WestConnex

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New M5

Environmental Impact Statement

Technical working paper: Contamination

Appendix O

November 2015

WestConnex

WestConnex The New M5

Technical Working Paper: Contamination

Client: Roads and Maritime Services

ABN: 76 236 371 088

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Quality Information

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Glossary of Terms

Term	Description
ACM	Asbestos Containing Materials
AEC	Areas of Environmental Concern
AHD	Australian Height Datum
ANZECC	Australian and New Zealand Environment and Conservation Council
AST	Above Ground Storage Tank
ARI	Average Recurrence Interval
BTEX	Benzene, toluene, ethylbenzene and xylenes
Btoc	Below top of casing
PCoC	Potential Contaminants of Concern
CPAH	carcinogenic PAH
CSM	Conceptual Site Model
DADI	Dial a Dump Industries
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethylene
DDT	Dichlorodiphenyltrichloroethane
DPI (Water)	Department of Primary Industries (Water), formerly the NSW Office of Water
EMP	Environmental Management Plan
ENM	Excavated Natural Material
EO	Explosive ordinance due diligence assessment
EIS	Environmental Impact Statement
ESA	Environmental Site Assessment
HCBs	Hexachlorobenzene
HILs	Health Investigation Levels
HSLs	Health Screening Levels
KGRIU	King Georges Road Interchange Upgrade
mbgs	Metres below ground surface
mbtoc	Metres below top of casing
NoW	NSW Office of Water, now known as Department of Primary Industries (Water)
NEPC	National Environment Protection Council
NEPM	National Environment Protection (Assessment of Site Contamination) Measure
NSW DECC	NSW Department of Environment and Climate Change
NSW DEC	NSW Department of Environment and Conservation
NSW EPA	New South Wales Environment Protection Authority
NSW LPI	NSW Government Land and Property Information

Term	Description
OEH	NSW Government Office of Environment and Heritage
OCP	Organochlorine Pesticides
OPP	Organophosphate Pesticides
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated biphenyls
PID	Photoionisation Detector
PRP	Pollution Reduction Program
RSLs	Regional Screening Levels
SACL	Sydney Airport Corporation Limited
SAS	Site Audit Statement
SRP	Soluble reactive phosphorus
SWC	Sydney Water Corporation
SWL	Standing Water Level
SVOC	Semi Volatile Organic Hydrocarbons
TOC	Total organic carbon
TEQ	Toxicity Equivalent Quotient
TKN	Total Kieldahl Nitrogen
TPH	Total Petroleum Hydrocarbons
TRH	Total Recoverable Hydrocarbons
TWA	Trade Waste Agreement
UCL	Upper Confidence Limit
UPSS	Underground Petroleum Storage System
US EPA	United States Environmental Protection Agency
UST	Underground storage tank
VENM	Virgin Excavation Natural Material
WDA	WestConnex Delivery Authority
WHO	World Health Organisation

Executive Summary

NSW Roads and Maritime Services (Roads and Maritime) is seeking approval to construct and operate the New M5 (the project), which would comprise a new, tolled multi-lane road link between the existing M5 East Motorway, east of King Georges Road, and St Peters. The project would also include an interchange at St Peters and connections to the existing road network.

Approval is being sought under Part 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The project is declared to be State significant infrastructure (SSI) under section 115U(2) of the EP&A Act by reason of the operation of clause 14 and Schedule 3 of the *State Environmental Planning Policy (State and Regional Development) 2011*. Accordingly, the project is subject to assessment under Part 5.1 of the EP&A Act and requires the approval of the Minister for Planning. An environmental impact statement (EIS) is therefore also required. Roads and Maritime is seeking the project to be declared by the Minister for Planning as State significant infrastructure and critical State significant infrastructure under sections 115U(4) and 115V of the EP&A Act.

On 11 August 2015, the Commonwealth Minister for the Environment determined that the project has the potential to significantly impact on a matter of national environmental significance and is therefore a 'controlled action'. This means that approval of the project will be required from the Commonwealth Minister for the Environment in addition to environmental and planning approvals required under State legislation.

