Health Infrastructure
c/o: Price Waterhouse Coopers

Detailed Site Investigation
Stage 2 Acute Services Building – Blacktown Hospital

Blacktown Road
Blacktown, NSW

14 June 2016

51850-103997 (Rev 0)

JBS&G Australia Pty Ltd

www.jbsg.com.au

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Abbreviations

Term	Definition
ACM	Asbestos Containing Material
AEC	Area of Environmental Concern
AHD	Australian Height Datum
ASS	Acid Sulphate Soils
AST	Above-ground Storage tank
BTEX	Benzene, Toluene Ethylbenzene and Xylene
CLM	Contaminated Land Management
COPC	Contaminant of Potential Concern
CSM	Conceptual Site Model
DIPNR	Department of Infrastructure, Planning and Natural Resources
DMR	Department of Mineral Resources
DP	Deposited Plan
DSI	Detailed Site Investigation
DQI	Date Quality Indicators
DQO	Data Quality Objectives
EPA	Environmental Protection Authority
ESA	Environmental Site Assessment
Ha	Hectare
JBS	JBS Environmental Pty Ltd (now JBS&G Australia Pty Ltd)
JBS&G	JBS&G Australia Pty Ltd
LEP	Local Environmental Plan
LOR	Limit of Reporting
LPI	Land and Property Information
NSW	New South Wales
OCP	Organochlorine Pesticide
OEH	Office of the Environment and Heritage
OPP	Organophosphorus Pesticide
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyl
POEO	Protection of the Environment Operations
PSI	Preliminary Site Assessment
RAP	Remedial Action Plan
RMS	Roads and Maritime Services
RPD	Relative Percent Difference
SCID	Stored Chemical Information Database
TPH	Total Petroleum Hydrocarbons
TRH	Total Recoverable Hydrocarbons
UST	Underground Storage Tank
VOC	Volatile Organic Compounds

Executive Summary

JBS&G Australia Pty Ltd (JBS&G) was engaged by Health Infrastructure (the client, care of PricewaterhouseCoopers) to complete a Detailed Site Investigation (DSI), otherwise referred to as a Phase 2 Environmental Site Assessment (ESA), for the Stage 2 Acute Services Building Redevelopment at Blacktown Hospital, located on the corner of Blacktown Road and Marcel Crescent, Blacktown, NSW (the Site). The Site is legally identified as part of Lot 1 in Deposited Plan (DP) 128344 and part of Lot 3 in DP 71010. The site occupies an approximate area of 11,500 m^2, and is shown in **Figures 1** and **2**.

In 2012, the NSW Government announced a major expansion and redevelopment of Blacktown Hospital. As part of these works, the Stage 2 Acute Services Building (the site), as presented in **Figure 2**, represents a subcomponent of the greater hospital development. Details of the proposed development are provided in **Appendix A**. In order to facilitate the redevelopment, the site is required to be assessed for suitability, from a contamination perspective, for ongoing use as a hospital.

A preliminary site investigation (PSI) was completed for the site in 2014[1]. As part of this investigation, a comprehensive desktop study was completed which involved the procurement, review and assessment of Dangerous Goods registers, historical aerial photographs, Section 149 documentation (from Blacktown City Council), and a review of the geographical setting of the site. During this investigation limited intrusive sampling was completed at the site, in conjunction with historical geotechnical investigations, in which 11 boreholes were advanced (8 by EIS 2014 and 3 by Coffey 2012[2]). Selected soil samples were analysed for heavy metals, total recoverable hydrocarbons (TRH), benzene, toluene, ethylbenzene, xylene (BTEX), polycyclic aromatic hydrocarbons (PAHs), organochlorine pesticides (OCPs), organophosphorus pesticides (OPPs), polychlorinated biphenyls (PCBs) and asbestos. Fill material general comprising reworked natural soils and gravels was reported generally less than 1 m depth, except at three locations in the northeast where fill up to 2 m depth was reported. Results from analysis of soil samples analysed were below the NEPC (2013) ASC NEPM[3] investigation levels for residential with accessible soil and/or commercial/industrial land use criteria. EIS (2014) concluded that the site was suitable for the proposed Stage 2 Redevelopment.

Contingent with *State Environmental Planning Policy 55 – Managing Land Contamination* (NSW EPA 2014[4]), the *ASC NEPM* and other guidelines made or endorsed by the NSW EPA, the site requires a DSI to be completed to assess the suitability of the site for ongoing hospital use. As such, the objective of this investigation is to assess the potential for contamination at the Site and to draw conclusions regarding the suitability of the Site for ongoing hospital use, or make recommendations to enable such conclusions to be made.

As part of the DSI, JBS&G completed a review of historical information available for the site including a historical titles, hospital dangerous goods register, and a review of the geographical setting of the site. Additionally, JBS&G advanced boreholes in 22 locations across the site area. Fill material within the site area was generally comprised of a heterogeneous light to dark brown gravelly clayey sand with inclusions of basalt gravels (blue metal), with little to no additional inclusions. Fill material were generally encountered beneath the surface asphalt/concrete to a depth of between 0.6 metres

1 Preliminary Site Investigation, Proposed Stage 2 Redevelopment of Blacktown Hospital, Blacktown, NSW, report written by Environmental Investigation Services (EIS), 18 July 2014 (EIS 2014)

2 Preliminary Contamination Assessment, Blacktown Hospital, NSW, report written by Coffey in 2012 (Coffey 2012)

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

4 *Managing Land Contamination. Planning Guidelines SEPP 55 – Remediation of Land*. Department of Urban Affairs and Planning. Environment Protection Authority 1998 (SEPP 55)

below ground surface (m bgs) and 1.0 m bgs, and at an average depth of approximately 0.8 m bgs across the site area. Natural materials underlying fill material were comprised of clays typical of a weathered shale profile overlying shale bedrock. No groundwater was encountered.

Collected samples were analysed for heavy metals, TRH/BTEX, PAHs, OCPs, PCBs, electric conductivity (EC) and foreign materials by the testing laboratory. Analytical results were compared against the most conservative land use criteria pursuant to the ASC NEPM (NEPC 2013) including health investigation/screening levels for residential with accessible soil land use, and ecological investigation/screening levels for urban residential and open space land uses. The reported concentrations were all below the residential and open space land use criteria for all analytes.

Based on the results of the investigation and subject to the limitations in **Section 12**, JBS&G have assessed the site as suitable for the ongoing hospital land use.

1. Introduction and Objectives

1.1 Introduction

JBS&G Australia Pty Ltd (JBS&G) was engaged by Health Infrastructure (the client, care of PricewaterhouseCoopers) to complete a Detailed Site Investigation (DSI), otherwise referred to as a Phase 2 Environmental Site Assessment (ESA), for the Stage 2 Acute Services Building Redevelopment at Blacktown Hospital, located on the corner of Blacktown Road and Marcel Crescent, Blacktown, NSW (the Site). The Site is legally identified as part of Lot 1 in Deposited Plan (DP) 128344 and part of Lot 3 in DP 71010. The site occupies an approximate area of 11,500 m^2, and is shown in **Figures 1** and **2**.

The site historically comprised the Oncology and Renal Dialysis units of Blacktown Hospital and is comprised of two one-storey buildings with two separate on-grade pavement car parks. Some small landscaped areas are present between the two site structures. It should be noted at the time of reporting, demolition of existing site structures and earth works were underway subject of a previously approved application.

In 2012, the NSW Government announced a major expansion and redevelopment of Blacktown Hospital. As part of these works, the site, as presented in **Figure 2**, represents a subcomponent of the greater hospital development. Details of the proposed development are provided in **Appendix A**. In order to facilitate the redevelopment, the site is required to be assessed for suitability, from a contamination perspective, for ongoing use as a hospital.

A preliminary site investigation with limited intrusive sampling was previously completed by EIS (2014[5]) in which no signs of contamination as a result of historical site activities were identified as present. Contingent with *State Environmental Planning Policy 55 – Managing Land Contamination* (NSW EPA 2014[6]), the *ASC NEPM* (NEPC 2013[7]) and other guidelines made or endorsed by the NSW EPA, the site requires a DSI to be completed to assess the suitability of the site for ongoing hospital use.

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

1.2 Objective

The objective of the investigation is to assess the potential for contamination at the Site and to draw conclusions regarding the suitability of the Site for ongoing hospital use, or make recommendations to enable such conclusions to be made.

1.3 Scope of Works

The agreed scope of works completed for this assessment comprised:

- A review of available Site history and background information to identify potential areas of environmental concern (AECs) and associated contaminants of potential concern (COPC), including:
    - Review of previous assessment information, including physical observations and analytical results;

[5] Preliminary Site Investigation, Proposed Stage 2 Redevelopment of Blacktown Hospital, Blacktown, NSW, report written by Environmental Investigation Services (EIS), 18 July 2014 (EIS 2014)

[6] *Managing Land Contamination. Planning Guidelines SEPP 55 – Remediation of Land*. Department of Urban Affairs and Planning. Environment Protection Authority 1998 (SEPP 55)

[7] *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013)*. National Environment Protection Council (NEPC 2013)

- Section 149 certificate obtained from Blacktown City Council (Council) and review of current LEP zoning;
- Historical aerial photographs obtained from the Department of Lands (as provided by EIS 2014);
- Publicly available heritage records held by the Department of Planning and Environment and Council, where readily available;
- Records of stored Dangerous Goods held by WorkCover (as provided by EIS 2014)
- Current and historical land title records to gain an understanding of potential land use;
- Records of environmental incidents or former environmental licenses as held by the EPA; and
- Licensed bores present within a 1.0 km radius of the Site available on the online by NSW Department of Primary Industries.

- Review of the environmental setting including a review of the topography, geology and hydrogeology of the Site and surrounding areas;
- A detailed Site inspection to identify potential AECs and confirm desktop findings;
- Development and documentation of a conceptual site model (CSM) based on the available information;
- Development and documentation of the data quality objectives (DQOs) for the DSI in general accordance with relevant EPA guidelines;
- Implementation of a detailed soil investigation program;
- Comparison of collected data against regulator published / endorsed investigation criteria to facilitate the assessment of land use suitability;
- Preparation of a DSI report in general accordance with relevant EPA guidelines; and
- Assessment of the potential for contamination based on current and historical site activities and to draw conclusions regarding the potential contamination status of the Site for the relevant land uses, or make recommendations to enable such conclusions to be made.

2. Site Condition & Surrounding Environment

2.1 Site Identification

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

Table 2.1: Summary Site Details

Lot/DP	Part of Lot 1 in DP128344 Part of Lot 3 in DP71010
Address	Cnr Marcel Crescent and Blacktown Road, Blacktown, NSW
Local Government Authority	Blacktown City Council
Approximate MGA Coordinates (MGA 56)	As shown on **Figure 2**
Site Zoning	SP1 – Special Activities (Health Services Facility) consistent with Blacktown Local Environmental Plan (LEP) 2015
Current Use	Hospital
Previous Use	Hospital
Proposed Use	Hospital
Permissible Uses	Health services facility, roads, recreation areas, per Blacktown LEP 2015
Site Area	Approximately 11 500 m^2

2.2 Site Description

A detailed Site inspection was conducted by one of JBS&G's trained and experienced environmental consultants[8] on 13 November 2015. The site layout is shown on **Figure 2**. A description of the site at the time of assessment is summarised below.

The ground surface within the investigation area was comprised of asphalt (roadways and carparks), concrete (footpaths and gutters) and grassed soft-landscaped areas. The site is approximately rectangular in shape with frontages of approximately 140 m along west to east axis and approximately 85 m along the north to south axis of the site. A local ridgeline representing the most elevated portion of the site is present along the extent of the southern boundary. Generally, the site topography dips towards the north, with the extent of the northern boundary representing the lowest point in site elevation.

Internal hospital roads are present along the full extent of all site boundaries, with the main hospital building which includes emergency drop off and additional facilities is located in proximity to the northern boundary. On the site, two single-storey brick buildings are present in the western portion of the site. The northernmost of these structures houses the hospital's renal dialysis facility and the southernmost structure houses the hospital's oncology unit. Two on-grade pavement car park areas surround these buildings. Some unsealed (grassed) landscaped areas are present between these structures and include constructed planter boxes.

The eastern portion of the site comprises an on-grade pavement carpark with internal roads surrounding. Several trees are present through the middle of the site, forming a raised island between two north/south on-way roadways which provide access to the site's carparks.

2.3 Surrounding Land use

The current land use of adjacent properties or properties across adjacent roads at the time of assessment is summarised below.

- North – The site is bound to the north by Blacktown Road followed by low density residential housing and the railway;

[8] Chris Bielby of JBS&G with over four years' experience within the contaminated lands industry

- East – The site is bound to the east by low density residential housing followed by Blacktown Road and Orana Park;
- South – The site is bound to the south by Bungarribee Road, low density residential housing, Blacktown Uniting Church and the Mujar Bija Reserve; and
- West – The site is bound to the west by Panorama Parade, low density residential housing and the Blacktown City Bowling Club.

2.4 Topography

The regional topography is gently undulating. The site is located on a north-facing hill side slope which generally falls to the north and north-west at slopes of approximately 6 to 8 degrees. The crest of the slope is located approximately 80m to the south-east of the site. The natural site topography has been altered to accommodate the existing car park, paved surfaces and buildings which are generally level, resulting in localised slopes of approximately 17 to 30 degrees. The overall topography of the site falls to the north and north-west at approximately 5 to 6 degrees.

2.5 Geology

Reference to the 1:100 000 Geological Series Sheet for Penrith (DMR 1991[9]) indicates that the Site is underlain by the Bringelly Shale formation, the upper member of the Wianamatta Group laid down during the Triassic period. The Bringelly Shale typically consist of shale, carbonaceous claystone, claystone, laminate, fine to medium-grained lithic sandstone, rare coal and tuff. These rocks, particularly the claystones, usually weather to form moderately to highly reactive clay soils.

This is confirmed by previous geotechnical advice provided by JK Geotechnics (2014[10]) in which natural material underlying shallow fill at the site was generally described as silty clay that grades into weathered shales. JK (2014) logs are provided as **Appendix B**.

2.6 Acid Sulfate Soils

Based on observations of the soils encountered on site it is considered that there is a very low risk of acid sulfate soils being found on the site. Acid sulfate soils (ASS) are typically formed in coastal areas, along estuaries and rivers.

The Department of Land and Water Conservation has prepared a series of Acid Sulfate Soil Risk Maps for the Sydney Metropolitan and Suburban Areas. The maps, however, do not extend further west than Prospect/Parramatta indicating that the risk is confined to the main river systems and coastal regions.

The nearest occurrence (low probability) of identified ASS comprises the Quaternary fluvial floodplain sediments located approximately 8 km to the south east of the Site along the Parramatta River.

2.7 Hydrology

The nearest surface water body is Blacktown Creek, a fresh waterbody which forms part of the upper Parramatta River Catchment, located approximately 500 m to the east of the site within Orana Park.

As the site surface is largely paved, precipitation falling onto the site is expected to flow into stormwater infrastructure.

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[9] *Penrith Geological Series Sheet 9030 (Edition 1*). NSW Department of Mineral Resources, 1991 (DMR 1991).

[10] Gotechnical Investigation for Stage 2 of Blacktown Hospital Redevelopment, commissioned by Health Infrastructure, written by JK Geotechnics, 24 July 2014 (JK 2014)

2.8 Hydrogeology

Registered groundwater bore information was obtained from the NSW Department of Primary Industries groundwater mapping tools (NSW DPI 2015[11]). A review of the registered bore information indicated that there were three bores within a 1.5 km radius of the Site. The registered bore searches are summarised in **Table 2.2**. Groundwater Reports are provided as **Appendix C**.

Table 2.2: Registered Groundwater Bore Search

Bore ID	Use	Standing Water Level (m bgs)	Well Depth (m)	Distance from Site
GW107205	Monitoring	3.0	11.4	800 m north east
GW107204	Monitoring	2.2	11.3	800 m north east
GW107203	Monitoring	-	3.0	800 m north east

Water bearing zones for the groundwater monitoring wells provided in **Table 2.2** were between 4.10 m bgs and 11.30 m bgs. It should be noted that these water bearing zones may be shallower than those on site due to the spatial distance between the site and these locations, and the proximity of groundwater monitoring wells to a surface water body.

The underlying geology of the site is comprised of clays and fine grained sedimentary sequences, representative of a weathered sedimentary profile. Shallow bedrock (i.e. <5 m bgs) and fine grained stratigraphy are expected to hinder groundwater as a usable resource within the area. With due consideration to the setting of the site within a highly urbanised area, and these implications, groundwater is not expected to be used as a potable resource.

Geotechnical investigations (JK 2014)[12] reported that no seepage water was encountered during drilling through fill, clay soil and shale bedrock, to depths of approximately 13.5 m. Groundwater seepage was later encountered in a series of standpipes installed in boreholes, with depths to water ranging between 3 m and 8 m, suggesting groundwater seepage in shale is under confining pressure. It was reported groundwater seepage may occur in excavations at the clay/bedrock interface and joints in shale, particularly during and following rainfall.

Deeper groundwater in bedrock beneath the site is inferred to locally follow topography (northward) towards Blacktown Creek. This is consistent with geotechnical investigations (JK 2014) which reported groundwater flow through shale following local topography.

