant guidelines and were suitable to assess ground gas conditions at the site. |

| Parameter | DQIs | Requirement | Auditor Assessment |
|---|---|---|---|
| Representativeness | Hazardous ground gas sampling methodology | HGG monitoring to be conducted in accordance with NSW EPA (2012) | The consultant (PRM 2019a) reported that HGG spot monitoring was conducted for six events over a 10 week period using a landfill gas analyser connected to the quick fit connections in the monitoring well caps. Monitoring was undertaken for atmospheric pressure, flow rate, oxygen concentration, carbon dioxide, methane concentration, hydrogen sulfide, hydrogen and carbon monoxide generally every 30 seconds for three to five minutes. The monitoring was undertaken generally during a fall in atmospheric pressure.<br>Continuous HGG monitoring was undertaken at three locations using GasClams™. Monitoring was undertaken every 30 minutes over a period of two weeks (HGG01 and HGG09) or five weeks (HGG06). Monitoring was undertaken for methane, carbon dioxide, oxygen, hydrogen sulfide and atmospheric pressure.<br>HGG monitoring was undertaken generally under falling atmospheric pressure conditions measured using a landfill gas analyser and based on Bureau of Meteorology data.<br>A summary of the spot and continuous monitoring results was provided in the report with field monitoring sheets and GasClam™ monitoring data provided as an appendix (PRM 2019a).<br>The auditor notes that there were inconsistencies in the HGG spot sampling with some readings not recorded and varying lengths of time for sampling. Given that the low levels of HGG detected, the non-conformances are not considered to be significant and to affect the reliability of the dataset. |
| | Soil and groundwater sampling containers | Soil samples to be collected into laboratory supplied, clean unpreserved Teflon lined jars.<br>Groundwater samples to be collected into laboratory supplied, clean and appropriately preserved sampling containers. | Soil samples were immediately placed in laboratory supplied samples jars which were sealed tight and placed on ice for transport to the analytical laboratories. Soil samples collected for asbestos analysis was placed in sealed zip-lock plastic bags for analysis.<br>Groundwater samples were immediately placed into appropriately preserved containers provided by the laboratory and placed on ice for transport to the analytical laboratories. |

| Parameter | DQIs | Requirement | Auditor Assessment |
|---|---|---|---|
| Representativeness | Soil and groundwater sampling equipment decontamination | Sampling equipment to be decontaminated between sampling locations or between sampling depths; and monitoring well locations where significant contamination is encountered. | The consultant (PRM 2019b) reported that soil sampling was conducted by hand using fresh nitrile gloves for each sample.<br>Groundwater samples were reported (PRM 2019a) to have been collected using single use HDPE tubing connected to the peristaltic pump into laboratory prepared sample containers.<br>While limited description of the sampling techniques were provided by the consultant (PRM 2019a and PRM 2019b), based on observations undertaken during inspection of the site investigation works by the auditor's assistant and the results of field QC samples, the auditor considers the sampling methods employed by the consultant during the investigation works are generally acceptable and are unlikely to have resulted in significant cross-contamination between sample locations. |
| | Soil sample contamination screening | Soil samples to be screened for contamination via visual / olfactory observations and photo-ionisation detector (PID) measurement. | The consultant (PRM 2019b) provided borelogs detailing observations of material types; visual and olfactory observations; sample depths; and soil moisture / water observations, where present.<br>The Auditor considers the screening of soil samples to have been undertaken in accordance with EPA guidelines. While PID screening was not undertaken during the soil investigations, the auditor does not consider the non-conformance to have affected the representativeness of the sampling undertaken. |
| | Sample storage and transport | Samples to be placed in an insulated container and chilled.<br>Samples to be transported to laboratory under chain of custody conditions. | All soil and groundwater samples were transported in ice-cooled/insulated chests, under chain of custody conditions, to laboratories that were NATA accredited for the analysis performed.<br>The consultant provided detailed laboratory reports and chain of custody documentation for the soil and groundwater sampling works (PRM 2019a and PRM 2019b). Review of sample receipt advice issued by the laboratories indicated that all samples were intact, correctly preserved, and chilled (as appropriate) at the time of receipt. |
| | Laboratory sample receipt advice | No damaged containers.<br>No samples submitted in containers which have not been chilled.<br>No samples to be submitted without sufficient times to comply with recommended holding times. | Laboratory sample receipt advice provided by the nominated laboratories confirmed that all samples were received in suitable condition, with sufficient times to comply with recommended holding times. |

| Parameter | DQIs | Requirement | Auditor Assessment |
|---|---|---|---|
| Representativeness | Holding times | Samples to be extracted and analysed within recommended holding times. | All samples extracted and analysed within holding times. |
| | Analytical Method | Samples to be analysed using NATA accredited methodology. | Laboratories used included: Envirolab Services Pty Ltd (primary) and ALS Sydney (secondary).<br>All laboratories utilised were NATA accredited.<br>The primary laboratory and the secondary laboratory employed for the chemical analyses used analytical methods which were considered appropriate for the identified COPCs at the site and for which the laboratories were NATA accredited. |
| Completeness | Sampling, analysis and quality plan completeness | 100 % of sampling, analysis and quality plan to be implemented. | A limited sampling and analysis strategy for the soil investigation program was provided via email (email via A. Dobson [Sydney Water] 2018, personal communication, 12 February and 13 February). The sampling and analysis strategy for the groundwater and HGG investigation program was documented in the SAQP (PRM 2018). |
| | Field documentation | All relevant field documentation to be collated including sampling logs and calibration records. | The consultant provided test pit/borehole logs, calibration records for the water quality meter, interface meter, landfill gas meter and GasClams™; groundwater purging data, landfill gas purging data; and relevant field notes. |
| | Laboratory documentation | All relevant laboratory documentation to be collated, including chain of custody records, sample receipt advice and analytical reports. | With the exception of the laboratory receipt advice from the secondary laboratory, the consultant provided all relevant COC documentation; laboratory sample receipt advice; and full laboratory certificates in the reports.<br>The auditor considers the non-conformance to not be significant and does not affect the outcome of the audit. |
| | Critical sample validity | All critical sample data to be valid. | The auditor considers that the data is considered reliable, for the purposes of the soil, groundwater and HGG investigations. |
| | Sampling, analysis and quality approach | Adequately comparable sampling, analysis and quality approach to be used throughout the project. | The auditor considers that the data is comparable, as consistent sampling methods were employed throughout the investigation works. All laboratory analyses were undertaken by NATA accredited laboratories.<br>Furthermore, consistent field staff were employed during the field program. |
| | Sampler | Samplers used throughout the project to have sufficient experience. | Consistent experienced field staff were employed by consultant during the field program. |

## 5.2 Audit Opinion

The quality assurance/quality control measures employed by the consultant (PRM 2019a and PRM 2019b) were checked and found to indicate that the consultant implemented a systematic planning process, and adequately complied with the requirements outlined in OEH 2011, NEPC 2013 and NSW EPA 2017. The laboratory QA/QC results have been reviewed and the results indicate that the analytical laboratories were achieving adequate levels of precision and accuracy. As such, the sampling, analytical and quality protocols undertaken by the consultant were considered to be

adequately reliable for the purpose of assessing the contamination status of the site; and the data is therefore considered reliable and useable for the purpose of this audit.

# 6. Assessment Criteria

The consultant (PRM 2019a and PRM 2019b) stated that the site was proposed for divestment for low density residential land use with accessible soils/gardens.

## 6.1 Soil Criteria

A Data Gap Analysis was undertaken by the consultant (PRM 2019b) to address data gaps from the previous site investigation.

Based on the proposed use, the site was assessed by the consultant (PRM 2019b) against guidelines presented in NEPC (2013) and other NSW EPA approved guidelines, including the following:

- Health Investigation Levels (HIL): HIL A – residential with garden/accessible soil (home grown produce <10% fruit and vegetable intake, no poultry, also includes children's day care centres, preschools and primary schools.
- Health Screening Levels (HSL): HSL A for vapour intrusion in low-high density residential land use, for sand soils.
- Management Limits for TPH fractions F1 – F4 in soil: residential, parkland and public open space, for coarse soils.
- HSLs for direct contact in residential (low density) land use adopted from CRC CARE Technical Report No. 10 (Friebel and Nadebaum 2011).
- Ecological Screening Levels (ESL): urban residential/ public open space land use, coarse grained soils.
- Ecological Investigation Levels (EIL) – urban residential/public open space and calculated based on site specific data;

A conservative criterion of no asbestos in any form was adopted as a preliminary screen and taking into consideration WHS regulations.

The consultant considered that as direct contact HSL-A have been adopted, the less conservative intrusive worker HSLs have not been adopted for comparison purposes. Similarly, the more conservative coarse grained soil criteria were adopted to address the different strata present at the site.

The consultant (PRM 2019b) also referenced NSW EPA (2014) *Waste Classification Guidelines Part 1: Classifying Waste* for assessing appropriate waste classification for off-site disposal of contaminated soil as solid waste.

The consultant also adopted aesthetic criteria as part of the site assessment.

## 6.2 Groundwater Criteria

Assessment of groundwater contamination (PRM 2019a) was undertaken against guidelines presented in NEPC (2013) and other NSW EPA approved guidelines, and comprised:

- Groundwater Investigation Levels (GILs) for fresh waters.
- *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZG 2018) – 90% and unknown reliability toxicant default guideline values.
- Groundwater Health Screening Levels for petroleum hydrocarbons and naphthalene – Vapour Intrusion – HSL A & HSL B for clay soils.

As there is no criteriion for dissolved methane, the laboratory limit of reporting was adopted as a conservative measure and initial screening approach.

The consultant (PRM 2019a) noted that the site and surrounding area are serviced by reticulated water and there is no known use of groundwater for potable purposes. The drinking water guidelines were therefore not considered appropriate for the assessment of current or future landuse scenarios.

### 6.3 Ground Gas Criteria

Assessment of hazardous ground gases (PRM 2019a) was undertaken against the *Guidelines for the Assessment and Management of Sites Impacted by Hazardous Ground Gas* (NSW EPA 2012).

### 6.4 Audit Opinion

The soil criteria adopted by the consultant (PRM 2019b) for the assessment of human health and ecological risk have been checked against and were consistent with, criteria made or approved by the EPA for the proposed potential residential with garden/accessible soil land use. Site specific soil characteristics determined during previous site investigation (Parsons Brinckerhoff 2015) were used to calculate site specific EILs. The EILs have been calculated in accordance with NEPC (2013) and considered appropriate for assessing impacts to ecological receptors.

The consultant adopted asbestos criteria of 'presence/absence' for assessment of asbestos contamination. The Auditor notes that this is in accordance with the requirement for no visible asbestos as provided in NEPC (2013), and considers that the adopted criteria is adequately conservative and suitable for the initial screening of asbestos in soils at the site given the limited detections of asbestos during previous site investigations.

The consultant also took into consideration aesthetic issues (i.e., odours and discolouration) as part of the assessment works, in accordance with NEPC 2013 and EPA 2017.

The groundwater investigation criteria adopted by the consultant (PRM 2019a) have been checked against, and were sourced from relevant EPA made or approved guidelines. In the absence of criterion for dissolved methane, the adopted laboratory limit of reporting is considered suitable for initial screening. The consultant considered the Cooks River as the nearest potential ecological receptor and adopted fresh water environmental guidelines in accordance with NEPC (2013) and ANZG (2018). The adopted groundwater criteria are considered appropriate for assessing the potential impacts to ecological receptors relevant to the site setting (i.e., in a highly disturbed urban environment).

The consultant considered drinking water guidelines not to be applicable to the site and surrounding area are reticulated and taking into consideration the unlikely extraction of groundwater for drinking water at the site, the auditor is satisfied that the groundwater beneath the site does not require assessment against drinking water guidelines.

The ground gas criteria adopted by the consultant (PRM 2019a) is based on criteria sourced from NSW EPA approved guidelines and therefore considered appropriate for assessment of the proposed landuses.

Overall, the auditor considers that the soil, groundwater and ground gas criteria adopted by the consultant were appropriate for assessing the nature and extent of contamination that may be present at the site.

# 7. Site Investigation Results

## 7.1 Field Observations

A summary of field observations encountered during the site investigations undertaken by the consultant (PRM 2019a and PRM 2019b) is provided below:

- The subsurface profile across the site typically comprised brown silty clay fill with anthropogenic material (concrete, glass, brick), gravels (sandstone, shale, ironstone and shale) and rootlets underlain by silty clay. Shale bedrock underlies the natural clay.
- With the exception of one soil bore in the southwest corner of the site, fill was encountered in all bores.
- Depth of fill varied across the site. Fill material was identified to depths between 0.3 m bgs (HGG05) and 2.3 m bgs (HGG04).
- Natural silty clay was encountered to depths between 0.8 m bgs (HGG06) and 3.25 m bgs (HGG03).
- No asbestos containing material (ACM) was observed during the soil investigations.
- No odours or staining were noted during the soil investigations.
- Groundwater seepage was not encountered during the installation of the bores for ground gas and/or groundwater monitoring well installation.
- Depth to groundwater was recorded at 5.50 m (GW08), 10.14 m (GW03) and 13.95 m (GW01) with localised groundwater flow indicated to be to the west towards the former brickworks pit.
- Groundwater quality parameters were recorded during the groundwater monitoring event completed on 9th and 10th September 2018 as follows:
    - pH ranged from 5.07 to 5.53
    - electrical conductivity ranged from 13,231 µS/cm to 14,852 µS/cm
    - dissolved oxygen ranged from 0.6 ppm to 9.28 ppm
    - oxidation reduction potential ranged from 81.3 mV to 168.8 mV.

  Physicochemical parameters were measured for two monitoring wells only due to limited groundwater in GW01 at the time of sampling.

## 7.2 Soil Investigation Results

The consultant provided a summary table (**Appendix D**) including the data gap soil investigations (PRM 2019b) in addition to laboratory reports and chain of custody documentation.

A summary of the soil analytical results, in comparison to the adopted soil investigation levels (as provided in **Section 6.1**) is provided in **Table 7.1**, below.

**Table 7.1: Summary of Soil Analytical Results (mg/kg)**

| Substance | Minimum concentration | Maximum concentration | Exceedance of SAC |
|---|---|---|---|
| **Metals** | | | |
| Arsenic | < 4 | 6 | No exceedance |
| Cadmium | <0.4 | < 0.4 | No exceedance |
| Chromium (VI) | 4 | 40 | No exceedance |
| Copper | <1 | 240 | Exceedance of EIL of 160 mg/kg at TP109 0 - 0.1 (240 mg/kg) |
| Lead | 3 | 150 | No exceedance |

| Substance | Minimum concentration | Maximum concentration | Exceedance of SAC |
|---|---|---|---|
| Nickel | 1 | 120 | No exceedance |
| Zinc | 1 | 450 | Exceedance of EIL of 390 mg/kg at TP109 0 – 0.1 (450 mg/kg) |
| **BTEXN** | | | |
| Benzene | <0.2 | <0.2 | No exceedance |
| Toluene | <0.5 | <0.5 | No exceedance |
| Ethylbenzene | <1 | <1 | No exceedance |
| Total Xylenes | <1 | <1 | No exceedance |
| Naphthalene | <0.1 | <0.1 | No exceedance |
| **TRH** | | | |
| TRH $C_6$-$C_{10\ (less\ BTEX)}$ (F1) | <25 | <25 | No exceedance |
| TRH $C_{10}$-$C_{16\ (less\ naphthalene)}$ (F2) | <50 | <50 | No exceedance |
| TRH $C_{16}$-$C_{34}$ (F3) | <90 | 1,500 | Exceedance of ESL of 300 mg/kg reported at TP107 0.1 - 0.2 (320 mg/kg) and TP103 0.3 – 0.4 (1,500 mg/kg) |
| TRH $C_{34}$-$C_{40}$ (F4) | <100 | 170 | No exceedance |
| **PAHs** | | | |
| Benzo(a)pyrene | <0.05 | 55 | Exceedance of ESL of 0.7 mg/kg reported at TP103 0.3 – 0.4 (55 mg/kg) |
| Benzo(a)pyrene TEQ | < 0.5 | 79 | Exceedance of HIL-A of 3 mg/kg reported at TP107 0.1 – 0.2 (11 mg/kg) and TP103 0.3 – 0.4 (79 mg/kg) |
| Total PAHs | < 0.05 | 790 | Exceedance of HIL-A of 300 mg/kg reported at TP103 0.3 – 0.4 (790 mg/kg) |
| **OCPs** | | | |
| DDE+DDD+DDT | < 0.1 | < 0.1 | No exceedance |
| Aldrin+Dieldrin | < 0.1 | < 0.2 | No exceedance |
| Individual OCPs | < 0.1 | < 0.1 | No exceedance |
| **OPPs** | | | |
| Individual OPPs | < 0.1 | < 0.1 | No exceedance |
| **PCBs** | | | |
| Total PCBs | < 0.1 | < 0.5 | No exceedance |
| **Asbestos** | | | |
| Asbestos fragments on surface | - | - | No potential ACM was observed on surface or during test pit excavation |
| Asbestos (ACM >7mm) | <0.01% w/w | <0.01% w/w | No exceedance |
| Asbestos in soil (<2mm AF/FA) | <0.001% w/w | <0.001% w/w | No exceedance |

## 7.3 Groundwater Investigation Results

The consultant (PRM 2019a) provided a summary table (**Appendix D**) in addition to laboratory reports and chain of custody documentation.

A summary of groundwater analytical results, in comparison to adopted groundwater investigation levels (as provided in **Section 6.2**) is provided in **Table 7.2**, below.

**Table 7.2: Summary of Groundwater Analytical Results (µg/L)**

| Substance | Minimum concentration | Maximum concentration | Exceedance of GAC |
|---|---|---|---|
| **Metals** | | | |
| Arsenic | < 1 | 8 | No exceedance |
| Cadmium | < 0.1 | 4.4 | GW08 |
| Chromium (III+VI) | < 1 | < 1 | No exceedance |
| Copper | 4 | 250 | GW01, GW03 and GW08 |
| Lead | < 1 | 1 | No exceedance |
| Mercury | < 0.05 | 0.1 | GW08 |
| Nickel | 49 | 180 | GW01, GW03 and GW08 |
| Zinc | 63 | 470 | GW01, GW03 and GW08 |

| Substance | Minimum concentration | Maximum concentration | Exceedance of GAC |
|---|---|---|---|
| **BTEXN** | | | |
| Benzene | < 1 | < 1 | No exceedance |
| Toluene | < 1 | < 1 | No exceedance |
| Ethylbenzene | < 1 | < 1 | No exceedance |
| Total Xylenes | < 2 | < 2 | No exceedance |
| Naphthalene | < 1 | < 1 | No exceedance |
| **TRH** | | | |
| TRH $C_6$-$C_{10\ (less\ BTEX)}$ (F1) | < 10 | < 10 | No exceedance |
| TRH $C_{10}$-$C_{16\ (less\ naphthalene)}$ (F2) | < 50 | < 50 | No exceedance |
| TRH $C_{16}$-$C_{34}$ (F3) | < 100 | < 100 | No exceedance |
| TRH $C_{34}$-$C_{40}$ (F4) | <100 | < 100 | No exceedance |
| **PAHs** | | | |
| Naphthalene | < 0.2 | < 0.2 | No exceedance |
| Total PAHs | < 0.1 | < 1 | No exceedance |
| **VOCs** | | | |
| Total VOCs | < 0.001 | < 10 | No exceedance |
| **Miscellaneous** | | | |
| Ammonia | 350 | 380 | No exceedance |
| Dissolved methane | < 5 | < 5 | No exceedance |

## 7.4 Ground Gas Investigation Results

The consultant (PRM 2019a) provided a summary table (**Appendix D**) in addition to laboratory reports and chain of custody documentation.

A summary of hazardous ground gas screening values (GSVs) calculated from spot and continuous monitoring results, in comparison to adopted ground gas criteria (as provided in **Section 6.3**) is provided in **Table 7.3**, below.

**Table 7.3: Summary of Gas Screening Values**

| Location | Minimum | Maximum | Continuous (GasClams™)[2] | Worse Case[1] |
|---|---|---|---|---|
| **Methane** | | | | |
| HGG01 | 0.0001 | 0.0022 | 0.001 | 0.0044 |
| HGG02 | 0.0001 | 0.0003 | NA | 0.0003 |
| HGG03 | 0.0001 | 0.0002 | NA | 0.0002 |
| HGG04 | 0.0001 | 0.0005 | NA | 0.0005 |
| HGG05 | 0.0001 | 0.0005 | NA | 0.0005 |
| HGG06 | 0.0001 | 0.0012 | 0.003 | 0.003 |
| HGG07 | 0.0001 | 0.0003 | 0.0001 | 0.0003 |
| HGG08 | 0.0001 | 0.0027 | 0.0001 | 0.0027 |
| HGG09 | 0.0001 | 0.0005 | 0.0001 | 0.0005 |
| **Carbon Dioxide** | | | | |
| HGG01 | 0.0018 | 0.0036 | 0.0046 | 0.0064 |
| HGG02 | 0.002 | 0.0087 | NA | 0.0261 |
| HGG03 | 0.0029 | 0.0056 | NA | 0.0058 |
| HGG04 | 0.0005 | 0.004 | NA | 0.0105 |
| HGG05 | 0.0015 | 0.021 | NA | 0.0295 |
| HGG06 | 0.0025 | 0.0036 | 0.024 | 0.024 |
| HGG07 | 0.0008 | 0.0072 | NA | 0.0216 |
| HGG08 | 0.0028 | 0.0216 | NA | 0.0576 |
| HGG09 | 0.0012 | 0.0033 | 0.0009 | 0.0033 |

Notes:

[1] GSV based on highest flow rate and concentration observed across all six rounds

[2] GSV based on highest concentration from GasClams™ and location of highest flow rate

[NA] Not installed

## 7.5 Consultant's Interpretations and Conclusions

### 7.5.1 Soil

The consultant (PRM 2019b) provided the following discussion of soil results, conclusions and recommendations:

- Concentrations of COPCs in soil were reported below the adopted site assessment criteria in the fill material, with the exception of copper, zinc, TRH $C_{16}$-$_{34}$, benzo(a)pyrene, benzo(a)pyrene TEQ and total PAHs detected in soil from three testpits.
- The consultant undertook assessment of PAH compounds in TPH103 0.3 – 0.4 using the PAH Source Analyst[2] and concluded that the PAHs detected at the site were likely to be primarily associated with a black coal ash source, consistent with ash/slag and charcoal.
- The consultant undertook statistical analysis of the dataset from the detailed site investigation (Parsons Brinckerhoff 2015) and from the data gap analysis (PRM 2019b). Using soil bore logs and field observations, the near surface fill layer located beneath the asphalt hardstand was considered to have sufficient data for statistical analysis. After removal of contamination hotspot results (individual sample results greater than 250% of the adopted site assessment criteria) removed from the dataset, the calculated 95% upper confidence limits were below the adopted site assessment criteria.
- Exceedances of the adopted site assessment criteria identified during the detailed site investigation (Parsons Brinkerhoff 2015) that were not able to be addressed via statistical analysis include:
    - Heavy metals – TP12 0.5 – 0.6 (zinc 2,400 mg/kg); TP11 0 – 0.1 (zinc 400 mg/kg);
    - TRH ($C_{16}$-$C_{34}$) – TP09 1.0 – 1.1 (380 mg/kg);
    - PAHs – TP03 0 – 0.1 (benzo(a)pyrene 4.1 mg/kg); TP09 1.0 – 1.1 (benzo(a)pyrene TEQ 9.5 mg/kg); TP14 0.05 – 0.1 (benzo(a)pyrene TEQ 14 mg/kg);
    - Asbestos – ACM was observed at two locations. Asbestos as ACM collected at TP11 0 – 0.1 (0.01 %w/w) exceeded the health screening level for low density residential land use.
- With respect to the fill quality, the consultant considers that the site is not suitable for low density residential land use in it's current condition without remediation. The site is also considered to present a risk of unexpected finds in relation to asbestos, particularly in the fill toward the southwest and western boundary.
- A remediation action plan (RAP) is recommended to be prepared for the site to render it suitable for proposed low density residential land use.

### 7.5.2 Groundwater

The consultant (PRM 2019a) provided the following discussion of groundwater results and conclusions:

- Concentrations of heavy metals (cadmium, copper, mercury, nickel and zinc) detected above the adopted site assessment criteria were considered likely to be indicative of background/natural water quality in the underlying shale aquifer.
- Significant concentrations of heavy metals were not detected in soil at the site and the location of the site at the top of a ridge would make impact from off-site sources unlikely.

[2] www.pahsourceanalyst.com.au

- Given the significant depth to groundwater, it is considered unlikely that groundwater would likely be intercepted during future development works and therefore exposure to potential ecological receptors would be negligible. The geological profile indicates that viability for groundwater abstraction is low.

The consultant (PRM 2019c) considers that groundwater as a secondary source of contamination at the site does not require further consideration.

### 7.5.3 Ground Gas

The GSVs for methane and carbon dioxide concentrations at the site have been calculated to be CS1 or very low risk. EPA (2012) states that where HGG concentrations are detected above 'typical maximum' concentrations of 1% v/v for methane and 5% v/v for carbon dioxide, an increase in the Characteristic Situation to CS2 should be considered.

While a single peak methane concentration of 2.2% v/v was identified in HGG01 during one HGG spot monitoring round, a maximum concentration of 0.5% v/v was measured during 14 day continuous monitoring using a GasClam™ during a period of comparable atmospheric pressure change. Given that methane concentrations were not detected during the other spot monitoring rounds and that site conditions do not indicate that methane surface emissions present a risk to future receptors, the consultant considered that the peak methane concentration measured at 2.2% v/v is not indicative of a 'typical maximum' concentration and that an increase in the site Characteristic Situation from CS1 to CS2 is not supported.

Peak carbon dioxide concentrations (over 5% v/v) of up to 8.7% v/v were identified in four HGG monitoring wells over two monitoring rounds with a maximum concentration of 6.7% v/v measured during continuous monitoring using GasClams™. While concentrations of carbon dioxide were detected marginally above the 'typical maximum' concentration of 5% v/v, the consultant considers that the concentrations are largely attributed to background or natural conditions, and an increase in the site Characteristic Situation from CS1 to CS2 is not supported. The geological profile and site conditions are considered unlikely to present a preferential pathway for migration of HGG from the adjacent former brickworks and present a significant risk to future receptors.

The consultant (PRM 2019c) considers that the presence of hazardous ground gases at the site do not require further consideration.

## 7.6 Audit Opinion

The consultant (PRM 2019a and PRM 2019b) provided tables which adequately summarised the laboratory results, in addition to the provision of complete laboratory reports and chain of custody documentation. The auditor notes that not all the identified COPCs were included in the summary tables. Ground gas field monitoring results were also adequately summarised in tables provided by the consultant (PRM 2019a).

The auditor notes that the exceedances of the site assessment criterion for zinc in soil in the current (PRM 2019b) and previous site investigations (Parsons Brinckerhoff 2015) in near surface samples at three locations has been inferred to be due to fill at the site. The auditor considers that given the proximity of the sample locations to existing buildings/structures and the high concentrations detected at TP12 0.5-0.6 (2,400 mg/kg), the likely source of impact is from lead/zinc-based paints on the buildings/structures at the site. The auditor does not consider this discrepancy to affect the outcome of the audit.

The auditor notes that there were inconsistencies in identification of monitoring wells as soil bores in the field records although the consultant (PRM 2019a) reports that the sequence of numbering of the locations is correct despite the use of incorrect label prefixes. Negative recordings of gas flow rate were reported by the consultant (PRM 2019a) as being instantaneous with gas flow returning to zero thereafter and therefore negative readings not being representative of actual gas flow. The

auditor considers the negative gas flow readings to be a discrepancy in the field records and accepts that gas flow rate should be considered to be zero for those incidences.

The site plans provided by the consultant (PRM 2019a and PRM 2019b) adequately identified the sampling locations relevant to the main site features such as boundaries and street frontage and have been produced to scale. Figures prepared by the consultant are included as **Appendix C.**

The laboratory procedures were generally appropriate for identified potential contaminants of concern and adopted criteria against which results were compared.

A review of the laboratory reports and associated chain of custody documentation indicates that samples were received appropriately, and no discrepancies were noted.

As part of the investigation works, the consultant (PRM 2019a and PRM 2019b) undertook appropriate assessment of aesthetic issues in accordance with EPA (2017) including contaminant odours, soil discolouration, anthropogenic material and/or presence of asbestos during soil sampling.

The consultant (PRM 2019a and PRM 2019b) addressed the potential migration of the identified contaminants of concern through an assessment of soils, groundwater and hazardous ground gases across the site. The conclusions reached by the consultant in relation to soil, groundwater and ground gas contamination issues at the site are considered appropriate and meet the requirements of the site audit. Overall, the consultant reports (PRM 2019a and PRM 2019b) are considered to have obtained and reported results in a manner which enable conclusions to be drawn regarding the need for remediation of the identified contamination for the site to be made suitable for the proposed divestment for low density residential land use.

# 8. Evaluation of Land Use Suitability

In assessing the suitability of a site for an existing or proposed land use in an urban context, the decision process for assessing urban redevelopment sites should be followed (Page 46 and 47, EPA 2017), as discussed in the following sections.

This audit was undertaken with the objective of independently reviewing the site investigation reports (PRM 2019a, PRM 2019b and PRM 2019c) to determine whether the nature and extent of contamination at the site has been appropriately determined.

## 8.1 Reporting in Accordance with EPA requirements

The documents provided by the consultant have been checked against, and meet the requirements of OEH 2011. As such, the reporting of the site investigation works is considered to be appropriate.

## 8.2 Aesthetics Have Been Addressed

As part of the site investigation works, the consultant (PRM 2019a and PRM 2019b) completed an assessment for aesthetic considerations including staining, odours, anthropogenic contaminants and/or presence of asbestos.

The consultant (PRM 2019a) reported that while no asbestos containing materials or asbestos in soil were identified during the DGA, there is potential risk of unexpected finds in relation to asbestos based on previous site investigation results.

As such, aesthetic issues are considered to have been adequately addressed.

## 8.3 Soils, Groundwater and Hazardous Ground Gases Have Been Assessed Against the Appropriate Investigation Levels and Screening Values

The criteria adopted by the consultant for the site investigation works were checked against, and are consistent with, appropriate criteria endorsed by the EPA for the proposed residential land use with garden/accessible soil. As such, the soils, groundwater and ground gases are considered to have been assessed against appropriate investigation levels.

## 8.4 Background Soil Concentrations Have Been Adequately Addressed

During the site investigation works, the consultant (PRM 2019b) sampled in natural formations, providing representation of local natural soil profiles. As such, background soil concentrations are considered to have been adequately addressed.

## 8.5 All impacts of Chemical Mixtures Have Been Assessed

No issues relating to chemical mixtures in relation to the identified contaminants of concern were identified by the consultant. Hence, there was no requirement to give any further consideration to the impact of chemical mixtures.

## 8.6 Any potential ecological risks have been assessed

Soil assessment criteria were based on EPA endorsed ESLs and EILs. Groundwater investigation levels were based on EPA endorsed criteria including ANZG (2018) which incorporate provisions for the protection of species in aquatic ecosystems.

As such, ecological risks for site are considered to have been appropriately assessed as part of the site audit.

## 8.7 Site Management Strategy is Appropriate

A site management strategy has not been developed for the site as yet.

### 8.8 Contaminant Migration (actual or potential) Has Been Addressed

The consultant addressed both the potential and actual migration of the identified contaminants of concern through an assessment of site history, site setting, soils, groundwater and hazardous ground gases across the site.

In the absence of any identified impacts to groundwater, no complete source pathway receptor linkages have been identified. The site Characteristic Situation has been determined to be CS1 or very low risk from ground gases at the site and no further action is required.

As such, the requirements of the site audit in relation to consideration of contaminant migration have been met.

# 9. Audit Summary Opinion

On the basis of the findings of the site audit, and subject to the limitations in **Section 10**, the following summary opinions are provided:

- The soil investigations identified concentrations of contaminants of potential concern (copper, zinc, TRH $C_{16-34}$, benzo(a)pyrene, benzo(a)pyrene TEQ and total PAHs) in fill soils above the adopted site assessment criteria, which require remediation or management for residential with accessible soils/gardens land use.
- While not identified in the recent site investigations (PRM 2019a and PRM 2019b), asbestos has previously been identified at the site as ACM fragments. There is potential for additional asbestos to be present in fill material at the site and consideration should be given to the presence of asbestos in any remediation and/or redevelopment plans for the site.
- While assessment of groundwater at the site identified concentrations of heavy metals above the adopted site assessment criteria, the detected concentrations were attributed to background groundwater quality. There are no complete source pathway receptor linkages identified.
- Hazardous ground gases at the site have been determined to pose very low risk and as such, no further action is required.
- Consideration of aesthetic issues including staining, odours, anthropogenic contaminants and presence of asbestos has been adequately addressed in the assessment of soils at the site.
- There is no evidence of migration of contaminants from the site which is likely to result in any unacceptable risks to surrounding human or ecological receptors.
- The site investigation works (PRM 2019a and PRM 2019b) are considered to have met the requirements of the *Contaminated Sites: Guidelines for the NSW Site Auditor Scheme (3rd Edition)* (EPA 2017). The nature and extent of contamination of soil, groundwater and ground gases at the site are considered to have been adequately assessed.

## 10. Limitations

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

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

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

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

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

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 and the Site Auditor reserve the right to review the report in the context of the additional information, subject to meeting relevant guideline requirements imposed by the EPA.