Under the Bilateral Agreement relating to environmental assessment (February 2015) between the Commonwealth Government and the NSW Government, this EIS has been adopted for the purpose of meeting the assessment requirements of both the Commonwealth EPBC Act and the NSW EP&A Act.

This technical working paper contains the Phase I Environmental Site Assessment (ESA) for the project. The Phase I ESA includes a desktop review of available background information relating to selected properties within the assessment area including setting, an assessment of land use history and an inspection of the project footprint, which was undertaken to evaluate the potential for soil and/or groundwater contamination to be present. The overall objective of the Phase 1 ESA was to identify potential contamination issues of land impacted by the project so further assessment can be undertaken or appropriate procedures can be put in place to manage contamination as part of the construction.

To achieve the objective, the Phase 1 ESA for the project was undertaken in the following key stages:

- Preliminary screening review of Project background/historical information to evaluate the potential for contamination to be present
- Inspection of the project to assist with the identification of potential on and off-site sources of contamination and to understand the general condition of the project
- Review and evaluation of desktop information relevant to identified areas of concern within the project
- Preparation of this report.

Key Findings

The key findings of this Phase 1 ESA are summarised below:

- AECOM was provided with a construction footprint that represented the worst case disturbance footprint. This was categorised into five discrete disturbance areas (identified as the 'Project Areas'). The project areas were identified as:
    - Project Area 1: Western surface works located near the western extent of the project
    - Project Area 2: Kingsgrove Road surface works
    - Project Area 3: Bexley Road surface works
    - Project Area 4: Arncliffe surface works
    - Project Area 5: St Peters interchange and local roads upgrades located at the eastern extent of the project
- Individual lots and areas adjacent to the Project Areas had a range of land uses including; residential, commercial/industrial, roadways, waterways and recreational open space

- Identified potential areas/sources of contamination identified within the Project Areas and in the immediate vicinity included:
    - Historical land use activities associated with the various commercial/industrial properties
    - Areas of historical landfilling
    - Wolli Creek, Alexandra Canal and Cooks River
- Based on a review of New South Wales Environment Protection Authority (NSW EPA) and local council searches, a number of properties located within the project areas were identified as being of particular potential contamination concern (refer to **Chapter 9.0**) which should be considered as part of planning for the project. These properties generally comprised sites that have the potential to have historically been subject to uncontrolled filling, various commercial/industrial land uses including brick works, fertiliser manufacture and/or supply, market gardening, laundering and various public utility and/or council works sites. More recently, these sites have been subject to various warehousing and commercial/industrial uses and/or are located adjacent to Cooks River and Alexandra Canal.

Conclusions and Recommendations

- Based on the information reviewed, AECOM concludes that there is a potential for localised areas of soil, fill, groundwater and ground gas contamination associated with historically contaminating land uses to be encountered during construction of the project at selected locations within Project Areas 1 to 5 and further assessment is warranted. The discovery of contaminated materials is considered most likely to occur during near surface excavation works associated with road and tunnel construction activities
- Based on the findings of the Phase 1 ESA, AECOM recommends the following:
    - Intrusive soil, fill, groundwater, leachate and ground gas investigations should be undertaken in the specific areas of environmental concern, outlined in **Chapter 9.0** (where investigations have not been previously conducted), to further evaluate and manage the presence and extent of contamination in areas identified to be directly affected/disturbed by the proposed construction works
    - Subject to the nature of the proposed upgrade works, sampling activities should be undertaken prior to disturbance of these areas to minimise the potential for identifying unexpected finds and project delays during construction. The investigations should be undertaken in accordance with ASC NEPM (2013) guidelines. Findings of the investigation should be used to inform appropriate remediation and management options (if required) for the proposed future road upgrades. All future investigations and remedial planning should be undertaken in the context of the proposed design plans for the Project Areas
    - An environmental management plan incorporating an unexpected finds procedure/ should be in place to manage potentially contaminated materials which may be encountered in areas not identified/anticipated as part of this Phase 1 ESA. The procedure should outline the process for the identification and assessment of potentially contaminated material in the event that previously unidentified contamination is discovered during construction or excavation activities. The information obtained as part of the intrusive investigation program should be used to inform appropriate health and safety risk mitigation measures, waste management protocols and off-site disposal of material excavated
- With respect to Alexandra Canal, the Construction Environmental Management Plan would detail specific methodologies and management measures for the outlet construction works which would detail the control measures to satisfy the requirements of the existing Remediation Order for the Alexandria Canal. The detailed design of the outlets and corresponding Construction Environmental Management Plan would be provided to Sydney Water and NSW EPA for approval in accordance with the requirements of the Remediation Order.