2.9 Meteorology

A review of average climatic data for the nearest Bureau of Meteorology monitoring location (Parramatta North - Masons Drive[13]) indicates the Site is located within the following meteorological setting:

- Average minimum temperatures vary from 6.2 in July to 17.6 in January;
- Average maximum temperatures vary from 17.4 in July to 28.4 in January;
- The average annual rainfall is approximately 970.6 mm with rainfall greater than 1 mm occurring on an average of 90.3 days per year; and
- Monthly rainfall varies from 52.4 mm in September to 105.7 mm in January with the wettest periods occurring on average in January and February.

[11] NSW Department of Primary Industries, 2015. Groundwater Monitoring Overview Map. http://allwaterdata.water.nsw.gov.au/water.stm. Accessed 18 February 2016.

[12] Geotechnical Investigation for Stage 2 of Blacktown Hospital Redevelopment at Blacktown Road, Blacktown, NSW. JK Geotechnics, 24 July 2014 (JK 2014).

[13] http://www.bom.gov.au/climate/averages/tables/cw_066037.shtml Commonwealth of Australia, 2013 Bureau of Meteorology, Product IDCJCM0028 prepared at 20 October 2015 and accessed by JBS& on 20 December 2015

3. Site History

3.1 Aerial Photographs

The following information has been summarised from EIS (2014). Historical aerial photographs described below were dated 1943, 1951, 1961, 1970, 1978, 1986, 1994, 2005 and 2011 (sourced from EIS 2014). A review of the aerial photographs have identified the following features:

- 1943 - The subject site formed part of a wider lot which was predominantly vacant land. Several small rural/residential style dwellings were located in the north section of the wider hospital site with frontage onto Blacktown Road. Some scattered trees were located in the vicinity of the subject site. A small creek was located in the north-west corner of the wider site.

  The site surrounds were comprised of predominantly rural and/or vacant land.

- 1951 - The site and immediate surrounds generally appeared similar to the 1943 photograph.

- 1961 - The site and immediate surrounds generally appeared similar to the 1951 photograph. With the exception of numerous small residential dwellings having being constructed to the east and west of the site. A large quarry was located further south of the site.

- 1970 - The majority of the subject site was occupied by numerous large buildings associated with the hospital. Hardstand areas were located in the immediate vicinity of the buildings. The north section of the wider hospital was vacant land. Numerous internal roads had been created which provided access to Blacktown Road and Marcel Crescent.

  The immediate surrounds appear to be predominantly high density residential.

- 1978 - The hospital had expanded further to the north-west and west of the wider site. Hard stand areas were located further to the south of the subject site.

  The immediate surrounds generally appeared similar to the 1970 photograph.

- 1986 - The site and immediate surrounds generally appeared similar to the 1978 photograph.

- 1994 - The site and immediate surrounds generally appeared similar to the 1986 photograph. The quarry located to the south at the site had been filled.

- 2005 - The main hospital buildings were located further to the north of the wider site with frontage onto Blacktown Road. The wider site appeared similar to the present layout.

- 2010 (following information provided by JBS&G) – The site area comprises the Renal and Oncology buildings within the western portion of the site which appear to have on-grade hardstand car park areas immediately to the north, southwest and east. Small landscaped areas are present in the western portion of the site between the Renal and Oncology buildings. Various vehicle thoroughfares are present looping around the site area providing access to various hospital facilities.

- 2015 (JBS&G) - The site appears relatively unchanged from the 2010 photograph. The area immediately adjacent to the eastern boundary of the site has been demolished and appears to be in the process of being developed into a multi-storey building, recently completed at the time of reporting.

3.2 Title Details

A historic title search was conducted for the Site with detailed results are included in **Appendix D**.

A summary of land ownership is provided in **Table 3.1** and **Table 3.2** below.

Table 3.1: Historical title details for part Lot 3 of DP 71010

Date of Acquisition and term held	Registered Proprietor(s) & Occupations where available	Reference to Title at Acquisition and sale
Circa 1918 (1918 to 1949)	Henry Harvey (Railway Employee) and his Estate	Vol 2814 Fol 239
11.7.1949 (1949 to 1954)	Harry Harvey (Engineer)	Vol 2814 Fol 239 then Vol 6060 Fol 100
15.9.1954 (1954 to 1962)	Parramatta District Hospital	Vol 6060 Fol 100
7.11.1962 (1962 to Date)	Blacktown District Hospital now # Western Sydney Local Health District	Vol 6060 Fol 100 now Folio 3/71010

Table 3.2: Historical title details for part Lot 1 of DP 128344

Date of Acquisition and term held	Registered Proprietor(s) & Occupations where available	Reference to Title at Acquisition and sale
16.12.1912 (1912 to 1927)	Mildred Ethel Harris (Spinster)	Vol 862 Fol 39 then Vol 4077 Fol 123
21.11.1927 (1927 to 1928)	Walter Latimer Trotter (Ironmonger)	Vol 4077 Fol 123
31.5.1928 (1928 to 1937)	James Joseph McCarthy (Bank Official)	Vol 4077 Fol 123
8.1.1937 (1937 to 1957)	Cumberland Tile & Brick Pty Limited	Vol 4077 Fol 123
24.9.1954 (hatched red) 25.2.1957 (hatched blue) (1954/1957 to 1964)	Parramatta District Hospital (Noting that the part of the subject area shown hatched red forms part of Old Blacktown Road which was resumed and vested in Parramatta District Hospital under the provisions of the Public Works Act 1912 by notification in Gazette dated 24.9.1954)	Gaz 24.9.1954 (hatched red) and Vol 4077 Fol 123 (hatched blue) then Vol 8466 Fol 48
2.3.1964 (1964 to Date)	Blacktown District Hospital now # Western Sydney Local Health District	Vol 8466 Fol 48 now Folio 1/128344

3.3 EPA Records

A search of the NSW EPA's public register maintained under the *Protection of the Environment Operations Act 1997* (POEO Act) was undertaken for the Site and surrounding properties. The results of the search are presented in **Appendix E**. The search identified that there were no current or former prevention, clean-up or prohibition notices for the Site or for properties directly adjacent the Site.

A search was also undertaken through the EPAs public contaminated land register (**Appendix E**). The search identified that there have been no notices issued under the *Contaminated Land Management Act 1997* for the Site and immediate surrounds.

In addition, a review of the EPA's list of NSW Contaminated Sites Notified to Office of Environment and heritage (OEH) identified that the Site or nearby sites have not been notified to EPA under Section 60 of the *Contaminated Land Management Act 1997* (CLM Act). The review identified there were no records relating to any properties located in the immediate vicinity of the Site.

A review of licences issued under the *Protection of the Environment Operations (Waste) Regulation 2014* indicates a licence is held by Western Sydney Area Health Service for Blacktown Hospital for the generation or storage of 'hazardous, industrial or Group A waste'. A copy of the applicable licence is provided in **Appendix E**.

3.4 Australian and NSW Heritage Register

A search of the Australian Heritage Trust database and the NSW Heritage Inventory was undertaken and relevant are included in **Appendix F.** The search identified that there are no registered heritage items at the Site, however records indicated the presence of a recorded site pertaining to the 'Old Boiler House' – located within the greater Blacktown Hospital site.

3.5 Council Records

The planning certificates for the Site were obtained from Blacktown City Council on 26 May 2016 are included in **Appendix G**. Relevant information is summarised below.

The certificate includes the following information regarding the site at that time:

- The Site is zoned SP1 Special Activities (Health Services Facility) under the Blacktown Local Environmental Plan 2015;
- The land is not in a Conservation Area;
- The land is subject to a Heritage Classification by the National Trust;
- There are no areas of general or archaeological heritage at the site noted on the Blacktown LEP 2015 heritage map (Sheet HER_014);
- There are currently no mainstream or backwater flood-related development controls adopted by Council that apply to the land;
- The land is not within a mine subsidence district;
- The land comprised no critical habitat or threatened species;
- The land has not been certified as biodiversity certified land;
- The land has not been identified as bush fire prone land;
- The land is not the subject of a Site Audit Statement (SAS); and
- The land is not declared to be significantly contaminated land under the *Contaminated Land Management Act 1997*.

3.6 Dangerous Goods Licences

A WorkCover search of the Stored Chemical Information Database (SCID) and the microfiche records held by WorkCover was not undertaken as part of the scope of this assessment. It should be noted that no dangerous goods have been identified as stored at the site within the hospital's Dangerous Goods Register and Hazardous Substances Register, maintained by the WHS coordinator and as provided by EIS (2014).

The following is summarised from EIS (2014), which identified the following hazards in proximity to the site:

- A majority of the dangerous goods are stored within the main hospital building and used for medical related purposes;
    - A 5000L diesel fuel AST located on Level 1 in the Main Building in the Bulk Diesel Storage Area;
    - 1L automotive diesel fuel (Ref: 240675) located on Level 1, main building in the Engineering Diesel Store area;
    - 20L diesel fuel (Ref: 2308) located on Level 1, main building in the Engineering Gardeners Store area;

- 20L premium unleaded petrol (Ref: 7095) located on Level 1, main building in the Engineering Gardeners Store area;
- 5L diesel fuel (Ref: 2308) located on Level 5, main building in the Plant Room area; and
- 20L clax laundry fluid (Ref: 12271) located on Level 1, main building in the General Services MGR Office area

With consideration to the information above, JBS&G have assessed the risk of gross or widespread contamination as a result of the storage of dangerous goods with the subject site is low. It is noted the majority of goods identified are predominantly within the existing Main Building, northeast of the site.

3.7 Integrity Assessment

Based on the range of sources and the general consistency of the historical information, it is considered that the historical assessment has an acceptable level of accuracy with respect to the potentially contaminating activities historically occurring at the Site.

It is considered that the site has been used for a range of residential and commercial land uses in the past. Based on the range of sources and the general consistency of the historical information, it is considered that the historical assessment has an acceptable level of accuracy with respect to the potentially contaminating activities historically occurring at the site.

4. Previous Environmental Investigations

4.1 EIS 2014

A preliminary site investigation (PSI) was completed for the site by EIS in 2014. As part of this investigation, a comprehensive desktop study was completed which involved the procurement, review and assessment of Dangerous Goods registers, historical aerial photographs, Section 149 documentation (Blacktown City Council), and a review of the geographical setting of the site. As part of this investigation, limited intrusive sampling was completed at the site in which 8 boreholes were advanced, as shown on **Figure 2**.

Fill materials at the site were generally encountered between 0.3 m bgs and 2.5 m bgs, and was generally described as a gravelly silty sand with inclusions of igneous and

Samples were analysed for heavy metals, TRH/BTEX, PAHs, OCPs/OPPs, PCBs and Asbestos.

Soil data was compared by EIS to the most conservative land use setting pursuant to the ASC NEPM (NEPC 2013) for human health – HIL A, and against commercial/industrial land use setting for ecological receptors. The results were all reported below the adopted site criteria.

As was done by EIS (2014), soil data was utilised by JBS&G in the current investigation where it was compared against the most conservative land use assessment criteria (HIL-A, NEPC 2013) and applicable ecological investigation/screening levels (EILs/ESLs). The results of this assessment did not present concentrations of any contaminants of potential concern (COPCs) above the adopted site criteria. The analytical data collected by EIS (2014) is presented as part of **Table A**.

Based on the results of their investigation, EIS (2014) concluded that the site was suitable for the proposed Stage 2 Redevelopment.

It should be noted that summary information pertaining to geotechnical investigations are made within EIS (2014) to works completed by Coffey (2012), JK Geotechnics (1996).

4.2 JK Geotechnics 2014

JK Geotechnics completed a geotechnical investigation at Blacktown Hospital in June 2014 in which 10 boreholes were advanced across the site area. Whilst no chemical data was collected, the results of the investigation indicated that the site was underlain by shallow fill material covering residual silty clay that graded into weathered shale bedrock. The shale was found to be deeply weathered. Groundwater was not intercepted at shallow depths (i.e. > 10 m bgs). Borelogs are provided as **Appendix B**.

4.3 Coffey 2012

The following report was not provided to JBS&G however was summarised in EIS 2014, as presented below.

Coffey was engaged to undertake preliminary contamination assessment for the proposed Stage 1 Redevelopment works at the wider hospital site. Coffey advanced three boreholes at the current site, as shown in **Figure 2**.

A limited site history was completed for the greater Stage 1 area in which several areas of environmental concern (AECs) were identified, as follows:

- Fill material; and
- Previous hospital footprint and demolition works which could have resulted in potential site contamination.

As part of the preliminary assessment, 20 selected soil samples obtained from the geotechnical boreholes were analysed for a range of COPCs identified by Coffey. The laboratory results were

reported below the adopted health-based assessment criteria. Several samples encountered an elevated concentration of nickel above the phytotoxicity investigation levels (PPILs). The PPIL criteria have now been superseded by the Ecological Investigation Levels (EILs) outlined in the NEPM 2013.

5. Conceptual Site Model

5.1 Areas of Environmental Concern

Based on the Site history review, observations of Site conditions during the recent detailed Site inspection, and results of the previous assessment by EIS in 2014 (**Section 4**), AECs and associated potential COPC have been identified and are presented in **Table 5.1**.

Table 5.1: Areas of Environmental Concern and associated Contaminants of Potential Concern

Area of Environmental Concern (AEC)	Material Type	Contaminants of Potential Concern (COPCs)
Fill materials Uncontrolled fill material and/or historical impacts due to site activities	Soils	Heavy metals, polycyclic aromatic hydrocarbons (PAHs), total recoverable hydrocarbons (TRH), benzene, toluene, ethylbenzene and xylenes (BTEX), asbestos, organochlorine pesticides (OCPs) and polychlorinated biphenyls (PCBs)

5.2 Potentially Contaminated Media

Previous environmental investigations completed at the site (EIS 2014), did not identify concentrations of contaminants above the most conservative health-based guideline criteria (low density residential). Although it is noted that some intrusive investigations were completed for the site during this investigation, JBS&G acknowledge that the number of sampling locations (10) did not satisfy the minimum required by EPA (1995) for a site of 1.15 ha (22), and as such, the potential for contamination existed within fill material that has not yet been characterised. However, as presented in **Section 9** and **10,** fill materials were shown to be suitable for the proposed land use.

Groundwater at the Site is not considered to be a potentially contaminated medium based on the geological profile of the site which is not considered to represent a significantly conductive hydraulic system, and the lack of identified point sources such as underground tanks. Furthermore, due to the lack of permeable ground surfaces at the site, the rate of surface water infiltration to groundwater is considered to be low, therefore retarding the mobilisation of potentially soluble contaminants in fill material to groundwater. As such, groundwater is not considered to be a potentially contaminated medium at the site.

5.3 Potential for Migration

Contaminants generally migrate from site via a combination of windblown dusts, rainwater infiltration, groundwater migration and surface water runoff. The potential for contaminants to migrate is a combination of:

- The nature of the contaminants (solid/liquid and mobility characteristics);
- The extent of the contaminants (isolated or widespread);
- The location of the contaminants (surface soils or at depth); and
- The site topography, geology, hydrology and hydrogeology.

The potential contaminants identified as part of the Site history review are generally in either a solid form (e.g. heavy metals) and liquid form (e.g. fuel, lubricants, etc.).

As a majority of the site is covered with pavements and a small amount of turfed areas, the potential for windblown dust migration of contamination from the Site is generally low. The potential for contaminant migration via surface water movement and infiltration through the soil profile is considered low. Given the fine-grained geological profile of the site and the presence of impermeable surfaces across a majority of the site's surface, the subsequent migration of these dissolved phase contaminates in groundwater, is assessed as low.

The vapour generation potential associated with volatile and semi-volatile potential contaminants of concern (TRH and BTEX) is considered low given that no known dangerous goods are identified as being stored within the site itself. The main building, in which several dangerous goods are known to

be stored, is considered to be sufficiently far from the site and hydrogeologically downgradient so as to not pose a risk to contamination at the site.

5.4 Potential Exposure Pathways

Based on the COPC identified in various media, as discussed above, the exposure pathways for the Site include:

- Dermal;
- Ingestion; and
- Inhalation.

Asbestos is potentially toxic through inhalation pathways only. Should friable asbestos and/or asbestos fines be present in fill material at concentrations above 0.001% w/w (NEPC ASC 2013), potential inhalation exposures, as airborne fibres, may occur to site users from surface soils.

For other COPCs, direct contact with surface and subsurface fill/soils that may be exposed during future site use may provide for potential exposure pathways including dermal exposure, inhalation and ingestion of soil/fill, should dust be generated. Dermal exposure could occur during site redevelopment and/or future intrusive works. Direct contact pathways (oral and dermal) will only be relevant for near surface soils in unpaved areas of the site for most site users. This would be anticipated to be restricted to the unpaved/landscaped areas of the site; and/or

As there are no surface water bodies at the site and groundwater is not anticipated to be extracted under the proposed land-use, direct contact, inhalation or ingestion of groundwater is considered unlikely. Exposure to groundwater during construction activities is also unlikely based on geotechnical investigations (JK 2014) indicating excavations are not anticipated to intercept significant groundwater .