# Appendix A Guidelines made or approved by the EPA

**Guidelines made or approved by the EPA (s.105 CLM Act 1997)**

Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia (ANZG 2018)

Australian Drinking Water Guidelines, National Health and Medical Research Council and Agriculture and Resource Management Council of Australia and New Zealand, 2011 (NHMRC/NRMMC 2011)

Composite Sampling, Lock, W. H., National Environmental Health Forum Monographs, Soil Series No.3, 1996, SA Health Commission, (NEHF 1996)

Contaminated Sites: Sampling Design Guidelines, NSW EPA, 1995 (EPA 1995)

Contaminated Sites: Guidelines for the Vertical Mixing of Soil on Former Broad-Acre Agricultural Land, NSW EPA, 1995 (EPA 1995b)

Contaminated Sites: Guidelines for the Assessment and Clean Up of Cattle Tick Dip Sites for Residential Purposes, NSW Agriculture and CMPS&F Environmental, February 1996 (NSW Agr. 1996)

Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites, NSW EPA, 1997 (EPA 1997, reprinted and updated by the Office of Environment and Heritage in 2011)

Contaminated Sites: Guidelines for Assessing Banana Plantation Sites, NSW EPA, 1997 (EPA 1997b)

Contaminated Sites: Guidelines for Assessing Former Orchards and Market Gardens, NSW EPA, 2005 (EPA 2005)

Contaminated Sites: Guidelines for the NSW Site Auditor Scheme (3rd Edition), NSW EPA, 2017 (EPA 2017)

Contaminated Sites: Guidelines for the Assessment and Management of Groundwater Contamination, NSW EPA, March 2007 (EPA 2007)

Contaminated Sites: Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997, NSW EPA, June 2009 (EPA 2009)

Environmental Health Risk Assessment: Guidelines for assessing human health risks from environmental hazards, Department of Health and Ageing and EnHealth Council, Commonwealth of Australia, June 2002 (EnHealth 2002)

National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended 2013, National Environment Protection Council (NEPC 2013)

## Appendix B Audit Correspondence

## Christine Louie

**From:** DOBSON, AMY <AMY.DOBSON@sydneywater.com.au>
**Sent:** Tuesday, 13 February 2018 1:17 PM
**To:** Christine Louie
**Cc:** Andrew Lau
**Subject:** RE: Auditor Services for Ashbury Reservoir
**Attachments:** 118234504_02 - PLAN - 18 12 2017.pdf

**Follow Up Flag:** Follow up
**Flag Status:** Completed

Hi Christine,

Further to the below, PRM have confirmed the approximate location of the additional 8 investigation locations (refer **X** below). The locations are targeted in the vicinity of TP09 (as per PB 2015 recommendations), and also across the remainder of the site to assist with delineation and insitu waste classification. PRM will aim to reach natural material, or machine limit (~3m) (whichever occurs first) at all locations and sample each strata encountered. PRM have allowed for two samples to be analysed per location, plus QA/QC samples. The proposed analytical suite includes metals, PAH, TRH, BTEX, OCP, OPP, PCBs and Asbestos. Select samples will also be screened for TCLP. The analytical suite is designed for the material characterisation (type/extent) and also to support the insitu waste classification. In regards to the RAP, all data collected by PRM will be used in addition to the data collected by PB in their 2015 DSI.
The extent of this data gap assessment is limited by the buildings and structures remaining in place currently. Soils beneath these structures will be assessed during the early part of the remedial works following building demolition.

I've also attached the most recent plan of subdivision attached, showing what is proposed to be the new Lot for disposal.

## Christine Louie

**From:** Christine Louie
**Sent:** Tuesday, 20 February 2018 1:27 PM
**To:** DOBSON, AMY
**Cc:** Andrew Lau
**Subject:** RE: Auditor Services for Ashbury Reservoir

Hi Amy,

Apologies for the delay in providing comments.

Please find following Auditor comments on the reports below:

- *Hazardous Building Material Pre-Demolition Audit, Ashbury Water Reservoir WS0003 165-169 Holden Street, Ashbury NSW*. Revision 2: Final, November 2017 (PRM, 2017a)

a) Details of the site description are limited although it is noted that building details are included in Table 3 in later Section 5. What were the normal operations at the time of the site inspection?
b) Table 4 states that there are no Priority 1 or Priority 2 Asbestos Containing Materials (ACM), SMF containing materials, PCB containing materials or OCD containing material items identified during the audit yet Appendix B lists the Police Communications and Depot Office Building, Southern Shed and/or Northwest Shed as Priority Risk Rating P2 for these items asbestos. Lead containing materials are listed as P2 in Table 4 but P1 in Appendix B for the Police Communications and Depot Office Building.

- *Hazardous Building Materials Removal Plan, Ashbury Water Reservoir WS0003 165-169 Holden Street, Ashbury NSW*. Revision 1: Final, December 2017 (PRM, 2017b)

a) Table 4: SMF containing materials – the SMF materials register in PRM (2017a) identified 1 unit of internal insulation material within the Rheem hot water heater – please clarify if the quantity is less than 1 $m^2$ as listed in Table 4.

The proposed scope of works for delineation of previously identified impacts and waste classification is in accordance with NSW EPA guidance.

Could you please advise what time works are scheduled tomorrow so that I can do a site visit?

Also, could you please provide copies of the PB PSI and DSI completed previously?

Regards,
Christine

**Christine Louie** | Principal | JBS&G
Sydney | Melbourne | Adelaide | Perth | Brisbane | Canberra | Darwin | Wollongong
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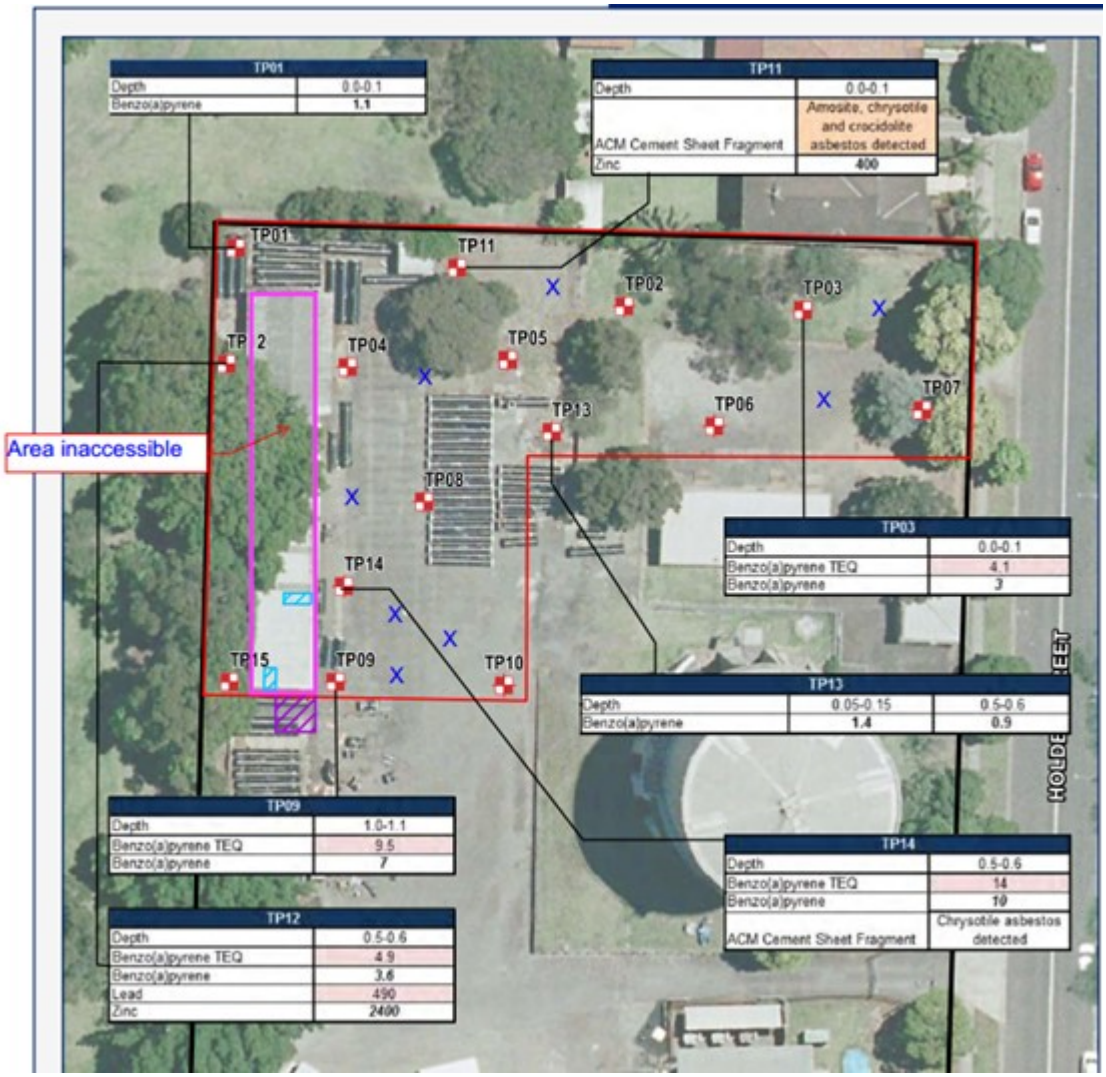


Regards,

Amy Dobson
Senior Project Manager – Environmental Services
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---

**From:** DOBSON, AMY
**Sent:** Monday, 12 February 2018 2:15 PM
**To:** 'Christine Louie' <clouie@jbsg.com.au>
**Cc:** Andrew Lau <ALau@jbsg.com.au>
**Subject:** RE: Auditor Services for Ashbury Reservoir

Hi Christine,

Thanks for your fast response on this.

Please find the two PRM documents attached.

With respect to the data gap assessment/pre-demolition soil testing, I confirm the plan is for PRM to mobilise within two weeks to complete the following:

- **Scope**: 8 test pits (locations not yet defined, I've requested from PRM).
- **Aim**: provide vertical characterisation/delineation of impacted soils to further refine the extent of contamination, confirm the waste classification and inform the RAP (to be developed following the exercise).
- **Sample analysis**: 2 primary samples per test pit for a broad standard suite of analysis.
- **QA/QC samples**: duplicates.
- **Deliverable**: brief data-gap report.

Can you please confirm turnaround of your comments on the documents and the proposed data gap assessment plan. We also plan to conduct further test pitting and soil testing following building demolition and prior to commencement of soil removal.

Cheers,

Regards,

Amy Dobson
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amy.dobson@sydneywater.com.au

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---

**From:** Christine Louie [mailto:clouie@jbsg.com.au]
**Sent:** Monday, 12 February 2018 1:40 PM
**To:** DOBSON, AMY <AMY.DOBSON@sydneywater.com.au>
**Cc:** Andrew Lau <ALau@jbsg.com.au>
**Subject:** RE: Auditor Services for Ashbury Reservoir

Hi Amy,

2018 has definitely started as a busy year!

It would be great if we could receive the two available reports upfront so that we can review the proposed works on-site.

Regards,
Christine

**Christine Louie** | Principal | JBS&G
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---

**From:** DOBSON, AMY [mailto:AMY.DOBSON@sydneywater.com.au]
**Sent:** Monday, 12 February 2018 9:22 AM
**To:** Christine Louie <clouie@jbsg.com.au>
**Cc:** Andrew Lau <ALau@jbsg.com.au>
**Subject:** Auditor Services for Ashbury Reservoir

Hi Christine and Andrew,

Hope the beginning of 2018 has been as busy and productive as it was looking to be.

Thanks for your patience on the Ashbury Auditing works. The heritage planning approvals and internal sign-offs are complete and Sydney Water have engaged PRM to complete a soil data gap assessment (one days' test pitting on site) and development of a RAP for the site which will be completed within the next 4-6 weeks.

To date we have the two following reports finalised:

1. HBM Audit Report, (PRM, November 2017).
2. HBM Removal Scope for Contracting Demolition Services (PRM, December 2017).

Do you suggest a review of these two documents upfront, or provision of these plus the RAP for joint review, anticipated for mid-March?

Happy to discuss if easiest.

Regards,

Amy Dobson
Senior Project Manager – Environmental Services
Property, Sydney Water
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---

**From:** Christine Louie [mailto:clouie@jbsg.com.au]
**Sent:** Tuesday, 12 December 2017 9:31 AM
**To:** DOBSON, AMY <AMY.DOBSON@sydneywater.com.au>

**Cc:** Andrew Lau <ALau@jbsg.com.au>
**Subject:** RE: Letter of Engagement - Auditor Services for Ashbury and Bankstown

Hi Amy,

Thanks for the update.

With Christmas upon us soon, it is good to hear that the tight turnaround times will not be applying.

Regards,
Christine

**Christine Louie**| Principal | JBS&G
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---

**From:** DOBSON, AMY [mailto:AMY.DOBSON@sydneywater.com.au]
**Sent:** Monday, 11 December 2017 4:40 PM
**To:** Christine Louie <clouie@jbsg.com.au>
**Cc:** Andrew Lau <ALau@jbsg.com.au>
**Subject:** RE: Letter of Engagement - Auditor Services for Ashbury and Bankstown

Hi Christine,

I am expecting receipt of final versions of the following two documents next week at which time I'll be in touch and provide.

1. HBM Audit Report, (PRM, initially expected November 2017)
2. HBM Removal Scope for Contracting Demolition Services (PRM, initially expected November 2017)

The project has also experienced some delays in terms of Heritage planning approvals and internal sign-offs resulting in some uncertainty around when and if the property can be sold. Ill hopefully know more on this shortly and will keep you updated. Regardless, the urgency around timing for delivery of tasks has been significantly reduced.

Much appreciated,

Regards,

Amy Dobson
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Property, Sydney Water
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**From:** Christine Louie [mailto:clouie@jbsg.com.au]
**Sent:** Wednesday, 6 December 2017 10:44 AM
**To:** DOBSON, AMY <AMY.DOBSON@sydneywater.com.au>
**Cc:** Andrew Lau <ALau@jbsg.com.au>
**Subject:** RE: Letter of Engagement - Auditor Services for Ashbury and Bankstown

Hi Amy,

With the Christmas period approaching quickly, could you provide an update on the status and schedule for Ashbury please?

Regards,
Christine

**Christine Louie**| Principal | JBS&G
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**From:** BRADBEER, EMMA [mailto:EMMA.BRADBEER@sydneywater.com.au]
**Sent:** Thursday, 23 November 2017 3:38 PM
**To:** Andrew Lau <ALau@jbsg.com.au>
**Cc:** Christine Louie <clouie@jbsg.com.au>
**Subject:** Letter of Engagement - Auditor Services for Ashbury and Bankstown

Hi Andrew,

Thank you for your recent proposal regarding Auditor Services at 4 Sydney Water sites planned for Disposal.

Following review of the Proposals, JBS&G have been awarded the Auditor Services for Ashbury and Bankstown (Engagement Letter attached).

Amy and I will collate the available reports and send them through to you early next week to commence the Audit process, with Bankstown DSI field work being undertaken on Monday 27th November if you would like to attend?.

Many thanks, Emma

## Christine Louie

**From:** DOBSON, AMY <AMY.DOBSON@sydneywater.com.au>
**Sent:** Wednesday, 21 February 2018 2:08 PM
**To:** Christine Louie
**Cc:** Andrew Lau
**Subject:** Ashbury Reservoir works - PB DSI
**Attachments:** 118234504_02 - PLAN - 18 12 2017 Subdivision Plan.pdf; 2015 - DSI - Ashbury - Holden Street zip 1 of 2.pdf

Thanks Christine,

I understand PRM will aim to complete another location instead – perhaps in the north of the site. It may constitute more of a surface scrape to delineate asbestos rather than a deep test pit.

We expect interim findings in one week, draft reporting two weeks following and final reporting two weeks following. Development of the RAP to follow (likely by end of March). Ill provide final documents as soon as available.

Please find the PB report attached (part 1 of 2) along with the new proposed subdivision boundary. Ill email 2 of 2 shortly.

Regards,

Amy Dobson
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amy.dobson@sydneywater.com.au

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---

**From:** Christine Louie [mailto:clouie@jbsg.com.au]
**Sent:** Wednesday, 21 February 2018 12:15 PM
**To:** DOBSON, AMY <AMY.DOBSON@sydneywater.com.au>
**Cc:** Andrew Lau <ALau@jbsg.com.au>
**Subject:** RE: Ashbury Reservoir works - 21/2 - site contacts.

Hi Amy,

I attended the site this morning and the testpitting appeared to be going to plan. I note that the site boundary has changed from what was originally proposed and that seven instead of eight testpits are to be excavated.

Could you please provide the previous PB reports for background purposes? Please also provide an indication of timing for deliverables for this site.

Regards,

Christine

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**From:** DOBSON, AMY [mailto:AMY.DOBSON@sydneywater.com.au]
**Sent:** Tuesday, 20 February 2018 2:10 PM
**To:** Christine Louie <clouie@jbsg.com.au>
**Subject:** Ashbury Reservoir works - 21/2 - site contacts.

Hi Christine,

Please find Anna's, Ben's and Jono's details below for the site works tomorrow. Ben and Jess will be on site from PRM.

Cheers,

Amy

Ben Mcgiffin - PRM - 0401313206.

Jonathan Coffey [mailto:jonathan.coffey@progressiverm.com.au

> Anna Flack
>
> Property Environmental Services
>
> Group Property – Finance
>
> Level 13, 1 Smith Street Parramatta, NSW 2150

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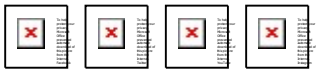



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## Christine Louie

**From:** DOBSON, AMY <AMY.DOBSON@sydneywater.com.au>
**Sent:** Friday, 23 February 2018 2:05 PM
**To:** Christine Louie
**Cc:** Andrew Lau
**Subject:** RE: Auditor Services for Ashbury Reservoir

**Follow Up Flag:** Follow up
**Flag Status:** Completed

Thanks again Christine,

The comments below have been provided to PRM for consideration and response. I will provide feedback when available from PRM; in the meantime please see comments from me below in **blue.**

Enjoy your weekend and speak soon,

Regards,

Amy Dobson
Senior Project Manager – Environmental Services
Property, Sydney Water
Level 13, 1 Smith Street, Parramatta NSW 2150

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amy.dobson@sydneywater.com.au

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---

**From:** Christine Louie [mailto:clouie@jbsg.com.au]
**Sent:** Tuesday, 20 February 2018 1:27 PM
**To:** DOBSON, AMY <AMY.DOBSON@sydneywater.com.au>
**Cc:** Andrew Lau <ALau@jbsg.com.au>
**Subject:** RE: Auditor Services for Ashbury Reservoir

Hi Amy,

Apologies for the delay in providing comments.

Please find following Auditor comments on the reports below:

- *Hazardous Building Material Pre-Demolition Audit, Ashbury Water Reservoir WS0003 165-169 Holden Street, Ashbury NSW*. Revision 2: Final, November 2017 (PRM, 2017a)

a) Details of the site description are limited although it is noted that building details are included in Table 3 in later Section 5. What were the normal operations at the time of the site inspection? **The site was unoccupied during**

**the audit survey and the site condition was as per current (buildings in question were unoccupied though the remainder of the site is active but unmanned.**

b) Table 4 states that there are no Priority 1 or Priority 2 Asbestos Containing Materials (ACM), SMF containing materials, PCB containing materials or OCD containing material items identified during the audit yet Appendix B lists the Police Communications and Depot Office Building, Southern Shed and/or Northwest Shed as Priority Risk Rating P2 for these items asbestos. Lead containing materials are listed as P2 in Table 4 but P1 in Appendix B for the Police Communications and Depot Office Building.

- *Hazardous Building Materials Removal Plan, Ashbury Water Reservoir WS0003 165-169 Holden Street, Ashbury NSW*. Revision 1: Final, December 2017 (PRM, 2017b)

a) Table 4: SMF containing materials – the SMF materials register in PRM (2017a) identified 1 unit of internal insulation material within the Rheem hot water heater – please clarify if the quantity is less than 1 $m^2$ as listed in Table 4.

The proposed scope of works for delineation of previously identified impacts and waste classification is in accordance with NSW EPA guidance.

Could you please advise what time works are scheduled tomorrow so that I can do a site visit?

Also, could you please provide copies of the PB PSI and DSI completed previously? **Emailed separately; please advise both emails didn't arrive with attachments.**

Regards,
Christine

**Christine Louie** | Principal | JBS&G
Sydney | Melbourne | Adelaide | Perth | Brisbane | Canberra | Darwin | Wollongong
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---

**From:** DOBSON, AMY [mailto:AMY.DOBSON@sydneywater.com.au]
**Sent:** Tuesday, 20 February 2018 12:47 PM
**To:** Christine Louie <clouie@jbsg.com.au>
**Cc:** Andrew Lau <ALau@jbsg.com.au>
**Subject:** Re: Auditor Services for Ashbury Reservoir

Hi Christine,

Just double checking the comments will be available today for Ashfield? PRM are requesting input and whether feedback will impact their scope of works. They are completing service locating this afternoon and can have additional / different areas cleared as needed.

Thanks,

Amy

## Christine Louie

**From:** DOBSON, AMY <AMY.DOBSON@sydneywater.com.au>
**Sent:** Thursday, 1 March 2018 1:30 PM
**To:** Christine Louie
**Cc:** Andrew Lau
**Subject:** Auditor Services for Ashbury Reservoir - Updated HBM Register
**Attachments:** P033623.001 Sydney Water Pre-Demo Hazmat Ashbury Reservoir 20171025 R3.pdf

**Follow Up Flag:** Follow up
**Flag Status:** Completed

Hi Christine, Andrew -

Thanks again for your comments on Ashbury.

Please find attached the updated PRM HBM Survey Report which addresses the following:

- *1B* - Table 4 states that there are no Priority 1 or Priority 2 Asbestos Containing Materials (ACM), SMF containing materials, PCB containing materials or OCD containing material items identified during the audit yet Appendix B lists the Police Communications and Depot Office Building, Southern Shed and/or Northwest Shed as Priority Risk Rating P2 for these items asbestos. Lead containing materials are listed as P2 in Table 4 but P1 in Appendix B for the Police Communications and Depot Office Building. Report has been updated to reconcile.
- *2A* - Table 4: SMF containing materials – the SMF materials register in PRM (2017a) identified 1 unit of internal insulation material within the Rheem hot water heater – please clarify if the quantity is less than 1 $m^2$ as listed in Table 4. Register within the report has been updated to reflect the same quantities as the removal scope. No amendments to the contractor scope have been deemed required.

Comments in response to your review are also provided in green in the email below. Please advise if any further comments or queries.

The draft data gap assessment document following the test pitting exercise is due within one week. I will review ASAP as well as provide for your comment. PRM would like to discuss the approach for BaP and potential use of the CRC Care guidance on screening criteria. Is it suitable to discuss this approach between finalisation of the data gap assessment report and prior to finalising the RAP which will following shortly after?

Cheers,

Regards,

Amy Dobson
Senior Project Manager – Environmental Services
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**From:** Christine Louie [mailto:clouie@jbsg.com.au]
**Sent:** Tuesday, 20 February 2018 1:27 PM
**To:** DOBSON, AMY <AMY.DOBSON@sydneywater.com.au>
**Cc:** Andrew Lau <ALau@jbsg.com.au>
**Subject:** RE: Auditor Services for Ashbury Reservoir

Hi Amy,

Apologies for the delay in providing comments.

Please find following Auditor comments on the reports below:

- *Hazardous Building Material Pre-Demolition Audit, Ashbury Water Reservoir WS0003 165-169 Holden Street, Ashbury NSW*. Revision 2: Final, November 2017 (PRM, 2017a)

a) Details of the site description are limited although it is noted that building details are included in Table 3 in later Section 5. We'll ensure site is clearly defined in documents moving forward.
What were the normal operations at the time of the site inspection? Vacant, unmanned site in same condition as current.
b) Table 4 states that there are no Priority 1 or Priority 2 Asbestos Containing Materials (ACM), SMF containing materials, PCB containing materials or OCD containing material items identified during the audit yet Appendix B lists the Police Communications and Depot Office Building, Southern Shed and/or Northwest Shed as Priority Risk Rating P2 for these items asbestos. Lead containing materials are listed as P2 in Table 4 but P1 in Appendix B for the Police Communications and Depot Office Building.

- *Hazardous Building Materials Removal Plan, Ashbury Water Reservoir WS0003 165-169 Holden Street, Ashbury NSW*. Revision 1: Final, December 2017 (PRM, 2017b)

a) Table 4: SMF containing materials – the SMF materials register in PRM (2017a) identified 1 unit of internal insulation material within the Rheem hot water heater – please clarify if the quantity is less than 1 $m^2$ as listed in Table 4.

The proposed scope of works for delineation of previously identified impacts and waste classification is in accordance with NSW EPA guidance.

Could you please advise what time works are scheduled tomorrow so that I can do a site visit?

Also, could you please provide copies of the PB PSI and DSI completed previously?

Regards,
Christine

**Christine Louie** | Principal | JBS&G
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## Christine Louie

**From:** Andrew Lau
**Sent:** Thursday, 22 March 2018 11:09 AM
**To:** DOBSON, AMY; Christine Louie; Andrew Lau
**Subject:** Audit comments for Holden St, Ashbury - Draft DGA and Draft RAP

Hi Amy,

Thanks for sending through the DGI and RAP reports which I've reviewed in conjunction with the previous PB report. I have the following comments for your consideration:

- While considerable data have been collected from the site, the assessment of the data and characterisation of the contamination at the site to inform a useful conceptual site model (CSM) needs further work. The nature and extent of contamination presented in the reports provided for review relies too heavily on single value exceedances of investigation criteria and the data haven't been assessed in accordance with relevant guidance in the ASC NEPM such that decisions are able to be made on the extent of remediation required. For example, it appears that there is a body of fill material at the site with ash/slag/charcoal materials and that there are elevated levels of BaP throughout much of the material. There has been no statistical analyses of the BaP data from this fill type to assess whether the fill material as a whole is suitable to remain at the site under the proposed residential landuse. Instead, spot exceedances have been used to interpret the extent of BaP impact and there are gaps in the data set where BaP concentrations have not been measured at the appropriate depth (i.e., within the fill material). As such, I am not satisfied that the site investigation process has substantially followed relevant guidance in relation to data assessment (including data quality assessment specifically around representatives and completeness) and reporting.

- The areas of potential concern and associated contaminants of potential concern are considered to be generally appropriate. However, to date, insufficient consideration has been given to the potential for hazardous ground gas (HGG) to be present at the site given the proximity of the site to a former large scale brickworks pit which has been backfilled with materials of unknown origin and which has the potential to generate HGG. An assessment is required to be undertaken to address this data gap in accordance with the relevant NSW EPA guidance.

- In addition to the two abovementioned issues, the data gap analyses has not included any data quality objectives or data useability assessment (of either the previous data or the additional data) in accordance with relevant guidance, so there is uncertainty as to whether the data obtained from the additional data gap investigation is of adequate quality for its intended purpose.

- In light of the shortcomings associated with the data assessment and inadequate conceptual site model, along with the critical data gap relating to the assessment of hazardous ground gas, I'm not yet satisfied that the assessment of contamination at the site is at a sufficient stage to enable a meaningful RAP to be developed. For this reason, I have not attempted to provide comments on the RAP, as I suspect it will require significant revision once the site characterisation process has been completed in an appropriate manner.

Separately, in relation to your two queries below, the EPA's general immobilisation approval appears to be appropriate to use in the circumstances apparent at the site. In relation to the risks posed by BaP, this can be considered once the data have been adequately interpreted.

Happy to discuss if you have any queries.

Regards,
Andrew

**Andrew Lau** | Managing Director, Accredited Auditor | JBS&G
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**From:** DOBSON, AMY [mailto:AMY.DOBSON@sydneywater.com.au]
**Sent:** Wednesday, 14 March 2018 10:02 AM
**To:** Christine Louie <clouie@jbsg.com.au>
**Cc:** Andrew Lau <ALau@jbsg.com.au>
**Subject:** Auditor Services for Holden St, Ashbury - Draft DGA and Draft RAP

Hi Christine,

Apologies for the phone tag last week; seems we are all quite busy!

Please find the following documents from PRM attached in relation to Holden St, Ashbury:

- Draft Data Gap Analysis (V2, 13 March 2018).
- Draft Remediation Action Plan (March 2018 – with Sydney Water comments).

PRM are looking to utilise approaches from the following in their approach to site remediation:

- Immobilisation approval 1999/05 relating to Ash, Ash-contaminated natural excavated materials or coal-contaminated natural excavated material to manage the high PAH and BaP exceeding CT2.
- CRC Care Technical Report No. 39, Risk-based management and remediation guidance for benzo(a)pyrene, 2017 – in relation to the assessment of risk from BaP.

Can you please advise how we are best to proceed with obtaining your commentary on this approach? If you consider a meeting upfront with all parties is warranted, can you please provide your availability and we'll look to schedule.

Many thanks,

Regards,

Amy Dobson
Senior Project Manager – Environmental Services
Property, Sydney Water
Level 13, 1 Smith Street, Parramatta NSW 2150

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## Christine Louie

**From:** Christine Louie
**Sent:** Friday, 23 March 2018 4:11 PM
**To:** DOBSON, AMY
**Cc:** Andrew Lau
**Subject:** RE: Auditor Services for Ashbury Reservoir - Updated HBM Register

Hi Amy,

The amendments to *Hazardous Building Material Pre-Demolition Audit, Ashbury Water Reservoir WS0003 165-169 Holden Street, Ashbury NSW* and emailed response from PRM sufficiently address the Auditor's comments on the hazardous materials reports.

Regards,
Christine

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**From:** DOBSON, AMY [mailto:AMY.DOBSON@sydneywater.com.au]
**Sent:** Thursday, 1 March 2018 1:30 PM
**To:** Christine Louie <clouie@jbsg.com.au>
**Cc:** Andrew Lau <ALau@jbsg.com.au>
**Subject:** Auditor Services for Ashbury Reservoir - Updated HBM Register

Hi Christine, Andrew -

Thanks again for your comments on Ashbury.

Please find attached the updated PRM HBM Survey Report which addresses the following:

- *1B* - Table 4 states that there are no Priority 1 or Priority 2 Asbestos Containing Materials (ACM), SMF containing materials, PCB containing materials or OCD containing material items identified during the audit yet Appendix B lists the Police Communications and Depot Office Building, Southern Shed and/or Northwest Shed as Priority Risk Rating P2 for these items asbestos. Lead containing materials are listed as P2 in Table 4 but P1 in Appendix B for the Police Communications and Depot Office Building. Report has been updated to reconcile.
- *2A* - Table 4: SMF containing materials – the SMF materials register in PRM (2017a) identified 1 unit of internal insulation material within the Rheem hot water heater – please clarify if the quantity is less than 1 $m^2$ as listed in Table 4. Register within the report has been updated to reflect the same quantities as the removal scope. No amendments to the contractor scope have been deemed required.

## Christine Louie

**From:** DOBSON, AMY <AMY.DOBSON@sydneywater.com.au>
**Sent:** Tuesday, 1 May 2018 11:39 AM
**To:** Christine Louie; Andrew Lau
**Cc:** BRADBEER, EMMA
**Subject:** RE: Audit comments for Holden St, Ashbury - Draft DGA and Draft RAP - next steps
**Attachments:** P033725.001 Result Table Stats DRAFT.PDF; Historical Aerials - 1940s to 1970s.jpg; Historical Aerials - 1980s to 2010s.jpg

Morning Christine, Andrew –

PRM have provided the following comments prior to our telecon today to discuss Ashbury next steps:

- As noted in the DGA, the fill type and extent at the site is highly variable. The only fill layer with adequate data to complete a meaningful statistical analysis is the PAH impacted ash/slag/charcoal layer. The statistical analysis (95% UCL) of all data for the layer (PB 2015 and PRM 2018 data), has been undertaken and is summarised in the attached Table. The results indicate that the 95% UCL for the ash/slag/charcoal fill layer exceeds the adopted residential HIL. It is noted that if the highest BaP TEQ result of 79 mg/kg is excluded from the data set, the 95%UCL of 5.9 mg/kg still exceeds the adopted residential HIL.
- The DQO's and laboratory QA/QC for the DGA have been completed and will be provided in the revised DGA, along with a summary of the statistical analysis noted above.
- The assessment of HGG was outside the scope of the DGA, however, considering the proximity of the former brick pit to the site, the targeted screening of HGG would be prudent. The attached images show the historical aerial imagery for the site/brick pit for our reference.

I understand PRM will update the DGA report following our discussion today.

I look forward to discussing further at 1.00 today. Please note the dial in details within the calendar invite.