1.0 Introduction

NSW Roads and Maritime Services (Roads and Maritime) is seeking approval to construct and operate the New M5 (the project), which would comprise a new, tolled multi-lane road link between the existing M5 East Motorway, east of King Georges Road, and St Peters. The project would also include an interchange at St Peters and connections to the existing road network.

Approval is being sought under Part 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The project is declared to be State significant infrastructure (SSI) under section 115U(2) of the EP&A Act by reason of the operation of clause 14 and Schedule 3 of the *State Environmental Planning Policy (State and Regional Development) 2011*. Accordingly, the project is subject to assessment under Part 5.1 of the EP&A Act and requires the approval of the Minister for Planning. An environmental impact statement (EIS) is therefore also required.

Roads and Maritime is seeking the project to be declared by the Minister for Planning as State significant infrastructure and critical State significant infrastructure under sections 115U(4) and 115V of the EP&A Act.

This technical working paper contains the Phase I Environmental Site Assessment (ESA) for the project. The Phase I ESA includes a desktop review of available background information relating to selected properties with the assessment study area including setting, an assessment of land use history and an inspection of the project footprint, which was undertaken to evaluate the potential for soil and/or groundwater contamination to be present.

This technical working paper also provides a summary of the key findings of other key contamination reports prepared by AECOM and other consultants for specific sites that are relevant to the project (as detailed in **Chapter 3.0**).

1.1 Overview of WestConnex

WestConnex is a 33 kilometre motorway that is intended to link Sydney's west with the airport and the Port Botany precinct. The component projects of the WestConnex program of works are:

- M4 Widening – Pitt Street, Parramatta to Homebush Bay Drive, Homebush (planning approval granted on 21 December 2014 and under construction)
- M4 East – Homebush Bay Drive, Homebush to Parramatta Road and City West Link (Wattle Street) at Haberfield (planning application lodged and subject to planning approval)
- New M5 – (the subject of this EIS)
- King Georges Road Interchange Upgrade (planning approval granted on 3 March 2015 and under construction)
- M4-M5 Link – Haberfield to St Peters (undergoing concept development and subject to planning approval)
- Sydney Gateway (is the subject of further investigations by the NSW Government and would be subject to separate planning approval).

Separate planning applications have or will be lodged for each component project. Each project will be assessed separately, but the impact of each project will also be considered in the context of the wider WestConnex program of works.

A proposed Southern extension from Arncliffe to Kogarah is currently being investigated by the NSW Government, and would connect the New M5 to the southern and bayside suburbs of Sydney, and the proposed F6 motorway.

Following the achievement of early milestones for Stage 1 and Stage 2 of WestConnex, the NSW Government took the opportunity to evolve the early governance model created to deliver WestConnex.

On 1 October 2015 the transfer of the project delivery functions of WestConnex Delivery Authority (WDA) to Sydney Motorway Corporation (SMC) was finalised, forming a single decision-making entity to finance and deliver the WestConnex motorway. SMC is a private corporation, whose shareholders are the Minister for Roads, Maritime and Freight and the Treasurer, with a majority independent board of nine directors.

Roads and Maritime Services (Roads and Maritime) is the Government client agency for the WestConnex motorway. In that capacity Roads and Maritime will enter into contractual arrangements with SMC subsidiary entities which will design, build, own and operate the motorway on behalf of Roads and Maritime. Roads and Maritime and SMC are working together to manage the planning approval process for the project. However, for the purpose of the planning application for the project, Roads and Maritime is the proponent.