5.5 Potential Human and Ecological Receptors

Potential receptors of environmental impact present within the Site which will require to be addressed with respect to the suitability of the Site for its permissible land uses include:

- Future workers, patients and general public whom may potentially be exposed to COPC through direct contact with impacted soils and / or inhalation of dusts / fibres associated with impacted soils.
- Excavation / construction / maintenance workers conducting activities at the Site, who may potentially be exposed to COPC through direct contact with impacted soils present within excavations and / or inhalation of dusts / fibres associated with impacted soils.

Where petroleum or other volatile hydrocarbon compound impact is identified, potential inhalation exposure to vapours may also need to be considered should gross hydrocarbon contamination be identified.

5.6 Preferential Pathways

For the purpose of this assessment, preferential pathways have been identified as natural and/or man-made pathways that result in the preferential migration of COPCs as either liquids or gases. A range of preferential pathways are currently present on the site as associated with near surface fill horizons and former services present across the site area (i.e. drainage lines, sumps, pits etc.).

Preferential pathways may be created with the proposed development. Future installation of services will occur in shallow soils where remediation works are proposed. Based on the absence of significant levels of near surface soils and general absence of potential leachable constituents, these potential pathways are not considered to be significant.

6. Sampling and Analysis Plan

Based on the review of the site history and site inspection prior to the completion of intrusive investigation works at the site, several areas of environmental concern (AEC) and associated contaminants of potential concern (COPC) were identified at the site. These AECs were considered in the formulation of the site sampling analysis and quality plan (SAQP) which was employed as a framework for the collection of samples and site specific data. Further discussion based on the results of field works and laboratory results are presented in **Section 9**.

6.1 Data Quality Objectives

DQOs were developed for the investigation of contamination, as discussed in the following sections.

6.1.1 State the Problem

In 2012, the NSW Government announced a major expansion and redevelopment of Blacktown Hospital. As part of these works, the Stage 2 area of the site, as presented in **Figure 2**, represents a subcomponent of the greater hospital development and is proposed to be redeveloped to provide additional facilities to the hospital. Details of the proposed development are provided in **Appendix A**. In order to facilitate the redevelopment, the site is required to be assessed for suitability, from a contamination perspective, for ongoing use as a hospital. At present, the site is comprised of the Renal Dialysis, Oncology Facility and two separate on-grade pavement car-parks.

A review of previous environmental investigations (EIS 2014) and historical information available for the site indicates that gross contamination is not expected to be present as a result of historical and current activities. However, limited intrusive sampling was previously completed for the site and as such, a more encompassing and comprehensive sampling program was required to be completed to adequately assess the suitability of the site, to which this report details.

In conjunction with data collected in 2012, analytical data collected as part of the current assessment will be used to assessment land use suitability.

6.1.2 Identify the Decision

Based on the decision making process for assessing an urban redevelopment site detailed in DEC (2006[14]), the following decisions must be made:

- Are there any unacceptable risks to likely future on-Site receptors from impacted soils?
- Are there any issues relating to local area background soil concentrations that exceed the appropriate soil criteria?
- Are there any impacts of chemical mixtures?
- Are there any aesthetic concerns in fill soils present at the Site?
- Is there any evidence of, or potential for, migration of contaminants off-Site?
- Is a Site management strategy required?

6.1.3 Identify Inputs to the Decision

Inputs to the decisions will be:

- Previous Site assessment information including physical observations and analytical data;
- Detailed Site inspection;

[14] *Contaminated Sites: Guidelines for the NSW Site Auditor Scheme (2nd Edition)*. NSW Department of Environment and Conservation 2006 (DEC 2006)

- The delineation and interpretation of fill and natural material through the drilling of boreholes / advancement sample locations via plant (drill rig) and collection of soil samples;
- Development of appropriate assessment criteria for evaluation of analytical results;
- Laboratory analysis of samples of potentially contaminated media for COPC; and
- Confirmation that data generated by sample analysis are of an acceptable quality to allow reliable comparison to assessment criteria by assessment of quality assurance / quality control (QA/QC) as per the data quality indicators established in **Section 6.1.6**.

Specifically, sufficient data needs to be collected from each of the identified potentially impacted media (*e.g.* fill material/natural soils) in the identified AECs for the associated COPC (**Table 5.1**).

6.1.4 Define the Study Boundaries

The site boundaries are restricted to the site area presented in **Figure 2**, and as formally identified as part of Lot 1 in DP128344 and part of Lot 3 in DP71010. The site has an area of approximately 11,500 m^2.

The site is located on the corner of Marcel Crescent and Blacktown Road, Blacktown, NSW.

The maximum vertical extent of the investigation was approximately 2.5 m bgs.

Due to the nature of potential contaminants identified, seasonality was not assessed as part of this investigation. The field program was conducted in November 2015.

6.1.5 Develop a Decision Rule

Laboratory analytical data were assessed against EPA endorsed criteria as identified in **Section 7**.

The decision rules adopted to answer the decisions identified in **Section 6.1.2** are summarised in **Table 6.1**.

Table 6.1: Summary of Decision Rules

Decision Required to be Made	Decision Rule
1. Are there any unacceptable risks to on Site future receptors from soils?	Soil analytical data was compared against EPA endorsed criteria including NEPC (2013). If concentrations of contaminants were reported above the adopted EPA endorsed criteria, the answer is Yes. If concentrations of contaminants were reported below the adopted EPA endorsed criteria, the answer is No. <u>Use of statistical methods:</u> For the characterisation of sample sets, statistical analysis of the data can be undertaken as appropriate and in accordance with relevant guidance documents, to facilitate the decisions. The following statistical criteria was adopted with respect to soils: Either the reported concentrations were all below the Site criteria, or the average Site concentration for each analyte was below the adopted site criterion, no single analyte concentration exceeded 250% of the adopted Site criterion, and the standard deviation of the results was less than 50% of the Site criterion. If the resulting 95% upper confidence limit (UCL) of the average concentration for each analyte was below the adopted site criterion, the answer to the decision was No. If the statistical criteria were not satisfied, the answer to the decision was Yes.
2. Are there any issues relating to local area background soil concentrations that exceed the appropriate soil criteria?	Analytical data in natural soil samples were compared to the background levels for urban areas of NSW as described in NEPC (2013). Where concentrations were less than the background levels, the answer to the decision was No. Otherwise the answer to the decision was Yes.
3. Are there any chemical mixtures?	Were there more than one group of contaminants present which increase the risk of harm? If there was, the answer to the decision was Yes. Otherwise, the answer to the decision was No.

Decision Required to be Made	Decision Rule
4. Are there any aesthetic issues associated with potentially impacted media at the site?	If there were any unacceptable odours, soil discolouration or other aesthetic aspect, the answer to the decision was Yes. Otherwise, the answer to the decision was No.
5. Is there any potential for contaminant migration from the site?	A qualitative assessment of contaminant sources, migration pathways and receptors was completed during assessment of investigation data collected. If the assessment identifies unacceptable risks to off-site receptors, the answer to the decision was Yes. Otherwise the answer to the decision was No.
6. Is a site management strategy required?	Was the answer to any of the above decisions Yes? If so, further characterisation and/or remedial works were required to render the site suitable for the proposed land use. Otherwise, the answer to the decision was No.

6.1.6 Specify Limits on Decision Errors

This step is to establish the decision maker's tolerable limits on decision errors, which are used to establish performance goals for limiting uncertainty in the data. Data generated during this project must be appropriate to allow decisions to be made with confidence.

Specific limits for this project have been adopted in accordance with the appropriate guidance from the NSW OEH (2011[15]), NEPC (2013), EPA (1995[16]), appropriate data quality indicators (DQIs used to assess quality assurance / quality control) and standard JBS&G procedures for field sampling and handling.

To assess the usability of the data prior to making decisions, the data will be assessed against pre-determined DQIs.

The pre-determined DQIs established for the project are discussed below in relation to precision, accuracy, representativeness, comparability and completeness (PARCC parameters), and are shown in **Table 6.2**.

- **Precision** - measures the reproducibility of measurements under a given set of conditions. The precision of the laboratory data and sampling techniques is assessed by calculating the Relative Percent Difference (RPD) of duplicate samples.
- **Accuracy** - measures the bias in a measurement system. The accuracy of the laboratory data that are generated during this study is a measure of the closeness of the analytical results obtained by a method to the 'true' value. Accuracy is assessed by reference to the analytical results of laboratory control samples, laboratory spikes and analyses against reference standards.
- **Representativeness** – expresses the degree which sample data accurately and precisely represent a characteristic of a population or an environmental condition. Representativeness is achieved by collecting samples on a representative basis across the site, and by using an adequate number of sample locations to characterise the site to the required accuracy.
- **Comparability** - expresses the confidence with which one data set can be compared with another. This is achieved through maintaining a level of consistency in techniques used to collect samples; ensuring analysing laboratories use consistent analysis techniques and reporting methods.

[15] *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites*. NSW Office of Environment and Heritage, 2011 (OEH 2011)

[16] *Contaminated Sites: Sampling Design Guidelines.* NSW Environment Protection Authority, 1995 (EPA 1995)

- **Completeness** – is defined as the percentage of measurements made which are judged to be valid measurements. The completeness goal is set at there being sufficient valid data generated during the study.
- **Sensitivity** – expresses the appropriateness of the chosen laboratory methods, including the limits of reporting, in producing reliable data in relation to the adopted site assessment criteria.

Table 6.2: Summary of Quality Assurance / Quality Control (QA/QC) Program

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

1 Relative percent difference

If any of the DQIs are not met, further assessment will be necessary to determine whether the non-conformance will significantly affect the usefulness of the data. Corrective actions may include requesting further information from samplers and/or analytical laboratories, downgrading of the quality of the data or alternatively, re-collection of the data.

6.1.7 Optimise the Design for Obtaining Data

For a site of approximately 1.2 ha, the *Contaminated Sites: Sampling Design Guidelines* (NSW EPA 1995[17]) require a minimum of 22 sampling locations. On this basis, JBS&G completed 22 boreholes generally adhering to a systematic grid across accessible areas of the site, as shown in **Figure 2**. Previous investigations at the site (EIS 2014) completed an additional 10 borehole locations within the site area (**Figure 2**).

[17] *Contaminated Sites: Sampling Design Guidelines,* NSW Environmental Protection Authority, 1995 (NSW EPA 1995)

6.2 Soil Sampling Methodology

The following sampling methodology was employed during the collection of samples in the most recent field program.

6.2.1 Collection of In-Situ Soil Samples

An intrusive investigation at the site was completed on the 9th and 10th November 2015. Based on the area of the Main Building Excavation Footprint (approximately 11,500 m^2) and in accordance with the minimum sampling requirements for sites in *The Sampling Design Guidelines* (NSW EPA 1995), 22 sampling locations were advanced through the asphalt hardstand into fill materials in accessible roadways and carparks within the investigation area (**Figure 2**). Based on an average depth of fill being approximately 0.9 metres below ground surface (m bgs), one discrete sample from each sampling location was selected for analysis as detailed in **Table 4.1**. All soil samples were collected via boreholes which were advanced using a 200 mm diameter auger. Select samples of the underlying natural soils were also collected.

Collected soil samples were immediately transferred to laboratory supplied sample jars, which were then sealed with Teflon lined screw closures. The sample containers were transferred to a chilled esky for sample preservation prior to and during shipment to the testing laboratory. Asbestos samples were collected in 500mL asbestos sample bags. A chain-of-custody form was completed and forwarded with the samples to the testing laboratory, as provided in **Appendix H**.

All samples collected by JBS&G were analysed for 8 heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc), PAHs, asbestos, BTEX, OCPs, PCBs and TRH.

6.3 Laboratory Analysis

JBS&G contracted project laboratories which are National Association of Testing Authorities (NATA) accredited for the required analyses. Primary samples were sent to Eurofins|mgt (Eurofins) and secondary samples were sent to Envirolab Services. In addition to laboratory quality requirements, the laboratories were required to meet JBS&G's internal Quality Assurance requirements. The analytical schedule is presented in **Table 6.3**.

Table 6.3: Stage 2 - Main Building Excavation Footprint Sampling and Analysis.

Borehole Locations	Depth to Natural (approx.) (m bgs)	Sample ID	Completed Laboratory Analysis
Fill Materials			
22 locations: BH01 BH02 BH03 BH04 BH05 BH06 BH07 BH08 BH09 BH10 BH11 BH12 BH13 BH14 BH15 BH16 BH17 BH18 BH19 BH20 BH21 BH22	 1.0 0.9 0.9 0.7 0.8 1.0 0.8 0.9 0.9 1.0 0.85 0.9 1.0 0.9 0.85 0.6 0.65 0.75 0.7 0.7 0.7 0.8	 BH01-D BH02-D BH03-D BH04-D BH05-D BH06-D BH07-D BH08-D BH09-D BH10-D BH11-D BH12-D BH13-D BH14-D BH15-D BH16-D BH17-D BH18-D BH19-D BH20-C BH21-D BH22-D QA/QC01 Duplicate/Triplicate of BH01-D QA/QC02 Duplicate/Triplicate of BH14-D	 8 heavy metals PAHs TRH/BTEX OCPs PCBs EC Asbestos Foreign Materials
Natural Materials			
6 locations: BH01 BH02 BH04 BH06 BH13 BH17	 1.0 0.9 0.7 1.0 1.0 0.65	 BH01-N BH02-N BH04-N BH06-N BH13-V BH17-V	 8 heavy metals PAHs TRH/BTEX OCPs PCBs EC Asbestos

In addition to the above analyses, for QA/QC purposes field duplicates and triplicates were analysed at a rate of 1/20 primary samples.

7. Assessment Criteria

7.1 Regulatory Guidelines

The assessment was undertaken with consideration to aspects of the following guidelines as relevant:

- *Contaminated Sites: Sampling Design Guidelines*. NSW EPA, 1995 (EPA 1995);
- *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites*. NSW OEH, 2011 (OEH 2011);
- *Contaminated Sites: Guidelines for the NSW Site Auditor Scheme, 2nd Edition*. NSW EPA, 2006 (DEC 2006);
- *National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013 (No. 1*). National Environment Protection Council (NEPC 2013); and
- *Contaminated Sites: Guidelines on Duty to Report Contamination under the Contaminated Land Management Act 1997 (as amended 2015)*. EPA 2015 (EPA 2015).

7.2 Soil Criteria

Based on the current and proposed land uses of the site comprising a combination of hospital, road and recreational areas, and with due consideration to the utilisation of the site by sensitive receptors (children and elderly), concentrations of contaminants in the soil were compared against the most conservative low-density residential with accessible soil land use criteria for direct contact exposures, sourced from ASC NEPM (NEPC 2013), as follows:

- Health-based investigation levels for residential with accessible soil – HIL-A;
- Health-based screening levels for commercial/industrial land use – HSL-D.

In accordance with NEPC (2013), a fine grained soil texture was adopted given the occurrence of predominately silty clay soils.

Where there are no NSW EPA endorsed thresholds the laboratory limit of reporting (LOR) has been adopted as an initial screening value for the purposes of this assessment.

Works have been completed in accordance with the decision process for assessment of urban redevelopment sites (DEC 2006).

Due to the planned redevelopment of the site, ecological risks to plants at the site are unlikely, as development plans (**Appendix A**) will likely preclude plantings in natural soils found at the site in its current condition. Any vegetated areas are likely to be within constructed planter-boxes using imported growing media. As such, comparison of soil data against ecological investigation/screening levels (EILs/ESLs) is not warranted for this site assessment. However, as a conservative measure, and consistent with the previous investigation (EIS 2014), results have been compared against EILs/ESLs consistent with commercial/industrial land use scenarios, using site-specific physiochemical parameters (e.g. pH, cation exchange capacity) to derive site-specific EILs for selected heavy metals, consistent with NEPC (2013).

The criteria are presented in **Table A**.

7.3 Derivation of Ecological Investigation Levels

Generic physiochemical properties for clay soils were utilised in the derivation of ecological investigation levels (EILs). EILs were derived using the NEPC (2013) EIL calculator which uses ambient

background concentrations (ABCs) derived from Olszowy *et al.* (Olszowy *et al.* 1995)[18] using 25th percentile data from 'old suburbs, low traffic'.

The EILs calculated for the site are presented in **Table A**.

[18] *Trace element concentrations in soils from rural and urban areas of Australia*, H Olszowy, P Torr, P Imray, Department of Human Services and Health, Environmental Protection Agency, published 1995 (Olszowy *et* al. 1995)

8. Quality Assurance/Quality Control

8.1 QA/QC Results

The QA/QC result for soil samples collected at the Site as part of the 2012 and current investigation are summarised in **Table 8.1** and discussed in **Section 8.2**. Detailed QA/QC results are included in **Appendix I**. Laboratory certificates of analysis are included as **Appendix H**.