Cheers,

Regards,

Amy Dobson
Senior Project Manager – Environmental Services
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**From:** Christine Louie [mailto:clouie@jbsg.com.au]
**Sent:** Monday, 23 April 2018 1:47 PM

| | |
|---|---|
| **Project Name:** | Data Gap Analysis |
| **Site Address:** | Ashbury Reservoir, 165-169 Holden Street, Ashbury NSW |
| **Client Name:** | Sydney Water Corporation |
| **Project Reference:** | P033725 / C0151 |
| **Analytical Table:** | Table A: Soil and Fragment Results with Statistics |

| Analyte | | | TRH (mg/kg) | | | BTEX (mg/kg) | | | | | PAH (mg/kg) | | | | | | Heavy Metals (mg/kg) | | | | | | | | Total PCBs (mg/kg) | Organochloropesticides (mg/kg) | | | | | | | | | | | ACM by weight calculation | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | F1 - TRH C6-C10 less BTEX | F2 - TRH C10-C16 less naphthalene | TRH C16-C34 | TRH C34-C40 | Benzene | Toluene | Ethylbenzene | Xylenes | Naphthalene | Benzo(a)pyrene | Benzo(a)pyrene TEQ (half) | Total +ve PAHs | Benzo(a)pyrene TCLP (mg/L) | Total +ve PAHs TCLP (mg/L) | Arsenic | Cadmium | Chromium (VI) | Copper | Lead | Mercury | Nickel | Zinc | | Total DDTs (mg/kg) | DDT + DDE + DDD | Aldrin and Dieldrin | Chlordane | Endosulfan | Endrine | Heptachlor | Hexachlorobenzene | Methoxychlor | Total OPPs (mg/kg) | Asbestos ID in Soil as per AS4964^ | Trace Analysis* | AFFA Analysis (% w/w) | ACM observed or suspected i.e building rubble | Screened soil volume (L) | Weight of screened soil (kg) | Fragment/s positive for containing asbestos | Weight of ACM (kg) | Calculated ACM asbestos percentage (%) | ACM (% w/w) |
| **NEPM 2013 HIL-A** | | | - | - | - | - | - | - | - | - | - | - | 3 | 300 | - | - | 100 | 20 | 100 | 6000 | 300 | 40 | 400 | 7400 | 1 | 240 | 6 | 50 | 270 | 10 | 6 | 10 | 300 | 160 | - | - | - | | | | | | | - |
| **NEPM 2013 HSL-A, 0m - <1m, Sand** | | | 45 | 110 | - | - | 0.5 | 160 | 55 | 40 | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | NAD | NAD | 0.001 | | | | | | | 0.01 |
| **NEPM 2013 HSL-A, 0m - <1m, Clay** | | | 50 | 280 | - | - | 0.7 | 480 | NL | 110 | 5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | | | | | | | | | |
| **CRC Care 2011 Direct Contact HSL-A** | | | 4400 | 3300 | 4500 | 6300 | 100 | 14,000 | 4500 | 12,000 | 1400 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | | | | | | | - |
| **NEPM 2013 ML Residential (Coarse)** | | | 700 | 1000 | 2500 | 10,000 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | | | | | | | - |
| **NEPM 2013 EIL Residential[1]** | | | - | - | - | - | - | - | - | - | 170 | - | - | - | - | - | 100 | - | 830 | 160 | 1100 | - | 190 | 390 | - | 180 | - | - | - | - | - | - | - | - | - | - | - | | | | | | | - |
| **NEPM 2013 ESL Residential (Fine)** | | | 180 | 120 | 1300 | 5600 | 65 | 105 | 125 | 45 | - | 33 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | | | | | | | - |
| **NEPM 2013 ESL Residential (Coarse)** | | | 180 | 120 | 300 | 2800 | 50 | 85 | 70 | 105 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | | | | | | | - |
| **Sample ID** | **Sample Depth** | **Layer Depth** | **Description** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PRM TP104_0.1 | 0.1-0.2 | 0.0-0.2 | Topsoil - Fill dark brown silty sand | <25 | <50 | <100 | <100 | <0.2 | <0.5 | <1 | <1 | <0.1 | 0.3 | <0.5 | 3 | - | - | <4 | <0.4 | 11 | 29 | 42 | <0.1 | 14 | 91 | <0.1 | <0.1 | <0.1 | <LOR | <LOR | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <LOR | NAD | NAD | <0.001 | - | 10 | 14.36 | - | - | - | <0.01 |
| PRM TP105_0.1 | 0.1-0.2 | 0.0-0.1 | Topsoil - Fill dark brown silty sand | <25 | <50 | <100 | <100 | <0.2 | <0.5 | <1 | <1 | <0.1 | 0.84 | 1.2 | 8.1 | | | <4 | <0.4 | 29 | 37 | 80 | <0.1 | 45 | 97 | <0.1 | <0.1 | <0.1 | <LOR | <LOR | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <LOR | NAD | NAD | <0.001 | Y | 10 | 14.02 | - | - | - | <0.01 |
| PRM TP107_0.1 | 0.1-0.2 | 0.0-0.2 | Topsoil - Fill dark brown silty sand | <25 | <50 | 320 | <100 | <0.2 | <0.5 | <1 | <1 | <0.1 | 8.1 | 11 | 130 | <0.001 | NIL (+ve) | 5 | <0.4 | 11 | 14 | 150 | 0.1 | 5 | 62 | <0.5 | <0.1 | <0.1 | <LOR | <LOR | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <LOR | NAD | NAD | - | - | 10 | 12.65 | - | - | - | <0.01 |
| PRM TP108_0.0 | 0.0-0.1 | 0.0-0.2 | Topsoil - Fill dark brown silty sand | <25 | <50 | 150 | <100 | <0.2 | <0.5 | <1 | <1 | <0.1 | 0.68 | 1 | 7.8 | - | - | <4 | <0.4 | 12 | 60 | 78 | <0.1 | 30 | 98 | <0.2 | <0.1 | <0.1 | <LOR | <LOR | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <LOR | NAD | NAD | - | - | - | - | - | - | - | - |
| PRM TP109_0.0 | 0.0-0.1 | 0.0-0.2 | Topsoil - Fill dark brown silty sand | <25 | <50 | 200 | <100 | <0.2 | <0.5 | <1 | <1 | <0.1 | 0.3 | 0.5 | 3.6 | - | - | <4 | <0.4 | 25 | 240 | 250 | <0.1 | 35 | 450 | <0.1 | <0.1 | <0.1 | <LOR | <LOR | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <LOR | NAD | NAD | - | - | - | - | - | - | - | - |
| PB TP03 | 0.0-0.1 | 0.0-0.3 | Fill brown silty clay with roots and gravels | | | 180 | | | | | | | | 4.1 | | | | | | | | 26 | 210 | | 150 | | | | | | | | | | | | | | | | | | | | | |
| PB TP05 | 0.0-0.1 | 0.0-0.2 | Fill brown gravelly clay with gravels and roots | | | <90 | | | | | | | | 0.7 | | | | | | | | 15 | 51 | | 67 | | | | | | | | | | | | | | | | | | | | | |
| PB TP11 | 0.0-0.1 | 0.0-0.35 | Fill brown gravelly clay with brick / concrete / ash / slag / FCS | | | <90 | | | | | | | | 0.4 | | | | | | | | 48 | 130 | | 400 | | | | | | | | | | | | | | | | | | | Y | | | 0.0107 |
| PRM TP101_0.15 | 0.15-0.2 | 0.15-0.4 | Fill light brown sandy clay with gravel (under asphalt) | <25 | <50 | 140 | 160 | <0.2 | <0.5 | <1 | <1 | <0.1 | 0.1 | <0.5 | 1.2 | - | - | <4 | <0.4 | 18 | 24 | 16 | <0.1 | 63 | 31 | <0.1 | <0.1 | <0.1 | <LOR | <LOR | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <LOR | NAD | NAD | - | - | - | - | - | - | - | - |
| PRM TP102_0.4 | 0.4-0.5 | 0.3-0.5 | Fill light brown gravelly clay, brick / wire / terracotta (under asphalt) | <25 | <50 | <100 | <100 | <0.2 | <0.5 | <1 | <1 | <0.1 | <0.05 | <0.5 | <0.05 | - | - | 4 | <0.4 | 5 | 4 | 7 | <0.1 | 3 | 4 | <0.1 | <0.1 | <0.1 | <LOR | <LOR | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <LOR | NAD | NAD | <0.001 | Y | 10 | 13.61 | - | - | - | <0.01 |
| PRM TP106_0.3 | 0.3-0.4 | 0.2-0.5 | Fill brown sandy clay, gravels (under asphalt) | <25 | <50 | <100 | <100 | <0.2 | <0.5 | <1 | <1 | <0.1 | <0.05 | <0.5 | <0.05 | - | - | <4 | <0.4 | 26 | 40 | 3 | <0.1 | 150 | 36 | <0.1 | <0.1 | <0.1 | <LOR | <LOR | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <LOR | NAD | NAD | - | - | - | - | - | - | - | - |
| PRM TP103_0.3 | 0.3-0.4 | 0.2-0.5 | Fill grey gravelly clay, fly ash / coal wash (under asphalt) | <25 | <50 | 1500 | 170 | <0.2 | <0.5 | <1 | <1 | <0.1 | 55 | 79 | 790 | <0.001 | NIL (+ve) | 5 | <0.4 | 18 | 28 | 59 | <0.1 | 54 | 120 | <0.1 | <0.1 | <0.1 | <LOR | <LOR | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <LOR | NAD | NAD | <0.001 | Y | 10 | 14.61 | - | - | - | <0.01 |
| PB TP01 | 0.05-0.15 | 0.05-0.2 | Fill grey fly ash (under asphalt) | | | <90 | | | | | | | | 1.5 | | | | | | | | 51 | 170 | | 260 | | | | | | | | | | | | | | | | | | | | | |
| PB TP04 | 0.05-0.15 | 0.05-0.2 | Fill grey clayey gravel (under asphalt) | | | 200 | | | | | | | | 0.2 | | | | | | | | 86 | 120 | | 160 | | | | | | | | | | | | | | | | | | | | | |
| PB TP07 | 0.05-0.15 | 0.05-0.35 | Fill grey clayey gravel (under asphalt) | | | <90 | | | | | | | | 0.4 | | | | | | | | 43 | 34 | | 47 | | | | | | | | | | | | | | | | | | | | | |
| PB TP08 | 0.05-0.15 | 0.05-0.3 | Fill brown gravelly clay with ash (under asphalt) | | | 240 | | | | | | | | <0.2 | | | | | | | | 40 | 16 | | 67 | | | | | | | | | | | | | | | | | | | | | |
| PB TP10 | 0.05-0.1 | 0.05-0.25 | Fill grey gravelly clay with concrete / charcoal / slag (under asphalt) | | | 180 | | | | | | | | <0.2 | | | | | | | | 110 | 76 | | 180 | | | | | | | | | | | | | | | | | | | | | |
| PB TP12 | 0.05-0.1 | 0.05-0.67 | Fill grey clayey gravel with basalt and minor charcoal (under asphalt) | | | <90 | | | | | | | | 0.9 | | | | | | | | 79 | 64 | | 190 | | | | | | | | | | | | | | | | | | | | | |
| PB TP12 | 0.5-0.6 | 0.05-0.67 | Fill grey clayey gravel with basalt and minor charcoal (under asphalt) | | | 120 | | | | | | | | 4.9 | | | | | | | | 13 | 490 | | 2400 | | | | | | | | | | | | | | | | | | | | | |
| PB TP13 | 0.05-0.1 | 0.05-0.3 | Fill grey gravelly clay with concrete / charcoal / ash / roots (under asphalt) | | | 110 | | | | | | | | 1.8 | | | | | | | | 35 | 64 | | 70 | | | | | | | | | | | | | | | | | | | | | |
| PB TP14 | 0.05-0.1 | 0.05-0.3 | Fill grey gravelly sandy clay (under asphalt) | | | 540 | | | | | | | | 14 | | | | | | | | 31 | 82 | | 140 | | | | | | | | | | | | | | | | | | | Y | | | <0.01 |
| | | | **95 % UCL** | | | 446 | | | | | | | | 67.8 | | | | | | | | | 197 | | 1059 | | | | | | | | | | | | | | | | | | | | | |
| PRM TP104_0.4 | 0.4-0.5 | 0.2-0.6 | Fill brown red clay, brick / concrete | <25 | <50 | <100 | <100 | <0.2 | <0.5 | <1 | <1 | <0.1 | <0.05 | <0.5 | <0.05 | - | - | <4 | <0.4 | 40 | 36 | 18 | <0.1 | 120 | 59 | <0.1 | <0.1 | <0.1 | <LOR | <LOR | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <LOR | NAD | NAD | <0.001 | Y | 10 | 15.87 | - | - | - | <0.01 |
| PRM TP105_0.4 | 0.4-0.5 | 0.2-0.6 | Fill brown red clay with gravels, concrete | <25 | <50 | <100 | <100 | <0.2 | <0.5 | <1 | <1 | <0.1 | 0.56 | 0.8 | 5 | - | - | <4 | <0.4 | 23 | 42 | 43 | <0.1 | 45 | 64 | <0.1 | <0.1 | <0.1 | <LOR | <LOR | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <LOR | NAD | NAD | <0.001 | - | 10 | 15.28 | - | - | - | <0.01 |
| PRM TP107_0.3 | 0.3-0.4 | 0.2-0.5 | Fill brown red clay with gravels, brick | <25 | <50 | <100 | <100 | <0.2 | <0.5 | <1 | <1 | <0.1 | 0.58 | 0.8 | 7.2 | - | - | 8 | <0.4 | 15 | 7 | 61 | 0.1 | 2 | 44 | <0.1 | <0.1 | <0.1 | <LOR | <LOR | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <LOR | NAD | NAD | - | Y | 10 | 13.72 | - | - | - | <0.01 |
| PB TP02 | 0.5-0.6 | 0.5-0.9 | Fill grey gravelly clay with gravels | | | <90 | | | | | | | | 0.9 | | | | | | | | 20 | 110 | | 71 | | | | | | | | | | | | | | | | | | | | | |
| PB TP15 | 0.5-0.6 | 0.2-0.6 | Fill brown gravelly sandy clay, brick / slag | | | <90 | | | | | | | | 0.5 | | | | | | | | 56 | 13 | | 74 | | | | | | | | | | | | | | | | | | | | | |
| PB TP09 | 0.5-0.6 | 0.44-0.9 | Fill brown gravelly clay, brick / terracotta / concrete / slag | | | <90 | | | | | | | | 0.8 | | | | | | | | 57 | 59 | | 79 | | | | | | | | | | | | | | | | | | | | | |
| PRM TP103_0.6 | 0.6-0.7 | 0.5-0.8 | Fill light brown gravelly clay, brick / tile | <25 | <50 | <100 | <100 | <0.2 | <0.5 | <1 | <1 | <0.1 | 2.4 | 3.5 | 34 | <0.001 | NIL (+ve) | 6 | <0.4 | 12 | 16 | 88 | 0.1 | 3 | 59 | <0.1 | <0.1 | <0.1 | <LOR | <LOR | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <LOR | NAD | NAD | <0.001 | Y | 10 | 14.04 | - | - | - | <0.01 |
| PB TP09 | 1.0-1.1 | 0.9-2.1 | Fill yellow sand, bricks / some slag | | | 380 | | | | | | | | 9.5 | | | | | | | | 33 | 61 | | 52 | | | | | | | | | | | | | | | | | | | | | |
| PB TP15 | 1.0-1.1 | 0.6-1.2 | Fill yellow sand, bricks / concrete / terracotta | | | <90 | | | | | | | | 1 | | | | | | | | 25 | 99 | | 100 | | | | | | | | | | | | | | | | | | | | | |
| PB TP06 | 0.45-0.55 | 0.25-0.55 | Fill white sandstone and sand, clinker / slag (under asphalt) | | | 270 | | | | | | | | <0.2 | | | | | | | | 15 | 17 | | 44 | | | | | | | | | | | | | | | | | | | | | |
| PB TP15 | 2.0-2.1 | 2.0-2.2 | Fill dark brown clay, gravels / brick | | | - | | | | | | | | 0.5 | | | | | | | | 17 | 110 | | 180 | | | | | | | | | | | | | | | | | | | | | |
| PRM TP101_0.6 | 0.6-0.7 | 0.4-1 | Natural orange brown clay | <25 | <50 | <100 | <100 | <0.2 | <0.5 | <1 | <1 | <0.1 | <0.05 | <0.5 | <0.05 | - | - | 5 | <0.4 | 6 | 6 | 11 | <0.1 | 3 | 4 | <0.1 | <0.1 | <0.1 | <LOR | <LOR | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <LOR | NAD | NAD | - | - | 10 | 13.42 | - | - | - | <0.01 |
| PRM TP102_0.6 | 0.6-0.7 | 0.5-1.2 | Natural orange brown clay | <25 | <50 | <100 | <100 | <0.2 | <0.5 | <1 | <1 | <0.1 | <0.05 | <0.5 | <0.05 | - | - | <4 | <0.4 | 4 | 6 | 6 | <0.1 | 1 | 2 | <0.1 | <0.1 | <0.1 | <LOR | <LOR | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <LOR | NAD | NAD | - | - | 10 | 14.92 | - | - | - | <0.01 |
| PRM TP103_0.9 | 0.9-1.0 | 0.8-1.1 | Natural orange brown clay | - | - | - | - | - | - | - | - | - | 0.06 | <0.5 | 0.5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| PRM TP106_0.7 | 0.7-0.8 | 0.5-0.8 | Natural orange brown clay | <25 | <50 | <100 | <100 | <0.2 | <0.5 | <1 | <1 | <0.1 | <0.05 | <0.5 | <0.05 | - | - | <4 | <0.4 | 8 | <1 | 8 | <0.1 | 1 | 1 | <0.1 | <0.1 | <0.1 | <LOR | <LOR | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <LOR | NAD | NAD | - | - | - | - | - | - | - | - |
| PB TP07 | 0.5-0.6 | 0.35-0.9 | Red brown clay | | | - | | | | | | | | <0.2 | | | | | | | | 1.1 | 15 | | 8 | | | | | | | | | | | | | | | | | | | | | |
| PB TP09 | 2.1-2.2 | 2.1-2.5 | Shale | | | - | | | | | | | | <0.2 | | | | | | | | 9.5 | 7 | | 4.2 | | | | | | | | | | | | | | | | | | | | | |
| PB TP10 | 0.5-0.6 | 0.25-1.0 | Grey red clay | | | - | | | | | | | | <0.2 | | | | | | | | 2.9 | 8 | | 3.6 | | | | | | | | | | | | | | | | | | | | | |
| PB TP12 | 1.0-1.1 | 0.67-1.4 | Red brown clay | | | - | | | | | | | | - | | | | | | | | - | 14 | | - | | | | | | | | | | | | | | | | | | | | | |
| PB TP14 | 1.0-1.1 | 0.95-1.3 | Red grey clay | | | - | | | | | | | | <0.2 | | | | | | | | 10 | 18 | | 33 | | | | | | | | | | | | | | | | | | | | | |
| PB TP15 | 2.9-3.0 | 2.2-3.0 | Shale | | | - | | | | | | | | <0.2 | | | | | | | | 30 | 10 | | 9.7 | | | | | | | | | | | | | | | | | | | | | |

Notes

^Laboratory ID in soil has been presented even when quantities are below reporting limit of 0.1 g/kg as per AS4964

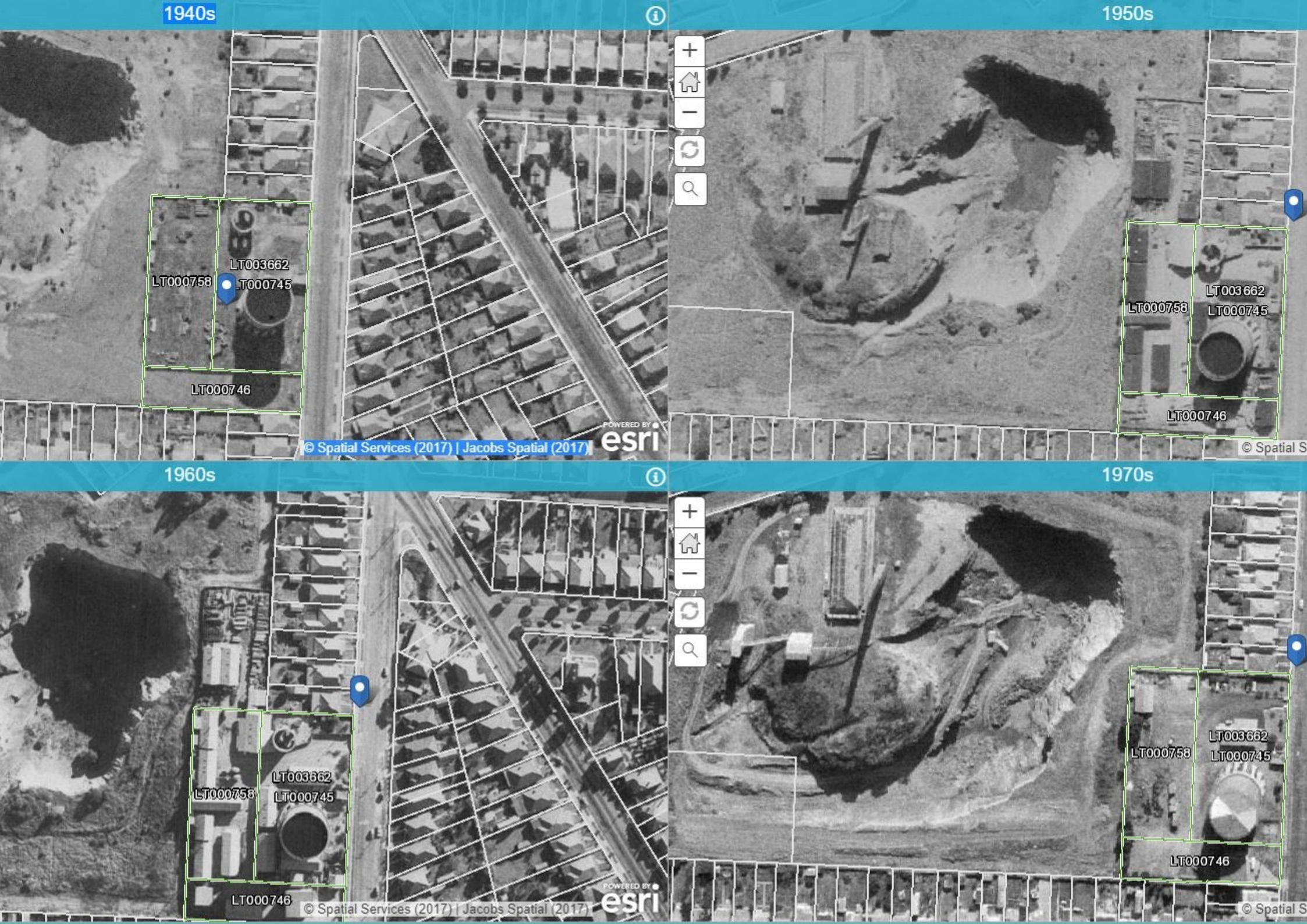
* Trace analysis of respirable fibres, not able to be included in gravimetric analysis methods

[1]: Adopted from PB DSI Ashbury, Dated July 2015

LOR = Limit of Reporting

NL = Not Limiting

NAD = No Asbestos Detected


1940s
LT000758
LT003662
LT000745
LT000746
© Spatial Services (2017) | Jacobs Spatial (2017)
POWERED BY esri
1950s
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1960s
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© Spatial S


1980s
1990s
2000s
2010s
LT000758
LT003662
LT000745
LT000746
© Spatial Services (2017) | Jacobs Spatial (2017)
POWERED BY esri

## Christine Louie

**From:** Christine Louie
**Sent:** Tuesday, 24 July 2018 5:27 PM
**To:** DOBSON, AMY
**Cc:** Andrew Lau
**Subject:** RE: Ashbury Draft SAQP

Hi Amy,

Thank you for the SAQP.

The Site Auditor has conducted a review of the *Sampling, Analysis and Quality Plan Ashbury Reservoir 165-169 Holden Street, Ashbury NSW* prepared by Progressive Risk Management (PRM) dated July 2018 and provides the following comments:

a) Section 4 Preliminary Conceptual Site Model – the preliminary CSM should provide a representation of the contamination sources, receptors and exposure pathways for all potentially affected media for the site, not just the targeted media of groundwater and hazardous ground gases.
b) Section 4.1 Potential Source of Contamination should be clear on the origins of the contamination sources (eg uncontrolled fill from unknown sites, ACM from demolished/existing buildings) and the potential impacts from the former adjacent brickworks (upgradient groundwater impacts, ground gases, ash/slag fill?)
c) Section 4.5 Potential Receptors – future site users should be specific and refer to future residents.
d) Section 7.1 Assessment of Hazardous Ground Gases – the key requirement of NSW EPA (2012) is the capture of worst-case meteorological conditions for ground gas monitoring – will three monitoring rounds over a four period be sufficient? Note that Section 3.4.6 of NSW EPA (2012) states that '*NSW has relatively infrequent, slow moving weather systems … a longer period of monitoring for each risk setting is likely to be required to capture the worst case*'. Which two monitoring locations are proposed for continuous gas monitoring?
e) Section 8 Well Installation and Sampling Methodology – what depth is groundwater anticipated and how deep will be groundwater/gas monitoring wells be installed to? What depth will screens be installed at? How will periods of low atmospheric pressure and therefore gas sampling be identified prior to mobilisation? The Site Auditor should be consulted should soil vapour sampling be considered to be required to be undertaken.
f) Section 10 Reporting – the Data Gap Assessment should be revised, update and prepared in accordance with the NSW EPA reporting guidelines (OEH 2011). The report should be reviewed/approved by a certified contaminated land consultant in the event that it is used in support of a development application in the future.

Regards,
Christine

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## Christine Louie

**From:** DOBSON, AMY <AMY.DOBSON@sydneywater.com.au>
**Sent:** Wednesday, 1 August 2018 4:54 PM
**To:** Andrew Lau; Christine Louie
**Cc:** FLACK, ANNA
**Subject:** Amended Ashbury SAQP
**Attachments:** P033725.003 Sydney Water_Ashbury SAQP Final V0.pdf

Hi Andrew, Christine –

Please find below email chain and attached amended SAQP for Ashbury.

Can you please provide an indicative turnaround for your review so I can advise PRM.

In addition, Ill provide an update if any sampling data becomes available from Council in relation to Peace Park.

Appreciated.

Regards,

Amy Dobson
Senior Project Manager – Environmental Services
Property, Sydney Water
Level 13, 1 Smith Street, Parramatta NSW 2150

Sydney WATER

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amy.dobson@sydneywater.com.au

All enquiries to propertyenvironmental@sydneywater.com.au

---

**From:** DOBSON, AMY
**Sent:** Wednesday, 1 August 2018 4:47 PM
**To:** 'Jonathan Coffey' <jonathan.coffey@progressiverm.com.au>
**Cc:** FLACK, ANNA <ANNA.FLACK@sydneywater.com.au>; Ben McGiffin <ben.mcgiffin@progressiverm.com.au>
**Subject:** Amended Ashbury SAQP - SW comments

Thanks Jono,

I've read over the changes and will send the below plus amended document to Andrew now for review and request an anticipated TAT. Two comment below in green.

I have also contacted Canterbury Council and requested any sampling data available for Peace Park. I expect a response on this tomorrow and will advise and send any available documentation your way.

Appreciated.

Regards,

Amy Dobson
Senior Project Manager – Environmental Services
Property, Sydney Water
Level 13, 1 Smith Street, Parramatta NSW 2150

Sydney WATER

Mob 0411 306 656
amy.dobson@sydneywater.com.au

All enquiries to propertyenvironmental@sydneywater.com.au

**From:** Jonathan Coffey [mailto:jonathan.coffey@progressiverm.com.au]
**Sent:** Wednesday, 1 August 2018 11:56 AM
**To:** DOBSON, AMY <AMY.DOBSON@sydneywater.com.au>
**Cc:** FLACK, ANNA <ANNA.FLACK@sydneywater.com.au>; Ben McGiffin <ben.mcgiffin@progressiverm.com.au>
**Subject:** Re: Ashbury SAQP - JBS&G comments

Hi Amy,

Please see below response to the auditor comments and the updated SAQP attached.

a) Section 4 Preliminary Conceptual Site Model – the preliminary CSM should provide a representation of the contamination sources, receptors and exposure pathways for all potentially affected media for the site, not just the targeted media of groundwater and hazardous ground gases.
Noted and amended

b) Section 4.1 Potential Source of Contamination should be clear on the origins of the contamination sources (eg uncontrolled fill from unknown sites, ACM from demolished/existing buildings) and the potential impacts from the former adjacent brickworks (upgradient groundwater impacts, ground gases, ash/slag fill?)
Noted and amended

c) Section 4.5 Potential Receptors – future site users should be specific and refer to future residents.
Noted and amended

d) Section 7.1 Assessment of Hazardous Ground Gases – the key requirement of NSW EPA (2012) is the capture of worst-case meteorological conditions for ground gas monitoring – will three monitoring rounds over a four period be sufficient? Note that Section 3.4.6 of NSW EPA (2012) states that 'NSW has relatively infrequent, slow moving weather systems … a longer period of monitoring for each risk setting is likely to be required to capture the worst case'. Which two monitoring locations are proposed for continuous gas monitoring?
Amended. A total of 6 rounds of spot monitoring is now proposed to be completed over a 3 month period. Additional commentary regarding well selection for continuous monitoring locations has been included. Placement of both along the western boundary isn't warranted?

e) Section 8 Well Installation and Sampling Methodology – what depth is groundwater anticipated and how deep will be groundwater/gas monitoring wells be installed to? What depth will screens be installed at?

Depth to groundwater is currently unknown. There are no monitoring bores surrounding the site with relevant water depths or screening depths to assist. Furthermore, it is considered likely the underlying hydrological conditions have been impacted/ influenced by the former Brickworks pit adjacent to the site.

Geotechnical works are proposed to be completed in parallel with the HGG / GW assessment (commencing the day before the HGG/GW well installation works). Where possible, PRM proposed to utilise information from the intrusive geotechnical works to support the HGG/GW installation depths and well design.

It is proposed that HGG wells will be installed either to the top of rock (or method refusal with solid stem auger) or 0.5m above the groundwater table (whichever is intercepted first) and screened to 0.5m below the ground surface in order to allow for adequate bentonite/grout seal.

How will periods of low atmospheric pressure and therefore gas sampling be identified prior to mobilisation?
Forecast maps for Mean Sea Pressure Prognosis from BOM will be utilised to support the timing of the spot monitoring events.

The Site Auditor should be consulted should soil vapour sampling be considered to be required to be undertaken.
Noted

f) Section 10 Reporting – the Data Gap Assessment should be revised, update and prepared in accordance with the NSW EPA reporting guidelines (OEH 2011). The report should be reviewed/approved by a certified contaminated land consultant in the event that it is used in support of a development application in the future
Noted. This could be added as a point within Section 10 if further amendments to the report are warranted.

Kind Regards,

Jono

**Jonathan Coffey**
**Team Leader - Environmental Risk**

E: jonathan.coffey@progressiverm.com.au

M: 0435 448 008

On 24 July 2018 at 17:41, DOBSON, AMY <AMY.DOBSON@sydneywater.com.au> wrote:

Hi Jono,

The Site Auditor has conducted a review of the Sampling, Analysis and Quality Plan Ashbury Reservoir 165-169 Holden Street, Ashbury NSW prepared by Progressive Risk Management (PRM) dated July 2018 and provides the following comments:

a) Section 4 Preliminary Conceptual Site Model – the preliminary CSM should provide a representation of the contamination sources, receptors and exposure pathways for all potentially affected media for the site, not just the targeted media of groundwater and hazardous ground gases.

b) Section 4.1 Potential Source of Contamination should be clear on the origins of the contamination sources (eg uncontrolled fill from unknown sites, ACM from demolished/existing buildings) and the potential impacts from the former adjacent brickworks (upgradient groundwater impacts, ground gases, ash/slag fill?)

c) Section 4.5 Potential Receptors – future site users should be specific and refer to future residents.

d) Section 7.1 Assessment of Hazardous Ground Gases – the key requirement of NSW EPA (2012) is the capture of worst-case meteorological conditions for ground gas monitoring – will three monitoring rounds over a four period be sufficient? Note that Section 3.4.6 of NSW EPA (2012) states that 'NSW has relatively infrequent, slow moving weather systems … a longer period of monitoring for each risk setting is likely to be required to capture the worst case'. Which two monitoring locations are proposed for continuous gas monitoring?

e) Section 8 Well Installation and Sampling Methodology – what depth is groundwater anticipated and how deep will be groundwater/gas monitoring wells be installed to? What depth will screens be installed at? How will periods of low atmospheric pressure and therefore gas sampling be identified prior to mobilisation? The Site Auditor should be consulted should soil vapour sampling be considered to be required to be undertaken.

f) Section 10 Reporting – the Data Gap Assessment should be revised, update and prepared in accordance with the NSW EPA reporting guidelines (OEH 2011). The report should be reviewed/approved by a certified contaminated land consultant in the event that it is used in support of a development application in the future.

Once you've digested can you please indicate whether you'd like to discuss any of the above with me or JBS&G, your anticipated turnaround of the final document and which of the items/outcomes have a bearing on the cost of the assessment moving forward.

Many thanks,

Regards,

Amy Dobson

Senior Project Manager – Environmental Services

Property, Sydney Water

Level 13, 1 Smith Street, Parramatta NSW 2150

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amy.dobson@sydneywater.com.au

All enquiries to propertyenvironmental@sydneywater.com.au

**From:** Jonathan Coffey [mailto:jonathan.coffey@progressiverm.com.au]
**Sent:** Monday, 23 July 2018 3:27 PM
**To:** DOBSON, AMY <AMY.DOBSON@sydneywater.com.au>
**Subject:** Re: Ashbury SAQP- SW comments

Ok, thanks Amy. We'll do what we can with the contractors availability etc. Hopefully the planets align when we need to get to site!

**Jonathan Coffey**

**Team Leader - Environmental Risk**

E: jonathan.coffey@progressiverm.com.au

M: 0435 448 008

On 23 July 2018 at 15:22, DOBSON, AMY <AMY.DOBSON@sydneywater.com.au> wrote:

Andrew returned from leave today and in his absence Christine had flagged he will be able to meet his standard TAT of 1-2 weeks. I am hoping we can still meet the timeframes specified.