1.2 The project

Key components of the project, as shown on **Figure 1**, would include:

- Twin motorway tunnels between the existing M5 East Motorway (between King Georges Road and Bexley Road) and St Peters. The western portals along the M5 East Motorway would be located east of King Georges Road, and the eastern portals at St Peters would be located in the vicinity of the Princes Highway and Canal Road. Each tunnel would be about nine kilometres in length and would be configured as follows:
    - Between the western portals and Arncliffe, the tunnels would be built to be three lanes but marked for two lanes as part of the project. Any change from two lanes to three lanes would be subject to future environmental assessment and approval
    - Between the Arncliffe and St Peters, the tunnels would be built to be five lanes but marked for two lanes as part of the project. Any change from two lanes to any of three, four or five lanes would be subject to future environmental assessment and approval
- The western portals along the M5 East Motorway would be located east of King Georges Road, and the eastern portals at St Peters would be located in the vicinity of the Princes Highway and Canal Road
- Tunnel stubs to allow for a potential future connection to the M4-M5 Link and a potential future connection to southern Sydney
- Surface road widening works along the M5 East Motorway between east of King Georges Road and the new tunnel portals
- A new road interchange at St Peters, which would initially provide road connections from the main alignment tunnels to Campbell Road and Euston Road, St Peters
- Two new road bridges across Alexandra Canal which would connect St Peters interchange with Gardeners Road and Bourke Road, Mascot
- Closure and remediation of the Alexandria Landfill site, to enable the construction and operation of the new St Peters interchange
- Works to enhance and upgrade local roads near the St Peters interchange
- Ancillary infrastructure and operational facilities for electronic tolling, signage (including electronic signage), ventilation structures and systems, fire and life safety systems, and emergency evacuation and smoke extraction infrastructure
- A motorway control centre that would include operation and maintenance facilities
- New service utilities and modifications to existing service utilities
- Temporary construction facilities and temporary works to facilitate the construction of the project
- Infrastructure to introduce tolling on the existing M5 East Motorway
- Surface road upgrade works within the corridor of the M5 East Motorway.