Table 8.1: QA/QC Results Summary

Data Quality Indicator	Results	DQI met?
Precision		
Blind duplicates (intra laboratory)	No blind duplicates were able to be collected due to the sample volume required for the sampling scope of works.	Partial[1]
Split duplicates (inter laboratory)	0-129 % RPD Split duplicate samples were analysed at 2 per 22 primaries or 11%.	Partial[1]
Laboratory Duplicates	0-30 % RPD Laboratory duplicate samples were analysed at a rate greater than 1 in 20 samples.	Yes
Accuracy		
Surrogate spikes	71-104 % Recovery Surrogate spikes were completed for all organic samples	Yes
Laboratory Control Samples	72-123 % Recovery Laboratory control samples were completed for all organic and metals samples	Yes
Matrix spikes	70-130 % Recovery Matrix spikes were completed for all organic and metals samples	Yes
Representativeness		
Sampling appropriate for media and analytes	All sampling conducted in accordance with JBS&G procedures	Yes
Laboratory blanks	<LOR	Yes
Samples extracted and analysed within holding times.	Additional samples contain holding time errors.	Yes
Trip spikes	83 %-99 % recovery	Yes
Trip blanks	<LOR	Yes
Rinsate blank	<LOR	Yes
Comparability		
Standard operating procedures used for sample collection & handling	Field staff used same standard operating procedures throughout works	Yes
Standard analytical methods used	Standard analytical methods used as detailed in **Section 7**	Yes
Consistent field conditions, sampling staff and laboratory analysis	Sampling was conducted by JBS&G field staff members using standard operating procedures in the same conditions throughout the works. The laboratories were NATA accredited using similar methods.	Yes
Limits of reporting appropriate and consistent	Limits of reporting were consistent and appropriate.	Yes
Completeness		
Soil description & COCs completed	All bore logs and COCs were completed appropriately.	Yes
Appropriate documentation	All appropriate field documentation is included in the Appendices.	Yes
Satisfactory frequency/result for QC samples	The QC results are considered adequate for the purposes of the investigation.	Yes
Data from critical samples is considered valid	Data from critical samples is considered valid.	Yes
Sensitivity		
Analytical methods and limits of recovery appropriate for media and adopted site assessment criteria	Analytical methods and limits of recovery were considered appropriate for media and adopted site assessment criteria for all soil analytes.	Yes

1. See discussion of DQI exceedances in **Section 8.2**.

8.2 QA/QC Discussion

8.2.1 Precision

Blind Duplicates (intra laboratory)

Blind duplicates were not able to be collected as a result of not enough soil being generated by the sampling methodology. Due to constraints (due to an active hospital) in the sampling methodology i.e. 200 mm diameter boreholes as opposed to testpitting, the amount of soil able to be recovered for the collection of both primary and split duplicates (included 6kg samples for foreign materials analysis) was not sufficient.

Notwithstanding the aforementioned, given the sampling and analytical density completed for a property of this size and with due consideration of the Site history, the data set is considered reliable for the purpose of Site characterisation.

Split Duplicates (inter laboratory)

Soil field blind (intra-laboratory) duplicates were analysed at a rate of 2 duplicate samples per 22 samples (11%) for heavy metals, TRH/BTEX, PAHs, OCPs/PCBs and asbestos.

Split (intra laboratory) duplicates for soil RPDs were all within the acceptable JBS&G acceptable limit (0-50%), with the exception of:

- The following pertains to parent/duplicate BH01D/QC01:
  - Lead with an RPD of 124%;
  - Nickel with an RPD of 100%;
  - Zinc with an RPD of 60%;
  - TRH (C16-C34) with an RPD of 67%;
  - TRH (C34-C40) with an RPD of 89%;
  - TPH (C29-C36) with an RPD of 129%;
- The following pertains to parent/duplicate BH14D/QC02:
  - Benzo(a)pyrene TEQ with an RPD of 53%.

Laboratory asbestos screening results were in agreeance.

The elevated RPD calculations for the soil may be attributed to the heterogeneous nature of the fill present, or when the analyte concentrations are close to the LOR and is not considered to limit the overall precision of the dataset. The higher reported concentration between the primary and duplicate sample was considered not to effect the outcomes when comparing against Site assessment criteria.

Laboratory Duplicates

The RPDs of all laboratory duplicates were reported within the acceptable criteria.

8.2.2 Accuracy

Surrogate Spikes

All surrogate samples analysed reported recoveries within the JBS&G acceptable range (70-130%),

Surrogate spikes were conducted for all organic samples.

Laboratory Control Samples

Laboratory control samples analysed reported recoveries within the JBS&G acceptable range (70- 130%).

Matrix Spikes

Matrix spikes were analysed above the required frequency, with all matrix spike recoveries within the JBS&G acceptable range (70-130 %)

8.2.3 Representativeness

Sampling appropriate for media and analytes

All soil sampling works completed during the investigation were conducted in accordance with JBS&G standard operating procedures. Soil sampling was conducted as per **Section 6.2**, which is considered appropriate for COPC.

Laboratory Blanks

There were no reported concentrations of contaminant compounds above the laboratory LOR in the laboratory method blank.

Holding Times

The extraction and analysis of all samples were completed within the recommended holding times. As such, the data set is considered reliable.

Trip Spike

No trip spikes were submitted for analysis. However standard JBS&G sampling procedures were adhered to and with consideration to the reported concentrations of volatile constituents in soil samples being below the laboratory limit of reporting (LOR), this is not considered to have a significant impact on the reliability of the data set.

Trip Blank

No trip blanks were submitted for analysis. However, standard JBS&G sampling procedures were adhered to and with consideration to the reported concentrations of COPCs below the adopted site criteria, JBS&G consider there is no consequential risk present for potential cross-contamination between samples and between sampling locations. Furthermore, disposable sampling equipment/gloves were used for every sample collected.

8.2.4 Comparability

Experienced JBS&G personnel undertook all sampling in accordance with standard JBS&G sampling methods.

The laboratory LORs are consistent and are considered appropriate.

8.2.5 Completeness

Samples were transported under full chain of custody (COC) documentation. The COC documentation was completed correctly and the selected analyses were correctly conducted.

The frequency of analysis and result for all QC samples are appropriate. As discussed above, addition sample analysis has resulted in a lead and TRH marginally falling below the adopted DQI's. Notwithstanding the aforementioned, given the sampling and analytical density completed for a property of this size and with due consideration of the Site history, the data set is considered reliable for the purpose of Site characterisation.

8.2.6 Sensitivity

Laboratory analysis methods for all contaminants in soil adopted during the investigation used limits of reporting less than the Site assessment criteria to ensure that contaminant concentrations could be confidently identified as being less than the adopted soil site assessment criteria.

8.3 QA/QC Assessment

The field sampling and handling procedures produced QA/QC results which indicate that the data is of an acceptable quality and suitable for use in site characterisation.

The NATA certified laboratory results sheets indicate that the project laboratory was generally achieving levels of performance within its recommended control limits during the period when the samples from this program were analysed.

On the basis of the results of the field and laboratory QA/QC program, the data is of an acceptable quality upon which to draw conclusions regarding the environmental condition of the Site.

9. Results

9.1 Field Observations

The ground surface within the investigation area was comprised of asphalt (roadways and carparks), concrete (footpaths and gutters) and grassed soft-landscaped areas.

Fill material within the site area was generally comprised of a heterogeneous light to dark brown gravelly clayey sand with inclusions of basalt gravels (blue metal), with little to no additional inclusions. This observation was confirmed by the reported laboratory results, provided in **Appendix H**, which reported levels of less than 0.2% foreign material content within samples. No visual or olfactory indicators alluding to the presence of deleterious inclusions including asbestos or hydrocarbon impact was identified.

Fill materials at the site were generally encountered beneath the surface asphalt/concrete to a depth of between 0.6 metres below ground surface (m bgs) and 2.5 m bgs, and at an average depth of approximately 1.0 m bgs across the site area.

Natural material was identified underlying this fill material and was described as cream to light brown, highly plastic clays which are typical of a weathered shale profile. EIS (2014) reported that these natural soils were generally encountered to a depth of approximately 1.5 to 4.5 m bgs. Beneath these natural soils was shale bedrock.

EIS (2014) reported that groundwater seepage was not encountered during the drilling of boreholes. No groundwater during drilling into shale up to 13.5 m. Subsequent water levels in standpipes ranged from 3 to 7 m, under confining pressure. Minor groundwater seepage either at clay/shale interface or fractures in shale was reported to follow topography northward.

9.2 Soil Analytical Results

Soil sample locations are shown on **Figures 3** and summarised laboratory results are presented in **Table A**. Detailed laboratory reports and chain of custody documentation are provided in **Appendix H**.

During the JBS&G investigation a total of 28 soil samples were submitted for analysis of COPC including heavy metals, TRH/TPH, BTEX, PAHs, PCBs, OCPs and asbestos. During the EIS (2014) investigation a total of 20 soil samples were submitted for analysis of heavy metals, TRH, BTEX, PAHs, OCPs and organophosphorous pesticides (OPPs). EIS (2014) also analysed samples for physiochemical parameters including pH, CEC and % clay content. Results from the JBS&G 2015 and EIS 2014 investigations are shown in **Table A**. Analytical results are discussed in the following sections.

9.2.1 Metals

During the EIS 2014 and JBS&G 2015 investigations a total of 48 soil samples were submitted for analysis of heavy metals. All concentrations were reported below the adopted human and ecological health assessment criteria.

9.2.2 TRH

During the EIS 2014 and JBS&G 2015 investigations a total of 48 soil samples were submitted for analysis of TRH. All concentrations were below the adopted human and ecological health assessment criteria. 35 of the 48 sample submitted for TRH analysis reported values below the LOR.

9.2.3 BTEX

During the EIS 2014 and JBS&G 2015 investigations a total of 48 soil samples were submitted for analysis of BTEX. All concentrations were below the laboratory LOR and the adopted human and ecological health assessment criteria.

9.2.4 PAHs

Over the 2014 and 2015 assessment programs, a total of 48 soil samples were submitted for analysis of a range of PAH compounds. All concentrations were below the adopted health assessment criteria, with the exception of benzo(a)pyrene (BaP) which was reported above the ESL of 0.7 mg/kg at BH10-D (1.8 mg/kg) and BH15-D (1.8 mg/kg). These concentrations are not considered to represent a risk given that BaP is not readily bioavailable (NEPC 2013). Further, the material represented by these exceedances (fill material) is likely to be excavated and disposed offsite to facilitate the redevelopment of the site area.

The majority of soil samples reported PAH's below the LOR.

9.3 OCPs

A total of six soil samples were submitted for OCP analysis. All concentrations were below the laboratory LOR and the adopted assessment criteria.

9.3.1 PCBs

A total of six soil samples were submitted for a range of PCBs. All concentrations were below the laboratory LOR and the adopted assessment criteria.

9.3.2 Asbestos

During intrusive investigations, ACM fragments were not visually identified within the fill soil profile.

A total of 28 soil samples were screened by the laboratory for the presence of asbestos. The results are summarised in **Table A**. All concentrations were below the laboratory LOR.

10. Site Characterisation

Based on the decision making process for assessing urban redevelopment sites detailed in DEC (2006 and discussed in **Section 6** and with due consideration to the update assessment criteria in NEPC (2013), the decisions requiring to be made are discussed below.

10.1 Are there any unacceptable risks to likely future on-Site receptors from impacted soils?

No. Based on the results of the investigation, JBS&G does not consider there to be unacceptable risks to future site users or ecological receptors under the proposed redevelopment. On this basis, there are considered to not be any issues associated with unacceptable risks to likely future receptors at the site.

10.2 Are there any issues relating to local area background soil concentrations that exceed the appropriate soil criteria?

No. In-situ natural soils were analysed as part of the assessment. When the results were compared to the background levels for urban areas published in NEPC (2013), reported concentrations were within background levels. On this basis, there are considered to not be any issues associated with background soil concentrations that require further consideration.

10.3 Are there any impacts of chemical mixtures?

No. There were no potential chemical mixtures identified during the investigations that may pose a management issue at the Site.

10.4 Are there any aesthetic concerns in fill soils present at the Site?

No. Based on observations made during the current investigation and that of EIS (2014), no visible ACM, odours, staining or other aesthetic concerns were identified on unsealed ground surfaces or within excavated site soils during the investigation that may pose an unacceptable issue at the Site.

10.5 Is there any evidence of, or potential for, migration of contaminants off-Ste?

As the Site is primarily covered with hardstand at the time of reporting and similarly in proposed redevelopment plans, the potential for windblown dust migration of contamination from the Site is generally low. During the construction phase of redevelopment works dust generation may increase, however, noting the absence of identified contamination at the site, the risk of contaminant migration is considered very low. The result of soil assessment does not indicate vertical migration of contaminants into natural soils or likely migration to deeper groundwater in shale or at the clay/shale interface.

10.6 Is a Site management plan required?

Based on the results of the investigations and subject to the limitations presented in **Section 12**, it is considered the site does not present any unacceptable risks that would preclude the ongoing use of the site as a hospital and therefore, the site is considered suitable without the need for further investigation or ongoing contamination management strategy.

11. Conclusions

Based on the results of presented herein, and subject to the limitation in **Section 12**, it is concluded the site as suitable for the ongoing use as a hospital without further contamination investigation or management.

12. Limitations

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

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

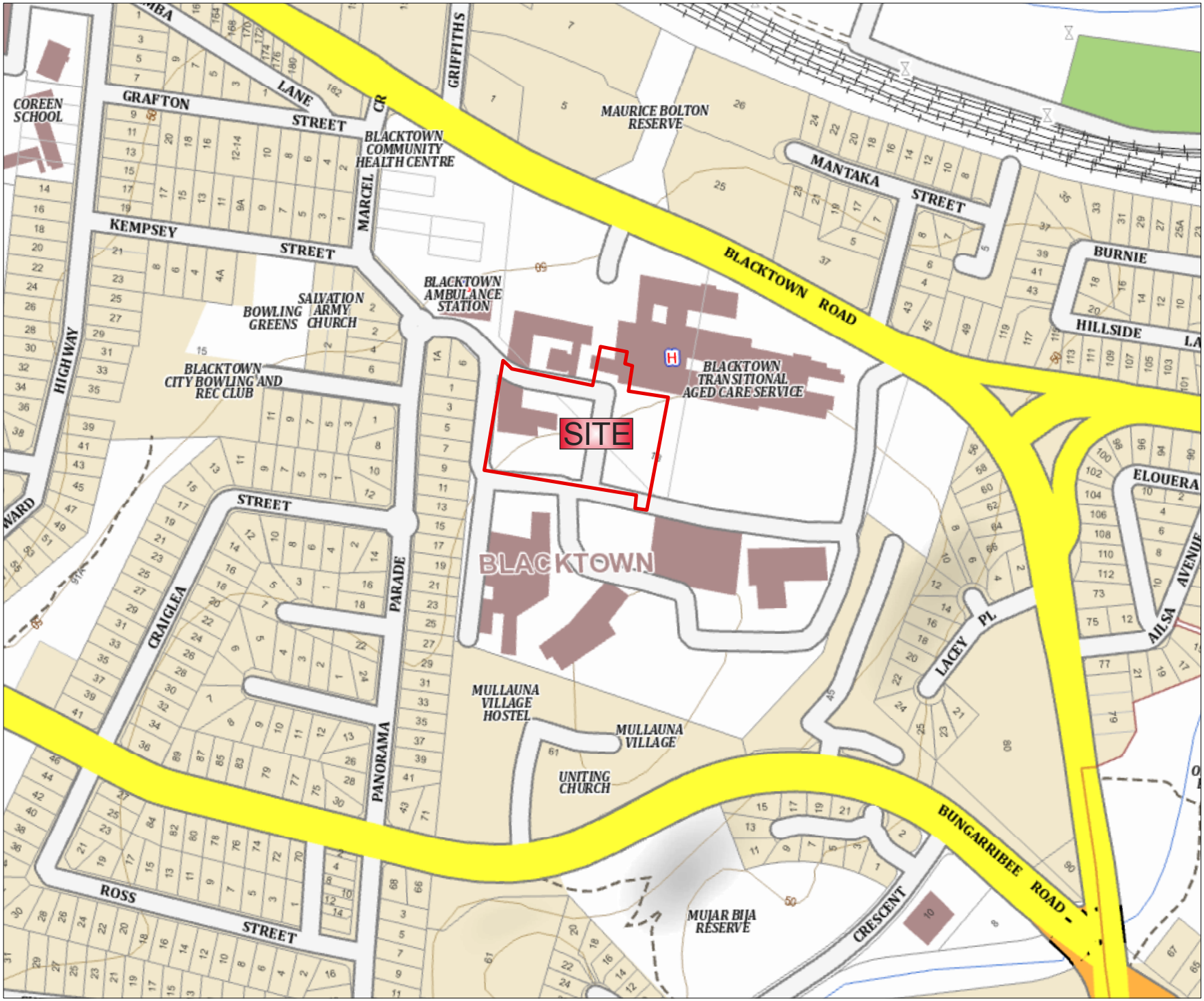
JBS&G accepts no liability for use or interpretation by any person or body other than the client who commissioned the works. This report should not be reproduced without prior approval by the client, or amended in any way without prior approval by JBS&G, and should not be relied upon by other parties,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

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

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

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

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



Legend:

Approxiamte Site Boundary

JBS&G

Job No: 51850

Client: Health Infrastructure

Version: R01 Rev A	Date: 03-Jun-2016
Drawn By: SE	Checked By: DD

Scale 1:4,000

0 50 100

metres

Coor. Sys. GDA 1994 MGA Zone 56

Blacktown Hospital
Stage 2 Main Building
Marcel Crescent, Blacktown, NSW

SITE LOCATION

FIGURE 1:

File Name: 51850_01
Reference: https://maps.six.nsw.gov.au/

Legend:

Approxiamte Site Boundary

Sample Locations

- JBS&G 2016
- Coffey Geotechnics 2011
- JK Geotechnics 1996
- JK Geotechnics 2014

JBS&G

Job No: 51850

Client: Health Infrastructure

Version: R01 Rev A	Date: 03-Jun-2016
Drawn By: SE	Checked By: DD

Scale 1:1,500

0 25 50

metres

Coor. Sys. GDA 1994 MGA Zone 56

Blacktown Hospital
Stage 2 Main Building
Marcel Crescent, Blacktown, NSW

SITE LAYOUT AND SAMPLE LOCATIONS

FIGURE 2:

File Name: 51850_02
Reference: www.nearmap.com

Tables

Table A: Analytical Results - Soil
Project Number: 51850
Project Name: DSI - Blacktown Hospital Stage 2 Expansion

Field ID	Sample Date	Lab Report	Metals & Metalloids								TPHs (NEPC 1999)				
			Arsenic (Total)	Cadmium	Chromium (Total)	Copper	Lead	Mercury (Inorganic)	Nickel	Zinc	C6-C9 Fraction	C10-C14 Fraction	C15-C28 Fraction	C29-C36 Fraction	C10-C36 Fraction (Total)
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL			2.00	0.40	1.00	1.00	1.00	0.05	1.00	1.00	20.00	20.00	50.00	50.00	50.00
NEPM 2013 Soil HIL A			100[#1]	20	100[#2]	6000	300[#3]	40[#4]	400	7400					
NEPM 2013 Soil HSL D															
NEPM 2013 EILs (Generic)			100		300[#2]	250	1100		1200	1300					
NEPM 2013 ESLs (Commercial/Industrial)															
BH01-D	13/11/2015	479519	2.2	<0.4	8.7	43	5.2	<0.05	30	27	<20	<20	<50	<50	<50
BH01-N	13/11/2015	479519	2.1	<0.4	<5	12	<5	<0.05	<5	5.8	<20	<20	<50	<50	<50
BH02-D	13/11/2015	479519	<2	<0.4	8.1	70	<5	<0.05	38	28	<20	<20	<50	<50	<50
BH02-N	13/11/2015	479519	3.4	<0.4	8	37	6	<0.05	18	24	<20	<20	<50	<50	<50
BH03-D	13/11/2015	479519	<2	<0.4	9.4	66	<5	<0.05	44	31	<20	<20	<50	<50	<50
BH04-D	13/11/2015	479519	6.3	<0.4	9.6	18	8	<0.05	11	15	<20	<20	<50	<50	<50
BH04-N	13/11/2015	479519	7.5	<0.4	11	26	8.5	<0.05	19	21	<20	<20	<50	<50	<50
BH05-D	13/11/2015	479519	<2	<0.4	7.1	60	<5	<0.05	56	35	<20	<20	80	200	280
BH06-D	13/11/2015	479519	<2	<0.4	6	68	<5	<0.05	43	33	<20	<20	<50	160	160
BH06-N	13/11/2015	479519	3.6	<0.4	7.7	20	12	<0.05	<5	9.7	<20	<20	<50	<50	<50
BH07-D	13/11/2015	479519	4.8	<0.4	11	19	6.2	<0.05	7.7	15	<20	<20	<50	<50	<50
BH08-D	13/11/2015	479521	2.8	<0.4	12	27	23	<0.05	11	43	<20	<20	<50	<50	<50
BH09-D	13/11/2015	479521	2.8	<0.4	13	26	30	<0.05	10	52	<20	<20	<50	140	140
BH10-D	13/11/2015	479519	3.3	<0.4	14	55	23	<0.05	13	47	<20	<20	89	240	330
BH11-D	13/11/2015	479519	2.3	<0.4	11	22	17	<0.05	11	50	<20	<20	<50	160	160
BH12-D	13/11/2015	479519	8.2	<0.4	10	17	6.2	<0.05	<5	19	<20	<20	<50	<50	<50
BH13-D	13/11/2015	479519	2.7	<0.4	12	30	15	<0.05	9.4	38	<20	<20	70	260	330
BH13-V	13/11/2015	479519	8.4	<0.4	19	26	21	<0.05	<5	15	<20	<20	<50	<50	<50
BH14-D	13/11/2015	479521	2.4	<0.4	23	33	19	<0.05	16	48	<20	<20	<50	200	200
BH15-D	13/11/2015	479521	2.5	<0.4	15	25	23	<0.05	12	53	<20	<20	57	300	360
BH16-D	13/11/2015	479519	6.8	<0.4	15	15	16	<0.05	7.4	21	<20	<20	<50	<50	<50
BH17-D	13/11/2015	479519	3.9	<0.4	12	56	7.9	<0.05	41	34	<20	<20	<50	160	160
BH17-V	13/11/2015	479519	8.4	<0.4	20	16	14	<0.05	<5	17	<20	<20	<50	<50	<50
BH18-D	13/11/2015	479519	2.1	<0.4	13	40	5.7	<0.05	87	52	<20	<20	<50	<50	<50
BH19-D	13/11/2015	479519	4.6	<0.4	10	24	8	<0.05	33	35	<20	<20	<50	<50	<50
BH20-C	13/11/2015	479519	2.1	<0.4	8.1	20	<5	<0.05	30	19	<20	<20	<50	<50	<50
BH21-D	13/11/2015	479519	2.5	<0.4	13	26	37	<0.05	66	85	<20	<20	<50	57	57
BH22-D	13/11/2015	479519	4.5	<0.4	8.2	14	7.5	<0.05	<5	9.2	<20	<20	<50	<50	<50
EIS (2014)															
BH201_0.3	EIS(2014)	EIS(2014)	4	-	9	21	10	-	4	34	-	-	-	-	-
BH201_1.2	EIS(2014)	EIS(2014)	<1	-	8	12	5	-	5	230	-	-	-	-	-
BH202_0.02	EIS(2014)	EIS(2014)	<1	-	20	56	5	-	61	39	-	-	-	-	-
BH203_0.25	EIS(2014)	EIS(2014)	4	-	12	31	9	-	14	70	-	-	-	-	-
BH203_0.8	EIS(2014)	EIS(2014)	<1	-	5	13	5	-	2	21	-	-	-	-	-
BH204_0	EIS(2014)	EIS(2014)	5	-	12	37	20	-	18	150	-	-	-	-	-
BH205_0.03	EIS(2014)	EIS(2014)	<1	-	4	14	14	-	3	14	-	-	-	-	-
BH206_0.02	EIS(2014)	EIS(2014)	<1	-	7	35	1	-	100	28	-	-	-	-	-
BH206_0.35	EIS(2014)	EIS(2014)	<1	-	9	13	11	-	4	18	-	-	-	-	-
BH207_0.4	EIS(2014)	EIS(2014)	<1	-	10	35	6	-	18	24	-	-	-	-	-
BH208_0	EIS(2014)	EIS(2014)	<1	-	10	45	12	-	27	36	-	-	-	-	-
BH208_0.8	EIS(2014)	EIS(2014)	5	-	15	17	15	-	10	24	-	-	-	-	-
BH209_0.05	EIS(2014)	EIS(2014)	<1	-	15	32	17	-	9	36	-	-	-	-	-
BH209_0.5	EIS(2014)	EIS(2014)	<1	-	7	35	10	-	11	67	-	-	-	-	-
BH210_0.04	EIS(2014)	EIS(2014)	<1	-	9	17	20	-	7	35	-	-	-	-	-
BH210_0.5	EIS(2014)	EIS(2014)	4	-	13	13	9	-	4	15	-	-	-	-	-
BH211_0.5	EIS(2014)	EIS(2014)	4	-	7	26	10	-	9	27	-	-	-	-	-
BH211_1.3	EIS(2014)	EIS(2014)	<1	-	10	17	13	-	8	30	-	-	-	-	-
BH212_0	EIS(2014)	EIS(2014)	5	-	15	29	66	-	20	54	-	-	-	-	-
BH213_0	EIS(2014)	EIS(2014)	<1	-	8	25	10	-	7	31	-	-	-	-	-

Field ID	TRHs (NEPC 2013)					TRH - Silica Gel	BTEX					
	>C10-C16 Fraction	>C16-C34 Fraction	C6-C10 Fraction	>C34-C40 Fraction	C6 - C10 less BTEX (F1)	>C10 - C16 less Naphthalene (F2)	Benzene	Ethylbenzene	Toluene	Xylene (m & p)	Xylene (o)	Xylene (Total)
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL	50.00	100.00	20.00	100.00	20.00	50.00	0.10	0.10	0.10	0.20	0.10	0.30
NEPM 2013 Soil HIL A									160[#5]			
NEPM 2013 Soil HSL D					260	NL	3	NL	NL			230
NEPM 2013 EILs (Generic)												
NEPM 2013 ESLs (Commercial/Industrial)		2500		6600	215	170	95	185	135	95		
BH01-D	<50	<100	<20	<100	<20	<50	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3
BH01-N	<50	<100	<20	<100	<20	<50	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3
BH02-D	<50	<100	<20	<100	<20	<50	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3
BH02-N	<50	<100	<20	<100	<20	<50	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3
BH03-D	<50	<100	<20	<100	<20	<50	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3
BH04-D	<50	<100	<20	<100	<20	<50	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3
BH04-N	<50	<100	<20	<100	<20	<50	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3
BH05-D	<50	230	<20	170	<20	<50	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3
BH06-D	<50	120	<20	250	<20	<50	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3
BH06-N	<50	<100	<20	<100	<20	<50	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3
BH07-D	<50	<100	<20	<100	<20	<50	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3
BH08-D	<50	<100	<20	<100	<20	<50	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3
BH09-D	<50	<100	<20	180	<20	<50	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3
BH10-D	<50	260	<20	270	<20	<50	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3
BH11-D	<50	150	<20	260	<20	<50	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3
BH12-D	<50	<100	<20	<100	<20	<50	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3
BH13-D	<50	240	<20	270	<20	<50	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3
BH13-V	<50	<100	<20	<100	<20	<50	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3
BH14-D	<50	130	<20	260	<20	<50	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3
BH15-D	<50	210	<20	350	<20	<50	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3
BH16-D	<50	<100	<20	<100	<20	<50	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3
BH17-D	<50	140	<20	150	<20	<50	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3
BH17-V	<50	<100	<20	<100	<20	<50	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3
BH18-D	<50	<100	<20	<100	<20	<50	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3
BH19-D	<50	<100	<20	<100	<20	<50	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3
BH20-C	<50	<100	<20	<100	<20	<50	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3
BH21-D	<50	<100	<20	<100	<20	<50	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3
BH22-D	<50	<100	<20	<100	<20	<50	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3
EIS (2014)												
BH201_0.3	-	<100	-	<100	<25	<50	<0.2	<1	<0.5	-	-	<3
BH201_1.2	-	<100	-	<100	<25	<50	<0.2	<1	<0.5	-	-	<3
BH202_0.02	-	140	-	360	<25	<50	<0.2	<1	<0.5	-	-	<3
BH203_0.25	-	<100	-	<100	<25	<50	<0.2	<1	<0.5	-	-	<3
BH203_0.8	-	<100	-	<100	<25	<50	<0.2	<1	<0.5	-	-	<3
BH204_0	-	<100	-	<100	<25	<50	<0.2	<1	<0.5	-	-	<3
BH205_0.03	-	<100	-	<100	<25	<50	<0.2	<1	<0.5	-	-	<3
BH206_0.02	-	<100	-	<100	<25	<50	<0.2	<1	<0.5	-	-	<3
BH206_0.35	-	<100	-	<100	<25	<50	<0.2	<1	<0.5	-	-	<3
BH207_0.4	-	<100	-	<100	<25	<50	<0.2	<1	<0.5	-	-	<3
BH208_0	-	<100	-	<100	<25	<50	<0.2	<1	<0.5	-	-	<3
BH208_0.8	-	<100	-	<100	<25	<50	<0.2	<1	<0.5	-	-	<3
BH209_0.05	-	400	-	470	<25	52	<0.2	<1	<0.5	-	-	<3
BH209_0.5	-	<100	-	<100	<25	<50	<0.2	<1	<0.5	-	-	<3
BH210_0.04	-	310	-	430	<25	<50	<0.2	<1	<0.5	-	-	<3
BH210_0.5	-	<100	-	<100	<25	<50	<0.2	<1	<0.5	-	-	<3
BH211_0.5	-	<100	-	<100	<25	<50	<0.2	<1	<0.5	-	-	<3
BH211_1.3	-	<100	-	<100	<25	<50	<0.2	<1	<0.5	-	-	<3
BH212_0	-	<100	-	<100	<25	<50	<0.2	<1	<0.5	-	-	<3
BH213_0	-	<100	-	<100	<25	<50	<0.2	<1	<0.5	-	-	<3

Field ID	Polycyclic Aromatic Hydrocarbons																					
	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a)pyrene	Benzo(a)pyrene TEQ (lower bound)*	Benzo(a)pyrene TEQ (medium bound)*	Benzo(a)pyrene TEQ (upper bound)*	Benzo(b,j)fluoranthene	Benzo(b,k)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Carcinogenic PAHs as B(a)P TPE	Naphthalene	Phenanthrene	PAHs (Total)	Pyrene
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL	0.10	0.10	0.10	0.10	0.05	0.50	0.50	0.50	0.50	0.20	0.10	0.50	0.10	0.10	0.10	0.10	0.10		0.10	0.10	0.50	0.10
NEPM 2013 Soil HIL A																		3[#6]			300[#7]	
NEPM 2013 Soil HSL D																			NL			
NEPM 2013 EILs (Generic)																			170			
NEPM 2013 ESLs (Commercial/Industrial)					0.7																	
BH01-D	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#6]	<0.5	<0.5	<0.5	<0.5
BH01-N	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#6]	<0.5	<0.5	<0.5	<0.5
BH02-D	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#6]	<0.5	<0.5	<0.5	<0.5
BH02-N	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#6]	<0.5	<0.5	<0.5	<0.5
BH03-D	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#6]	<0.5	<0.5	<0.5	<0.5
BH04-D	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#6]	<0.5	<0.5	<0.5	<0.5
BH04-N	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#6]	<0.5	<0.5	<0.5	<0.5
BH05-D	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#6]	<0.5	<0.5	<0.5	<0.5
BH06-D	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#6]	<0.5	<0.5	<0.5	<0.5
BH06-N	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#6]	<0.5	<0.5	<0.5	<0.5
BH07-D	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#6]	<0.5	<0.5	<0.5	<0.5
BH08-D	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#6]	<0.5	<0.5	<0.5	<0.5
BH09-D	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	-	<0.5	<0.5	<0.5	<0.5	1	<0.5	<0.5	<1.21[#6]	<0.5	<0.5	2	1
BH10-D	<0.5	<0.5	0.7	2.1	1.8	2.4	2.7	2.9	1.8	-	0.7	1.5	1.8	<0.5	4.9	<0.5	0.6	2.675[#3]	<0.5	2.1	23	4.7
BH11-D	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#6]	<0.5	<0.5	<0.5	<0.5
BH12-D	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#6]	<0.5	<0.5	<0.5	<0.5
BH13-D	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	-	<0.5	<0.5	<0.5	<0.5	0.6	<0.5	<0.5	<1.21[#6]	<0.5	<0.5	1.2	0.6
BH13-V	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#6]	<0.5	<0.5	<0.5	<0.5
BH14-D	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	-	<0.5	<0.5	<0.5	<0.5	1.2	<0.5	<0.5	<1.21[#6]	<0.5	0.8	3.1	1.1
BH15-D	<0.5	<0.5	<0.5	1.7	1.8	2.4	2.6	2.9	1.6	-	0.9	1.5	1.6	<0.5	3.3	<0.5	0.7	2.625[#3]	<0.5	1.5	18	3.4
BH16-D	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#6]	<0.5	<0.5	<0.5	<0.5
BH17-D	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#6]	<0.5	<0.5	<0.5	<0.5
BH17-V	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#6]	<0.5	<0.5	<0.5	<0.5
BH18-D	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#6]	<0.5	<0.5	<0.5	<0.5
BH19-D	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#6]	<0.5	<0.5	<0.5	<0.5
BH20-C	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#6]	<0.5	<0.5	<0.5	<0.5
BH21-D	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#6]	<0.5	<0.5	<0.5	<0.5
BH22-D	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	1.2	<0.5	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.21[#6]	<0.5	<0.5	<0.5	<0.5
EIS (2014)																						
BH201_0.3	-	-	-	-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-
BH201_1.2	-	-	-	-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-
BH202_0.02	-	-	-	-	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-
BH203_0.25	-	-	-	-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-
BH203_0.8	-	-	-	-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-
BH204_0	-	-	-	-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-
BH205_0.03	-	-	-	-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-
BH206_0.02	-	-	-	-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-
BH206_0.35	-	-	-	-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-
BH207_0.4	-	-	-	-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-
BH208_0	-	-	-	-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-
BH208_0.8	-	-	-	-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-
BH209_0.05	-	-	-	-	0.71	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-
BH209_0.5	-	-	-	-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-
BH210_0.04	-	-	-	-	0.46	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-
BH210_0.5	-	-	-	-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-
BH211_0.5	-	-	-	-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-
BH211_1.3	-	-	-	-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-
BH212_0	-	-	-	-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-
BH213_0	-	-	-	-	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-