Regards,

Amy Dobson

Senior Project Manager – Environmental Services

Property, Sydney Water

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amy.dobson@sydneywater.com.au

All enquiries to propertyenvironmental@sydneywater.com.au

**From:** Jonathan Coffey [mailto:jonathan.coffey@progressiverm.com.au]
**Sent:** Monday, 23 July 2018 3:18 PM
**To:** DOBSON, AMY <AMY.DOBSON@sydneywater.com.au>
**Subject:** Re: Ashbury SAQP- SW comments

Thanks Amy,

Do you think we will meet the schedule I put forward in regards to review times? i.e is Andrew away or going away?

I need to start thinking about booking in contractors etc.

Cheers,

Jono

**Jonathan Coffey**

**Team Leader - Environmental Risk**

E: jonathan.coffey@progressiverm.com.au

M: 0435 448 008

On 23 July 2018 at 15:11, DOBSON, AMY <AMY.DOBSON@sydneywater.com.au> wrote:

> Thanks again Jono,
>
> I've provided the attached to Andrew Lau as I had very few (minor) comments. Enjoy your time off and hopefully we'll have comments available shortly after your return.
>
> Cheers,
>
> Regards,

Amy Dobson

Senior Project Manager – Environmental Services

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amy.dobson@sydneywater.com.au

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**From:** Jonathan Coffey [mailto:jonathan.coffey@progressiverm.com.au]
**Sent:** Friday, 20 July 2018 11:35 AM
**To:** DOBSON, AMY <AMY.DOBSON@sydneywater.com.au>
**Cc:** Ben McGiffin <ben.mcgiffin@progressiverm.com.au>; Nick Passlow <nick.passlow@progressiverm.com.au>
**Subject:** Ashbury SAQP- Draft for comment

Hi Amy,

Please see attached the draft Ashbury SAQP for review and comment.

FYI Nick is on leave for two weeks and I'm off Wed-Friday next week, but I'll have my phone with me so feel free to call if you need.

Have a great weekend.

Jono

**Jonathan Coffey**

## Team Leader - Environmental Risk

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Royal North Shore Hospital Post Office

NSW 2065

## Christine Louie

**From:** Christine Louie
**Sent:** Monday, 13 August 2018 10:49 AM
**To:** DOBSON, AMY
**Cc:** Andrew Lau; FLACK, ANNA
**Subject:** RE: Ashbury Data and Mobilisation

Hi Amy,

Thank you for the additional information.

An audit site visit for this programme of works is not necessary.

Just keep Andrew and myself updated on PRM's progress.

Regards,
Christine

**Christine Louie** | Principal | JBS&G
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Level 1, 50 Margaret Street Sydney NSW 2000
T: 02 8245 0300 | M: 0423 539 373| E: clouie@jbsg.com.au | W: www.jbsg.com.au
**Contaminated Land | Groundwater Remediation | Environmental Approvals | Auditing and Compliance | Hygiene and Hazardous Materials | Due Diligence and Liability | Stakeholder and Risk Management**



---

**From:** DOBSON, AMY <AMY.DOBSON@sydneywater.com.au>
**Sent:** Friday, 3 August 2018 1:35 PM
**To:** Christine Louie <clouie@jbsg.com.au>
**Cc:** Andrew Lau <ALau@jbsg.com.au>; FLACK, ANNA <ANNA.FLACK@sydneywater.com.au>
**Subject:** Ashbury Data and Mobilisation

Hi Christine,

PRM propose to commence on site from 20 August. Please let me know if you'd like to coordinate a site visit.

Also, PRM clarified that only 3 combined HGG/GW wells are proposed, with 6 wells being HGG only.

The only reports I have gathered from the adjacent Peace Park (former brickworks) is the discharge data provided to Sydney Water as a condition of the Trade Waste Agreement with Council with commentary that "the discharge from the (former brickworks) site is via the sewerage system". The lab reports have been provided to PRM for review. I've attached to this email for completeness.

Council anecdotally indicated the waste used to fill Peace Park was general building material rather than putrescible and the gas being generated is understood to be low (yet they don't appear to have data available to substantiate this).

Happy to discuss any element of the works as needed.

Cheers,

Regards,

Amy Dobson
Senior Project Manager – Environmental Services
Property, Sydney Water
Level 13, 1 Smith Street, Parramatta NSW 2150

Sydney WATER

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amy.dobson@sydneywater.com.au

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---

**From:** Christine Louie [mailto:clouie@jbsg.com.au]
**Sent:** Thursday, 2 August 2018 1:07 PM
**To:** DOBSON, AMY <AMY.DOBSON@sydneywater.com.au>
**Cc:** FLACK, ANNA <ANNA.FLACK@sydneywater.com.au>; Andrew Lau <ALau@jbsg.com.au>
**Subject:** RE: Amended Ashbury SAQP

Hi Amy,

Thank you for the revised SAQP and PRM email correspondence.

The Site Auditor has reviewed the amended SAQP and email chain response and provides the following comments:

- Section 7.1 Assessment of Hazardous Ground Gases – continuous HGG monitoring of one boundary and one central site location is acceptable.
- Section 8 Well Installation and Sampling Methodology – six out of the proposed nine monitoring wells are combined HGG and GW wells. If the HGG/GW wells are to be installed to the top of rock or 0.5 m above the groundwater table (whichever is intercepted first) then these are essentially HGG wells and construction of these six wells should reflect this purpose. It is noted that a PRM work instruction is provided in the appendix only for the installation of groundwater monitoring wells.
- While an amended SAQP incorporating all the responses to the Auditor comments would be preferable, the combined amended SAQP and email response sufficiently address the remainder of the Auditor comments. A revised SAQP is not required.

Regards,
Christine

**Christine Louie** | Principal | JBS&G
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## Christine Louie

**From:** DOBSON, AMY <AMY.DOBSON@sydneywater.com.au>
**Sent:** Tuesday, 21 August 2018 11:47 AM
**To:** Andrew Lau
**Cc:** Christine Louie
**Subject:** RE: Ashbury Update + GW Query

**Follow Up Flag:** Follow up
**Flag Status:** Completed

Thanks Andrew,

Ill convey to PRM and request they extend to 15 mbgl and install the 3 bores as planned.

Regards,

Amy Dobson
Senior Project Manager – Environmental Services
Property, Sydney Water
Level 13, 1 Smith Street, Parramatta NSW 2150

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---

**From:** Andrew Lau [mailto:ALau@jbsg.com.au]
**Sent:** Tuesday, 21 August 2018 11:37 AM
**To:** DOBSON, AMY <AMY.DOBSON@sydneywater.com.au>
**Cc:** Christine Louie <clouie@jbsg.com.au>
**Subject:** Re: Ashbury Update + GW Query

Groundwater guidelines say 15m. Beyond this I'm happy not to go further.

Andrew Lau
JBS&G
0412 512 614
www.jbsg.com.au

On 21 Aug 2018, at 10:42, DOBSON, AMY <AMY.DOBSON@sydneywater.com.au> wrote:

> Hi Andrew, Christine –
>
> Drilling is going well at Ashbury however PRM's first attempted groundwater bore location remains dry (email below provides context).

Noting the SAQP describes groundwater bores to be installed to 10 m depth, can we please discuss the merit on progressing a bore beyond current drilled depth or suitability to draw risk based conclusions from potential contamination from groundwater at >10 m depth.

I'd appreciate if you can spare some time asap to discuss so I can feedback to PRM in real time. Is this possible?

Thanks,

Regards,

Amy Dobson
Senior Project Manager – Environmental Services
Property, Sydney Water
Level 13, 1 Smith Street, Parramatta NSW 2150

<image002.png>Mob 0411 306 656
amy.dobson@sydneywater.com.au



**From:** Geoff Fletcher [mailto:geoff.fletcher@progressiverm.com.au]
**Sent:** Tuesday, 21 August 2018 7:41 AM
**To:** DOBSON, AMY <AMY.DOBSON@sydneywater.com.au>
**Cc:** Jonathan Coffey <jonathan.coffey@progressiverm.com.au>
**Subject:** Ashbury Update

Hi Amy,

As discussed in our phone conversations yesterday and today we extended one of the boreholes to 10 metres. The location has been circled in yellow on the attached plan. During drilling no groundwater seepage was observed and the borehole was dry on completion. The borehole was also dry when arriving to site this morning, 16 hours after drilling completion.

The following sub surface conditions were encountered during the drilling of this location:

- fill soils to a depth of 0.7m
- residual clay's from 0.7m to 1.5m
- shale bedrock from a depth of 1.5m to 10m

As discussed you will be in contact with the Site Auditor with these findings to discuss whether deeper drilling is required to find groundwater. I look forward to the Site
Auditors response.

**Geoff Fletcher**
Senior Consultant - Environmental Risk

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Progressive Risk Management Pty Ltd
www.progressiverm.com.au

Unit 14/76 Reserve Road
Artarmon NSW 2064

PO Box 4001
Royal North Shore Hospital Post Office
NSW 2065



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<P033725.003 Figure 2.pdf>

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**Site Auditor Initial Review Comments – Ashbury HGG & GW**

| | | | |
|---|---|---|---|
| **Site Auditor:** | Andrew Lau | **Site:** | Ashbury Reservoir 165-169 Holden Street, Ashbury NSW |
| **Date:** | 13/02/2019 | **Report / Document:** | HGG and GW Assessment (P033725.004/C0151 Version A Draft, December 2018) |

| No. | Issue /Comment | PRM Response |
|---|---|---|
| 1 | Executive Summary – please see comments on Section 10 Conclusions. | Noted. |
| 2 | Section 1.1 Project Background – the latest version of the DGA is December 2018 not March. | Noted. |
| 3 | Section 7.1 Subsurface Conditions – groundwater gauging and sampling field data has not been tabulated. No discussion has been provided on the groundwater field monitoring parameters and conditions. Please provide clarification on why no field parameters were recorded for monitoring well GW01. | Noted. New Section added (7.1.2 Groundwater Screeing) to discuss groundwater field parameters. As described in the comments section of the field sheet for GW01 field parameters not collected prior to sampling due to the limited head of water within the monitoring well. Collection of parameters in GW01 would have limited the CoPC in the groundwater analysis. |
| 4 | Section 7.3.1 Spot Monitoring – please tabulate the gas monitoring results as the HGG field sheets provided in Appendix D use incorrect well IDs, contain overwritten results, and are generally incomplete (no gas flows are recorded in some fields). The gas monitoring methodology proposed in the SAQP does not appear to have been followed consistently (e.g. sampling periods range from 1 minute to 5 minutes). Please provide comment on the gas monitoring undertaken and assess effects of any inconsistencies against the DQIs. | Spot Monitoring results have been tabulated and attached in Appendix D prior to the original field sheets. Noted that some sheets have been labelled with different IDs (e.g. BH1, HGG/GW01 and 01) however the number sequence is correct.<br>Correct, readings do appear to be missing for some elements of spot monitoring round 1. Field personnel have indicated that this has occurred due to either a 0 reading and or previous reading continued into the next sample interval.<br>As outlined in Section 5.4.1 HGG parameters were recorded generally every 30 seconds to 1 minute for at least 3 to 5 minutes. An increase in time from the 3 minutes specified in the SAQP was based on field observations to allow for stabilisation of HGG parameters. Following the increase to 5 minutes this length of time was adopted for consistency. |
| 5 | Section 7.3.2 Continuous Monitoring – Gas monitoring well HGG01 is a combined gas/groundwater monitoring well which was installed to a total depth of approximately 15 m bgl. Please provide comment on whether the length of well may have impacted gas concentrations | Noted. Same would apply to HGG03 prior to damaging and HGG08. The depth of these wells to approximately 15 m bgl into shale bedrock may have increased concentrations of gas due to background concentrations from natural sources (i.e shale). However, HGG concentrations recorded are considered unlikely to have been significantly impacted due to the length of the well and screen.<br>No change to the report proposed. |

| No. | Issue /Comment | PRM Response |
|---|---|---|
| 6 | Section 7.4 Quality Assurance/Quality Control – the gas monitoring field sheets indicate various factors that may affect the dataset e.g. negative gas flow readings, water covering monitoring well. Please provide comment on the impact of these field conditions on the monitoring results. It is noted that the laboratory prepared trip spike was in water, not soil as stated in the report. | Noted and amended trip spike to water.<br>Negative recordings of flow were instantaneous on the GFM meter, returning to 0, and are not representative of actual flow. Water was noted within the road box/ gatic covering at HGG08. This water was removed entirely and well cap integrity checked before obtaining HGG readings with the GFM meter. |
| 7 | Section 8 Discussion – while heavy metals concentrations detected above the ecological GILs are considered background concentrations, please provide comment on the impacts for the proposed land use. | Noted. Added comment in regards to proposed land use. |
| 8 | Section 9 Revised Conceptual Site Model – the inhalation of fibres and dust from uncontrolled fill does not apply to groundwater or HGG. The revised CSM for the site should be presented with consideration of the findings of the groundwater and ground gas monitoring and therefore present only the source, pathway and receptors linkages that are complete. | Noted and amended. |
| 9 | Section 10 Conclusions – while it is acknowledged that the investigation was undertaken on groundwater and ground gas, it would be appropriate to provide a statement on the suitability of the site overall (including soil) for the proposed development (stated in project objectives) given that no further site investigations are proposed. | Noted. Statement added. Also added in executive summary to address comment 1. |
| 10 | Appendix B: Groundwater Field Sheets – where are the field parameters for GW01? | As per response to comment 3 above the field sheet for GW01 comments that field parameters were not collected prior to sampling due to the limited head of water within the monitoring well. Collection of parameters in GW01 would have limited the CoPC in the groundwater analysis. |
| 11 | Appendix F: Calibration Certificates – please provide the calibration certificates for the gas clams. | Noted. Calibration certificates now attached |

## Christine Louie

**From:** Christine Louie
**Sent:** Tuesday, 19 March 2019 1:22 PM
**To:** DOBSON, AMY
**Cc:** Andrew Lau
**Subject:** RE: Updated Ashbury Report for Comment

Hi Amy,

Thank you for the revised report and response from RPM.

The auditor comments have been sufficiently addressed in the revised Hazardous Ground Gas and Groundwater Assessment report.

Is a final version of the Data Gap Assessment report including the UCL calculations forthcoming in addition to the summary report?

Regards,
Christine

**Christine Louie** | Principal | JBS&G
Sydney | Melbourne | Adelaide | Perth | Brisbane | Canberra | Darwin | Wollongong
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**Contaminated Land | Groundwater Remediation | Environmental Approvals | Auditing and Compliance | Hygiene and Hazardous Materials | Due Diligence and Liability | Stakeholder and Risk Management**



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**From:** DOBSON, AMY <AMY.DOBSON@sydneywater.com.au>
**Sent:** Thursday, 7 March 2019 11:54 AM
**To:** Christine Louie <clouie@jbsg.com.au>
**Cc:** Andrew Lau <ALau@jbsg.com.au>
**Subject:** Updated Ashbury Report for Comment

Hi Christine, Andrew -

Please find attached response and updated Hazardous Ground Gas and Groundwater Assessment report (part 2 to follow in separate email) from PRM in response to your comments below.

In addition, I've commissioned PRM to produce a summary letter in response to your overarching comment around wanting to see a clear and consolidated site recommendations on what is required to enable divestment of the site. I'll provide this to you as soon as I'm able.

Given both the GW/HGG and the DGA reports remain intentionally separate, the summary letter will reference both final reports and will provide a consolidated CSM and recommendations for the site (including soil, gas and GW findings). Can you please flag with me if you have a strong preference otherwise.

Regards,

Amy Dobson
Senior Project Manager
Group Property – Environmental Services
Sydney Water, Level 13, 1 Smith Street, Parramatta NSW 2150

Sydney WATER

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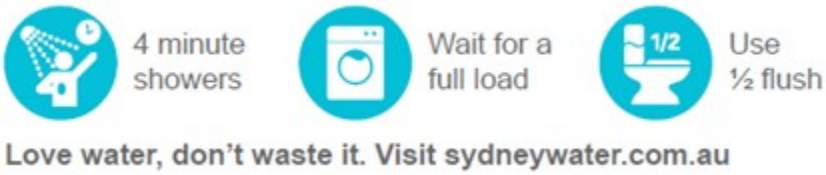
amy.dobson@sydneywater.com.au




All enquiries to propertyenvironmental@sydneywater.com.au

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**From:** Christine Louie <clouie@jbsg.com.au>
**Sent:** Monday, 21 January 2019 2:13 PM
**To:** DOBSON, AMY <AMY.DOBSON@sydneywater.com.au>
**Cc:** Andrew Lau <ALau@jbsg.com.au>
**Subject:** RE: Ashbury Reports for Comment

HI Amy,

Please see auditor comments on the two reports below.

The two reports issued, while address different aspects of the site, should consider the site as a whole and therefore reference the other investigations as necessary in assessing the suitability of the site for the proposed land use.

The Data Gap Assessment (Rev 3) has been updated to include DQOs and a QA/QC assessment of the DGA works, and 95% UCL analysis (calculations not included). No other changes have been made to the report including the requirement for additional investigations including ground gas and groundwater. It is unclear from the report what is required to enable divestment of the site.

The following report has been reviewed by the Auditor with comments provided below:

*Hazardous Ground Gas and Groundwater Assessment Ashbury Reservoir 165-169 Holden Street, Ashbury NSW*. Ref: P033725.004/C0151 Version A Draft, December 2018.

- Executive Summary – please see comments on Section 10 Conclusions.
- Section 1.1 Project Background – the latest version of the DGA is December 2018 not March.
- Section 7.1 Subsurface Conditions – groundwater gauging and sampling field data has not been tabulated. No discussion has been provided on the groundwater field monitoring parameters and conditions. Please provide clarification on why no field parameters were recorded for monitoring well GW01.
- Section 7.3.1 Spot Monitoring – please tabulate the gas monitoring results as the HGG field sheets provided in Appendix D use incorrect well IDs, contain overwritten results, and are generally incomplete (no gas flows are recorded in some fields). The gas monitoring methodology proposed in the SAQP does not appear to have been

## Christine Louie

**From:** Christine Louie
**Sent:** Thursday, 2 May 2019 2:48 PM
**To:** DOBSON, AMY
**Cc:** Andrew Lau
**Subject:** RE: Ashbury - Summary Report and DGA Update for Comment

Hi Amy,

The following reports have been reviewed:

- *Data Gap Analysis: Ashbury Reservoir, 165 – 169 Holden Street, Ashbury NSW*. Ref: P033725.001/C0151 Version 4_Final, 29/03/2019. PRM. (PRM 2019a)
- *Summary of Contamination Condition Part of Ashbury Reservoir, 165 – 169 Holden Street, Ashbury NSW*. Ref: P033725.005/C0151 Version A, 29/03/2019. PRM. (PRM 2019b)

The auditor has the following comments on the reports:

- PRM 2019a has not included the dataset used in the UCL calculations. These should be provided in the report.
- PRM 2019a should state that the site is not suitable for low density residential land use in its current condition without remediation and/or management rather than 'not suitable for the proposed divestment for a residential land use'.
- PRM 2019b provides two options for divestment of the site – preparation of a RAP and remediation of the site or notification of identified contamination to potential purchasers with management/remediation of contamination prior to or during site development (it is noted that PRM 2019a stated that there should be no ongoing restrictions or limitations, such as an EMP, placed on the title).

In light of the recommendations in PRM 2019a which concludes that the site is not suitable for low density residential land use without remediation of identified contamination and validation, PRM 2019b should provide a recommendation consistent with this finding. Following preparation of a RAP for remediation of the identified contamination, a Section B SAS/SAR can be prepared certifying that the site can be made suitable for residential with accessible soil land use on implementation of the RAP.

Regards,
Christine

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**From:** DOBSON, AMY <AMY.DOBSON@sydneywater.com.au>
**Sent:** Monday, 1 April 2019 1:49 PM

**To:** Christine Louie <clouie@jbsg.com.au>
**Cc:** Andrew Lau <ALau@jbsg.com.au>
**Subject:** RE: Ashbury - Summary Report and DGA Update for Comment

Hi Christine, Andrew –

Please find the two updated documents from PRM attached for Ashbury.

Look forward to discussing following your review.

Cheers,

Regards,

Amy Dobson
Senior Project Manager
Property – Environmental Services
Sydney Water, Level 13, 1 Smith Street, Parramatta NSW 2150

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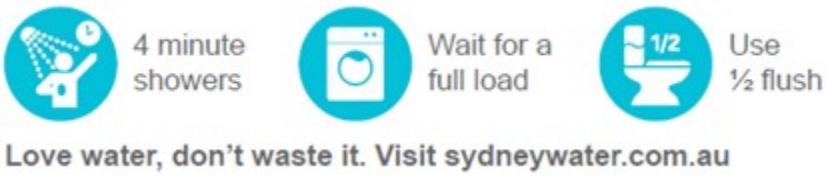
amy.dobson@sydneywater.com.au




All enquiries to propertyenvironmental@sydneywater.com.au

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**From:** DOBSON, AMY
**Sent:** Tuesday, 26 March 2019 3:01 PM
**To:** 'Christine Louie' <clouie@jbsg.com.au>
**Cc:** Andrew Lau <ALau@jbsg.com.au>
**Subject:** Ashbury - Summary Report and DGA Update for Comment

Hi Christine, Andrew –

PRM are finalising their draft Summary Letter and the final version of the Data Gap Assessment report including the UCL calculations and will provide to you direct this week, given I am on leave.

Look forward to discussing next week.

Regards,

Amy Dobson
Senior Project Manager
Property – Environmental Services
Sydney Water, Level 13, 1 Smith Street, Parramatta NSW 2150

## Christine Louie

**From:** Christine Louie
**Sent:** Thursday, 20 June 2019 10:17 AM
**To:** DOBSON, AMY
**Cc:** Andrew Lau
**Subject:** RE: Ashbury - Finalised DGA and Summary Letter

Hi Amy,

The amended reports satisfactorily address the auditor's comments and may be accepted as final.

A Section B1 SAS certifying the nature and extent of contamination as having been appropriately determined and SAR will be issued in draft for your review within the next three weeks.

Regards,
Christine

**Christine Louie** | Principal | JBS&G
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Level 1, 50 Margaret Street Sydney NSW 2000
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**Contaminated Land | Groundwater Remediation | Environmental Approvals | Auditing and Compliance | Hygiene and Hazardous Materials | Due Diligence and Liability | Stakeholder and Risk Management**



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**From:** DOBSON, AMY <AMY.DOBSON@sydneywater.com.au>
**Sent:** Tuesday, 18 June 2019 1:17 PM
**To:** Christine Louie <clouie@jbsg.com.au>; Andrew Lau <ALau@jbsg.com.au>
**Subject:** Ashbury - Finalised DGA and Summary Letter

Hi Christine, Andrew –

I hope you are both well.

Please see below comments from PRM and attached amended Ashbury documents. I understand all comments have been addressed.

- *PRM 2019a has not included the dataset used in the UCL calculations. These should be provided in the report.* The raw data has been included in Appendix F.
- *PRM 2019a should state that the site is not suitable for low density residential land use in its current condition without remediation and/or management rather than 'not suitable for the proposed divestment for a residential land use'..* *Noted and amended*
- *PRM 2019b provides two options for divestment of the site – preparation of a RAP and remediation of the site or notification of identified contamination to potential purchasers with management/remediation of contamination prior to or during site development (it is noted that PRM*

*2019a stated that there should be no ongoing restrictions or limitations, such as an EMP, placed on the title).* Noted and amended.

Can you please advise at your earliest convenience whether these reports are accepted to form the basis of the B1 SAS; and confirmed timing for the delivery of your draft report.

Cheers,

Regards,

Amy Dobson
Senior Project Manager
Property – Environmental Services
Sydney Water, Level 13, 1 Smith Street, Parramatta NSW 2150

Sydney WATER

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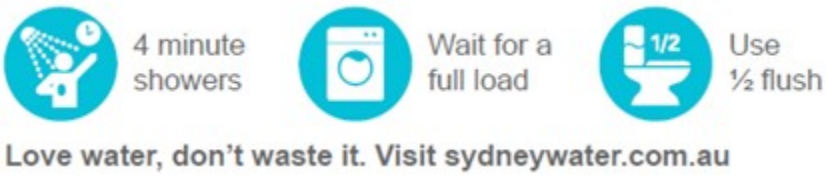
amy.dobson@sydneywater.com.au




All enquiries to propertyenvironmental@sydneywater.com.au

## Appendix C Consultant's Figures


| | |
|---|---|
| Project Reference | P033725 |
| Report Name | Data Gap Analysis |
| Client | Sydney Water |

**165 - 169 Holden Street Ashbury, NSW**

**Site Location Plan Figure 1**

PROGRESSIVE RISK MANAGEMENT

Scale: 1:5000

Coor. Sys: GDA 1994 MGA Zone56

## Legend

Approx. Disposal Area Boundary

Image Source: Sixmaps (2017)


| | |
|---|---|
| Project Reference | P033725 |
| Report Name | Data Gap Analysis |
| Client | Sydney Water |

**165 - 169 Holden Street**
**Ashbury, NSW**

**Site Testing Plan**
**Figure 2**

PROGRESSIVE RISK MANAGEMENT

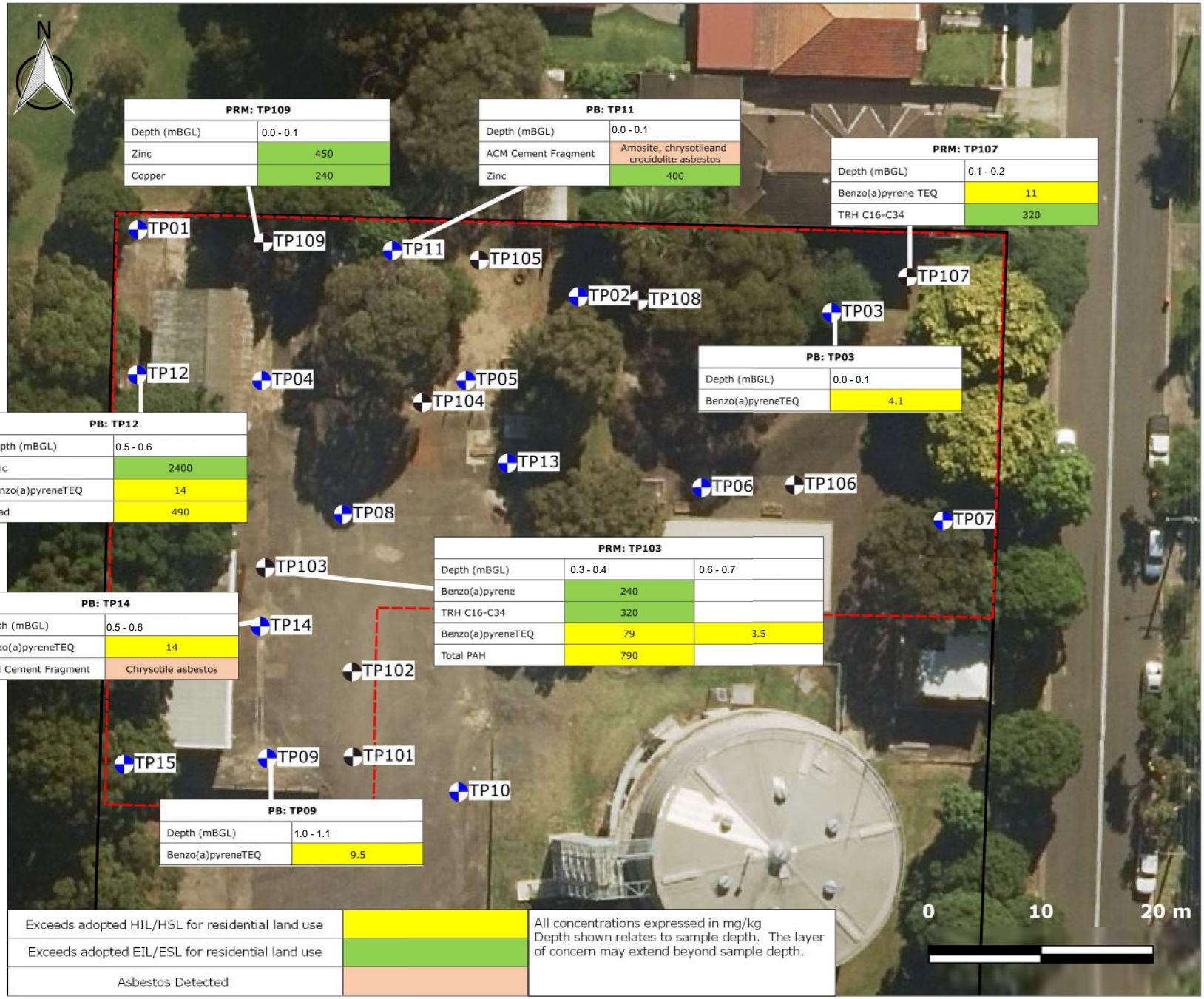
Scale: 1:450

Coor. Sys: GDA 1994 MGA Zone56

## Legend

- PB Testpit Locations (2015)
- PRM Testpit Location
- Approx. Disposal Area Boundary
- Approx. Sydney Water Property

Image Source: Sixmaps (2017)




| | |
|---|---|
| Project Reference | P033725 |
| Report Name | Data Gap Analysis |
| Client | Sydney Water |

**165 - 169 Holden Street Ashbury, NSW**

**Exceedances of SAC Figure 3**

PROGRESSIVE RISK MANAGEMENT

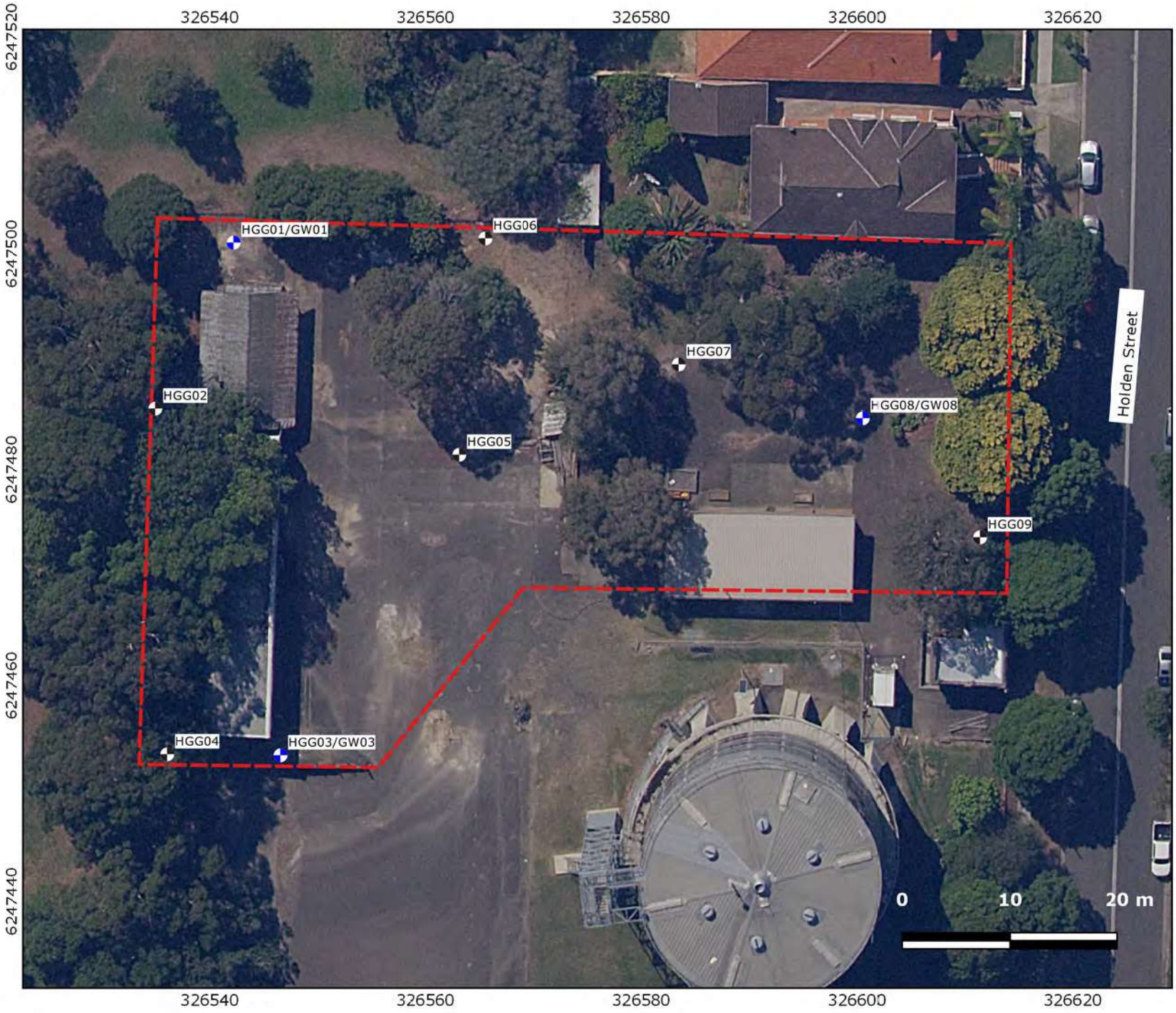
Scale: 1:450

Coor. Sys: GDA 1994 MGA Zone56

## Legend

- PB Testpit Locations (2015)
- PRM Testpit Location (2017)
- Approx. Disposal Area Boundary

Image Source: Sixmaps (2017)




| | |
|---|---|
| Project Reference | P033725.004 |
| Report Name | HGG and Groundwater Assessment |
| Client | Sydney Water |

**Ashbury Reservoir**
**165-169 Holden Street,**
**Ashbury NSW**

**Figure 2**
**Monitoring Well Location Plan**

PROGRESSIVE RISK MANAGEMENT

Scale: 1:500

Coor. Sys: GDA 1994 MGA Zone56

## Legend

- Approximate Site Boundary
- HGG Monitoring Well Location
- HGG & GW Monitoring Well Location

N

Image Source: Spookfish 2018

# Appendix D Consultant's Summary Tables

| | |
|---|---|
| **Project Name:** | Data Gap Analysis |
| **Site Address:** | Ashbury Reservoir, 165-169 Holden Street, Ashbury NSW |
| **Client Name:** | Sydney Water Corporation |
| **Project Reference:** | P033725 / C0151 |
| **Analytical Table:** | Table A: Soil and Fragment Results with Statistics |

PRM
Progressive Risk Management

| Analyte | TRH (mg/kg) | | | | BTEX (mg/kg) | | | | PAH (mg/kg) | | | | | | Heavy Metals (mg/kg) | | | | | | | | Organochloropesticides (mg/kg) | | | | | | | | | | | | ACM by weight calculation | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | F1 - TRH C6-C10 less BTEX | F2 - TRH C10-C16 less naphthalene | TRH C16-C34 | TRH C34-C40 | Benzene | Toluene | Ethylbenzene | Xylenes | Naphthalene | Benzo(a)pyrene | Benzo(a)pyrene TEQ (half) | Total +ve PAHs | Benzo(a)pyrene TCLP (mg/L) | Total +ve PAHs TCLP (mg/L) | Arsenic | Cadmium | Chromium (VI) | Copper | Lead | Mercury | Nickel | Zinc | Total PCBs (mg/kg) | DDT + DDE + DDD | Aldrin and Dieldrin | Chlordane | Endosulfan | Endrin | Heptachlor | Hexachlorobenzene | Methoxychlor | Total OPPs (mg/kg) | Asbestos ID in Soil as per AS4964:^ | Trace Analysis* | AFFA Analysis (% w/w) | ACM observed or suspected i.e building rubble | Screened soil volume (L) | Weight of screened soil (kg) | Fragment/s positive for containing asbestos | Weight of ACM (kg) | Calculated ACM asbestos percentage (%) | ACM (% w/w) |
| **NEPM 2013 HIL-A** | - | - | - | - | - | - | - | - | - | - | 3 | 300 | - | - | 100 | 20 | 100 | 6000 | 300 | 40 | 400 | 7400 | 1 | 240 | 6 | 50 | 270 | 10 | 6 | 10 | 300 | 160 | - | - | - | | | | | | | - |
| **NEPM 2013 HSL-A, 0m - <1m, Sand** | 45 | 110 | - | - | 0,5 | 160 | 55 | 40 | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | NAD | NAD | 0,001 | | | | | | | 0,01 |
| **NEPM 2013 HSL-A, 0m - <1m, Clay** | 50 | 280 | - | - | 0,7 | 480 | NL | 110 | 5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | | | | | | | | | | |
| **CRC Care 2011 Direct Contact HSL-A** | 4400 | 3300 | 4500 | 6300 | 100 | 14,000 | 4500 | 12,000 | 1400 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | | | | | | | - |
| **NEPM 2013 ML Residential (Coarse)** | 700 | 1000 | 2500 | 10,000 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | | | | | | | - |
| **NEPM 2013 EIL Residential[1]** | - | - | - | - | - | - | - | - | 170 | - | - | - | - | - | 100 | - | 830 | 160 | 1100 | - | 190 | 390 | - | 180 | - | - | - | - | - | - | - | - | - | - | - | | | | | | | - |
| **NEPM 2013 ESL Residential (Fine)** | 180 | 120 | 1300 | 5600 | 65 | 105 | 125 | 45 | - | 33 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | | | | | | | - |
| **NEPM 2013 ESL Residential (Coarse)** | 180 | 120 | 300 | 2800 | 50 | 85 | 70 | 105 | - | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | | | | | | | - |
| **Sample ID** | **Sample Depth** | **Layer Depth** | **Description** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PRM TP104_0.1 | 0.1-0.2 | 0.0-0.2 | Topsoil - Fill dark brown silty sand | <25 | <50 | <100 | <100 | <0.2 | <0.5 | <1 | <1 | <0.1 | 0.3 | <0.5 | 3 | - | - | <4 | <0.4 | 11 | 29 | 42 | <0.1 | 14 | 91 | <0.1 | <0.1 | <LOR | <LOR | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <LOR | NAD | NAD | <0.001 | - | 10 | 14,36 | - | - | - | <0.01 |
| PRM TP105_0.1 | 0.1-0.2 | 0.0-0.1 | Topsoil - Fill dark brown silty sand | <25 | <50 | <100 | <100 | <0.2 | <0.5 | <1 | <1 | <0.1 | 0.84 | 1.2 | 8.1 | | | <4 | <0.4 | 29 | 37 | 80 | <0.1 | 45 | 97 | <0.1 | <0.1 | <LOR | <LOR | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <LOR | NAD | NAD | <0.001 | Y | 10 | 14,02 | - | - | - | <0.01 |
| PRM TP107_0.1 | 0.1-0.2 | 0.0-0.2 | Topsoil - Fill dark brown silty sand | <25 | <50 | 320 | <100 | <0.2 | <0.5 | <1 | <1 | <0.1 | 8.1 | 11 | 130 | <0.001 | NIL (+ve) | 5 | <0.4 | 11 | 14 | 150 | 0.1 | 5 | 62 | <0.5 | <0.1 | <LOR | <LOR | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <LOR | NAD | NAD | - | - | 10 | 12,65 | - | - | - | <0.01 |
| PRM TP108_0.0 | 0.0-0.1 | 0.0-0.2 | Topsoil - Fill dark brown silty sand | <25 | <50 | 150 | <100 | <0.2 | <0.5 | <1 | <1 | <0.1 | 0.68 | 1 | 7.8 | - | - | <4 | <0.4 | 12 | 60 | 78 | <0.1 | 30 | 98 | <0.2 | <0.1 | <LOR | <LOR | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <LOR | NAD | NAD | - | - | - | - | - | - | - | - |
| PRM TP109_0.0 | 0.0-0.1 | 0.0-0.2 | Topsoil - Fill dark brown silty sand | <25 | <50 | 200 | <100 | <0.2 | <0.5 | <1 | <1 | <0.1 | 0.3 | 0.5 | 3.6 | - | - | <4 | <0.4 | 25 | 240 | 250 | <0.1 | 35 | 450 | <0.1 | <0.1 | <LOR | <LOR | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <LOR | NAD | NAD | - | - | - | - | - | - | - | - |
| PB TP03 | 0.0-0.1 | 0.0-0.3 | Fill brown silty clay with roots and gravels | | | 180 | | | | | | | | 4.1 | | | | | | | 26 | 210 | | | 150 | | | | | | | | | | | | | | | | | | | | |
| PB TP05 | 0.0-0.1 | 0.0-0.2 | Fill brown gravelly clay with gravels and roots | | | <90 | | | | | | | | 0.7 | | | | | | | 15 | 51 | | | 67 | | | | | | | | | | | | | | | | | | | | |
| PB TP11 | 0.0-0.1 | 0.0-0.35 | Fill brown gravelly clay with brick / concrete / ash / slag / FCS | | | <90 | | | | | | | | 0.4 | | | | | | | 48 | 130 | | | 400 | | | | | | | | | | | | | | | | | | Y | | 0.0107 |
| PRM TP101_0.15 | 0.15-0.2 | 0.15-0.4 | Fill light brown sandy clay with gravel (under asphalt) | <25 | <50 | 140 | 160 | <0.2 | <0.5 | <1 | <1 | <0.1 | 0.1 | <0.5 | 1.2 | - | - | <4 | <0.4 | 18 | 24 | 16 | <0.1 | 63 | 31 | <0.1 | <0.1 | <LOR | <LOR | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <LOR | NAD | NAD | - | - | - | - | - | - | - | - |
| PRM TP102_0.4 | 0.4-0.5 | 0.3-0.5 | Fill light brown gravelly clay, brick / wire / terracotta (under asphalt) | <25 | <50 | <100 | <100 | <0.2 | <0.5 | <1 | <1 | <0.1 | <0.05 | <0.5 | <0.05 | - | - | 4 | <0.4 | 5 | 4 | 7 | <0.1 | 3 | 4 | <0.1 | <0.1 | <LOR | <LOR | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <LOR | NAD | NAD | <0.001 | Y | 10 | 13,61 | - | - | - | <0.01 |
| PRM TP106_0.3 | 0.3-0.4 | 0.2-0.5 | Fill brown sandy clay, gravels (under asphalt) | <25 | <50 | <100 | <100 | <0.2 | <0.5 | <1 | <1 | <0.1 | <0.05 | <0.5 | <0.05 | - | - | <4 | <0.4 | 26 | 40 | 3 | <0.1 | 150 | 36 | <0.1 | <0.1 | <LOR | <LOR | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <LOR | NAD | NAD | - | - | - | - | - | - | - | - |
| PRM TP103_0.3 | 0.3-0.4 | 0.2-0.5 | Fill grey gravelly clay, fly ash / coal wash (under asphalt) | <25 | <50 | 1500 | 170 | <0.2 | <0.5 | <1 | <1 | <0.1 | 55 | 79 | 790 | <0.001 | NIL (+ve) | 5 | <0.4 | 18 | 28 | 59 | <0.1 | 54 | 120 | <0.1 | <0.1 | <LOR | <LOR | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <LOR | NAD | NAD | <0.001 | Y | 10 | 14,61 | - | - | - | <0.01 |
| PB TP01 | 0.05-0.15 | 0.05-0.2 | Fill grey fly ash (under asphalt) | | | <90 | | | | | | | | 1.5 | | | | | | | 51 | 170 | | | 260 | | | | | | | | | | | | | | | | | | | | |
| PB TP04 | 0.05-0.15 | 0.05-0.2 | Fill grey clayey gravel (under asphalt) | | | 200 | | | | | | | | 0.2 | | | | | | | 86 | 120 | | | 160 | | | | | | | | | | | | | | | | | | | | |
| PB TP07 | 0.05-0.15 | 0.05-0.35 | Fill grey clayey gravel (under asphalt) | | | <90 | | | | | | | | 0.4 | | | | | | | 43 | 34 | | | 47 | | | | | | | | | | | | | | | | | | | | |
| PB TP08 | 0.05-0.15 | 0.05-0.3 | Fill brown gravelly clay with ash (under asphalt) | | | 240 | | | | | | | | <0.2 | | | | | | | 40 | 16 | | | 67 | | | | | | | | | | | | | | | | | | | | |
| PB TP10 | 0.05-0.1 | 0.05-0.25 | Fill grey gravelly clay with concrete / charcoal / slag (under asphalt) | | | 180 | | | | | | | | <0.2 | | | | | | | 110 | 76 | | | 180 | | | | | | | | | | | | | | | | | | | | |
| PB TP12 | 0.05-0.1 | 0.05-0.67 | Fill grey clayey gravel with basalt and minor charcoal (under asphalt) | | | <90 | | | | | | | | 0.9 | | | | | | | 79 | 64 | | | 190 | | | | | | | | | | | | | | | | | | | | |
| PB TP12 | 0.5-0.6 | 0.05-0.67 | Fill grey clayey gravel with basalt and minor charcoal (under asphalt) | | | 120 | | | | | | | | 4.9 | | | | | | | 13 | 490 | | | 2400 | | | | | | | | | | | | | | | | | | | | |
| PB TP13 | 0.05-0.1 | 0.05-0.3 | Fill grey gravelly clay with concrete / charcoal / ash / roots (under asphalt) | | | 110 | | | | | | | | 1.8 | | | | | | | 35 | 64 | | | 70 | | | | | | | | | | | | | | | | | | | | |
| PB TP14 | 0.05-0.1 | 0.05-0.3 | Fill grey gravelly sandy clay (under asphalt) | | | 540 | | | | | | | | 14 | | | | | | | 31 | 82 | | | 140 | | | | | | | | | | | | | | | | | | Y | | <0.01 |
| | | | **95 % UCL** | | | 220 | | | | | | | | 2.4 | | | | | | | | 197 | | | 194.4 | | | | | | | | | | | | | | | | | | | | |
| PRM TP104_0.4 | 0.4-0.5 | 0.2-0.6 | Fill brown red clay, brick / concrete | <25 | <50 | <100 | <100 | <0.2 | <0.5 | <1 | <1 | <0.1 | <0.05 | <0.5 | <0.05 | - | - | <4 | <0.4 | 40 | 36 | 18 | <0.1 | 120 | 59 | <0.1 | <0.1 | <LOR | <LOR | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <LOR | NAD | NAD | <0.001 | Y | 10 | 15,87 | - | - | - | <0.01 |
| PRM TP105_0.4 | 0.4-0.5 | 0.2-0.6 | Fill brown red clay with gravels, concrete | <25 | <50 | <100 | <100 | <0.2 | <0.5 | <1 | <1 | <0.1 | 0.56 | 0.8 | 5 | - | - | <4 | <0.4 | 23 | 42 | 43 | <0.1 | 45 | 64 | <0.1 | <0.1 | <LOR | <LOR | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <LOR | NAD | NAD | <0.001 | - | 10 | 15,28 | - | - | - | <0.01 |
| PRM TP107_0.3 | 0.3-0.4 | 0.2-0.5 | Fill brown red clay with gravels, brick | <25 | <50 | <100 | <100 | <0.2 | <0.5 | <1 | <1 | <0.1 | 0.58 | 0.8 | 7.2 | - | - | 8 | <0.4 | 15 | 7 | 61 | 0.1 | 2 | 44 | <0.1 | <0.1 | <LOR | <LOR | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <LOR | NAD | NAD | - | Y | 10 | 13,72 | - | - | - | <0.01 |
| PB TP02 | 0.5-0.6 | 0.5-0.9 | Fill grey gravelly clay with gravels | | | <90 | | | | | | | | 0.9 | | | | | | | 20 | 110 | | | 71 | | | | | | | | | | | | | | | | | | | | |
| PB TP15 | 0.5-0.6 | 0.2-0.6 | Fill brown gravelly sandy clay, brick / slag | | | <90 | | | | | | | | 0.5 | | | | | | | 56 | 13 | | | 74 | | | | | | | | | | | | | | | | | | | | |
| PB TP09 | 0.5-0.6 | 0.44-0.9 | Fill brown gravelly clay, brick / terracotta / concrete / slag | | | <90 | | | | | | | | 0.8 | | | | | | | 57 | 59 | | | 79 | | | | | | | | | | | | | | | | | | | | |
| PRM TP103_0.6 | 0.6-0.7 | 0.5-0.8 | Fill light brown gravelly clay, brick / tile | <25 | <50 | <100 | <100 | <0.2 | <0.5 | <1 | <1 | <0.1 | 2,4 | 3.5 | 34 | <0.001 | NIL (+ve) | 6 | <0.4 | 12 | 16 | 88 | 0.1 | 3 | 59 | <0.1 | <0.1 | <LOR | <LOR | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <LOR | NAD | NAD | <0.001 | Y | 10 | 14,04 | - | - | - | <0.01 |
| PB TP09 | 1.0-1.1 | 0.9-2.1 | Fill yellow sand, bricks / some slag | | | 380 | | | | | | | | 9.5 | | | | | | | 33 | 61 | | | 52 | | | | | | | | | | | | | | | | | | | | |
| PB TP15 | 1.0-1.1 | 0.6-1.2 | Fill yellow sand, bricks / concrete / terracotta | | | <90 | | | | | | | | 1 | | | | | | | 25 | 99 | | | 100 | | | | | | | | | | | | | | | | | | | | |
| PB TP06 | 0.45-0.55 | 0.25-0.55 | Fill white sandstone and sand, clinker / slag (under asphalt) | | | 270 | | | | | | | | <0.2 | | | | | | | 15 | 17 | | | 44 | | | | | | | | | | | | | | | | | | | | |
| PB TP15 | 2.0-2.1 | 2.0-2.2 | Fill dark brown day, gravels / brick | | | - | | | | | | | | 0.5 | | | | | | | 17 | 110 | | | 180 | | | | | | | | | | | | | | | | | | | | |
| PRM TP101_0.6 | 0.6-0.7 | 0.4-1 | Natural orange brown day | <25 | <50 | <100 | <100 | <0.2 | <0.5 | <1 | <1 | <0.1 | <0.05 | <0.5 | <0.05 | - | - | 5 | <0.4 | 6 | 6 | 11 | <0.1 | 3 | 4 | <0.1 | <0.1 | <LOR | <LOR | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <LOR | NAD | NAD | - | - | 10 | 13,42 | - | - | - | <0.01 |
| PRM TP102_0.6 | 0.6-0.7 | 0.5-1.2 | Natural orange brown day | <25 | <50 | <100 | <100 | <0.2 | <0.5 | <1 | <1 | <0.1 | <0.05 | <0.5 | <0.05 | - | - | <4 | <0.4 | 4 | 6 | 6 | <0.1 | 1 | 2 | <0.1 | <0.1 | <LOR | <LOR | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <LOR | NAD | NAD | - | - | 10 | 14,92 | - | - | - | <0.01 |
| PRM TP103_0.9 | 0.9-1.0 | 0.8-1.1 | Natural orange brown day | - | - | - | - | - | - | - | - | - | 0,06 | <0.5 | 0,5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| PRM TP106_0.7 | 0.7-0.8 | 0.5-0.8 | Natural orange brown day | <25 | <50 | <100 | <100 | <0.2 | <0.5 | <1 | <1 | <0.1 | <0.05 | <0.5 | <0.05 | - | - | <4 | <0.4 | 8 | <1 | 8 | <0.1 | 1 | 1 | <0.1 | <0.1 | <LOR | <LOR | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <LOR | NAD | NAD | - | - | - | - | - | - | - | - |
| PB TP07 | 0.5-0.6 | 0.35-0.9 | Red brown day | | | - | | | | | | | | <0.2 | | | | | | | 1,1 | 15 | | | 8 | | | | | | | | | | | | | | | | | | | | |
| PB TP09 | 2.1-2.2 | 2.1-2.5 | Shale | | | - | | | | | | | | <0.2 | | | | | | | 9,5 | 7 | | | 4,2 | | | | | | | | | | | | | | | | | | | | |
| PB TP10 | 0.5-0.6 | 0.25-1.0 | Grey red clay | | | - | | | | | | | | <0.2 | | | | | | | 2,9 | 8 | | | 3,6 | | | | | | | | | | | | | | | | | | | | |
| PB TP12 | 1.0-1.1 | 0.67-1.4 | Red brown day | | | - | | | | | | | | - | | | | | | | - | 14 | | | - | | | | | | | | | | | | | | | | | | | | |
| PB TP14 | 1.0-1.1 | 0.95-1.3 | Red grey day | | | - | | | | | | | | <0.2 | | | | | | | 10 | 18 | | | 33 | | | | | | | | | | | | | | | | | | | | |
| PB TP15 | 2.9-3.0 | 2.2-3.0 | Shale | | | - | | | | | | | | <0.2 | | | | | | | 30 | 10 | | | 9,7 | | | | | | | | | | | | | | | | | | | | |

Notes

^Laboratory ID in soil has been presented even when quantities are below reporting limit of 0.1 g/kg as per AS4964

* Trace analysis of respirable fibres, not able to be included in gravimetric analysis methods

[1]- Adopted from PB DSI Ashbury, Dated July 2015

LOR = Limit of Reporting

NL = Not Limiting

NAD = No Asbestos Detected

| | |
|---|---|
| **Project Name:** | Data Gap Analysis |
| **Site Address:** | Ashbury Reservoir, 165-169 Holden Street, Ashbury NSW |
| **Client Name:** | Sydney Water Corporation |
| **Project Reference:** | P033725 / C0151 |
| **Analytical Table:** | **Table B: Field QA Results** |

PROGRESSIVE RISK MANAGEMENT

| Analyte (Soil) | | TRH (mg/kg) | | | | BTEX (mg/kg) | | | | PAH (mg/kg) | | | | Heavy Metals (mg/kg) | | | | | | | | Total PCBs (mg/kg) | Organochloropesticides (mg/kg) | | | | | | | | | Total OPPs (mg/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | F1 - TRH C6-C10 less BTEX | F2 - TRH C10-C16 less naphthalene | TRH C16-C34 | TRH C34-C40 | Benzene | Toluene | Ethylbenzene | Xylenes | Naphthalene | Benzo(a)pyrene | Benzo(a)pyrene TEQ | Total +ve | Arsenic | Cadmium | Chromium (VI) | Copper | Lead | Mercury | Nickel | Zinc | | DDT + DDE + DDD | Aldrin and Dieldrin | Chlordane | Endosulfan | Endrine | Heptachlor | Hexachlorobenzene | Methoxychlor | |
| **Sample ID** | **Type** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP107_0.3 | Primary | <25 | <50 | <100 | <100 | <0.2 | <0.5 | <1 | <1 | <1 | 0.58 | 0.8 | 7.2 | 8 | <0.4 | 15 | 7 | 61 | 0.1 | 2 | 44 | <0.1 | <0.1 | <LOR | <LOR | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <LOR |
| DUP01 | Intra Dup | <25 | <50 | <100 | <100 | <0.2 | <0.5 | <1 | <1 | <1 | 0.61 | 0.9 | 7.2 | 9 | <0.4 | 15 | 8 | 69 | 0.1 | 2 | 55 | <0.1 | <0.1 | <LOR | <LOR | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <LOR |
| **RPD Calculation (%):** | | - | - | - | - | - | - | - | - | - | 5% | - | 0% | - | - | 0% | 13% | 12% | - | - | 22% | - | - | - | - | - | - | - | - | - | - |
| **Within range:** | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| TP108_0.0 | Primary | <25 | <50 | <100 | <100 | <0.2 | <0.5 | <1 | <1 | <1 | 0.68 | 1 | 7.8 | <4 | <0.4 | 12 | 60 | 78 | <0.1 | 30 | 98 | <0.1 | <0.1 | <LOR | <LOR | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <LOR |
| DUP02 | Intra Dup | <10 | <50 | 150 | <100 | <0.2 | <0.5 | <0.5 | <0.5 | <1 | 0.99 | 1.5 | 11 | <4 | <0.4 | 10 | 61 | 86 | <0.1 | 30 | 91 | <0.1 | <0.1 | <LOR | <LOR | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 | <LOR |
| **RPD Calculation (%):** | | - | - | - | - | - | - | - | - | - | 37% | 40% | 34% | - | - | 18% | 2% | 10% | - | 0% | 7% | - | - | - | - | - | - | - | - | - | - |
| **Within range:** | | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | - | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| BLK001 | Trip Blank | <25 | - | - | - | <0.2 | <0.5 | <1 | <1 | <1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Within range:** | | Yes | - | - | - | Yes | Yes | Yes | Yes | Yes | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| SPK001 | Trip Spike | - | - | - | - | 96% | 96% | 98% | 98% | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Within range:** | | - | - | - | - | Yes | Yes | Yes | Yes | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

Notes

LOR = Limit of Reporting

An assessment of field quality control samples was completed by calculating the RPD of duplicate samples. A RPD of +/- 30 % for inorganic analytes and +/- 50 % for organic analytes is generally considered typically acceptable by NSW EPA.
RPD was not reported in the following circumstances:
- Where the laboratory limit of reporting (LOR) are different and both samples are below the LOR.
- One sample is below the LOR and the other has a recorded detection below the other laboratory LOR.
- Both results are less than or equal to 5 times the LOR.

| | |
|---|---|
| **Project Name:** | Data Gap Analysis |
| **Site Address:** | Ashbury Reservoir, 165-169 Holden Street, Ashbury NSW |
| **Client Name:** | Sydney Water Corporation |
| **Project Reference:** | P033725 / C0151 |
| **Analytical Table:** | **Table C: Waste Criteria Comparison** |

PROGRESSIVE RISK MANAGEMENT

| Analyte | | TRH (mg/kg) | | | | | BTEX (mg/kg) | | | | PAH (mg/kg) | | | Heavy Metals (mg/kg) | | | | | | | | | | | | | Asbestos | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | C6-C9 | C10 - C14 | C15 - C28 | C29 - C36 | Sum C10 - C36 | Benzene | Toluene | Ethylbenzene | Xylenes | Benoz(a)pyrene | Total +ve PAHs | Benzo(a)pyrene TCLP (ug/L) | Arsenic | Cadmium | Chromium (VI) | Copper | Lead | Mercury | Nickel | Zinc | Lead TCLP (mg/L) | Nickel TCLP (mg/L) | Total PCBs (mg/kg) | Total OCPs (mg/kg) | Total OPPs (mg/kg) | Asbestos ID in Soil~ | Asbestos Containing Material |
| **General Solid Waste (<CT1)** | | 650 | - | - | - | 10000 | 10 | 288 | 600 | 1000 | 0.8 | 200 | - | 100 | 20 | 100 | - | 100 | 4 | 40 | - | - | - | <50 | <50 | - | - | - |
| **Restricted Solid Waste (<CT2)** | | 2600 | - | - | - | 40000 | 40 | 1152 | 2400 | 4000 | 3.2 | 800 | - | 400 | 80 | 400 | - | 400 | 16 | 160 | - | - | - | <50 | <50 | - | - | - |
| **Hazardous Waste (>CT2)** | | >2600 | - | - | - | >40000 | >40 | >1152 | >2400 | >4000 | >3.2 | >800 | - | >400 | >80 | >400 | - | >400 | >16 | >160 | - | - | - | >50 | >50 | - | - | - |
| **General Solid Waste (<SCC1 / TCLP1)** | | 650 | - | - | - | 10000 | 10 | 288 | 600 | 1000 | 10 | 200 | 0.04 | 500 | 100 | 1900 | - | 1500 | 50 | 1050 | - | 5 | 2 | <50 | <50 | - | - | - |
| **Restricted Solid Waste (<SCC2 / TCLP2)** | | 2600 | - | - | - | 40000 | 40 | 1152 | 2400 | 4000 | 23 | 800 | 0.16 | 2000 | 400 | 7600 | - | 6000 | 200 | 4200 | - | 20 | 8 | <50 | <50 | - | - | - |
| **Hazardous Waste (>SCC2 / TCLP2)** | | >2600 | - | - | - | >40000 | >40 | >1152 | >2400 | >4000 | >23 | >800 | >0.16 | >2000 | >400 | >7600 | - | >6000 | >200 | >4200 | - | >20 | >8 | >50 | >50 | - | - | - |
| **Special Waste (Asbestos)** | | - | - | - | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | NAD | NAD |
| **Sample ID** | **Depth** | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TP101_0.15 | 0.15-0.2 | <25 | <50 | <100 | 180 | 330 | <0.2 | <0.5 | <1 | <1 | 0.1 | 1.2 | - | <4 | <0.4 | 18 | 24 | 16 | <0.1 | 63 | 31 | - | 0.04 | <0.1 | <LOR | <LOR | NAD | - |
| TP101_0.6 | 0.6-0.7 | <25 | <50 | <100 | <100 | <LOR | <0.2 | <0.5 | <1 | <1 | <0.05 | <0.05 | - | 5 | <0.4 | 6 | 6 | 11 | <0.1 | 3 | 4 | - | - | <0.1 | <LOR | <LOR | NAD | - |
| TP102_0.4 | 0.4-0.5 | <25 | <50 | <100 | <100 | <LOR | <0.2 | <0.5 | <1 | <1 | <0.05 | <0.05 | - | 4 | <0.4 | 5 | 4 | 7 | <0.1 | 3 | 4 | - | - | <0.1 | <LOR | <LOR | NAD | - |
| TP102_0.6 | 0.6-0.7 | <25 | <50 | <100 | <100 | <LOR | <0.2 | <0.5 | <1 | <1 | <0.05 | <0.05 | - | <4 | <0.4 | 4 | 6 | 6 | <0.1 | 1 | 2 | - | - | <0.1 | <LOR | <LOR | NAD | - |
| TP103_0.3 | 0.3-0.4 | <25 | <50 | 1100 | 520 | 1670 | <0.2 | <0.5 | <1 | <1 | 55 | 790 | <0.001^ | 5 | <0.4 | 18 | 28 | 59 | <0.1 | 54 | 120 | - | <0.02 | <0.1 | <LOR | <LOR | NAD | - |
| TP103_0.6 | 0.6-0.7 | <25 | <50 | <100 | <100 | <LOR | <0.2 | <0.5 | <1 | <1 | 2.4 | 34 | <0.001 | 6 | <0.4 | 12 | 16 | 88 | 0.1 | 3 | 59 | - | - | <0.1 | <LOR | <LOR | NAD | - |
| TP103_0.9 | 0.9-1.0 | - | - | - | - | - | - | - | - | - | 0.06 | 0.5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| TP104_0.1 | 0.1-0.2 | <25 | <50 | <100 | <100 | <LOR | <0.2 | <0.5 | <1 | <1 | 0.3 | 3 | - | <4 | <0.4 | 11 | 29 | 42 | <0.1 | 14 | 91 | - | - | <0.1 | <LOR | <LOR | NAD | - |
| TP104_0.4 | 0.4-0.5 | <25 | <50 | <100 | <100 | <LOR | <0.2 | <0.5 | <1 | <1 | <0.05 | <0.05 | - | <4 | <0.4 | 40 | 36 | 18 | <0.1 | 120 | 59 | - | <0.02 | <0.1 | <LOR | <LOR | NAD | - |
| TP105_0.1 | 0.1-0.2 | <25 | <50 | <100 | <100 | <LOR | <0.2 | <0.5 | <1 | <1 | 0.84 | 8.1 | <0.001 | <4 | <0.4 | 29 | 37 | 80 | <0.1 | 45* | 97 | - | - | <0.1 | <LOR | <LOR | NAD | - |
| TP105_0.4 | 0.4-0.5 | <25 | <50 | <100 | <100 | <LOR | <0.2 | <0.5 | <1 | <1 | 0.56 | 5 | - | <4 | <0.4 | 23 | 42 | 43 | <0.1 | 45 | 64 | - | 0.03 | <0.1 | <LOR | <LOR | NAD | - |
| TP106_0.3 | 0.3-0.4 | <25 | <50 | <100 | <100 | <LOR | <0.2 | <0.5 | <1 | <1 | <0.05 | <0.05 | - | <4 | <0.4 | 26 | 40 | 3 | <0.1 | 150 | 36 | - | 0.03 | <0.1 | <LOR | <LOR | NAD | - |
| TP106_0.7 | 0.7-0.8 | <25 | <50 | <100 | <100 | <LOR | <0.2 | <0.5 | <1 | <1 | <0.05 | <0.05 | - | <4 | <0.4 | 8 | <1 | 8 | <0.1 | 1 | 1 | - | - | <0.1 | <LOR | <LOR | NAD | - |
| TP107_0.1 | 0.1-0.2 | <25 | <50 | 260 | 100 | 410 | <0.2 | <0.5 | <1 | <1 | 8.1 | 130 | <0.001 | 5 | <0.4 | 11 | 14 | 150 | 0.1 | 5 | 62 | 0.06 | - | <0.5 | <LOR | <LOR | NAD | - |
| TP107_0.3 | 0.3-0.4 | <25 | <50 | <100 | <100 | <LOR | <0.2 | <0.5 | <1 | <1 | 0.58 | 7.2 | - | 8 | <0.4 | 15 | 7 | 61 | 0.1 | 2 | 44 | - | - | <0.1 | <LOR | <LOR | NAD | - |
| TP109_0.0 | 0.0-0.1 | <25 | <50 | 130 | 120 | 300 | <0.2 | <0.5 | <1 | <1 | 0.3 | 3.6 | - | <4 | <0.4 | 25 | 240 | 250 | <0.1 | 35 | 450 | 0.61 | - | <0.1 | <LOR | <LOR | NAD | - |

Notes

^SCC criteria can be ignored based on the adopted immobilisation approval 1999/05 for this area. TCLP results only can be referred to for waste classification.