Table A: Analytical Results - Soil
Project Number: 51850
Project Name: DSI - Blacktown Hospital Stage 2 Expansion

			Polychlorinated Biphenyls							Organochlorine Pesticides																					Asbestos										Other	Other
			Arcolor 1016	Arcolor 1232	Arcolor 1242	Arcolor 1248	Arcolor 1254	Arcolor 1260	PCBs (Total)	Aldrin	Aldrin + Dieldrin (Sum of Total)	4,4-DDE	Dieldrin	alpha-BHC	DDD	beta-BHC	DDT	DDT+DDE+DDD (Sum of Total)	Chlordane	delta-BHC	Endosulfan alpha	Endosulfan beta	Endosulfan sulphate	Endrin	Endrin aldehyde	Endrin ketone	Heptachlor	Heptachlor Epoxide	Lindane	Methoxychlor	Toxaphene	Approx. Sample Mass	Asbestos from ACM in Soil	Mass ACM	Asbestos from FA & AF in Soil	Mass Asbestos in ACM	Mass FA	Mass Asbestos in FA	Mass AF	Mass Asbestos in AF	Mass Asbestos in FA & AF	% Moisture 103oC	%Moisture
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	g	%w/w	g	%w/w	g	g	g	g	g	g	%	%
EQL			0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.05		0.05	0.05	0.05	0.05	0.05	0.05		0.10	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.20	1.00											0.10	0.10
NEPM 2013 Soil HIL A									1[#8]		6							240	50						10			6				300	20										
NEPM 2013 Soil HSL D																																											
NEPM 2013 EILs (Generic)																	180																										
NEPM 2013 ESLs (Commercial/Industrial)																																											
Field ID	**Sample Date**	**Lab Report**																																								
BH01-D	13/11/2015	479519	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	702	0	0	0	0	0	0	0	0	0	13	-
BH01-N	13/11/2015	479519	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<0.1[#5]	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.15[#2]	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<1	94	0	0	0	0	0	0	0	0	0	15	-
BH02-D	13/11/2015	479519	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	764	0	0	0	0	0	0	0	0	0	7.5	-
BH02-N	13/11/2015	479519	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<0.1[#5]	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.15[#2]	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<1	102	0	0	0	0	0	0	0	0	0	17	-
BH03-D	13/11/2015	479519	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	718	0	0	0	0	0	0	0	0	0	13	-
BH04-D	13/11/2015	479519	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	555	0	0	0	0	0	0	0	0	0	14	-
BH04-N	13/11/2015	479519	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<0.1[#5]	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.15[#2]	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<1	150	0	0	0	0	0	0	0	0	0	14	-
BH05-D	13/11/2015	479519	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	712	0	0	0	0	0	0	0	0	0	4.5	-
BH06-D	13/11/2015	479519	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	822	0	0	0	0	0	0	0	0	0	4.7	-
BH06-N	13/11/2015	479519	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<0.1[#5]	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.15[#2]	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<1	592	0	0	0	0	0	0	0	0	0	15	-
BH07-D	13/11/2015	479519	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	751	0	0	0	0	0	0	0	0	0	17	-
BH08-D	13/11/2015	479521	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	454	0	0	0	0	0	0	0	0	0	11	-
BH09-D	13/11/2015	479521	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	643	0	0	0	0	0	0	0	0	0	6.5	-
BH10-D	13/11/2015	479519	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	692	0	0	0	0	0	0	0	0	0	7.2	-
BH11-D	13/11/2015	479519	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	679	0	0	0	0	0	0	0	0	0	9.3	-
BH12-D	13/11/2015	479519	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	412	0	0	0	0	0	0	0	0	0	16	-
BH13-D	13/11/2015	479519	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	760	0	0	0	0	0	0	0	0	0	6.8	-
BH13-V	13/11/2015	479519	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<0.1[#5]	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.15[#2]	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<1	191	0	0	0	0	0	0	0	0	0	11	-
BH14-D	13/11/2015	479521	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	619	0	0	0	0	0	0	0	0	0	9.8	-
BH15-D	13/11/2015	479521	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	485	0	0	0	0	0	0	0	0	0	10	-
BH16-D	13/11/2015	479519	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	437	0	0	0	0	0	0	0	0	0	9.9	-
BH17-D	13/11/2015	479519	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	747	0	0	0	0	0	0	0	0	0	12	-
BH17-V	13/11/2015	479519	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<0.1[#5]	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.15[#2]	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2	<1	509	0	0	0	0	0	0	0	0	0	24	-
BH18-D	13/11/2015	479519	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	591	0	0	0	0	0	0	0	0	0	5	-
BH19-D	13/11/2015	479519	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	661	0	0	0	0	0	0	0	0	0	11	-
BH20-C	13/11/2015	479519	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	535	0	0	0	0	0	0	0	0	0	3.4	-
BH21-D	13/11/2015	479519	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	780	0	0	0	0	0	0	0	0	0	4.7	-
BH22-D	13/11/2015	479519	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	751	0	0	0	0	0	0	0	0	0	18	-
EIS (2014)																																										
BH201_0.3	EIS(2014)	EIS(2014)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH201_1.2	EIS(2014)	EIS(2014)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH202_0.02	EIS(2014)	EIS(2014)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH203_0.25	EIS(2014)	EIS(2014)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH203_0.8	EIS(2014)	EIS(2014)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH204_0	EIS(2014)	EIS(2014)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH205_0.03	EIS(2014)	EIS(2014)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH206_0.02	EIS(2014)	EIS(2014)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH206_0.35	EIS(2014)	EIS(2014)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH207_0.4	EIS(2014)	EIS(2014)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH208_0	EIS(2014)	EIS(2014)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH208_0.8	EIS(2014)	EIS(2014)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH209_0.05	EIS(2014)	EIS(2014)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH209_0.5	EIS(2014)	EIS(2014)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH210_0.04	EIS(2014)	EIS(2014)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH210_0.5	EIS(2014)	EIS(2014)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH211_0.5	EIS(2014)	EIS(2014)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH211_1.3	EIS(2014)	EIS(2014)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH212_0	EIS(2014)	EIS(2014)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH213_0	EIS(2014)	EIS(2014)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Appendix A Proposed Development Plans

6/05/2016 8:07:44 AM

43- FACADE VIEW 2

JACOBS

NSW GOVERNMENT Health Infrastructure

BLACKTOWN AND MT. DRUITT HOSPITALS
REDEVELOPMENT - STAGE 2

Stage 2 Main Building – Scope of Works

Acute Services Building Package

The Stage 2 expansion at the Blacktown Hospital campus comprises:

- Construction of a new 9 storey Acute Services Building (ASB) (approximately 36,000 m²), including the following critical services:
  - Emergency
  - Intensive Care Unit
  - Operating Suite
  - Sterile Supply
  - Birthing Suite
  - Newborn Care
  - Maternity & Women's Health Inpatient Units
  - Paediatric Inpatient Unit
- New entry atrium to connect the existing hospital building and Stage 1 Clinical Services Building (CSB) to the new Stage 2 ASB. This will include a new patient drop off and forecourt area as the main entry point;
- Provision of new patient drop-off and ambulance bay at entry to Emergency Department;
- Bridge link and tunnel connections to existing building, Stage 1 CSB and Multi Story Car Park; and
- Provision of engineering services connected to the infrastructure completed under Stage 1 Early Works Package (Road and Service Diversions).

The following engineering services will be provided within the ASB:

- Hydraulic services such as stormwater, subsoil and roof drainage, sewer connections, water pumps, pipework, fire hydrant and domestic cold water storage tanks and gas meters;
- Fire services such as sprinkler systems, isolation valves, pipework, fire alarm monitoring network and alarm signalling equipment;
- Mechanical and medical gas services such as air handling, smoke management, pneumatic tube system, medical gas, medical breathing and oxygen services;
- Electrical services such as MSBs, building switchboards, distribution boards, generators, lighting, power, nurse call systems and new UPS; and
- New Endeavour Energy 3x 1500kVA transformer substation located south of the Stage 2 ASB.

The Stage 2 expansion also involves refurbishment to existing hospital areas (approximately 4,700m²), including:

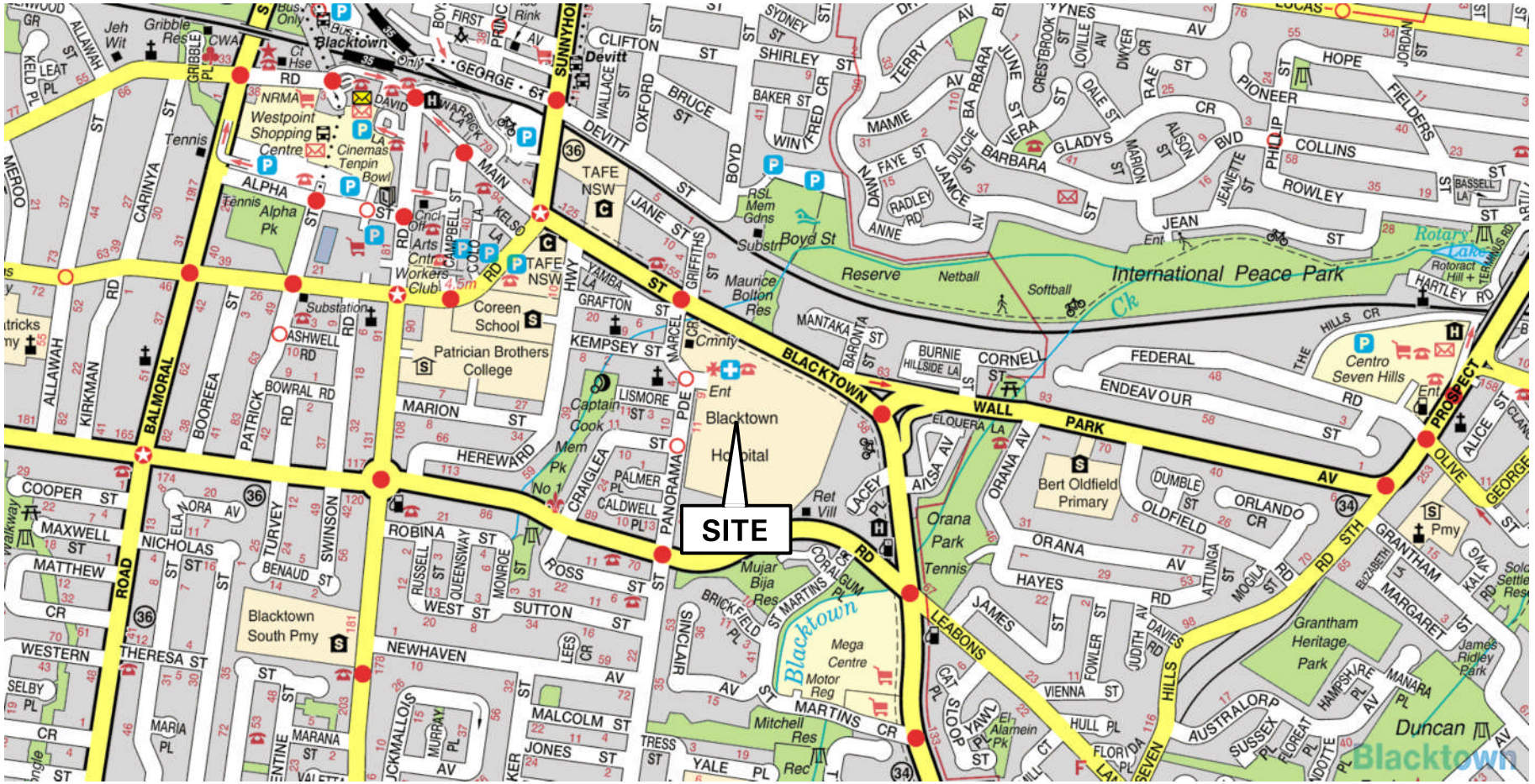
- Conversion of the existing Emergency Department into Ambulatory Care;
- Refurbishment of the existing medical imaging;
- Refurbishment of the existing inpatient dialysis unit;
- Conversion of 50 per cent of the existing Operating Suite into an Endoscopy Procedure Suite; and
- Refurbishment of pathology into an administration unit.

Appendix B Previous Report Information

Appendix B

EIS (2014)

JK Geotechnics (2014)



NOTES:
Figure 1 has been recreated from UBD on disc (version 5.0). Figure is not to scale.

UBD Map ref: 188 Q2

Reference should be made to the report text for a full understanding of this plan.

ENVIRONMENTAL INVESTIGATION SERVICES	Project Number: E24416KB	Title: SITE LOCATION PLAN
	Figure: 1	Address: BLACKTOWN HOSPITAL, OFF BLACKTOWN ROAD, BLACKTOWN, NSW

LEGEND

- JK GEOTECHNICS BOREHOLE - 2014
- JK GEOTECHNICS BOREHOLE - 2009
- JK GEOTECHNICS BOREHOLE - 2008
- JK GEOTECHNICS BOREHOLE - 1996
- COFFEY GEOTECHNICS BOREHOLE - 2012
- COFFEY GEOTECHNICS BOREHOLE - 2011

Scale (m): 0 37.5

ENVIRONMENTAL INVESTIGATION SERVICES

Title: **BOREHOLE LOCATION PLAN**

Report Number: E24416KB

Figure Number: 2

Appendix A: Borehole Logs and Explanatory Notes

JK Geotechnics
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

BOREHOLE LOG

Borehole No. **201** 1/2

Client: HEALTH INFRASTRUCTURE

Project: STAGE 2 OF BLACKTOWN HOSPITAL REDEVELOPMENT

Location: BLACKTOWN ROAD, BLACKTOWN, NSW

Job No. 24416SB1 **Method:** SPIRAL AUGER JK350 **R.L. Surface:** 61.65m

Date: 13-6-14 **Datum:** AHD

Logged/Checked by: M.W./D.B.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION OF AUGERING					SPT 11/150mm REFUSAL	0		-	ASPHALTIC CONCRETE: 20mm.t	D			
									FILL: Sandy gravel, fine to coarse grained sub rounded to sub angular igneous and sandstone, fine to medium grained sand.	MC>PL			
						1			FILL: Silty clay, high plasticity, grey and brown, with fine to medium grained sand, trace of root fibres, fine to medium grained sub rounded to sub angular sandstone and igneous gravel.	M			MODERATE TO HIGH 'TC' BIT RESISTANCE
					SPT 12/50mm REFUSAL				FILL: Clayey sand, fine to medium grained, orange brown, with sandstone gravel and cobbles, trace of silty clay nodules and plastic fragments.				
						2			FILL: Clayey gravelly sand, fine to medium grained, brown, fine to medium grained sandstone and igneous gravel.				
								CL	SILTY CLAY: medium plasticity, grey mottled red brown and orange brown, trace of fine to medium grained sub angular ironstone gravel.	MC<PL	H		SOIL RESISTANCE RESIDUAL
					N > 17 11,17/ 100mm REFUSAL	3						>600 >600 >600	
						4		-	INTERBEDDED SILTY CLAY: grey mottled red brown and orange brown, and SHALE: grey and red brown.	MC<PL/ XW	H/ EL		
						5		-	SHALE: grey and orange brown.	DW	VL VL-L		VERY LOW 'TC' BIT RESISTANCE VERY LOW RESISTANCE WITH LOW BANDS
						6							
						7							

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GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

BOREHOLE LOG

Borehole No. **201** 2/2

Client: HEALTH INFRASTRUCTURE

Project: STAGE 2 OF BLACKTOWN HOSPITAL REDEVELOPMENT

Location: BLACKTOWN ROAD, BLACKTOWN, NSW

Job No. 24416SB1 **Method:** SPIRAL AUGER JK350 **R.L. Surface:** 61.65m

Date: 13-6-14 **Datum:** AHD

Logged/Checked by: M.W./D.B.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
									SHALE: grey and orange brown.	DW	VL-L		
									SHALE: dark grey.		L		LOW RESISTANCE
													VERY LOW RESISTANCE WITH LOW BANDS
						8							
						9							
						10							
									REFER TO CORED BOREHOLE LOG				50mm DIA. PVC STANDPIPE INSTALLED TO 11.8m, SLOTTED BETWEEN 11.8n AND 5.8m, 2mm SAND FILTER PACK FROM 11.8m TO 5.4m BENTONITE SEAL FROM 5.4m TO 3m, CAPPED WITH SOIL AND GATIC COVER AT SURFACE
						11							
						12							
						13							
						14							

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GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