* TCLP undertaken on other sample within same location and subsequently compared to SCC1 criteria also

~Laboratory ID in soil has been presented even when quantities are below reporting limit

LOR = Limit of Reporting

NAD = No Asbestos Detected

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Field ID | GW01 | GW03 | GW08 | FR01 | FR01 |
| | | | | | | | | | Date | 10/09/2018 | 10/09/2018 | 9/07/2018 | 7/09/2018 | 10/09/2018 |
| | Unit | EQL | ANZG (2018) Freshwater (unknown reliability) toxicant DGVs | ANZG (2018) Freshwater 90% toxicant DGVs | NEPM 2013 Table 1C GILs, Fresh Waters | NEPM 2013 Table 1A(4) Res HSL A & B GW for Vapour Intrusion, Clay | | | | | | | | |
| | | | | | | 2-4m | 4-8m | >=8m | | | | | | |
| **Dissolved Gases in Water** | | | | | | | | | | | | | | |
| Methane | mg/L | 0.005 | | | | | | | | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| **HM in water - dissolved** | | | | | | | | | | | | | | |
| Arsenic (filtered) | mg/L | 0.001 | | | | | | | | 0.001 | <0.001 | 0.008 | <0.001 | <0.001 |
| Cadmium (filtered) | mg/L | 0.0001 | | 0.0004 | 0.0002 | | | | | 0.0003 | 0.0002 | 0.0044 | <0.0001 | <0.0001 |
| Chromium (III+VI) (filtered) | mg/L | 0.001 | | | | | | | | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Copper (filtered) | mg/L | 0.001 | | 0.0018 | 0.0014 | | | | | 0.004 | 0.016 | 0.25 | <0.001 | <0.001 |
| Lead (filtered) | mg/L | 0.001 | | 0.0056 | 0.0034 | | | | | <0.001 | <0.001 | 0.001 | <0.001 | <0.001 |
| Mercury (filtered) | mg/L | 0.00005 | | 0.0019 | 0.00006 | | | | | <0.00005 | <0.00005 | 0.0001 | <0.00005 | <0.00005 |
| Nickel (filtered) | mg/L | 0.001 | | 0.013 | 0.011 | | | | | 0.049 | 0.18 | 0.11 | <0.001 | <0.001 |
| Zinc (filtered) | mg/L | 0.001 | | 0.015 | 0.008 | | | | | 0.063 | 0.17 | 0.47 | <0.001 | <0.001 |
| **Miscellaneous Inorganics** | | | | | | | | | | | | | | |
| Ammonia | mg/L | 0.005 | | | 0.9 | | | | | 0.38 | 0.35 | 0.36 | <0.005 | <0.005 |
| **PAHs in Water - Low Level** | | | | | | | | | | | | | | |
| Benzo(b+j+k)fluoranthene | mg/L | 0.0002 | | | | | | | | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 |
| Acenaphthene | µg/L | 0.1 | | | | | | | | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Acenaphthylene | µg/L | 0.1 | | | | | | | | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Anthracene | µg/L | 0.1 | 0.1 | | | | | | | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Benz(a)anthracene | µg/L | 0.1 | | | | | | | | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Benzo(a) pyrene | µg/L | 0.1 | 0.1 | | | | | | | 0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Benzo(g,h,i)perylene | µg/L | 0.1 | | | | | | | | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Chrysene | µg/L | 0.1 | | | | | | | | 0.2 | <0.1 | <0.1 | <0.1 | <0.1 |
| Dibenz(a,h)anthracene | µg/L | 0.1 | | | | | | | | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Fluoranthene | µg/L | 0.1 | 1 | | | | | | | 0.2 | 0.1 | <0.1 | <0.1 | <0.1 |
| Fluorene | µg/L | 0.1 | | | | | | | | 0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Indeno(1,2,3-c,d)pyrene | µg/L | 0.1 | | | | | | | | <0.1 | <0.1 | <0.1 | <0.1 | <0.1 |
| Naphthalene | µg/L | 0.2 | | 37 | 16 | | | | | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 |
| Phenanthrene | µg/L | 0.1 | 0.6 | | | | | | | 0.2 | 0.1 | <0.1 | <0.1 | <0.1 |
| Pyrene | µg/L | 0.1 | | | | | | | | 0.2 | <0.1 | <0.1 | <0.1 | <0.1 |
| Benzo(a)pyrene TEQ | mg/L | 0.0005 | | | | | | | | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| **svTRH (C10-C40) in Water** | | | | | | | | | | | | | | |
| C10-C14 | µg/L | 50 | | | | | | | | <50 | <50 | <50 | <50 | <50 |
| C15-C28 | µg/L | 100 | | | | | | | | <100 | <100 | <100 | <100 | 100 |
| C29-C36 | µg/L | 100 | | | | | | | | <100 | <100 | <100 | <100 | <100 |
| C10-C16 | µg/L | 50 | | | | | | | | <50 | <50 | <50 | <50 | 82 |
| C10-C16 (F2 minus Naphthalene) | µg/L | 50 | | | | | | | | <50 | <50 | <50 | <50 | 82 |
| C16-C34 | µg/L | 100 | | | | | | | | <100 | <100 | <100 | <100 | <100 |
| C34-C40 | µg/L | 100 | | | | | | | | <100 | <100 | <100 | <100 | <100 |
| **VOCs in water** | | | | | | | | | | | | | | |
| 1,1,1,2-tetrachloroethane | µg/L | 1 | | | | | | | | <1 | <1 | <1 | <1 | <1 |
| 1,1,1-trichloroethane | µg/L | 1 | 270 | | | | | | | <1 | <1 | <1 | <1 | <1 |
| 1,1,2,2-tetrachloroethane | µg/L | 1 | 400 | | | | | | | <1 | <1 | <1 | <1 | <1 |
| 1,1,2-trichloroethane | µg/L | 1 | 330 | 7300 | 6500 | | | | | <1 | <1 | <1 | <1 | <1 |
| 1,1-dichloroethane | µg/L | 1 | | | | | | | | <1 | <1 | <1 | <1 | <1 |
| 1,1-dichloroethene | µg/L | 1 | 700 | | | | | | | <1 | <1 | <1 | <1 | <1 |
| 1,1-dichloropropene | µg/L | 1 | | | | | | | | <1 | <1 | <1 | <1 | <1 |
| 1,2,3-trichlorobenzene | µg/L | 1 | | 16 | 3 | | | | | <1 | <1 | <1 | <1 | <1 |
| 1,2,3-trichloropropane | µg/L | 1 | | | | | | | | <1 | <1 | <1 | <1 | <1 |
| 1,2,4-trichlorobenzene | µg/L | 1 | | 220 | 85 | | | | | <1 | <1 | <1 | <1 | <1 |
| 1,2,4-trimethylbenzene | µg/L | 1 | | | | | | | | <1 | <1 | <1 | <1 | <1 |
| 1,2-dibromo-3-chloropropane | µg/L | 1 | | | | | | | | <1 | <1 | <1 | <1 | <1 |
| 1,2-dibromoethane | µg/L | 1 | | | | | | | | <1 | <1 | <1 | <1 | <1 |
| 1,2-dichlorobenzene | µg/L | 1 | | 200 | 160 | | | | | <1 | <1 | <1 | <1 | <1 |
| 1,2-dichloroethane | µg/L | 1 | 1900 | | | | | | | <1 | <1 | <1 | <1 | <1 |
| 1,2-dichloropropane | µg/L | 1 | 900 | | | | | | | <1 | <1 | <1 | <1 | <1 |
| 1,3,5-trimethylbenzene | µg/L | 1 | | | | | | | | <1 | <1 | <1 | <1 | <1 |
| 1,3-dichlorobenzene | µg/L | 1 | | 350 | 260 | | | | | <1 | <1 | <1 | <1 | <1 |
| 1,3-dichloropropane | µg/L | 1 | 1100 | | | | | | | <1 | <1 | <1 | <1 | <1 |
| 1,4-dichlorobenzene | µg/L | 1 | | 75 | 60 | | | | | <1 | <1 | <1 | <1 | <1 |
| 2,2-dichloropropane | µg/L | 1 | | | | | | | | <1 | <1 | <1 | <1 | <1 |
| 2-chlorotoluene | µg/L | 1 | | | | | | | | <1 | <1 | <1 | <1 | <1 |
| 4-chlorotoluene | µg/L | 1 | | | | | | | | <1 | <1 | <1 | <1 | <1 |
| Benzene | µg/L | 1 | | 1300 | 950 | 5000 | 5000 | 5000 | | <1 | <1 | <1 | <1 | <1 |
| Bromobenzene | µg/L | 1 | | | | | | | | <1 | <1 | <1 | <1 | <1 |
| Bromochloromethane | µg/L | 1 | | | | | | | | <1 | <1 | <1 | <1 | <1 |
| Bromodichloromethane | µg/L | 1 | | | | | | | | <1 | <1 | <1 | <1 | <1 |
| Bromoform | µg/L | 1 | | | | | | | | <1 | <1 | <1 | <1 | <1 |
| Bromomethane | µg/L | 10 | | | | | | | | <10 | <10 | <10 | <10 | <10 |
| Carbon tetrachloride | µg/L | 1 | 240 | | | | | | | <1 | <1 | <1 | <1 | <1 |
| Chlorobenzene | µg/L | 1 | 55 | | | | | | | <1 | <1 | <1 | <1 | <1 |
| Chlorodibromomethane | µg/L | 1 | | | | | | | | <1 | <1 | <1 | <1 | <1 |
| Chloroethane | µg/L | 10 | | | | | | | | <10 | <10 | <10 | <10 | <10 |
| Chloroform | µg/L | 1 | 370 | | | | | | | <1 | <1 | <1 | <1 | <1 |
| Chloromethane | µg/L | 10 | | | | | | | | <10 | <10 | <10 | <10 | <10 |
| cis-1,2-dichloroethene | µg/L | 1 | | | | | | | | <1 | <1 | <1 | <1 | <1 |
| cis-1,3-dichloropropene | µg/L | 1 | | | | | | | | <1 | <1 | <1 | <1 | <1 |
| Cyclohexane | mg/L | 0.001 | | | | | | | | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Dibromomethane | µg/L | 1 | | | | | | | | <1 | <1 | <1 | <1 | <1 |
| Dichlorodifluoromethane | µg/L | 10 | | | | | | | | <10 | <10 | <10 | <10 | <10 |
| Hexachlorobutadiene | µg/L | 1 | | | | | | | | <1 | <1 | <1 | <1 | <1 |
| Isopropylbenzene | µg/L | 1 | 30 | | | | | | | <1 | <1 | <1 | <1 | <1 |
| n-butylbenzene | µg/L | 1 | | | | | | | | <1 | <1 | <1 | <1 | <1 |
| n-propylbenzene | µg/L | 1 | | | | | | | | <1 | <1 | <1 | <1 | <1 |
| p-isopropyltoluene | µg/L | 1 | | | | | | | | <1 | <1 | <1 | <1 | <1 |
| sec-butylbenzene | µg/L | 1 | | | | | | | | <1 | <1 | <1 | <1 | <1 |
| Styrene | µg/L | 1 | | | | | | | | <1 | <1 | <1 | <1 | <1 |
| Trichloroethene | µg/L | 1 | | | | | | | | <1 | <1 | <1 | <1 | <1 |
| tert-butylbenzene | µg/L | 1 | | | | | | | | <1 | <1 | <1 | <1 | <1 |
| Tetrachloroethene | µg/L | 1 | 70 | | | | | | | <1 | <1 | <1 | <1 | <1 |
| Toluene | µg/L | 1 | 180 | | | | | | | <1 | <1 | <1 | <1 | <1 |
| Ethylbenzene | µg/L | 1 | 80 | | | | | | | <1 | <1 | <1 | <1 | <1 |
| trans-1,2-dichloroethene | µg/L | 1 | | | | | | | | <1 | <1 | <1 | <1 | <1 |
| trans-1,3-dichloropropene | µg/L | 1 | | | | | | | | <1 | <1 | <1 | <1 | <1 |
| Trichlorofluoromethane | µg/L | 10 | | | | | | | | <10 | <10 | <10 | <10 | <10 |
| Vinyl chloride | µg/L | 10 | 100 | | | | | | | <10 | <10 | <10 | <10 | <10 |
| Xylene (m & p) | µg/L | 2 | | | | | | | | <2 | <2 | <2 | <2 | <2 |
| Xylene (o) | µg/L | 1 | | 470 | 350 | | | | | <1 | <1 | <1 | <1 | <1 |
| **vTRH(C6-C10)/BTEXN in Water** | | | | | | | | | | | | | | |
| C6-C9 | µg/L | 10 | | | | | | | | <10 | <10 | <10 | <10 | <10 |
| C6-C10 | µg/L | 10 | | | | | | | | <10 | <10 | <10 | <10 | <10 |
| C6-C10 (F1 minus BTEX) | µg/L | 10 | | | | | | | | <10 | <10 | <10 | <10 | <10 |
| Naphthalene | µg/L | 1 | | 37 | 16 | | | | | <1 | <1 | <1 | <1 | <1 |
| Benzene | µg/L | 1 | | 1300 | 950 | 5000 | 5000 | 5000 | | <1 | <1 | <1 | <1 | <1 |
| Toluene | µg/L | 1 | 180 | | | | | | | <1 | <1 | <1 | <1 | <1 |
| Ethylbenzene | µg/L | 1 | 80 | | | | | | | <1 | <1 | <1 | <1 | <1 |
| Xylene (m & p) | µg/L | 2 | | | | | | | | <2 | <2 | <2 | <2 | <2 |
| Xylene (o) | µg/L | 1 | | 470 | 350 | | | | | <1 | <1 | <1 | <1 | <1 |

**Environmental Standards**
ANZG, 2018, ANZG (2018) Freshwater (unknown reliability) toxicant DGVs

| | | Lab Report Number | 200271 | ES1826714 | | 200446 | 200446 | |
|---|---|---|---|---|---|---|---|---|
| | | Field ID | GW08 | DUP01 | | GW03 | DUP02 | |
| | | Matrix Type | water | water | | water | water | |
| | | Date | 7/09/2018 | 7/09/2018 | RPD | 10/09/2018 | 10/09/2018 | RPD |
| | Unit | Envirolab EQL | | | | | | |
| **Dissolved Gases in Water** | | | | | | | | |
| Methane | mg/L | 0.005 | <0.005 | <0.01 | 0 | <0.005 | <0.005 | 0 |
| **HM in water - dissolved** | | | | | | | | |
| Arsenic (filtered) | mg/L | 0.001 | 0.008 | 0.004 | 67 | <0.001 | <0.001 | 0 |
| Cadmium (filtered) | mg/L | 0.0001 | 0.0044 | 0.0044 | 0 | 0.0002 | 0.0002 | 0 |
| Chromium (III+VI) (filtered) | mg/L | 0.001 | <0.001 | <0.001 | 0 | <0.001 | <0.001 | 0 |
| Copper (filtered) | mg/L | 0.001 | 0.25 | 0.277 | 10 | 0.016 | 0.016 | 0 |
| Lead (filtered) | mg/L | 0.001 | 0.001 | <0.001 | 0 | <0.001 | <0.001 | 0 |
| Mercury (filtered) | mg/L | 0.00005 | <0.0001 | <0.0001 | 0 | <0.00005 | <0.00005 | 0 |
| Nickel (filtered) | mg/L | 0.001 | 0.11 | 0.128 | 15 | 0.18 | 0.18 | 0 |
| Zinc (filtered) | mg/L | 0.001 | 0.47 | 0.464 | 1 | 0.17 | 0.17 | 0 |
| **Miscellaneous Inorganics** | | | | | | | | |
| Ammonia | mg/L | 0.005 | 0.36 | 0.5 | 33 | 0.35 | 0.13 | 92 |
| **PAHs in Water - Low Level** | | | | | | | | |
| Benzo(b+j+k)fluoranthene | mg/L | 0.0002 | <0.0002 | <1 | 0 | <0.0002 | <0.0002 | 0 |
| Acenaphthene | µg/L | 0.1 | <0.1 | <1 | 0 | <0.1 | <0.1 | 0 |
| Acenaphthylene | µg/L | 0.1 | <0.1 | <1 | 0 | <0.1 | <0.1 | 0 |
| Anthracene | µg/L | 0.1 | <0.1 | <1 | 0 | <0.1 | <0.1 | 0 |
| Benz(a)anthracene | µg/L | 0.1 | <0.1 | <1 | 0 | <0.1 | <0.1 | 0 |
| Benzo(a) pyrene | µg/L | 0.1 | <0.1 | <0.5 | 0 | <0.1 | <0.1 | 0 |
| Benzo(g,h,i)perylene | µg/L | 0.1 | <0.1 | <1 | 0 | <0.1 | <0.1 | 0 |
| Chrysene | µg/L | 0.1 | <0.1 | <1 | 0 | <0.1 | 0.1 | 0 |
| Dibenz(a,h)anthracene | µg/L | 0.1 | <0.1 | <1 | 0 | <0.1 | <0.1 | 0 |
| Fluoranthene | µg/L | 0.1 | <0.1 | <1 | 0 | 0.1 | 0.2 | 67 |
| Fluorene | µg/L | 0.1 | <0.1 | <1 | 0 | <0.1 | <0.1 | 0 |
| Indeno(1,2,3-c,d)pyrene | µg/L | 0.1 | <0.1 | <1 | 0 | <0.1 | <0.1 | 0 |
| Naphthalene | µg/L | 0.2 | <0.2 | <1 | 0 | <0.2 | <0.2 | 0 |
| Phenanthrene | µg/L | 0.1 | <0.1 | <1 | 0 | 0.1 | 0.2 | 67 |
| Pyrene | µg/L | 0.1 | <0.1 | <1 | 0 | <0.1 | 0.1 | 0 |
| Benzo(a)pyrene TEQ | mg/L | 0.0005 | <0.0005 | <0.5 | 0 | <0.0005 | <0.0005 | 0 |
| **svTRH (C10-C40) in Water** | | | | | | | | |
| C10-C14 | µg/L | 50 | <50 | <50 | 0 | <50 | <50 | 0 |
| C15-C28 | µg/L | 100 | <100 | <100 | 0 | <100 | <100 | 0 |
| C29-C36 | µg/L | 100 | <100 | <50 | 0 | <100 | <100 | 0 |
| C10-C16 | µg/L | 50 | <50 | <100 | 0 | <50 | <50 | 0 |
| C10-C16 (F2 minus Naphthalene) | µg/L | 50 | <50 | <100 | 0 | <50 | <50 | 0 |
| C16-C34 | µg/L | 100 | <100 | <100 | 0 | <100 | <100 | 0 |
| C34-C40 | µg/L | 100 | <100 | <100 | 0 | <100 | <100 | 0 |
| **VOCs in water** | | | | | | | | |
| 1,1,1,2-tetrachloroethane | µg/L | 1 | <1 | <5 | 0 | <1 | <1 | 0 |
| 1,1,1-trichloroethane | µg/L | 1 | <1 | <5 | 0 | <1 | <1 | 0 |
| 1,1,2,2-tetrachloroethane | µg/L | 1 | <1 | <5 | 0 | <1 | <1 | 0 |
| 1,1,2-trichloroethane | µg/L | 1 | <1 | <5 | 0 | <1 | <1 | 0 |
| 1,1-dichloroethane | µg/L | 1 | <1 | <5 | 0 | <1 | <1 | 0 |
| 1,1-dichloroethene | µg/L | 1 | <1 | <5 | 0 | <1 | <1 | 0 |
| 1,1-dichloropropene | µg/L | 1 | <1 | <5 | 0 | <1 | <1 | 0 |
| 1,2,3-trichlorobenzene | µg/L | 1 | <1 | <5 | 0 | <1 | <1 | 0 |
| 1,2,3-trichloropropane | µg/L | 1 | <1 | <5 | 0 | <1 | <1 | 0 |
| 1,2,4-trichlorobenzene | µg/L | 1 | <1 | <5 | 0 | <1 | <1 | 0 |
| 1,2,4-trimethylbenzene | µg/L | 1 | <1 | <5 | 0 | <1 | <1 | 0 |
| 1,2-dibromo-3-chloropropane | µg/L | 1 | <1 | <5 | 0 | <1 | <1 | 0 |
| 1,2-dibromoethane | µg/L | 1 | <1 | <5 | 0 | <1 | <1 | 0 |
| 1,2-dichlorobenzene | µg/L | 1 | <1 | <5 | 0 | <1 | <1 | 0 |
| 1,2-dichloroethane | µg/L | 1 | <1 | <5 | 0 | <1 | <1 | 0 |
| 1,2-dichloropropane | µg/L | 1 | <1 | <5 | 0 | <1 | <1 | 0 |
| 1,3,5-trimethylbenzene | µg/L | 1 | <1 | <5 | 0 | <1 | <1 | 0 |
| 1,3-dichlorobenzene | µg/L | 1 | <1 | <5 | 0 | <1 | <1 | 0 |
| 1,3-dichloropropane | µg/L | 1 | <1 | <5 | 0 | <1 | <1 | 0 |
| 1,4-dichlorobenzene | µg/L | 1 | <1 | <5 | 0 | <1 | <1 | 0 |
| 2,2-dichloropropane | µg/L | 1 | <1 | <5 | 0 | <1 | <1 | 0 |
| 2-chlorotoluene | µg/L | 1 | <1 | <5 | 0 | <1 | <1 | 0 |
| 4-chlorotoluene | µg/L | 1 | <1 | <5 | 0 | <1 | <1 | 0 |
| Benzene | µg/L | 1 | <1 | <5 | 0 | <1 | <1 | 0 |
| Bromobenzene | µg/L | 1 | <1 | <5 | 0 | <1 | <1 | 0 |
| Bromochloromethane | µg/L | 1 | <1 | <5 | 0 | <1 | <1 | 0 |
| Bromodichloromethane | µg/L | 1 | <1 | <5 | 0 | <1 | <1 | 0 |
| Bromoform | µg/L | 1 | <1 | <5 | 0 | <1 | <1 | 0 |
| Bromomethane | µg/L | 10 | <10 | <50 | 0 | <10 | <10 | 0 |
| Carbon tetrachloride | µg/L | 1 | <1 | <5 | 0 | <1 | <1 | 0 |
| Chlorobenzene | µg/L | 1 | <1 | <5 | 0 | <1 | <1 | 0 |
| Chlorodibromomethane | µg/L | 1 | <1 | <5 | 0 | <1 | <1 | 0 |
| Chloroethane | µg/L | 10 | <10 | <50 | 0 | <10 | <10 | 0 |
| Chloroform | µg/L | 1 | <1 | <5 | 0 | <1 | <1 | 0 |
| Chloromethane | µg/L | 10 | <10 | <50 | 0 | <10 | <10 | 0 |
| cis-1,2-dichloroethene | µg/L | 1 | <1 | <5 | 0 | <1 | <1 | 0 |
| cis-1,3-dichloropropene | µg/L | 1 | <1 | <5 | 0 | <1 | <1 | 0 |
| Cyclohexane | mg/L | 0.001 | <0.001 | <5 | 0 | <0.001 | <0.001 | 0 |
| Dibromomethane | µg/L | 1 | <1 | <5 | 0 | <1 | <1 | 0 |
| Dichlorodifluoromethane | µg/L | 10 | <10 | <50 | 0 | <10 | <10 | 0 |
| Hexachlorobutadiene | µg/L | 1 | <1 | <5 | 0 | <1 | <1 | 0 |
| Isopropylbenzene | µg/L | 1 | <1 | <5 | 0 | <1 | <1 | 0 |
| n-butylbenzene | µg/L | 1 | <1 | <5 | 0 | <1 | <1 | 0 |
| n-propylbenzene | µg/L | 1 | <1 | <5 | 0 | <1 | <1 | 0 |
| p-isopropyltoluene | µg/L | 1 | <1 | <5 | 0 | <1 | <1 | 0 |
| sec-butylbenzene | µg/L | 1 | <1 | <5 | 0 | <1 | <1 | 0 |
| Styrene | µg/L | 1 | <1 | <5 | 0 | <1 | <1 | 0 |
| Trichloroethene | µg/L | 1 | <1 | <5 | 0 | <1 | <1 | 0 |
| tert-butylbenzene | µg/L | 1 | <1 | <5 | 0 | <1 | <1 | 0 |
| Tetrachloroethene | µg/L | 1 | <1 | <5 | 0 | <1 | <1 | 0 |
| Toluene | µg/L | 1 | <1 | <5 | 0 | <1 | <1 | 0 |
| Ethylbenzene | µg/L | 1 | <1 | <5 | 0 | <1 | <1 | 0 |
| trans-1,2-dichloroethene | µg/L | 1 | <1 | <5 | 0 | <1 | <1 | 0 |
| trans-1,3-dichloropropene | µg/L | 1 | <1 | <5 | 0 | <1 | <1 | 0 |
| Trichlorofluoromethane | µg/L | 10 | <10 | <50 | 0 | <10 | <10 | 0 |
| Vinyl chloride | µg/L | 10 | <10 | <50 | 0 | <10 | <10 | 0 |
| Xylene (m & p) | µg/L | 2 | <2 | <5 | 0 | <2 | <2 | 0 |
| Xylene (o) | µg/L | 1 | <1 | <5 | 0 | <1 | <1 | 0 |
| **vTRH(C6-C10)/BTEXN in Water** | | | | | | | | |
| C6-C9 | µg/L | 10 | <10 | <20 | 0 | <10 | <10 | 0 |
| C6-C10 | µg/L | 10 | <10 | <20 | 0 | <10 | <10 | 0 |
| C6-C10 (F1 minus BTEX) | µg/L | 10 | <10 | <20 | 0 | <10 | <10 | 0 |
| Naphthalene | µg/L | 0.2 | <0.2 | <1 | 0 | <0.2 | <0.2 | 0 |
| Benzene | µg/L | 1 | <1 | <1 | 0 | <1 | <1 | 0 |
| Toluene | µg/L | 1 | <1 | <2 | 0 | <1 | <1 | 0 |
| Ethylbenzene | µg/L | 1 | <1 | <2 | 0 | <1 | <1 | 0 |
| Xylene (m & p) | µg/L | 2 | <2 | <2 | 0 | <2 | <2 | 0 |
| Xylene (o) | µg/L | 1 | <1 | <2 | 0 | <1 | <1 | 0 |

*RPDs have only been considered where a concentration is greater than 1 times the EQL.

**Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each EQL multiplier range are: 81 (1 - 10 x EQL); 50 (10 - 30 x EQL); 30 ( > 30

***Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in

PROGRESSIVE RISK MANAGEMENT

| | vTRH(C6-C10)/BTEXN in Water | | | | | | | | | BTEX in Water | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | C6-C9 | C6-C10 | C6-C10 (F1 minus BTEX) | Naphthalene | Benzene | Toluene | Ethylbenzene | Xylene (m & p) | Xylene (o) | Benzene | Toluene | Ethylbenzene | Xylene (m & p) | Xylene (o) |
| | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | µg/L | % Recovery | % Recovery | % Recovery | % Recovery | % Recovery |
| EQL | 10 | 10 | 10 | 1 | 1 | 1 | 1 | 2 | 1 | - | - | - | - | - |
| **Field ID** | **Date** | | | | | | | | | | | | | |
| **TB** | **7/09/2018** | <10 | <10 | <10 | <1 | <1 | <1 | <1 | <2 | <1 | - | - | - | - | - |
| **TS** | **7/09/2018** | - | - | - | - | - | - | - | - | - | 102% | 103% | 106% | 106% | 106% |
| **TB** | **10/09/2018** | <10 | <10 | <10 | <1 | <1 | <1 | <1 | <2 | <1 | - | - | - | - | - |
| **TS** | **10/09/2018** | - | - | - | - | - | - | - | - | - | 109% | 110% | 112% | 111% | 110% |

| ID | $CH_4$ % | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Round 1 | | Round 2 | | Round 3 | | Round 4 | | Round 5 | | Round 6 | |
| | Peak | Steady | Peak | Steady | Peak | Steady | Peak | Steady | Peak | Steady | Peak | Steady |
| HGG01 | 0 | 0 | 0 | 0 | 2.2 | 0 | GasClam | | - | - | 0 | 0 |
| HGG02 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| HGG03 | 0 | 0 | 0 | 0 | Well damaged | | Well damaged | | Well damaged | | Well damaged | |
| HGG04 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| HGG05 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| HGG06 | 0 | 0 | 0.6 | 0 | GasClam | | GasClam | | - | - | 0 | 0 |
| HGG07 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| HGG08 | 0 | 0 | 0 | 0 | 0.3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| HGG09 | 0 | 0 | 0.5 | 0 | GasClam | | 0 | 0 | 0 | 0 | 0 | 0 |

| ID | $CO_2$ % | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Round 1 | | Round 2 | | Round 3 | | Round 4 | | Round 5 | | Round 6 | |
| | Peak | Steady | Peak | Steady | Peak | Steady | Peak | Steady | Peak | Steady | Peak | Steady |
| HGG01 | 1.8 | 1.8 | 1.8 | 1.8 | 2.4 | 2.2 | GasClam | | - | - | 3.2 | 3.2 |
| HGG02 | 1.7 | 1.7 | 2.0 | 2.0 | 3.5 | 3.5 | 7.4 | 7.3 | 8.7 | 8.7 | 2.3 | 2.2 |
| HGG03 | 2.8 | 1.9 | 2.9 | 2.8 | Well damaged | | Well damaged | | Well damaged | | Well damaged | |
| HGG04 | 0.8 | 0.8 | 1.4 | 1.4 | 0.5 | 0.3 | 2.0 | 2.0 | 7.0 | 2.0 | 1.8 | 1.8 |
| HGG05 | 4.2 | 3.5 | 4.3 | 2.4 | 1.9 | 1.8 | 5.6 | 5.1 | 5.9 | 5.8 | 1.5 | 1.5 |
| HGG06 | 0.5 | 0.5 | 1.8 | 1.7 | GasClam | | GasClam | | - | - | 2.8 | 2.7 |
| HGG07 | 1.8 | 1.8 | 2.2 | 2.2 | 0.5 | 0.1 | 6.1 | 6.1 | 7.2 | 7.1 | 0.8 | 0.8 |
| HGG08 | 0.8 | 0.8 | 2.8 | 2.2 | 2.4 | 1.9 | 6.4 | 6.3 | 5.6 | 5.0 | 3.2 | 3.0 |
| HGG09 | 1.2 | 1.2 | 1.6 | 1.6 | GasClam | | 3.3 | 3.3 | 4.8 | 2.6 | 2.1 | 2.1 |

| ID | $O_2$ % | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Round 1 | | Round 2 | | Round 3 | | Round 4 | | Round 5 | | Round 6 | |
| | Peak | Steady | Peak | Steady | Peak | Steady | Peak | Steady | Peak | Steady | Peak | Steady |
| HGG01 | 19.3 | 19.2 | 19.4 | 19.4 | 19.7 | 19.1 | GasClam | | - | - | 17.8 | 17.7 |
| HGG02 | 19.2 | 19.2 | 19.1 | 19.1 | 20.2 | 16.9 | 9.3 | 9.2 | 21.1 | 8 | 17.5 | 17.4 |
| HGG03 | 19.4 | 18.9 | 18.4 | 18.3 | Well damaged | | Well damaged | | Well damaged | | Well damaged | |
| HGG04 | 19.7 | 19.7 | 19.6 | 19.6 | 21.3 | 21.2 | 17.5 | 17.4 | 20.3 | 18.9 | 19.1 | 91.1 |
| HGG05 | 17.2 | 17.2 | 18.1 | 17.5 | 20.3 | 19.6 | 15.4 | 14.2 | 20.7 | 13.8 | 19.6 | 19.6 |
| HGG06 | 20.4 | 20.4 | 19.7 | 19.4 | GasClam | | GasClam | | - | - | 17.5 | 17.1 |
| HGG07 | 19.3 | 18.7 | 18.7 | 18.7 | 21.5 | 21.5 | 12.3 | 12.2 | 20.4 | 11.2 | 20.2 | 20.1 |
| HGG08 | 20.2 | 20.2 | 18.7 | 18.4 | 20.8 | 19.5 | 14.8 | 14.7 | 20.5 | 15.2 | 18.2 | 18.1 |
| HGG09 | 19.7 | 19.7 | 19.6 | 19.5 | GasClam | | 16.8 | 16.7 | 20.4 | 18.4 | 19.3 | 19.2 |

| ID | $CH_4$ (% LEL) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Round 1 | | Round 2 | | Round 3 | | Round 4 | | Round 5 | | Round 6 | |
| | Peak | Steady | Peak | Steady | Peak | Steady | Peak | Steady | Peak | Steady | Peak | Steady |
| HGG01 | 0 | 0 | 0 | 0 | 3.4 | 0 | GasClam | | - | - | 0 | 0 |
| HGG02 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| HGG03 | 0 | 0 | 0 | 0 | Well damaged | | Well damaged | | Well damaged | | Well damaged | |
| HGG04 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| HGG05 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| HGG06 | 0 | 0 | 0 | 0 | GasClam | | GasClam | | - | - | 0 | 0 |
| HGG07 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| HGG08 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| HGG09 | 0 | 0 | 0 | 0 | GasClam | | 0 | 0 | 0 | 0 | 0 | 0 |

| ID | Max $H_2S$ (ppm) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Round 1 | | Round 2 | | Round 3 | | Round 4 | | Round 5 | | Round 6 | |
| | Peak | Steady | Peak | Steady | Peak | Steady | Peak | Steady | Peak | Steady | Peak | Steady |
| HGG01 | 0 | 0 | 0 | 0 | 3 | 3 | GasClam | | - | - | 0 | 0 |
| HGG02 | 0 | 0 | 0 | 0 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 |
| HGG03 | 0 | 0 | 3 | 0 | Well damaged | | Well damaged | | Well damaged | | Well damaged | |
| HGG04 | 0 | 0 | 2 | 0 | 4 | 2 | 1 | 1 | 2 | 0 | 1 | 1 |
| HGG05 | 0 | 0 | 0 | 0 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 |
| HGG06 | 0 | 0 | 7 | 0 | GasClam | | GasClam | | - | - | 1 | 1 |
| HGG07 | 0 | 0 | 7 | 1 | 3 | 2 | 2 | 2 | 2 | 0 | 5 | 2 |
| HGG08 | 0 | 0 | 0 | 0 | 4 | 3 | 4 | 2 | 1 | 0 | 1 | 0 |
| HGG09 | 0 | 0 | 5 | 0 | GasClam | | 2 | 2 | 1 | 0 | 1 | 1 |

| ID | Flow (L/Hr) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Round 1 | | Round 2 | | Round 3 | | Round 4 | | Round 5 | | Round 6 | |
| | Peak | Steady | Peak | Steady | Peak | Steady | Peak | Steady | Peak | Steady | Peak | Steady |
| HGG01 | 0.2 | 0 | 0 | 0 | 0 | 0 | GasClam | | - | - | 0 | 0 |
| HGG02 | 0.3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| HGG03 | 0.2 | 0 | 0 | 0 | Well damaged | | Well damaged | | Well damaged | | Well damaged | |
| HGG04 | 0.5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -0.6 | 0 | 0 | 0 |
| HGG05 | 0.5 | 0.5 | 0.1 | 0 | 0.1 | 0 | 0 | 0 | -0.6 | 0 | 0 | 0 |
| HGG06 | 0.5 | 0.1 | 0.2 | 0 | GasClam | | GasClam | | - | - | 0 | 0 |
| HGG07 | 0.3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1 | 0 | 0 | 0 |
| HGG08 | 0.7 | 0.7 | 0 | 0 | 0.9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| HGG09 | 0.1 | 0 | 0 | 0 | GasClam | | 0 | 0 | 0 | 0 | 0 | 0 |

| ID | BP (hPa) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Round 1 | | Round 2 | | Round 3 | | Round 4 | | Round 5 | | Round 6 | |
| | Peak | DP | Peak | DP | Peak | DP | Peak | DP | Peak | DP | Peak | DP |
| HGG01 | 1010 | 1010 | 1007 | 1006 | 1002 | 999 | GasClam | | - | - | 1000 | 999 |
| HGG02 | 1010 | 1010 | 1005 | 1005 | 999 | 998 | 1010 | 1010 | 1009 | 1009 | 999 | 999 |
| HGG03 | 1010 | 1011 | 1005 | 1005 | Well damaged | | Well damaged | | Well damaged | | Well damaged | |
| HGG04 | 1010 | 1010 | 1005 | 1005 | 1000 | 998 | 1009 | 1009 | 1009 | 1008 | 999 | 999 |
| HGG05 | 1010 | 1010 | 1005 | 1004 | 999 | 999 | 1008 | 1008 | 1008 | 1008 | 998 | 998 |
| HGG06 | 1010 | 1010 | 1004 | 1003 | GasClam | | GasClam | | - | - | 998 | 998 |
| HGG07 | 1010 | 1010 | 1003 | 1003 | 999 | 999 | 1008 | 1007 | 1008 | 1008 | 998 | 997 |
| HGG08 | 1010 | 1010 | 1005 | 1005 | 999 | 997 | 1007 | 1007 | 1009 | 1009 | 997 | 996 |
| HGG09 | 1010 | 1010 | 1004 | 1003 | GasClam | | 1007 | 1006 | 1009 | 1009 | 997 | 997 |

# Appendix E Regulatory Search Results

# Search Results

**3 results found.**

| | | | |
|---|---|---|---|
| Andrews Avenue Urban Conservation Area | | Ashbury, NSW, Australia | (Indicative Place)<br>Register of the National Estate<br>(Non-statutory archive) |
| Ashbury Brickworks Kiln and Chimney Stack | Trevenar St | Ashbury, NSW, Australia | (Removed from Register or IL)<br>Register of the National Estate<br>(Non-statutory archive) |
| Ashbury Urban Conservation Area | | Ashbury, NSW, Australia | (Indicative Place)<br>Register of the National Estate<br>(Non-statutory archive) |

**Report Produced: Tue Jun 25 14:49:09 2019**

# Place Details

Send Feedback

## Andrews Avenue Urban Conservation Area, Ashbury, NSW, Australia

| | |
|---|---|
| **Photographs** | None |
| **List** | Register of the National Estate (Non-statutory archive) |
| **Class** | Historic |
| **Legal Status** | Indicative Place |
| **Place ID** | 102065 |
| **Place File No** | 1/16/011/0008 |

**Nominator's Statement of Significance**

Andrews Avenue Urban Conservation Area Ashbury is important because:

1) The area possesses streetscape integrity due to the development during one period and the excellent state of preservation of the houses and gardens.

2) The area has a uniformity of housing style including colour, form and architectural detail that gives the area an harmonious appearance.

3) The predominance of the Californian Bungalow type illustrates the important influence of American housing ideals and styles on Australia as an important adjunct to the previous English- and Indian-derived bungalows.

4) It reflects the availability of finance enabling the middle class to borrow money and fmance the purchase of a house and epitomises the great diversion of funds in Australia from private investment in industry and infrastructure to "non-productive" investment in private housing.

5) By virtue of the importance of home ownership in Australia, the area embodies the success in successive Australian governments' political control and subjection of the electorate.

**Official Values Not Available**

**Description**

Much of Canterbury depended on road transport and settlement was encouraged by the extension of the tramway from Hurlstone Park to Canterbury in 1921 and from Undercliffe to Earlwood three years later. But Canterbury's greatest growth occurred in the late 1920s with a 'spectacular surge of building' mainly brick cottages and bungalows on subdivisions created before 1919 around the villages of Canterbury, Belmore and Lakemba. Similar growth occurred in parts of Wylie Park and Punchbowl with access to the railway where the houses were mainly timber. This was assisted by the establishment of private motor bus services in the 1920s and the introduction of government feeder buses in 1933. The opening of the East Hills Line in 1931 promoted new subdivisions which were chiefly serviced by the new railway and the tram link to Earlwood which expanded greatly in the 1930s to create 'a highly uniform landscape of brick bungalows'.

The War Service Homes Commission was very active in the Canterbury municipality acquiring land previously occupied by sawmills, timberyards, brickpits and tile works and employing its own staff for construction. The Commission built on one estate near the Towers in South Belmore and on the Great Railway Estate, Belfield. Utilising eight different house styles of the type considered ideal for worker accommodation, the latter precinct includes Bazentin, Boronia, Persic and Linda Streets as well as Linda Parade. Distinctive features include roughcast walls with lattice decorations, six-paned windows, low-pitched roof and decorated timber gable. In 1921 the Commission ceased its building activities and subsequently provided funds for construction on the exserviceman's own land.

The interwar period was the time of Canterbury's greatest growth. In the 1920s, together with Bankstown, Canterbury experienced the greatest proportional increase in the Sydney metropolitan area, jointly accounting for one fifth of the population increase. Having reached a total of 37,639 by 1921, Canterbury's population more than doubled in the 1920s to 79,050. A further 20,000 settling there between 1933 and 1947 brought the total to 99,396. Described by Peter Spearritt as a mixed class district, Canterburys 8,000 plus houses were evenly divided between brick and timber in 1921 and their average price was 869 Pounds in 1928. In Canterbury too, the level of owner occupation was a high 71 per cent, (close to that of Ku-ring-gai) although the depression reduced this to 60 per cent in 1933. By that year, however, brick houses predominated over timber at a ratio of about 12 to 5. Fibro dwellings, which numbered 404 in 1933, increased to 2,199 by 1947 but, at 16,519 the overwhelming majority of Canterbury's houses were brick. In the same period the number of timber homes increased marginally from 5,131 to 5,4944.

Description
Housing in the area consists of small 1920s Californian Bungalows and was developed in the same period giving a consistency of streetscape.

**History Not Available**

**Condition and Integrity**

There are some unsympathetic alterations and additions on some of the houses

**Location**

Comprising the area shown in the National Trust of Australia (NSW) Interwar Housing Study map, prepared in March 1995, and identified as Canterbury Precinct 2.

**Bibliography**

1. Lesley Muir and Brian Madden (eds), The Heritage of the Canterbury Municipality, Canterbury District Historical Society, 1992, p 19
2. ibid, p 17
3. Peter Spearritt, Sydney Since the Twenties, Hale & Iremonger,
1978, p 34
4. Census 1921, 1933, 1947; Peter Spearritt, op cit, p 31

# Place Details

Send Feedback

## Ashbury Urban Conservation Area, Ashbury, NSW, Australia

| | |
|---|---|
| **Photographs** | None |
| **List** | Register of the National Estate (Non-statutory archive) |
| **Class** | Historic |
| **Legal Status** | Indicative Place |
| **Place ID** | 102066 |
| **Place File No** | 1/16/011/0009 |

### Nominator's Statement of Significance

Ashbury Urban Conservation Area is important because:

1) The area possesses streetscape integrity due to the development during one period and the excellent state of preservation of the houses and gardens.

2) The area has a uniformity of housing style including colour, form and architectural detail that gives the area an harmonious appearance.

3) The predominance of the Californian Bungalow type illustrates the important influence of American housing ideals and styles on Australia as an important adjunct to the previous English and Indian derived bungalows.

4) It reflects the availability of finance enabling the middle class to borrow money and finance the purchase of a house and epitomises the great diversion of funds in Australia from private investment in industry and infrastructure to non-productive investment in private housing.

5) By virtue of the importance of home ownership in Australia, the area embodies the success in successive Australian governments' political control and subjection of the electorate.

### Official Values Not Available

### Description

History
Much of Canterbury depended on road transport and settlement was encouraged by the extension of the tramway from Hurlstone Park to Canterbury in 1921 and from Undercliffe to Earlwood three years later. But Canterbury's greatest growth occurred in the late 1920s with a spectacular surge of building mainly brick cottages and bungalows on subdivisions created before 1919 around the villages of Canterbury, Belmore and Lakemba. Similar growth occurred in parts of Wylie Park and Punchbowl with access to the railway where the houses were mainly timber. This was assisted by the establishment of private motor bus services in the 1920s and the introduction of government feeder buses in 1933. The opening of the East Hills Line in 1931 promoted new subdivisions which were chiefly serviced by the new railway and the tram link to Earlwood which expanded greatly in the 1930s to create 'a highly uniform landscape of brick bungalows.

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Description
Ashbury is an area half-way between Ashfield and Canterbury (hence the name Ashbury) developed after World War I. The area was developed in a number of estates and the houses and allotments range in size from large (at the top of the hill near King Street) through medium (near the municipal boundary with Ashfield at the top of the hill) to small (at the foot of the hill near Canterbury Racecourse. The allotments on the Ashfield side of the Municipal boundary are much smaller and the discontinuity in street layout, allotment size etc is an interesting physical example of how differing regulations can have such marked different results on the built environment.

Housing in the area consists predominantly of 1920s Californian Bungalows and was developed in the same period giving a consistency of streetscape. There are some later 1930s houses on the slopes of the hill near King Street and in Forbes and Leopold Streets.

In Cheviot Street near the racecourse there is a series of small, liver brick cottages with lighthouse leadlight windows. The same house types is also located in Badminton Road, Croydon Park indicating that the same builder buit extensively.

There are some Eucalypt and Brushbox street trees in the area although these may be non-contemporary plantings.

**History Not Available**

**Condition and Integrity Not Available**

**Location**

Commencing at the south boundary of Peace Park proceed north along King Street to the municipal boundary. Proceed cast along the municipal boundary to Hoiden Street then proceed south along Hoiden Street to the south boundary of Peace Park. Proceed west along the south boundary of Peace Park to King Street.

## Bibliography


1 Lesley Muir and Brian Madden (eds), The Heritage of the Canterbury Municipality, Canterbury District Historical Society, 1992, p 19
2 ibid, p 17
3 Peter Spearritt, Sydney Since the Twenties, Hale & Iremonger,
1978, p 34
4 Census 1921, 1933, 1947; Peter Spearritt, op cit, p 31


**Report Produced Tue Jun 25 14:51:48 2019**

# Search for NSW heritage

Return to search page where you can refine/broaden your search.

## Statutory listed items

Information and items listed in the State Heritage Inventory come from a number of sources. This means that there may be several entries for the same heritage item in the database. For clarity, the search results have been divided into three sections.

- **Section 1** - contains Aboriginal Places declared by the **Minister for the Environment** under the National Parks and Wildlife Act. This information is provided by the Heritage Division.
- **Section 2** - contains heritage items listed by the **Heritage Council of NSW** under the NSW Heritage Act. This includes listing on the State Heritage Register, an Interim Heritage Order or protected under section 136 of the NSW Heritage Act. This information is provided by the Heritage Division.
- **Section 3** - contains items listed by **local councils** on Local Environmental Plans under the Environmental Planning and Assessment Act, 1979 and **State government agencies** under s.170 of the Heritage Act. This information is provided by local councils and State government agencies.

## Section 1. Aboriginal Places listed under the National Parks and Wildlife Act.

Your search did not return any matching results.

## Section 2. Items listed under the NSW Heritage Act.

Your search returned 1 record.

| Item name | Address | Suburb | LGA | SHR |
|---|---|---|---|---|
| Ashfield Reservoir (Elevated) (WS 0003) | Holden Street | Ashbury | Canterbury | 01622 |

## Section 3. Items listed by Local Government and State Agencies.

Your search returned 13 records.

| Item name | Address | Suburb | LGA | Information source |
|---|---|---|---|---|
| Ashfield Reservoir | 165-169 Holden Street | Ashbury | Canterbury | LGOV |
| Ashfield Reservoir (Elevated) (WS 0003) | Holden Street | Ashbury | Canterbury | SGOV |
| Canterbury Boys' High School | 220-252 Holden Street | Ashbury | Ashfield | LGOV |
| Federation House | 11 Second Street | Ashbury | Canterbury | LGOV |
| Federation House | 13 Second Street | Ashbury | Canterbury | LGOV |
| Federation House | 15 Second Street | Ashbury | Canterbury | LGOV |

| | | | | |
|---|---|---|---|---|
| **Federation House** | 5 Second Street | Ashbury | Canterbury | LGOV |
| **Federation House** | 7 Second Street | Ashbury | Canterbury | LGOV |
| **Federation House** | 9 Second Street | Ashbury | Canterbury | LGOV |
| **Group of Five Houses** | 262, 264, 266, 268, 270 Holden Street | Ashbury | Ashfield | LGOV |
| **House** | 38 Hanks Street | Ashbury | Ashfield | LGOV |
| **House, Pindari Illawarra** | 10 Hanks Street | Ashbury | Ashfield | LGOV |
| **Second Street Group** | 5, 7, 9, 11, 13, and 15 Second Street | Ashbury | Canterbury | LGOV |

There was a total of 14 records matching your search criteria.

**Key:**
LGA = Local Government Area
GAZ= NSW Government Gazette (statutory listings prior to 1997), HGA = Heritage Grant Application, HS = Heritage Study, LGOV = Local Government, SGOV = State Government Agency.
**Note:** While the Heritage Division seeks to keep the Inventory up to date, it is reliant on State agencies and local councils to provide their data. Always check with the relevant State agency or local council for the most up-to-date information.

# Ashfield Reservoir (Elevated) (WS 0003)

## Item details

| | |
|---|---|
| **Name of item:** | Ashfield Reservoir (Elevated) (WS 0003) |
| **Other name/s:** | WS 0003 |
| **Type of item:** | Built |
| **Group/Collection:** | Utilities - Water |
| **Category:** | Water Supply Reservoir/ Dam |
| **Location:** | Lat: -33.8989966008 Long: 151.1245631140 |
| **Primary address:** | Holden Street, Ashbury, NSW 2193 |
| **Parish:** | Petersham |
| **County:** | Cumberland |
| **Local govt. area:** | Canterbury |
| **Local Aboriginal Land Council:** | Metropolitan |

**Property description**

| Lot/Volume Code | Lot/Volume Number | Section Number | Plan/Folio Code | Plan/Folio Number |
|---|---|---|---|---|
| LOT | 1 | | DP | 911478 |

**All addresses**

| Street Address | Suburb/town | LGA | Parish | County | Type |
|---|---|---|---|---|---|
| Holden Street | Ashbury | Canterbury | Petersham | Cumberland | Primary Address |

## Owner/s

| Organisation Name | Owner Category | Date Ownership Updated |
|---|---|---|
| Sydney Water | State Government | |

## Statement of significance:

Ashfield Reservoir (Elevated) (WS 3) is one of a small group of four similar elevated reservoirs in the SWC system, the others being Bellevue Hill Reservoir (WS 10),1910, Drummoyne Reservoir (Elevated) (WS 38), 1910, and Penshurst Reservoir (Elevated) (WS 87), 1910. The group of reservoirs demonstrates a high level of engineering expertise and architectural detail, accommodating both structural requirements and aesthetic qualities.

**Date significance updated:** 10 Jun 05

*Note: The State Heritage Inventory provides information about heritage items listed by local and State government agencies. The State Heritage Inventory is continually being updated by local and State agencies as new information becomes available. Read the OEH* ***copyright and disclaimer****.*

## Description

| | |
|---|---|
| **Designer/Maker:** | Metropolitan Board of Water Supply and Sewerage |
| **Builder/Maker:** | Metropolitan Board of Water Supply and Sewerage |
| **Construction years:** | 1912-1912 |
| **Physical description:** | Ashfield Reservoir (Elevated) (WS 3) is one of a group of four similar elevated reservoirs in the SWC system, the others being Bellevue Hill Reservoir (WS 10),1910, Drummoyne Reservoir (Elevated) (WS 38), 1910, and Penshurst Reservoir (Elevated) (WS 87), 1910.<br><br>Each reservoir is an elevated cylindrical riveted steel tank, resting on a concrete apron and supported on a steel girder frame. The perimeter of the steel stand has a faade of concrete columns and arches, which forms a decorative, rather than a structural feature. The walkway around the rim of the reservoir is attached to the outside and supported on brackets (decking planks removed).<br><br>Standard features include: handrail in tubular steel, davit, access ladder, trigonometric station, inlet and outlet valve chambers.<br><br>Full Service Level: 80 m.<br>Capacity: 4.6 ML.<br><br>The site.<br>The site includes workshops and offices, as well as access to the Pressure Tunnels. Two skid huts are located in the grounds and are a rare survival, demonstrating former working conditions in MWS&DB.<br><br>**Date condition updated:**18 Dec 00 |
| **Modifications and dates:** | The reservoir has been roofed to safeguard water quality (1960s-1970s). |
| **Current use:** | Reservoir. |
| **Former use:** | Aboriginal land, farm, Reservoir. |

## History

**Historical notes:**

Due to the impact of the arrival of European colonists from 1788 and the almost immediate impact that this had on established patterns of subsistence, our knowledge of the Aboriginal people of the Sydney district is limited. Some eight individual groups or clans within the vicinity of the Parramatta area have been identified and two, the Cadigal and Wangal, most likely lived in the area that now makes up the Ashfield municiaplity. The Wangal group of the geographical area of Wann, which extended from the south side of Sydney Harbour from Sydney Cove to Rose Hill, are likely to have found Ashfield an attractive locality, the mangrove estuaries of the Long Cove and Iron Cove Creeks a good source of fish and molluscs (Attenbrow, V. & Pratten, C., quoted in SWC, 2005, 5).

Post-contact, the stretch of land between Iron Cove and the Cook's River was known as the Kangaroo Ground, the natural woodland would have provided a suitable habitat for possums, fern rhizomes and tubers, all of which would have been identified as valuable food sources for the Wangal (Pratten, C., quoted in SWC, 2005, 5).

Aboriginal people lived along the Cooks River for thousands of years prior to European arrival...The Cadigal and Wangal peoples made use of the land and seasons to hunt, trap, fish and forage for fruit and plants. As firestick farmers, they burned off scrub near rivers leaving only large trees spaced several meters apart, creating an open, park-like appearance (Marrickville Council website, quoted in ibid, 2005, 5).

Canterbury:

The first European land grant in this suburb...was of 100 acres to a "very good, pious, inoffensieve man", the Reverend Richard Johnson (1753-1827), the colony's first chaplain, in 1793. He called his grant Canterbury Vale, as a tribute to Canterbury in England, and the suburb took its name from the farm. The farm extended over the area of modern day Canterbury and Ashbury suburbs. By 1800, when it was sold to Lieutenant William Cox, the propery covered 600 acres. In 1803, when it covered 900 acres, it was sold to Robert Campbell the elder (1769-1846), who then bought up most of the land north to Liverpool Road.

The village of Canterbury was formed after 1841 subdivision of this land, then owned by Campbell. Sales of the land in the area west of Canterbury Road and north of the railway, were successful, and several other sales followed in the 1840s and 1850s.

Although the soil in this area was rather poor, there was some farm cultivation, but the main work was wood cutting and carting, and brickmaking. In 1840 the Australian Sugar Company bought 60 acres of Campbell's Canterbury estate and a steam engine was installed, but after passing through the hands of several owners, the factory closed in 1856.

The first post office opened in 1858, and the first official public school in 1878, and the district slowly developed. Canterbury Race Course, on the northern bank of the Cooks River has been one of Sydney's major racetracks since 1871. The railway station, on the Bankstown line, opened in 1895 (Pollen & Healy, 1988, 7-8 & 50).

Ashbury:

Ashbury is a predominantly residential area, that was largely developed between 1912 and 1940, with most development occuring during the Inter-War period and particularly during the building boom of the 1920s. Ashbury developed as part of the overall suburban expansion of Sydney that occurred along train lines and major roads. The area has a consistent subdivision pattern, building form and streetscape, largely because its development occurred over a relatively short period of time. A high standard of design and residential amenity was also achieved, and housing in this area has become increasingly sought after (Extent Heritage, 2017, 6).

Ashfield Reservoir:

When the Upper Nepean Scheme commenced operation in 1888, a single cast-iron pipeline connected Potts Hill to large in-ground reservoirs at Petersham and at Crown Street, Surry Hills. From Crown Street, water was pumped to reservoirs at Paddington and Woollahra, then on to Waverley. A second main was commenced almost immediately and commissioned in 1893 (ibid, 2017, 7).

Water from Petersham Reservoir served the (inner) western and Illawarra suburbs and a pumping station at Carlton passed water to tanks at Penshurst, from where the higher levels of Kogarah were supplied. The City and eastern suburbs were served from Crown Street, Paddington, Woollahra and Waverley Reservoirs, with water from Woollahra fed back to the elevated tank at Ashfield (ibid, 2017, 7).

By the early 20th century, increasing demand saw development of additional supply mains from Potts Hill, feeding the North Shore, the Granville district, Lidcombe/Auburn and Bankstown/Canterbury. From 1912, a pumping station at Potts HIll was commissioned to boost supply beyond what could be delivered by gravity alone (ibid, 2017, 7).

Ashfield Reservoir (Elevated) (WS 3), built in 1912, is one of a group of four similar elevated reservoirs in the Sydney Water Corporation system, the others being Bellevue Hill Reservoir (Elevated) (WS 10),1910, Drummoyne Reservoir (Elevated) (WS 38), 1910, and Penshurst Reservoir (Elevated) (WS 87), 1910.

Petersham Reservoir supplied western Sydney and Illawarra suburbs. A pumping station at Carlton lifted water to Penshurst to supply the higher areas of Kogarah.

Originally, water from Woollahra Reservoir was fed back to Ashfield Reservoir (1888) to supply the higher areas in Inner West. By 1927 an additional main from Potts Hill supplied Ashfield Reservoir. Ashfield Reservoir is now supplied by the City Tunnel, whcih was completed in 1961, with the first section, between Potts Hill and Ashfield, opened in 1957. Amongst other connections, the elevated Ashfield Reservoir was now supplied fromt he City Tunnel, via a new pumping station. Ashfield Reservoir supplies the elevated areas of Ashfield, Drummoyne and the western side of Petersham (ibid, 2017, 8).

## Historic themes

| Australian theme (abbrev) | New South Wales theme | Local theme |
|---|---|---|
| 1. Environment-Tracing the evolution of a continent's special environments | Environment - naturally evolved-Activities associated with the physical surroundings that support human life and influence or shape human cultures. | Topography: How did the environment, topography and the River influence early settlement? Is there a strong relationship-Peopling the Continent Contact |
| 3. Economy-Developing local, regional and national economies | Environment - cultural landscape-Activities associated with the interactions between humans, human societies and the shaping of their physical surroundings | Developing local, regional and national economies-National Theme 3 |
| 4. Settlement-Building settlements, towns and cities | Towns, suburbs and villages-Activities associated with creating, planning and managing urban functions, landscapes and lifestyles in towns, suburbs and villages | 20th Century infrastructure- |
| 4. Settlement-Building settlements, | Utilities-Activities associated with the provision of | Water and drainage- |

| | | |
|---|---|---|
| towns and cities | services, especially on a communal basis | |
| 4. Settlement-Building settlements, towns and cities | Utilities-Activities associated with the provision of services, especially on a communal basis | Water supply- |
| 7. Governing-Governing | Government and Administration-Activities associated with the governance of local areas, regions, the State and the nation, and the administration of public programs - includes both principled and corrupt activities. | State government- |
| 7. Governing-Governing | Government and Administration-Activities associated with the governance of local areas, regions, the State and the nation, and the administration of public programs - includes both principled and corrupt activities. | Developing roles for government - providing reticulated water- |
| 8. Culture-Developing cultural institutions and ways of life | Creative endeavour-Activities associated with the production and performance of literary, artistic, architectural and other imaginative, interpretive or inventive works; and/or associated with the production and expression of cultural phenomena; and/or environments that have inspired such creative activities. | Architectural styles and periods - Federation Free Classical- |

## Assessment of significance

| | |
|---|---|
| **SHR Criteria a)** [Historical significance] | Ashfield Reservoir (Elevated) (WS 3) is one of a small group of four similar elevated reservoirs, the others being Bellevue Hill Reservoir (WS 10),1910, Drummoyne Reservoir (Elevated) (WS 38), 1910, and Penshurst Reservoir (Elevated) (WS 87), 1910. |
| **SHR Criteria c)** [Aesthetic significance] | The group of reservoirs demonstrate a high level of engineering expertise and architectural detail, accommodating both structural requirements and aesthetic qualities, rare in NSW.<br>The reservoir is a landmark in the surrounding area. |
| **SHR Criteria e)** [Research potential] | This reservoir demonstrates the high level of technical expertise available to the MWS & DB for reservoir construction at the time. |
| **SHR Criteria f)** [Rarity] | This reservoir is one of four riveted steel elevated reservoirs on a steel girder stand with concrete surround in the SWC system, rarer still because of the high level of architectural detailing. The 'skid huts' are a rare survival. |
| **SHR Criteria g)** [Representativeness] | The riveted steel tank was common technology for surface reservoirs, but was extremely rare when combined with an elevated steel frame with concrete apron. |
| **Assessment criteria:** | Items are assessed against the **State Heritage Register (SHR) Criteria** to determine the |

level of significance. Refer to the Listings below for the level of statutory protection.

## Recommended management:

Manage the place and its significant components in accordance with the State Owned Heritage Asset Management Guidelines. Where no Conservation Management Plan, Heritage Assessment or Statement of Heritage Impact is in place, or where works are outside the scope existing heritage documentation, assess heritage impacts of proposed works in accordance with Sydney Water Environment Impact Assessment procedures. Undertake a Heritage Assessment and/or Statement of Heritage Impact as required by EIA procedures. Where the item is listed in a Local Environmental Plan Schedule of Heritage items, determine if works are exempt from approval under the LEP provisions. Where works are not exempt, obtain necessary approvals from the local council, in accordance with SWC EIA Guidelines. Undertake archival and photographic recording before major changes, in accordance with Heritage Council guidelines. Lodge copies of the archival record with the Sydney Water Archives and the NSW Heritage Office.

## Procedures /Exemptions

| Section of act | Description | Title | Comments | Action date |
|---|---|---|---|---|
| 21(1)(b) | Conservation Plan submitted for endorsement | Ashfield Reservoir WS0003 Draft CMP, prepared in house by Sydney Water for Sydney Water, dated June 2004 | | Sep 7 2004 |
| 21(1)(b) | Conservation Plan submitted for endorsement | Ashfield Reservoir WS0003 Draft CMP, by Sydney Water for Sydney Water, dated February 2005 | CMP endorsed by Heritage Council 16 June 2005 for a period of 5 years, expires 16 June 2010. | Jun 16 2005 |
| 57(2) | Exemption to allow work | Standard Exemptions | SCHEDULE OF STANDARD EXEMPTIONS HERITAGE ACT 1977<br>Notice of Order Under Section 57 (2) of the Heritage Act 1977<br><br>I, the Minister for Planning, pursuant to subsection 57(2) of the Heritage Act 1977, on the recommendation of the Heritage Council of New South Wales, do by this Order:<br><br>1. revoke the Schedule of Exemptions to subsection 57(1) of the Heritage Act made under subsection 57(2) and published in the Government Gazette on 22 February 2008; and<br><br>2. grant standard exemptions from subsection 57 (1) of the Heritage Act 1977, described in the Schedule attached.<br><br>FRANK SARTOR | Sep 5 2008 |

| | | | | |
|---|---|---|---|---|
| | | | Minister for Planning<br><br>Sydney, 11 July 2008<br><br>To view the schedule click on the Standard Exemptions for Works Requiring Heritage Council Approval link below. | |

**Standard exemptions** for works requiring Heritage Council approval

## Listings

| Heritage Listing | Listing Title | Listing Number | Gazette Date | Gazette Number | Gazette Page |
|---|---|---|---|---|---|
| Heritage Act - State Heritage Register | | 01622 | 15 Nov 02 | 220 | 9709 |
| Heritage Act - s.170 NSW State agency heritage register | | | | | |
| Local Environmental Plan | Canterbury LEP 2012 | I1 | | | |
| Within a conservation area on an LEP | Ashbury HCA, Canterbury LEP 2012 | | | | |
| Heritage study | Canterbury Heritage Study | | | | |

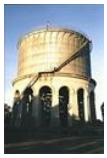
## Study details

| Title | Year | Number | Author | Inspected by | Guidelines used |
|---|---|---|---|---|---|
| Alexandra Canal Conservation Management Plan | 2004 | | NSW Department of Commenrce, Heritage Design Services | | Yes |

## References, internet links & images

| Type | Author | Year | Title | Internet Links |
|---|---|---|---|---|
| Written | Extent Heritage | 2017 | Ashfield Reservoir Site - Demolitions and Remediation - Statement of Heritage Impact - | |
| Written | Pollen, F. & Healy, G. (ed.s) | 1988 | "Ashbury" and "Canterbury" entries, in The Book of Sydney Suburbs | |
| Written | Sydney Water Corporation | 2005 | Ashfield Reservoir WS0003 - Conservation Management Plan | |

Note: internet links may be to web pages, documents or images.




**(Click on thumbnail for full size image and image details)**

## Data source

The information for this entry
comes from the following source:

| | |
|---|---|
| **Name:** | Heritage Office |
| **Database number:** | 5053873 |
| **File number:** | H04/00253 |

**Return to previous page**

# Ashfield Reservoir

## Item details

| | |
|---|---|
| **Name of item:** | Ashfield Reservoir |
| **Other name/s:** | Ashfield Reservoir (Elevated) (WS 0003) |
| **Type of item:** | Built |
| **Group/Collection:** | Utilities - Water |
| **Category:** | Water Tower |
| **Primary address:** | 165-169 Holden Street, Ashbury, NSW 2193 |
| **Parish:** | Petersham |
| **County:** | Cumberland |
| **Local govt. area:** | Canterbury |

## Boundary:

Lot 1 DP 911478. See State Heritage Register Listing for map.

**All addresses**

| Street Address | Suburb/town | LGA | Parish | County | Type |
|---|---|---|---|---|---|
| 165-169 Holden Street | Ashbury | Canterbury | Petersham | Cumberland | Primary Address |

## Statement of significance:

The reservoir provides historical evidence of the provision of metropolitan water supplies in the early 20th Century, and also evidence of the technological and engineering techniques of the time. The reservoir is a prominent local landmark item, and is of aesthetic interest for the way in which this utilitarian structure has been architecturally treated.

Ashfield Reservoir has State heritage significance as one of a small group of four similar elevated reservoirs in the SWC system, the others being Bellevue Hill Reservoir (WS 10),1910, Drummoyne Reservoir

(Elevated) (WS 38), 1910, and Penshurst Reservoir (Elevated) (WS 87), 1910. The group of reservoirs demonstrates a high level of engineering expertise and architectural detail, accommodating both structural requirements and aesthetic qualities. The listing includes the reservoir and all associated pipework, valves and valve houses to the property boundary, also skid huts (Sydney Water S170 Register).

**Date significance updated:** 23 Mar 06

*Note:*
*The State Heritage Inventory provides information about heritage items listed by local and State government agencies. The State Heritage Inventory is continually being updated by local and State agencies as new information becomes available. Read the OEH* ***copyright and disclaimer****.*

## Description

| | |
|---|---|
| **Designer/Maker:** | MWS&DB |
| **Builder/Maker:** | MWS&DB |
| **Physical description:** | An elevated reservoir, made of steel panels riveted together, standing on a steel frame. The base of the reservoir is concealed behind a concrete arched colonnade. The reservoir is located at a high point in the area, and is a very prominent local landmark item. It retains a high degree of original integrity.<br><br>One of a group of four reservoirs in the Sydney Metropolitan area of similar construction and date. Each reservoir is an elevated cylindrical riveted steel tank, resting on a concrete apron and supported on a steel girder frame. The perimeter of the steel stand has a façade of concrete columns and arches, which forms a decorative, rather than a structural feature. The walkway around the rim of the reservoir is attached to the outside and supported on brackets (decking planks removed). Standard features include: handrail in tubular steel, davit, access ladder, trigonometric station, inlet and outlet valve chambers (Sydney Water S170 Register).<br><br>Full Service Level: 80 m.<br><br>Capacity: 4.6 ML.<br><br>THE SITE<br>The site includes workshops and offices, as well as access to the Pressure Tunnels. Two skid huts are located in the grounds and are a rare survival, demonstrating former working conditions in MWS&DB. |
| **Physical condition and/or Archaeological potential:** | Generally well maintained, though graffitied.<br><br>**Date condition updated:**26 Nov 02 |
| **Modifications and dates:** | The reservoir has been roofed to safeguard water quality (1960s-1970s). |
| **Current use:** | Water Reservoir |

**Former use:** Water
Reservoir

## History

**Historical notes:** This water reservoir was built as an elevated steel service reservoir for the Southern water supply system in 1912. Its capacity was 1,000,000 gallons. It replaced an earlier reservoir erected in 1888, which was later moved to Holroyd.

Originally, Ashfield Reservoir (1888) was fed back by Woollara Reservoir to supply the higher areas in Inner West. An additional main from Potts Hill supplied the Reservoir by 1927 until the City Tunnel became the supplier.

It is one of the four similar elevated reservoirs in the SWC system, which are Bellevue Hill (1910), Drummoyne Reservoir (1910) and Penshurst Reservoir (1910). This group of reservoirs constructed in a high level of of engineering expertise and architectural detail.

## Historic themes

| Australian theme (abbrev) | New South Wales theme | Local theme |
|---|---|---|
| 4. Settlement-Building settlements, towns and cities | Utilities-Activities associated with the provision of services, especially on a communal basis | Servicing the community, provision and extension of services such as water supply, sewerage, gas, electricity, garbage r- |

## Assessment of significance

**SHR Criteria a)** [Historical significance]

Provides historical evidence for the provision metropolitan water supplies in the early 20th Century.