BOREHOLE LOG

Borehole No. **202** 1/2

Client: HEALTH INFRASTRUCTURE

Project: STAGE 2 OF BLACKTOWN HOSPITAL REDEVELOPMENT

Location: BLACKTOWN ROAD, BLACKTOWN, NSW

Job No. 24416SB1 **Method:** SPIRAL AUGER JK350 **R.L. Surface:** 61.80m

Date: 13-6-14 **Datum:** AHD

Logged/Checked by: M.W./D.B.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION OF AUGERING						0		-	ASPHALTIC CONCRETE: 20mm.t	M			
									FILL: Sandy gravel, fine to coarse grained sub rounded to sub angular igneous, fine to medium grained sand, trace of ash.				
					N = 14 4,6,8			CL	SILTY CLAY: medium plasticity, light grey mottled red brown, trace of ash and root fibres.	MC<PL	H	500 550 450	RESIDUAL
						1							
					N > 26 17,16, 10/50mm REFUSAL			-	SHALE: grey, with clay bands.	XW	EL	>600 >600 >600	
						2							
										DW	VL		VERY LOW 'TC' BIT RESISTANCE
▼ ON COMPLETION OF CORING						3			SHALE: grey.		VL-L		VERY LOW RESISTANCE WITH LOW BANDS
						4							
									SHALE: grey, with red brown iron indurated bands.		L		LOW RESISTANCE
						5							
									REFER TO CORED BOREHOLE LOG				
						6							
						7							

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BOREHOLE LOG

Borehole No. **203** 1/2

Client: HEALTH INFRASTRUCTURE

Project: STAGE 2 OF BLACKTOWN HOSPITAL REDEVELOPMENT

Location: BLACKTOWN ROAD, BLACKTOWN, NSW

Job No. 24416SB1 **Method:** SPIRAL AUGER JK350 **R.L. Surface:** 58.84m

Date: 17-6-14 **Datum:** AHD

Logged/Checked by: M.W./D.B.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION OF AUGERING						0			CONCRETE: 160mm.t				8mm DIA. REINFORCEMENT, 90mm TOP COVER
								-	FILL: Gravel, fine to coarse grained sub angular igneous.	M MC>PL			
								CL-CH	FILL: Silty clay, medium plasticity, grey and orange brown, trace of fine to medium grained igneous gravel.	MC<PL	H		RESIDUAL HAND AUGER TO 0.83m
						1			SILTY CLAY: medium to high plasticity, light grey mottled red brown, trace of fine to medium grained sub angular ironstone gravel.				
					N > 19 5,13, 6/20mm							>600	
					REFUSAL	2						>600	
												>600	
								-	SHALE: grey and orange brown.	DW	VL		VERY LOW 'TC' BIT RESISTANCE
						3							
											VL-L		VERY LOW TO LOW RESISTANCE
						4							
						5			SHALE: dark grey.		L		LOW RESISTANCE
						6							
									REFER TO CORED BOREHOLE LOG				
						7							

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BOREHOLE LOG

Borehole No. **204** 1/3

Client: HEALTH INFRASTRUCTURE

Project: STAGE 2 OF BLACKTOWN HOSPITAL REDEVELOPMENT

Location: BLACKTOWN ROAD, BLACKTOWN, NSW

Job No. 24416SB1 **Method:** SPIRAL AUGER JK350 **R.L. Surface:** 57.71m

Date: 22-6-14 **Datum:** AHD

Logged/Checked by: R.C./D.B.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION OF AUGER-ING						0			FILL: Silt, low plasticity, brown, trace of fine to coarse grained ironstone gravel, fine to medium grained sand and clay fines.	M/ MC<PL			GRASS COVER TRACE OF ROOTFIBRES TO 0.1m
					N = 13 4,4,9			CH	SILTY CLAY: high plasticity, light grey mottled orange brown, trace of fine to medium grained ironstone gravel.	MC≈PL	VSt	320	HAND AUGER TO 0.5m
						1				MC<PL	H	430 >600	
					N = 30 19,16,24	2						>600 >600 >600	
▼ ON COMPLET-ION OF CORING						3		-	SHALE: grey and orange brown with iron indurated bands and clay bands.	XW	EL		VERY LOW 'TC' BIT RESISTANCE
						4							
						5			SHALE: dark grey, with iron indurated bands.	DW	VL-L		VERY LOW TO LOW 'TC' BIT RESISTANCE
						6			SHALE: dark grey.		L		LOW RESISTANCE
						7							

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GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

BOREHOLE LOG

Borehole No. **204** 2/3

Client: HEALTH INFRASTRUCTURE

Project: STAGE 2 OF BLACKTOWN HOSPITAL REDEVELOPMENT

Location: BLACKTOWN ROAD, BLACKTOWN, NSW

Job No. 24416SB1 **Method:** SPIRAL AUGER JK350 **R.L. Surface:** 57.71m

Date: 22-6-14 **Datum:** AHD

Logged/Checked by: R.C./D.B.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
				■					SHALE: dark grey.	DW	L		
											L-M		LOW RESISTANCE WITH MODERATE BANDS
									REFER TO CORED BOREHOLE LOG				
						8							
						9							
						10							
						11							
						12							
						13							
						14							

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GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

BOREHOLE LOG

Borehole No. **205** 1/2

Client: HEALTH INFRASTRUCTURE

Project: STAGE 2 OF BLACKTOWN HOSPITAL REDEVELOPMENT

Location: BLACKTOWN ROAD, BLACKTOWN, NSW

Job No. 24416SB1 **Method:** SPIRAL AUGER JK350 **R.L. Surface:** 56.74m

Date: 20-6-14 **Datum:** AHD

Logged/Checked by: M.W./D.B.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION OF AUGERING						0		-	ASPHALTIC CONCRETE: 30mm.t	D			
								-	FILL: Clayey sandy gravel, fine to coarse grained sub rounded to sub angular igneous, fine to medium grained sand,				
								CL	SILTY CLAY: medium plasticity, light grey mottled red brown, trace of root fibres and fine to coarse grained sub angular ironstone gravel.	MC<PL	H	>600 >600 >600	RESIDUAL HAND AUGER TO 0.5m
					N = 28 9,12,16	1							
					N > 5 14,5/20mm REFUSAL	2						>600 >600 >600	
						3		-	SHALE: light grey.	XW	EL		
					SPT 8/20mm REFUSAL				SHALE: grey, trace of clay seams and orange brown iron indurated bands.	DW	VL		VERY LOW 'TC' BIT RESISTANCE
						4					L		
						5							
						6							
						7			REFER TO CORED BOREHOLE				

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BOREHOLE LOG

Borehole No. **206** 1/2

Client: HEALTH INFRASTRUCTURE

Project: STAGE 2 OF BLACKTOWN HOSPITAL REDEVELOPMENT

Location: BLACKTOWN ROAD, BLACKTOWN, NSW

Job No. 24416SB1 **Method:** SPIRAL AUGER JK350 **R.L. Surface:** 54.94m

Date: 16-6-14 **Datum:** AHD

Logged/Checked by: M.W./D.B.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION OF AUGERING ▼ ON COMPLETION OF CORING					N > 15 10,15/ 150mm REFUSAL	0		-	ASPHATIC CONCRETE: 20mm.t	M			HAND AUGER TO 1.2m
									FILL: Sandy gravel, fine to coarse grained igneous, fine to medium grained sand, trace of slag.	MC>PL			
									FILL: Gravelly sand, fine to medium grained, brown, rounded to sub rounded sandstone and igneous gravel, trace of slag and brick and concrete fragments.	M			
						1		CL	FILL: Silty clay, medium plasticity, grey and red brown, trace of ash and root fibres.	MC>PL	VSt	250 290 300	RESIDUAL HP TESTING ON REMOULDED SAMPLE
									FILL: Sand, fine to coarse grained, light grey and orange brown, trace of plastic fragments.		H	460 440 520	
						2		-	FILL: Clayey gravel, medium grained sub rounded to sub angular igneous.	XW-DW	EL-VL		
									SILTY CLAY: medium plasticity, light grey mottled red brown and orange brown, trace of root fibres and fine grained sub angular ironstone gravel.	DW	VL		VERY LOW 'TC' BIT RESISTANCE
						3			SHALE: grey and orange brown, with silty clay bands.				
						4							
						5			SHALE: grey, dark grey and orange brown.		VL-L		VERY LOW RESISTANCE WITH LOW BANDS
						6			REFER TO CORED BOREHOLE LOG				50mm DIA. PVC STANDPIPE INSTALLED TO 8.3m. SLOTTED BETWEEN 8.3m AND 2.3m, 2m SAND FILTER PACK FROM 7.2m TO 2.3m, BENTONITE SEAL FROM 2.3m TO 2.7m, CAPPED WITH SOIL AND GATIC COVER AT SURFACE
						7							

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BOREHOLE LOG

Borehole No. **207** 1/2

Client: HEALTH INFRASTRUCTURE

Project: STAGE 2 OF BLACKTOWN HOSPITAL REDEVELOPMENT

Location: BLACKTOWN ROAD, BLACKTOWN, NSW

Job No. 24416SB1 **Method:** SPIRAL AUGER JK350 **R.L. Surface:** 55.26m

Date: 17-6-14 **Datum:** AHD

Logged/Checked by: M.W./D.B.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION OF AUGERING						0		-	ASPHALTIC CONCRETE: 20mm.t	M			HAND AUGER TO 0.8m
									FILL: Sandy gravel, fine to coarse grained, sub rounded to sub angular igneous and ironstone, fine to medium grained sand.	MC>PL			
								CL-CH	FILL: Silty clay, medium plasticity, light grey, red brown and brown, trace of fine to coarse grained sub rounded igneous gravel.	MC<PL	H		RESIDUAL
						1			SILTY CLAY: medium to high plasticity, light grey mottled red brown and orange brown, trace of fine to coarse grained sub rounded ironstone gravel.			>600 >600 >600	
					N = 28 9,12,16								
						2							
					N > 35 8,15, 20/120mm	3					VSt-H	>600 390 290	
▼ ON COMPLETION OF CORING					REFUSAL								
						4		-	SHALE: grey and dark grey, with clay bands.	XW-DW	EL-VL		VERY LOW 'TC' BIT RESISTANCE
						5			SHALE: grey and orange brown.	DW	VL-L		VERY LOW RESISTANCE WITH LOW BANDS
									REFER TO CORED BOREHOLE LOG				
						6							
						7							

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BOREHOLE LOG

Borehole No. **208** 1/2

Client: HEALTH INFRASTRUCTURE

Project: STAGE 2 OF BLACKTOWN HOSPITAL REDEVELOPMENT

Location: BLACKTOWN ROAD, BLACKTOWN, NSW

Job No. 24416SB1 **Method:** SPIRAL AUGER JK350 **R.L. Surface:** 55.72m

Date: 22-6-14 **Datum:** AHD

Logged/Checked by: R.C./D.B.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION OF AUGERING					N = 5 3,3,2	0			FILL: Silty clay, medium plasticity, brown, with fine to coarse grained ironstone and igneous gravel, trace of fine to medium grained sand.	MC>PL		200 160 140	GRASS COVER TRACE OF ROOT FIBRES TO 0.1m HAND AUGER TO 1m APPEARS POORLY COMPACTED
					N = 25 10,12,13	2		CH	SILTY CLAY: high plasticity, light grey mottled orange brown, trace of fine to medium grained ironstone gravel.	MC<PL	H	590 >600 >600	RESIDUAL
▼ ON COMPLETION OF CORING					N > 15 19,15/ 70mm REFUSAL	3			as above, but with XW shale bands.			>600 >600 >600	
						4		-	SHALE: grey and orange brown, with iron indurated bands and clay bands.	DW	VL-L		VERY LOW 'TC' BIT RESISTANCE WITH LOW BANDS
						6			REFER TO CORED BOREHOLE LOG				50mm DIA. PVC STANDPIPE INSTALLED TO 9.2m, SLOTTED BETWEEN 9.2m AND 4.0m. 2mm SAND FILTER PACK FRON 9.2m TO 3.8m, BENTONITE SEAL, CAPPED WITH SOIL AND GATIC COVER AT SURFACE
						7							

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BOREHOLE LOG

Borehole No. 209 1/3

Client: HEALTH INFRASTRUCTURE

Project: STAGE 2 OF BLACKTOWN HOSPITAL REDEVELOPMENT

Location: BLACKTOWN ROAD, BLACKTOWN, NSW

Job No. 24416SB1 **Method:** SPIRAL AUGER JK350 **R.L. Surface:** 59.73m

Date: 18-6-14 **Datum:** AHD

Logged/Checked by: M.W./D.B.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION OF AUGERING						0		-	ASPHALTIC CONCRETE: 50mm.t				
									FILL: Gravelly clayey sand, fine to medium grained, brown, fine to coarse grained sub rounded ironstone and igneous gravel.	M			
					N = 17 4,8,9	1		CL	SILTY CLAY: medium plasticity, light grey mottled red brown and orange brown, trace of root fibres and and fine to coarse grained sub rounded to sub angular ironstone gravel.	MC<PL	VSt-H	400 430 310	RESIDUAL
					N = 26 3,13,13	2			as above, but with fine to coarse grained sub rounded to sub angular ironstone gravel.			350 450 500	
					N > 9 5,9/50mm REFUSAL	3		-	SHALE: grey and orange brown, with clay bands.	XW-DW	EL-VL		
										DW	VL-L		VERY LOW TO LOW 'TC' BIT RESISTANCE
▼ ON COMPLETION OF CORING						5			SANDSTONE: fine grained, grey.	SW	H		HIGH RESISTANCE
									SHALE: grey and dark grey, trace of H strength sandstone bands.	DW	L		LOW RESISTANCE WITH OCCASIONAL HIGH BANDS
						6			SHALE: grey and dark grey.		L-M		LOW TO MODERATE RESISTANCE
						7							

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BOREHOLE LOG

Borehole No. **209** 2/3

Client: HEALTH INFRASTRUCTURE

Project: STAGE 2 OF BLACKTOWN HOSPITAL REDEVELOPMENT

Location: BLACKTOWN ROAD, BLACKTOWN, NSW

Job No. 24416SB1 **Method:** SPIRAL AUGER JK350 **R.L. Surface:** 59.73m

Date: 18-6-14 **Datum:** AHD

Logged/Checked by: M.W./D.B.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
						8			SHALE: grey and dark grey.	DW	L-M		
						9					M		MODERATE RESISTANCE
						10			REFER TO CORED BOREHOLE LOG				
						11							
						12							
						13							
						14							

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BOREHOLE LOG

Borehole No. **210** 1/3

Client: HEALTH INFRASTRUCTURE

Project: STAGE 2 OF BLACKTOWN HOSPITAL REDEVELOPMENT

Location: BLACKTOWN ROAD, BLACKTOWN, NSW

Job No. 24416SB1 **Method:** SPIRAL AUGER JK350 **R.L. Surface:** 58.98m

Date: 18-6-14 **Datum:** AHD

Logged/Checked by: M.W./D.B.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLET-ION OF AUGER-ING						0		-	ASPHALTIC CONCRETE: 40mm.t				
									FILL: Gravelly sand, fine to medium grained, brown, fine to coarse grained sub angular to sub rounded igneous gravel, trace of ceramic fragments.	M			
					N = 10 4,4,6				FILL: Silty clay, medium plasticity, grey, red brown and orange brown, trace of root fibres, and fine grained sub rounded igneous gravel.	MC>PL		250 300 300	APPEARS MODERATELY COMPACTED
						1		CL-CH	SILTY CLAY: medium to high plasticity, light grey mottled orange brown, trace of fine to coarse grained sub rounded ironstone gravel, and root fibres.	MC>PL	H		RESIDUAL
					N = 24 8,9,15							580 >600 >600	
						2				MC<PL			
					N > 41 19,20 21/100mm	3						>600 >600 >600	
					REFUSAL			-	SHALE: grey and orange brown.	XW	EL		
AFTER 2 HRS ▼						4							
ON COMPLE-TION OF CORING										DW	VL-L		VERY LOW 'TC' BIT RESISTANCE WITH LOW BANDS
						5			SHALE: grey and dark grey, trace of clay bands.				
						6			SHALE: grey and orange brown.				
						7							

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BOREHOLE LOG

Borehole No. **210** 2/3

Client: HEALTH INFRASTRUCTURE

Project: STAGE 2 OF BLACKTOWN HOSPITAL REDEVELOPMENT

Location: BLACKTOWN ROAD, BLACKTOWN, NSW

Job No. 24416SB1 **Method:** SPIRAL AUGER JK350 **R.L. Surface:** 58.98m

Date: 18-6-14 **Datum:** AHD

Logged/Checked by: M.W./D.B.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
									SHALE: grey and orange brown.	DW	VL-L		
				■		8					L-M		LOW TO MODERATE RESISTANCE
						9							
									REFER TO CORED BOREHOLE LOG				
						10							
						11							
						12							
						13							
						14							