Ashfield Reservoir (Elevated) (WS 3) is one of a small group of four similar elevated reservoirs, the others being Bellevue Hill Reservoir (WS 10),1910, Drummoyne Reservoir (Elevated) (WS 38), 1910, and Penshurst Reservoir (Elevated) (WS 87), 1910 (Sydney Water S170 Register).

**SHR Criteria c)** [Aesthetic significance]

A very prominent landmark item in the local area. Of aesthetic significance on account of its design and construction technique, and for demonstrating the attempt of the water authority to ensure that a utilitarian structure was also architecturally considered.

The group of reservoirs demonstrate a high level of engineering expertise and architectural detail, accommodating both structural requirements and aesthetic qualities, rare in NSW (Sydney Water S170 Register).

**SHR Criteria e)** [Research potential]

Has the ability to provide evidence on the technological and engineering standards and techniques at the time of construction.

This reservoir demonstrates the high level of technical expertise available to the MWS & DB for reservoir construction at the time (Sydney Water S170 Register).

**SHR Criteria f)** [Rarity]

This reservoir is one of four riveted steel elevated reservoirs on a steel girder stand with concrete surround in the SWC system, rarer still because of the high level of architectural detailing. The 'skid huts' are a rare survival. The

riveted steel tank was common technology for surface reservoirs, but was extremely rare when combined with an elevated steel frame with concrete apron (Sydney Water S170 Register).

**SHR Criteria g)** [Representativeness] An excellent representative example of the group of reservoirs to which this belongs.

**Integrity/Intactness:** High

**Assessment criteria:** Items are assessed against the **State Heritage Register (SHR) Criteria** to determine the level of significance. Refer to the Listings below for the level of statutory protection.

## Recommended management:

Ensure regular maintenance works undertaken including the removal of graffiti. Manage the place in accordance with Conservation Management Plan for the site.

## Recommendations

| Management Category | Description | Date Updated |
|---|---|---|
| Statutory Instrument | List on a Local Environmental Plan (LEP) | 26 Nov 02 |
| Recommended Management | Produce a Conservation Management Plan (CMP) | 26 Nov 02 |

## Listings

| Heritage Listing | Listing Title | Listing Number | Gazette Date | Gazette Number | Gazette Page |
|---|---|---|---|---|---|
| Local Environmental Plan | Canterbury LEP 2012 | i1 | 01 Jan 13 | | |

## Study details

| Title | Year | Number | Author | Inspected by | Guidelines used |
|---|---|---|---|---|---|
| Canterbury Heritage Study Review | 2006 | | City Plan Heritage | | Yes |

## References, internet links & images

| Type | Author | Year | Title | Internet Links |
|---|---|---|---|---|
| Management Plan | Sydney Water | 2002 | Sydney Water S170 Heritage Register | |
| Written | Sydney Water | 2005 | Ashfield Reservoir WS0003 Conservation Management Plan | |
| Written | W.V. Aird | 1961 | Water Supply, Sewerage and drainage of Sydney | |

Note: internet links may be to web pages, documents or images.

**(Click on thumbnail for full size image and image details)**

## Data source

The information for this entry comes from the following source:

| | |
|---|---|
| **Name:** | Local Government |
| **Database number:** | 1300123 |

**Return to previous page**

# Ashfield Reservoir (Elevated) (WS 0003)

## Item details

| | |
|---|---|
| **Name of item:** | Ashfield Reservoir (Elevated) (WS 0003) |
| **Other name/s:** | (WS 0003) |
| **Type of item:** | Built |
| **Group/Collection:** | Utilities - Water |
| **Category:** | Water Supply Reservoir/ Dam |
| **Primary address:** | Holden Street, Ashbury, NSW 2193 |
| **Local govt. area:** | Canterbury |

**Property description**

| Lot/Volume Code | Lot/Volume Number | Section Number | Plan/Folio Code | Plan/Folio Number |
|---|---|---|---|---|
| LOT | 1 | | DP | 115504 |
| LOT | 1 | | DP | 711077 |
| LOT | 1 | | DP | 911478 |

UBD Sydney 37th Edition 2001 Map 254, C7

## Boundary:

**All addresses**

| Street Address | Suburb/town | LGA | Parish | County | Type |
|---|---|---|---|---|---|
| Holden Street | Ashbury | Canterbury | | | Primary Address |
| Armstrong Street | Ashbury | Canterbury | | | Alternate Address |

## Owner/s

| Organisation Name | Owner Category | Date Ownership Updated |
|---|---|---|
| Sydney Water | State Government | |

## Statement of significance:

Ashfield Reservoir (Elevated) (WS 3) is one of a small group of four similar elevated reservoirs in the SWC system, the others being Bellevue Hill Reservoir (WS 10),1910, Drummoyne Reservoir (Elevated) (WS 38), 1910, and Penshurst Reservoir (Elevated) (WS 87), 1910. The group of reservoirs demonstrates a high level of engineering expertise and architectural detail, accommodating both structural requirements and aesthetic qualities.

The listing includes the reservoir and all associated pipework, valves and valve houses to the property boundary, also skid huts.

**Date significance updated:** 14 Dec 00

*Note: The State Heritage Inventory provides information about heritage items listed by local and State government agencies. The State Heritage Inventory is continually being updated by local and State agencies as new information becomes available. Read the OEH* ***copyright and disclaimer****.*

## Description

| | |
|---|---|
| **Designer/Maker:** | Metropolitan Board of Water Supply and Sewerage |
| **Builder/Maker:** | Metropolitan Board of Water Supply and Sewerage |
| **Construction years:** | 1912-1912 |
| **Physical description:** | Ashfield Reservoir (Elevated) (WS 3) is one of a group of four similar elevated reservoirs in the SWC system, the others being Bellevue Hill Reservoir (WS 10),1910, Drummoyne Reservoir (Elevated) (WS 38), 1910, and Penshurst Reservoir (Elevated) (WS 87), 1910.<br><br>Each reservoir is an elevated cylindrical riveted steel tank, resting on a concrete apron and supported on a steel girder frame. The perimeter of the steel stand has a façade of concrete columns and arches, which forms a decorative, rather than a structural feature. The walkway around the rim of the reservoir is attached to the outside and supported on brackets (decking planks removed).<br><br>Standard features include: handrail in tubular steel, davit, access ladder, trigonometric station, inlet and outlet valve chambers.<br><br>Full Service Level: 80 m.<br>Capacity: 4.6 ML.<br><br>The site.<br>The site includes workshops and offices, as well as access to the Pressure Tunnels. Two skid huts are located in the grounds and are a rare survival, demonstrating former working conditions in MWS&DB. |
| **Physical condition and/or Archaeological potential:** | Depot now partly derelict. |

| | |
|---|---|
| | **Date condition updated:** 18 Dec 00 |
| **Modifications and dates:** | The reservoir has been roofed to safeguard water quality (1960s-1970s). |
| **Current use:** | Reservoir. |
| **Former use:** | Reservoir. |

## History

| | |
|---|---|
| **Historical notes:** | Ashfield Reservoir (Elevated) (WS 3), built in 1912, is one of a group of four similar elevated reservoirs in the SWC system, the others being Bellevue Hill Reservoir (Elevated) (WS 10),1910, Drummoyne Reservoir (Elevated) (WS 38), 1910, and Penshurst Reservoir (Elevated) (WS 87), 1910.<br><br>Petersham Reservoir supplied western Sydney and Illawarra suburbs. A pumping station at Carlton lifted water to Penshurst to supply the higher areas of Kogarah.<br><br>Originally, water from Woollahra Reservoir was fed back to Ashfield Reservoir (1888) to supply the higher areas in Inner West. By 1927 an additional main from Potts Hill supplied Ashfield Reservoir. The reservoir is now supplied by the City Tunnel. |

## Historic themes

| Australian theme (abbrev) | New South Wales theme | Local theme |
|---|---|---|
| 4. Settlement-Building settlements, towns and cities | Utilities-Activities associated with the provision of services, especially on a communal basis | Building settlements, towns and cities-National Theme 4 |

## Assessment of significance

| | |
|---|---|
| **SHR Criteria a)** [Historical significance] | Ashfield Reservoir (Elevated) (WS 3) is one of a small group of four similar elevated reservoirs, the others being Bellevue Hill Reservoir (WS 10),1910, Drummoyne Reservoir (Elevated) (WS 38), 1910, and Penshurst Reservoir (Elevated) (WS 87), 1910. |
| **SHR Criteria c)** [Aesthetic significance] | The group of reservoirs demonstrate a high level of engineering expertise and architectural detail, accommodating both structural requirements and aesthetic qualities, rare in NSW.<br><br>The reservoir is a landmark in the surrounding area. |
| **SHR Criteria e)** [Research potential] | This reservoir demonstrates the high level of technical expertise available to the MWS & DB for reservoir construction at the time. |
| **SHR Criteria f)** [Rarity] | This reservoir is one of four riveted steel elevated reservoirs on a steel girder stand with concrete surround in the SWC system, rarer still because of the high level of architectural detailing. The 'skid huts' are a rare survival. |

| | |
|---|---|
| **SHR Criteria g)** [Representativeness] | The riveted steel tank was common technology for surface reservoirs, but was extremely rare when combined with an elevated steel frame with concrete apron. |
| **Assessment criteria:** | Items are assessed against the **State Heritage Register (SHR) Criteria** to determine the level of significance. Refer to the Listings below for the level of statutory protection. |

## Recommended management:

Manage the place and its significant components in accordance with the State Owned Heritage Asset Management Guidelines. Where no Conservation Management Plan, Heritage Assessment or Statement of Heritage Impact is in place, or where works are outside the scope existing heritage documentation, assess heritage impacts of proposed works in accordance with Sydney Water Environment Impact Assessment procedures. Undertake a Heritage Assessment and/or Statement of Heritage Impact as required by EIA procedures. Where the item is listed in a Local Environmental Plan Schedule of Heritage items, determine if works are exempt from approval under the LEP provisions. Where works are not exempt, obtain necessary approvals from the local council, in accordance with SWC EIA Guidelines. Undertake archival and photographic recording before major changes, in accordance with Heritage Council guidelines. Lodge copies of the archival record with the Sydney Water Archives and the NSW Heritage Office.

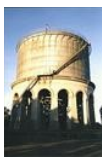
## Listings

| Heritage Listing | Listing Title | Listing Number | Gazette Date | Gazette Number | Gazette Page |
|---|---|---|---|---|---|
| Heritage Act - s.170 NSW State agency heritage register | Sydney Water Heritage Register | | 30 Jun 02 | | |

## References, internet links & images

None

Note: internet links may be to web pages, documents or images.



**(Click on thumbnail for full size image and image details)**

## Data source

The information for this entry comes from the following source:

**Name:** State Government

4575750

**Database number:**

**Return to previous page**

Every effort has been made to ensure that information contained in the State Heritage Inventory is correct. If you find any errors or omissions please send your comments to the **Database Manager**.

# Canterbury Boys' High School

## Item details

| | |
|---|---|
| **Name of item:** | Canterbury Boys' High School |
| **Type of item:** | Built |
| **Group/Collection:** | Education |
| **Category:** | School - State (public) |
| **Primary address:** | 220-252 Holden Street, Ashbury, NSW 2131 |
| **Local govt. area:** | Ashfield |

**All addresses**

| Street Address | Suburb/town | LGA | Parish | County | Type |
|---|---|---|---|---|---|
| 220-252 Holden Street | Ashbury | Ashfield | | | Primary Address |

## Listings

| Heritage Listing | Listing Title | Listing Number | Gazette Date | Gazette Number | Gazette Page |
|---|---|---|---|---|---|
| Local Environmental Plan | Ashfield LEP 2013 | 3 | 23 Dec 13 | | |
| Heritage study | | | | | |

## References, internet links & images

None

Note: internet links may be to web pages, documents or images.

**(Click on thumbnail for full size image and image details)**

## Data source

The information for this entry comes from the following source:

| | |
|---|---|
| **Name:** | Local Government |
| **Database number:** | 1020497 |

**Return to previous page**

# Federation House

## Item details

**Name of item:** Federation House

**Type of item:** Built

**Group/Collection:** Residential buildings (private)

**Category:** House

**Primary address:** 11 Second Street, Ashbury, NSW 2193

**Local govt. area:** Canterbury

**All addresses**

| Street Address | Suburb/town | LGA | Parish | County | Type |
|---|---|---|---|---|---|
| 11 Second Street | Ashbury | Canterbury | | | Primary Address |

## Listings

| Heritage Listing | Listing Title | Listing Number | Gazette Date | Gazette Number | Gazette Page |
|---|---|---|---|---|---|
| Local Environmental Plan | Canterbury LEP 2012 | i5 | 01 Jan 13 | | |

## References, internet links & images

None

Note: internet links may be to web pages, documents or images.

## Data source

The information for this entry comes from the following source:

**Name:** Local Government

**Database number:** 1300515

# Federation House

## Item details

**Name of item:** Federation House

**Type of item:** Built

**Group/Collection:** Residential buildings (private)

**Category:** House

**Primary address:** 13 Second Street, Ashbury, NSW 2193

**Local govt. area:** Canterbury

**All addresses**

| Street Address | Suburb/town | LGA | Parish | County | Type |
|---|---|---|---|---|---|
| 13 Second Street | Ashbury | Canterbury | | | Primary Address |

## Listings

| Heritage Listing | Listing Title | Listing Number | Gazette Date | Gazette Number | Gazette Page |
|---|---|---|---|---|---|
| Local Environmental Plan | Canterbury LEP 2012 | i6 | 01 Jan 13 | | |

## References, internet links & images

None

Note: internet links may be to web pages, documents or images.

## Data source

The information for this entry comes from the following source:

**Name:** Local Government

**Database number:** 1300516

# Federation House

## Item details

**Name of item:** Federation House

**Type of item:** Built

**Group/Collection:** Residential buildings (private)

**Category:** House

**Primary address:** 15 Second Street, Ashbury, NSW 2193

**Local govt. area:** Canterbury

**All addresses**

| Street Address | Suburb/town | LGA | Parish | County | Type |
|---|---|---|---|---|---|
| 15 Second Street | Ashbury | Canterbury | | | Primary Address |

## Listings

| Heritage Listing | Listing Title | Listing Number | Gazette Date | Gazette Number | Gazette Page |
|---|---|---|---|---|---|
| Local Environmental Plan | Canterbury LEP 2012 | i7 | 01 Jan 13 | | |

## References, internet links & images

None

Note: internet links may be to web pages, documents or images.

## Data source

The information for this entry comes from the following source:

**Name:** Local Government

**Database number:** 1300517

# Federation House

## Item details

**Name of item:** Federation House

**Type of item:** Built

**Group/Collection:** Residential buildings (private)

**Category:** House

**Primary address:** 5 Second Street, Ashbury, NSW 2193

**Local govt. area:** Canterbury

**All addresses**

| Street Address | Suburb/town | LGA | Parish | County | Type |
|---|---|---|---|---|---|
| 5 Second Street | Ashbury | Canterbury | | | Primary Address |

## Listings

| Heritage Listing | Listing Title | Listing Number | Gazette Date | Gazette Number | Gazette Page |
|---|---|---|---|---|---|
| Local Environmental Plan | Canterbury LEP 2012 | i2 | 01 Jan 13 | | |

## References, internet links & images

None

Note: internet links may be to web pages, documents or images.

## Data source

The information for this entry comes from the following source:

**Name:** Local Government

**Database number:** 1300512

# Federation House

## Item details

**Name of item:** Federation House

**Type of item:** Built

**Group/Collection:** Residential buildings (private)

**Category:** House

**Primary address:** 7 Second Street, Ashbury, NSW 2193

**Local govt. area:** Canterbury

**All addresses**

| Street Address | Suburb/town | LGA | Parish | County | Type |
|---|---|---|---|---|---|
| 7 Second Street | Ashbury | Canterbury | | | Primary Address |

## Listings

| Heritage Listing | Listing Title | Listing Number | Gazette Date | Gazette Number | Gazette Page |
|---|---|---|---|---|---|
| Local Environmental Plan | Canterbury LEP 2012 | i3 | 01 Jan 13 | | |

## References, internet links & images

None

Note: internet links may be to web pages, documents or images.

## Data source

The information for this entry comes from the following source:

**Name:** Local Government

**Database number:** 1300513

# Federation House

## Item details

**Name of item:** Federation House

**Type of item:** Built

**Group/Collection:** Residential buildings (private)

**Category:** House

**Primary address:** 9 Second Street, Ashbury, NSW 2193

**Local govt. area:** Canterbury

**All addresses**

| Street Address | Suburb/town | LGA | Parish | County | Type |
|---|---|---|---|---|---|
| 9 Second Street | Ashbury | Canterbury | | | Primary Address |

## Listings

| Heritage Listing | Listing Title | Listing Number | Gazette Date | Gazette Number | Gazette Page |
|---|---|---|---|---|---|
| Local Environmental Plan | Canterbury LEP 2012 | i4 | 01 Jan 13 | | |

## References, internet links & images

None

Note: internet links may be to web pages, documents or images.

## Data source

The information for this entry comes from the following source:

**Name:** Local Government

**Database number:** 1300514

# Group of Five Houses

## Item details

| | |
|---|---|
| **Name of item:** | Group of Five Houses |
| **Type of item:** | Complex / Group |
| **Group/Collection:** | Residential buildings (private) |
| **Category:** | House |
| **Primary address:** | 262, 264, 266, 268, 270 Holden Street, Ashbury, NSW 2131 |
| **Local govt. area:** | Ashfield |

**All addresses**

| Street Address | Suburb/town | LGA | Parish | County | Type |
|---|---|---|---|---|---|
| 262, 264, 266, 268, 270 Holden Street | Ashbury | Ashfield | | | Primary Address |

## Listings

| Heritage Listing | Listing Title | Listing Number | Gazette Date | Gazette Number | Gazette Page |
|---|---|---|---|---|---|
| Local Environmental Plan | Ashfield LEP 2013 | 4 | 23 Dec 13 | | |
| Heritage study | | | | | |

## References, internet links & images

None

Note: internet links may be to web pages, documents or images.

**(Click on thumbnail for full size image and image details)**

## Data source

The information for this entry comes from the following source:

| | |
|---|---|
| **Name:** | Local Government |
| **Database number:** | 1020498 |

**Return to previous page**

# House

## Item details

| | |
|---|---|
| **Name of item:** | House |
| **Type of item:** | Built |
| **Group/Collection:** | Residential buildings (private) |
| **Category:** | House |
| **Primary address:** | 38 Hanks Street, Ashbury, NSW 2131 |
| **Local govt. area:** | Ashfield |

**All addresses**

| Street Address | Suburb/town | LGA | Parish | County | Type |
|---|---|---|---|---|---|
| 38 Hanks Street | Ashbury | Ashfield | | | Primary Address |

## Listings

| Heritage Listing | Listing Title | Listing Number | Gazette Date | Gazette Number | Gazette Page |
|---|---|---|---|---|---|
| Local Environmental Plan | Ashfield LEP 2013 | 2 | 23 Dec 13 | | |
| Heritage study | | | | | |

## References, internet links & images

None

Note: internet links may be to web pages, documents or images.

**(Click on thumbnail for full size image and image details)**

## Data source

The information for this entry comes from the following source:

| | |
|---|---|
| **Name:** | Local Government |
| **Database number:** | 1020473 |

**Return to previous page**

# House, Pindari Illawarra

## Item details

**Name of item:** House, Pindari Illawarra

**Type of item:** Built

**Group/Collection:** Residential buildings (private)

**Category:** House

**Primary address:** 10 Hanks Street, Ashbury, NSW 2131

**Local govt. area:** Ashfield

**All addresses**

| Street Address | Suburb/town | LGA | Parish | County | Type |
|---|---|---|---|---|---|
| 10 Hanks Street | Ashbury | Ashfield | | | Primary Address |

## Statement of significance:

One of Ashfield s most authentic and attractive Federation-period Queen Anne houses. It is in immaculate and original condition, along with its immediate context, an ensemble comprising garden, architectural detailing, fence and gate, as well as an early rear-sited garage. It was erected by a very competent builder, who with his family lived there for many years. The property demonstrates quite remarkably the qualities appropriate to an important phase of the municipality s history.



## Description

**Physical description:** This is not merely a building but an intact, well-built and complete ensemble of a residence and its original context. The house, on the high side of the street, is a fairly simple Queen Anne design, with red-brown tuckpointed brickwork and lighter brick dressings, on a rendered plinth. In plan it is the expected L-shaped form, with a hipped main roof of slate, and a projecting gable with a window bay at one side and a verandah at the other. The main roof (which has possibly been re-slated authentically in recent times) has a pattern of lighter slates

on its forward slope and is trimmed with terra cotta hips, crested ridges and terminals. The gable wing has bulb-ended bargeboards, a decorative apex screen and a timber finial. The verandah has a roof of convex curved corrugated metal, turned timber posts, friezes of turned members, fretwork brackets, tesselated tiled floor and marble edges and threshold. The paired windows have flat arch heads, moulded sills and rendered aprons. From the tesselated front path, steps having marble treads, tiled risers, flared and rendered strings and urn bases ascend to the verandah. The tall chimneys are rendered and have convex friezes, cornices and chimney pots. The early skillion wing at the back of the house has been appropriately extended and at the rear there is an unobtrusive brick garage, approached by a concrete driveway. The brick front fence, which acts also as a garden retaining wall, appears to have been added a little later than the house itself. It has piers with carved vermiculated sandstone caps, between which are fine wrought iron palisade panels with curvilinear centres. The gate matches this design and leads, by means of steps, to the main pathway.

**Physical condition and/or Archaeological potential:** As observed from the street : Intact

**Modifications and dates:** Metal security screens have been added to windows and front doorway

**Further information:** (1) The Higinbotham & Robinson map of Ashfield, 1883, shows the area prior to the creation of Beechwood Estate. That estate appears in the H E C Robinson map of Ashfield South Ward which was first prepared about 1912. Both maps are in Ashfield Council Archives. (2) BA, 3 September 1915, No 2469, in Ashfield Council Archives. Mysteriously, Sands Directories record George Young as the occupier of a building called Illawarra on the site from 1908 to 1910. (3) Valuer-General s records, east ward 1920, No 440; 1922, No 387. (The property was then part of the east ward). (4) Valuer-General s records, ibid, 1943, No 444.

**Current use:** House, Pindari , 10 Hanks Street, Ashfield

## History

**Historical notes:** This property is in the Beechwood Estate, an area taken out of Robert Campbell's historic Canterbury Park Estate at about the turn of the 19th century. That part of Ashfield was then rated as in the East Ward.(1) The owner of this house was a builder, Charles Thomas Inman, who lodged a building application in 1915 for a three-room (sic) double-fronted cottage on a brick foundation with ÔMalthoidÕ dampcourse and a slate roof, with an estimated value of £575. He called the residence Illawarra.(2) In 1920 the valuation of the property was £248 unimproved and £800 improved. By 1922 the valuation had increased to £315 unimproved and £1,350 improved, possibly indicating an enlargement of the house to its present size, although no such extension is visible externally.(3) Then in 1943 the property was acquired by Mrs Eileen OÕDea from Ôthe estate of the late Thomas InmanÕ. Mrs OÕDea was occupier and executrix, and perhaps the inheritor, of the property. In that year the valuation of £382 unimproved and £1,200 improved was recorded. The reason for the reduction of the improved valuation is not known, but it could have been an effect of the financial downturn following the great depression of the 1930s.(4)

## Listings

| Heritage Listing | Listing Title | Listing Number | Gazette Date | Gazette Number | Gazette Page |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| Local Environmental Plan | Ashfield LEP 2013 | 1 | 23 Dec 13 | | |
| Heritage study | | | | | |

## Study details

| Title | Year | Number | Author | Inspected by | Guidelines used |
|---|---|---|---|---|---|
| Ashfield Heritage Study Review | 2001 | 5 08 01 | Bob Irving | | Yes |

## References, internet links & images

None

Note: internet links may be to web pages, documents or images.

## Data source

The information for this entry comes from the following source:

**Name:** Local Government

**Database number:** 1020292

Return to previous page

# Second Street Group

## Item details

**Name of item:** Second Street Group

**Type of item:** Built

**Group/Collection:** Residential buildings (private)

**Category:** House

**Primary address:** 5, 7, 9, 11, 13, and 15 Second Street, Ashbury, NSW 2193

**Parish:** Petersham

**County:** Cumberland

**Local govt. area:** Canterbury

## Boundary:

5 Second Street is situated on Lot 1 DP 950576; No. 7 on Lot 1 DP 124305; No. 9 on Lot 1 DP 952638; No. 11 on Lot 1 DP 798551; No. 13 on Lot 1 DP 122220; and No. 15 on Lot 1 DP 124113.

**All addresses**

| Street Address | Suburb/town | LGA | Parish | County | Type |
|---|---|---|---|---|---|
| 5, 7, 9, 11, 13, and 15 Second Street | Ashbury | Canterbury | Petersham | Cumberland | Primary Address |

## Statement of significance:

Largely intact group of small Federation period cottages.

**Date significance updated:** 04 Sep 02

*Note: The State Heritage Inventory provides information about heritage items listed by local and State government agencies. The State Heritage Inventory is continually being updated by local and State agencies as new information becomes available. Read the OEH* ***copyright and disclaimer****.*

## Description

| | |
|---|---|
| **Designer/Maker:** | Henry William Robert Newman |
| **Builder/Maker:** | Henry William Robert Newman |
| **Construction years:** | 1915-1915 |
| **Physical description:** | A group of narrow fronted brick Federation cottages. Roofed with Marseilles tiles, slate or have been re-roofed. Most of them retain original timber posts, valances and brackets on verandah. |
| **Current use:** | Residential |
| **Former use:** | Residential |

## History

**Historical notes:**

This land was part of the Canterbury Estate. The original Canterbury Farm buildings were in the vicinity of today's Third Street and Andrews Avenue. The Estate was owned by Robert Campbell from 1803, who used it as a grazing and farming property.

In 1841, Robert's younger daughter, Sarah Campbell, married Lieutenant Arthur Jeffreys RN at St Phillip's Church, Sydney. In 1845, he took his wife home to meet his family and their eldest son, John, was born in London in 1845. Their next son, Arthur Frederick was born in 1848, then twins, Robert and Sophia in 1851. Sophia lived only three months. Robert Campbell died at Duntroon in 1846, and on their father's death sisters Sophia and Sarah inherited the Canterbury Estate; Sarah's husband, Arthur Jeffreys, receiving the western half, today's suburb of Ashbury, and Sophia receiving the 673 acre eastern half which includes today's suburbs of Hurlstone Park, South Ashfield and part of Canterbury.

Arthur Jeffreys built a new house in 1853 on the western half of the Canterbury property. It became known as 'Canterbury House'. Arthur was by this time a member of the Legislative Council, and also a promoter of the Sydney Railway Company. The house was said to be "about a mile from the Ashfield Station".

In 1856, the Jeffreys family, accompanied by Sophia, left Sydney in search of better health. Arthur and Sarah were both believed to be suffering from tuberculosis. Sarah died at Madeira, nursed by her sister Sophia. The three boys were then aged 10, 7 and 4, and 'Aunt Sophy' seems to have taken on the role of mother to the children from this time on. Arthur and his family returned to Australia in 1857. They moved into Canterbury House, and in 1858 Sophia commissioned the family's architect Edmund Blacket to design a sandstone church, St Paul's, for Canterbury Village and also financed the construction of a Church of England schoolhouse, which opened in 1861. Arthur Jeffreys became one of the first churchwardens. Arthur began planning a return to England in 1860 to arrange for the education of the boys, advertising Canterbury Farm "to be let for a term of years". The family, with Sophia, left Sydney on the Duncan Dunbar in February 1861. Arthur died of kidney failure in November 1861, and Sophia Campbell was left to bring up the three boys. Arthur Jeffreys in his will appointed her their guardian.

Sophia Campbell died on 10 August 1891, leaving all her Canterbury Estate and other property to the two surviving boys, John and Arthur Frederick. After

Arthur's death in 1906, John and George Darell Jeffreys (Arthur's eldest son), subdivided the land into suburban allotments.

In 1908,
Jeffreys leased this land to Evan Tudor Jones of Annandale, medical practitioner, and John Portus of Ashfield, trustees of the Dobroyd Golf Course, which had moved to this location from Haberfield. The lease was renewed in 1913, but by then a subdivision of the land on the eastern side of King Street was planned. The estate was subdivided in 1914 as the Wattle Hill Estate, and the land was accessible both to the Canterbury Railway Station and to the new tramway which terminated at Wattle Hill (junction of Old and New Canterbury Roads). The first sale was lot 24 section C (5-7 Second Street) in June 1915 to Henry William Robert Newman, builder, who built many of the small single-fronted houses of the estate between 1915 and 1919. 5-15 and 8-26 Second Street are all his houses. This area attracted many speculative builders, who each bought a row of allotments and resubdivided them into smaller blocks. Issachar Oswald Barlow built 17 -19 and 28-34 Second Street in 1918-19, George Richard Bibb built 51-69 and 52-64 First Street and 45-55 First Street in 1917-1919, Alfred Wallace Gray built 37-49 First Street, probably in partnership with Bibb, and Ernest Cameron built 35-43 Second Street in 1918-19.

George Darell Jeffreys transferred the residue of the
estate to Charles William Bray King, surveyor, and Frederick Humphery, agent, in December 1917, and most of the lots in First and Second Street were sold by mid-1919. The new owners in the group of houses 5-15 Second Street are shown in Sands Directory in 1919 and 1920, indicating that the houses were probably built in 1916-1919. The remarkable uniformity of the estate is largely due to the high proportion of houses built by a small number of speculative builders between 1915 and 1920.

This group
consists of a uniform row of narrow fronted brick Late Federation cottages, built on lots subdivided into two in 1916-1919 by Henry William Robert Newman, a prolific speculative builder. Roofed with Marseilles tiles, slate or have been re-roofed. The cottages retain the original timber posts, valences and 'tulip' brackets on the verandas common on houses built by Newman.

The transfers contained a covenant by
Henry William Robert Newman that he or the transferees "will not erect or permit to be erected upon the land...any main building or buildings other than with external walls of stone brick wood or other approved material and the value of any such main building shall not be less than two hundred and fifty pounds. That they will not at any time thereinafter permit any excavation to be made on the said land for brick making quarrying or other purpose and shall not carry on upon the said land or any part thereof the trade or business of a brick maker or any noisome or noxious trade without the previous consent in writing of Henry William Robert Newman and Charles William King and Frederick William Bott Humphrey".

5 Second
Street, Ashbury 'Yamba'
Lot 1 DP950576 v.2605 f.10
Built by Henry
William Robert Newman 1916-8.
First owner: Cuthbert Victor Coleman of
South Ashfield, porter, bought the land 10 September 1915. Not sold until 1957. Occupied house from 1918-9

7 Second Street, Ashbury
'Carthona'
Lot 1 DP123795 v.6260 f.245
Built by Henry William
Robert Newman 1916-8.
First occupier: Alfred White 1918-9

9
Second Street, Ashbury 'Eastbourne'
Lot 1 DP952638 v.8038 f.143

Built by Henry William Robert Newman 1916-8.
First occupier: F.W.
Todd 1919-20

11 Second Street, Ashbury 'Lynwood'

Lot 1
DP798551 v.2669 f.178
Built by Henry William Robert Newman 1916-8.
Land bought by Florence Hannah Korff of Ashfield, spinster 27 May 1916.
Mortgaged 1916, not paid until1959.
First occupier: Frederick Wroe
1918-9

13 Second Street, Ashbury 'Kiaora'
Lot 1 DP122220
v.5346 f.4
Built by Henry William Robert Newman 1916-8.
First
occupier: Herbert J Ferris 1919-20

15 Second Street, Ashbury
'Kamaka'
Lot 1 DP124116 v.12474 f.48
Built by Henry William Robert
Newman 1916-8.
First occupier: Christian Helleman
1919-20

## Historic themes

| Australian theme (abbrev) | New South Wales theme | Local theme |
|---|---|---|
| 4. Settlement-Building settlements, towns and cities | Accommodation-Activities associated with the provision of accommodation, and particular types of accommodation – does not include architectural styles – use the theme of Creative Endeavour for such activities. | (none)- |

## Assessment of significance

**Integrity/Intactness:** High

**Assessment criteria:** Items are assessed against the **State Heritage Register (SHR) Criteria** to determine the level of significance. Refer to the Listings below for the level of statutory protection.

## Recommended management:

Continue ongoing regular maintenance.

## Recommendations

| Management Category | Description | Date Updated |
|---|---|---|
| Recommended Management | No Action, follow existing management contols | 04 Mar 05 |

## Listings

| Heritage Listing | Listing Title | Listing Number | Gazette Date | Gazette Number | Gazette Page |
|---|---|---|---|---|---|
| Local Environmental Plan | Canterbury LEP 2012 | | 01 Jan 13 | | |

| | | | | | |
|---|---|---|---|---|---|
| Local Environmental Plan | | 138 | 18 Nov 94 | | |

## Study details

| Title | Year | Number | Author | Inspected by | Guidelines used |
|---|---|---|---|---|---|
| Canterbury Heritage Study | 1988 | 8.1 | Terry Kass & Meredith Walker | | No |
| Canterbury Heritage Study Review | 2006 | | City Plan Heritage | | Yes |

## References, internet links & images

None

Note: internet links may be to web pages, documents or images.

**(Click on thumbnail for full size image and image details)**

## Data source

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| 0 | Christine Louie/ Andrew Lau | Andrew Lau | Andrew Lau |  | 16/08/2019 |