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BOREHOLE LOG

Borehole No. 211 1/3

Client: HEALTH INFRASTRUCTURE

Project: STAGE 2 OF BLACKTOWN HOSPITAL REDEVELOPMENT

Location: BLACKTOWN ROAD, BLACKTOWN, NSW

Job No. 24416SB1 **Method:** SPIRAL AUGER JK350 **R.L. Surface:** 58.56m

Date: 19-6-14 **Datum:** AHD

Logged/Checked by: M.W./D.B.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLE-TION OF AUGER-ING						0		-	ASPHALTIC CONCRETE: 40mm.t				
									FILL: Clayey gravely sand, fine to medium grained, brown, fine to coarse grained igneous and sandstone gravel.	D			
					N = 12 5,5,7					MC<PL		370 380 380	APPEARS MODERATELY COMPACTED
						1			FILL: Silty clay, high plasticity, light grey, red brown and brown, trace of root fibres, fine to coarse grained sub angular ironstone gravel, and shale gravel.				
													APPEARS POORLY COMPACTED
					N = 4 3,2,2							450 270 360	
						2		CL	SILTY CLAY: medium plasticity, light grey mottled red brown, trace of root fibres and fine to coarse grained sub rounded to sub angular ironstone gravel.	MC<PL	H		RESIDUAL
					N = 31 8,16,15	3						550 560 600	
▼ ON COMPLE-TION OF CORING						4							
					N = SPT 16/150mm REFUSAL			-	SHALE: grey.	XW	EL	>600	VERY LOW 'TC' BIT RESISTANCE
						5				DW	VL-L		
						6							
											H		HIGH RESISTANCE
						7			SHALE: grey and orange brown.	DW	L		LOW RESISTANCE

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BOREHOLE LOG

Borehole No. **211** 2/3

Client: HEALTH INFRASTRUCTURE

Project: STAGE 2 OF BLACKTOWN HOSPITAL REDEVELOPMENT

Location: BLACKTOWN ROAD, BLACKTOWN, NSW

Job No. 24416SB1 **Method:** SPIRAL AUGER JK350 **R.L. Surface:** 58.56m

Date: 19-6-14 **Datum:** AHD

Logged/Checked by: M.W./D.B.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
				■		8			SHALE: grey and orange brown. as above, but trace of medium strength iron indurated bands.	DW	L		
						9			REFER TO CORED BOREHOLE LOG				
						10							
						11							
						12							
						13							
						14							

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BOREHOLE LOG

Borehole No. **212** 1/3

Client: HEALTH INFRASTRUCTURE

Project: STAGE 2 OF BLACKTOWN HOSPITAL REDEVELOPMENT

Location: BLACKTOWN ROAD, BLACKTOWN, NSW

Job No. 24416SB1 **Method:** HAND AUGER **R.L. Surface:** 55.56m

Date: 20-6-14 **Datum:** AHD

Logged/Checked by: D.B./P.S.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	■					0			FILL: Silty gravelly clay, low plasticity, brown and grey sandstone, ironstone and shale gravel.	MC>PL			
▼ ON COMPLE-TION OF AUGER-ING	■							CL	SILTY CLAY: medium plasticity, red brown mottled brown, with ironstone gravel.	MC>PL	(St)		POSSIBLY FILL
									REFER TO CORED BORHOLE LOG				HAND AUGER REFUSAL
						1							
						2							
						3							
						4							
						5							
						6							
						7							

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BOREHOLE LOG

Borehole No. **213** 1/3

Client: HEALTH INFRASTRUCTURE

Project: STAGE 2 OF BLACKTOWN HOSPITAL REDEVELOPMENT

Location: BLACKTOWN ROAD, BLACKTOWN, NSW

Job No. 24416SB1 **Method:** HAND AUGER TO 0.4m THEN LOG OF BATTER **R.L. Surface:** 55.76m

Date: 20-6-14 **Datum:** AHD

Logged/Checked by: D.B./P.S.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLE -TION	■					0			FILL: Silty clay, medium plasticity, red brown and brown, with shale gravel.	MC<PL			
	■							CL-CH	SILTY CLAY: medium to high plasticity, red brown mottled light grey, with shale and ironstone gravel.	MC<PL	(H)		HAND AUGER REFUSAL LOG OF BATTER FROM 0.4m DEPTH
						1		-	SHALE: brown and grey, with clay bands.	XW	EL		
						2				DW	VL-L		
						3							
						4			SHALE: dark grey and brown, with occasional clay bands.	DW	L		
						5							
									END OF LOG AT 5.2m				
						6							
						7							

Appendix C Groundwater Bores

NSW Office of Water
Work Summary

GW107204

Licence: 10BL165294 **Licence Status:** ACTIVE

Authorised Purpose(s): MONITORING BORE
Intended Purpose(s): MONITORING BORE

Work Type: Bore
Work Status:
Construct.Method: Rotary
Owner Type:

Commenced Date:
Completion Date: 12/07/2005
Final Depth: 11.30 m
Drilled Depth: 11.30 m

Contractor Name: INTERTEC DRILLING SERVICES
Driller: William Crump
Assistant Driller:

Property: INTERNATIONAL PEACE PARK INTERNATIONAL PEACE PARK SEVEN HILLS 2147 NSW
GWMA: -
GW Zone: -
Standing Water Level: 2.200
Salinity:
Yield: 0.300

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	CUMBE	CUMBE.41	D 36666
Licensed:	CUMBERLAND	PROSPECT	Whole Lot D//36666

Region: 10 - Sydney South Coast
River Basin: - Unknown
Area/District:
CMA Map:
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown
Northing: 6261107.0
Easting: 307952.0
Latitude: 33°46'21.9"S
Longitude: 150°55'33.8"E

GS Map: - **MGA Zone:** 0 **Coordinate Source:** Unknown

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	1.20	152			Rotary Air
1		Hole	Hole	1.20	11.30	120			Rotary Air
1		Annulus	(Unknown)	0.00	0.00				Q:144.000m3
1	1	Casing	Pvc Class 9	0.00	1.20	140			Seated on Bottom
1	1	Opening	Screen	0.10	11.30	60		1	PVC Class 18, Screwed, A: 0.50mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
4.10	11.30	7.20	Unknown	2.20		0.30	11.30		6300.00

Geologists Log
Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	0.20	0.20	FILL	Fill	
0.20	4.10	3.90	CLAY BROWN	Clay	
4.10	11.30	7.20	SHALE	Shale	

Remarks

***** End of GW107204 *****

NSW Office of Water
Work Summary

GW107203

Licence: 10BL165294 **Licence Status:** ACTIVE

Authorised Purpose(s): MONITORING BORE
Intended Purpose(s): MONITORING BORE

Work Type: Bore
Work Status:
Construct.Method: Rotary
Owner Type:

Commenced Date: **Final Depth:** 3.00 m
Completion Date: 11/07/2005 **Drilled Depth:** 3.00 m

Contractor Name: INTERTEC DRILLING SERVICES
Driller: William Crump
Assistant Driller:

Property: INTERNATIONAL PEACE PARK INTERNATIONAL PEACE PARK SEVEN HILLS 2147 NSW **Standing Water Level:**
GWMA: - **Salinity:**
GW Zone: - **Yield:**

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	CUMBE	CUMBE.41	D 36666
Licensed:	CUMBERLAND	PROSPECT	Whole Lot D//36666

Region: 10 - Sydney South Coast **CMA Map:**
River Basin: - Unknown **Grid Zone:** **Scale:**
Area/District:

Elevation: 0.00 m (A.H.D.) **Northing:** 6261088.0 **Latitude:** 33°46'22.5"S
Elevation Source: Unknown **Easting:** 307944.0 **Longitude:** 150°55'33.5"E

GS Map: - **MGA Zone:** 0 **Coordinate Source:** Unknown

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	3.00	125			Auger
1		Annulus	Waterworn/Rounded	0.00	0.00				Graded, Q:30.000m3
1	1	Casing	Pvc Class 18	-0.80	0.00	60			Seated on Bottom, Screwed
1	1	Opening	Screen	0.00	3.00	60		1	PVC Class 18, Screwed, A: 0.50mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)

Geologists Log
Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	2.50	2.50	FILL	Fill	
2.50	3.00	0.50	CLAY	Clay	

Remarks

***** End of GW107203 *****

NSW Office of Water
Work Summary

GW107205

Licence: 10BL165294
Licence Status: ACTIVE

Authorised Purpose(s): MONITORING BORE
Intended Purpose(s): MONITORING BORE

Work Type: Bore
Work Status:
Construct.Method: Rotary
Owner Type:

Commenced Date:
Completion Date: 12/07/2005
Final Depth: 11.40 m
Drilled Depth: 11.40 m

Contractor Name: INTERTEC DRILLING SERVICES
Driller: William Crump
Assistant Driller:

Property: INTERNATIONAL PEACE PARK INTERNATIONAL PEACE PARK SEVEN HILLS 2147 NSW
GWMA: -
GW Zone: -
Standing Water Level: 3.000
Salinity:
Yield: 0.300

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	CUMBE	CUMBE.41	D 36666
Licensed:	CUMBERLAND	PROSPECT	Whole Lot D//36666

Region: 10 - Sydney South Coast
River Basin: - Unknown
Area/District:
CMA Map:
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown
Northing: 6261070.0
Easting: 307968.0
Latitude: 33°46'23.1"S
Longitude: 150°55'34.4"E

GS Map: - **MGA Zone:** 0 **Coordinate Source:** Unknown

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	1.20	152			Rotary Air
1		Hole	Hole	1.20	11.40	120			Rotary Air
1		Annulus	Waterworn/Rounded	0.00	0.00				Graded, Q:144.000m3
1	1	Casing	Pvc Class 18	-0.10	0.00	60			Other, Screwed
1	1	Casing	Pvc Class 9	0.00	1.20	140			Seated on Bottom
1	1	Opening	Screen	0.10	11.40	60		1	PVC Class 18, Screwed, A: 0.50mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
6.80	11.40	4.60	Unknown	3.00		0.30	11.40		10000.00

Geologists Log
Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	4.50	4.50	CLAY BROWN	Clay	
4.50	6.80	2.30	CLAY CREAM	Clay	
6.80	11.40	4.60	SHALE	Shale	

Remarks

***** End of GW107205 *****

Appendix D Historical Titles

scottASHWOOD PTY.LTD
An InfoTrack Company

ABN: 42 166 543 255
Ph: 02 9099 7400
Fax: 02 9232 7141
(Ph: 0412 199 304)

Level 14, 135 King Street
Sydney 2000
GPO Box 4103 Sydney NSW 2001
DX 967 Sydney

Summary of Owners Report

LPI **Sydney**

Address: - Part Blacktown District Hospital Site

Description: - The part Lot 3 DP71010 and the part Lot 1 DP128344 as shown within the red edge on the annexed cadastral plan

As regards the subject part of Lot 3 DP71010

Date of Acquisition and term held	Registered Proprietor(s) & Occupations where available	Reference to Title at Acquisition and sale
Circa 1918 (1918 to 1949)	Henry Harvey (Railway Employee) and his Estate	Vol 2814 Fol 239
11.7.1949 (1949 to 1954)	Harry Harvey (Engineer)	Vol 2814 Fol 239 then Vol 6060 Fol 100
15.9.1954 (1954 to 1962)	Parramatta District Hospital	Vol 6060 Fol 100
7.11.1962 (1962 to Date)	Blacktown District Hospital now # Western Sydney Local Health District	Vol 6060 Fol 100 now Folio 3/71010

# Denotes Current Registered Proprietor

Leases – whilst Lease AG329772 is currently noted on title – it does not appear to affect the subject area

Easements – whilst various easements are noted on title – none appear to affect the subject area

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As regards the subject part of Lot 1 DP128344 hatched blue on the annexed cadastral plan

Date of Acquisition and term held	Registered Proprietor(s) & Occupations where available	Reference to Title at Acquisition and sale
16.12.1912 (1912 to 1927)	Mildred Ethel Harris (Spinster)	Vol 862 Fol 39 then Vol 4077 Fol 123
21.11.1927 (1927 to 1928)	Walter Latimer Trotter (Ironmonger)	Vol 4077 Fol 123
31.5.1928 (1928 to 1937)	James Joseph McCarthy (Bank Official)	Vol 4077 Fol 123
8.1.1937 (1937 to 1957)	Cumberland Tile & Brick Pty Limited	Vol 4077 Fol 123

Continued on Page 2

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The subject part of Lot 1 DP128344 continued

Date of Acquisition and term held	Registered Proprietor(s) & Occupations where available	Reference to Title at Acquisition and sale
24.9.1954 (hatched red) 25.2.1957 (hatched blue) (1954/1957 to 1964)	Parramatta District Hospital (Noting that the part of the subject area shown hatched red forms part of Old Blacktown Road which was resumed and vested in Parramatta District Hospital under the provisions of the Public Works Act 1912 by notification in Gazette dated 24.9.1954)	Gaz 24.9.1954 (hatched red) and Vol 4077 Fol 123 (hatched blue) then Vol 8466 Fol 48
2.3.1964 (1964 to Date)	Blacktown District Hospital now # Western Sydney Local Health District	Vol 8466 Fol 48 now Folio 1/128344

# Denotes Current Registered Proprietor

Leases –

- 22.2.2005 AB159965, AB159966, AB159967 & AB159968 – expires 12.9.2024 (not investigated)
- 19.4.2006 AC224038, AC224039, AC224040 & AC224041 – expired or surrendered (not investigated)
- 19.12.2013 AI152053, AI152054 & AI152055 – expires 28.2.2026 (not investigated)

Easements –

- 22.8.1967 Easement for transmission line K749781

Peter Boyer
24 May, 2016

NSW Land & Property Information
Finance & Services

Cadastral Records Enquiry Report

Ref : surv:scim-grollm

Requested Parcel : Lot 3 DP 71010

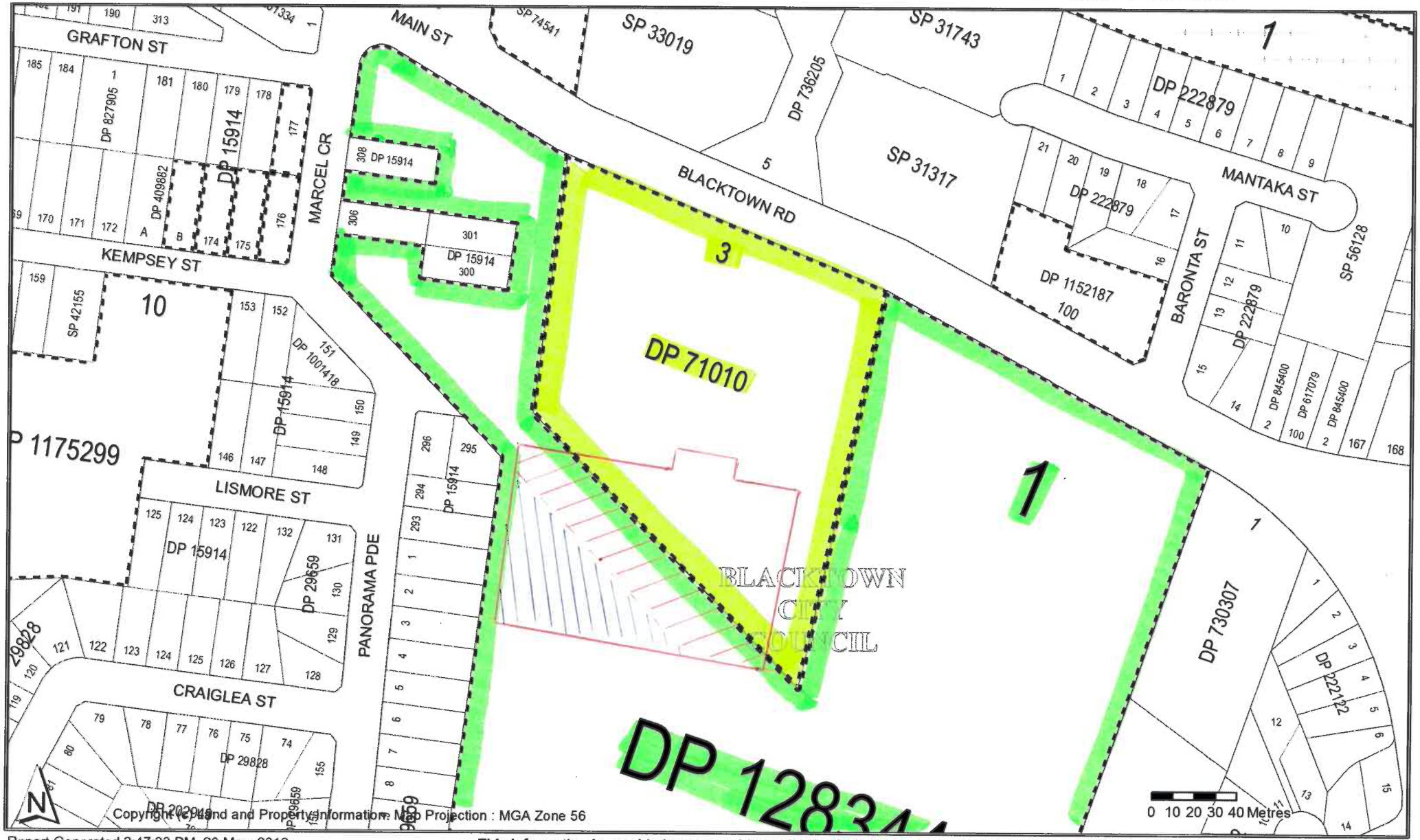
Identified Parcel : Lot 3 DP 71010

Locality : BLACKTOWN

LGA : BLACKTOWN

Parish : PROSPECT

County : CUMBERLAND



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Report Generated 2:47:33 PM, 20 May, 2016

This information is provided as a searching aid only. While every endeavour is made to ensure the current cadastral pattern is accurately reflected, the Registrar General cannot guarantee the information provided. For all ACTIVITY PRIOR to SEPT 2002 you must refer to the RGs Charting and Reference Maps.