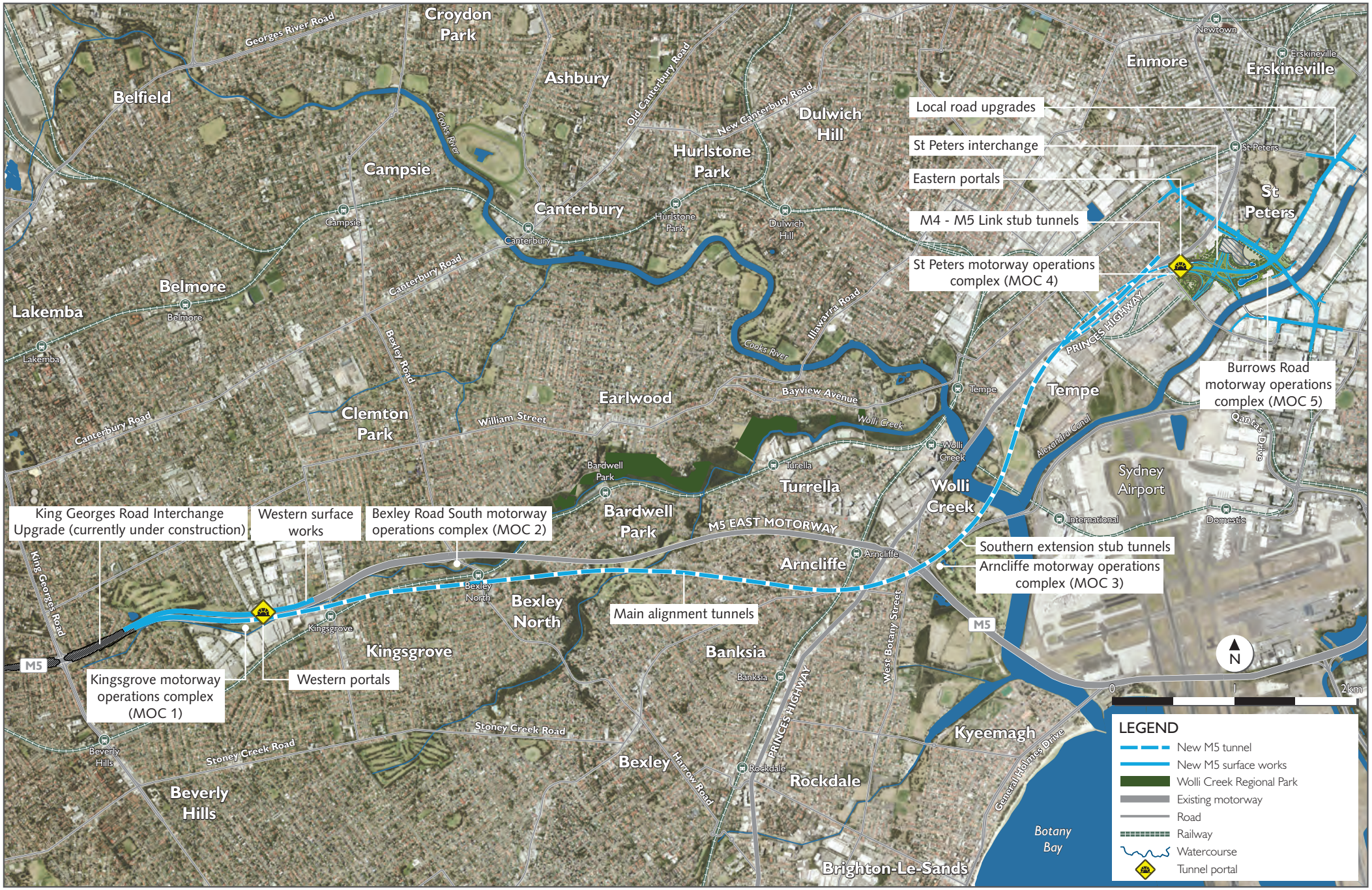

Figure 1 The project

Construction activities associated with the project would generally include:

- Commencement of enabling and temporary works, including construction power, water supply, ancillary site establishment, demolition works, property and utility adjustments and public transport modifications (if required)
- Construction of the road tunnels, interchanges, intersections and roadside infrastructure
- Haulage of spoil generated during tunnelling and excavation activities
- Fit out of the road tunnels and support infrastructure, including ventilation and emergency response systems
- Construction and fit out of the motorway control centre and ancillary operations buildings
- Upgrades to surface roads and construction of bridges
- Implementation of environmental management and pollution control facilities for the project.

Subject to the project obtaining environmental planning approval, construction of the project is anticipated to commence around mid-2016 and is expected to take around three years to complete.

The M5 Motorway corridor (the M5 East Motorway and the M5 South West Motorway) is the main passenger, commercial and freight corridor between Port Botany, Sydney Airport and south-west Sydney. Traffic demands on the M5 East Motorway currently exceed the design capacity of the roadway, and as a result, present a significant bottleneck to the M5 Motorway corridor with motorists experiencing heavy congestion and unreliable journey times. The project is needed to provide additional capacity along the M5 Motorway corridor, and would allow for a more robust and reliable transport network.

1.3 Project location

The project would be located within the Canterbury, Hurstville, Rockdale, Marrickville, Sydney and Botany Bay local government areas. The project corridor is located from about five to twenty kilometres to the south and south-west of the central business district of Sydney. The project would traverse the suburbs of Beverly Hills, Kingsgrove, Bexley North, Earlwood, Bardwell Park, Bardwell Valley, Arncliffe, Wolli Creek, Tempe, Sydenham, St Peters, Alexandria and Mascot.

1.4 Secretary's environmental assessment requirements

In preparing this Technical Working Paper: Contamination, the Secretary's Environmental Assessment Requirements (SEARs) issued for the New M5 Project on 5 March 2015, and re-issued on 26 August 2015 have been addressed. The key matters raised by the Secretary for consideration in the Technical Working Paper: Contamination and where this report addresses the SEARs are outlined in **Table 1**.

Table 1 Secretary's Environmental Assessment Requirements for this report

Secretary's Environmental Assessment Requirement	Section in this report
Contaminated sites – including but not limited to:	
An assessment of contaminated sites in accordance with the guidelines made or approved under section 105 of the *Contaminated Land Management Act 1997*. The assessment must include details of proposed remediation measures and justification for the proposed measures in terms of the proposed final use of that land.	**Chapter 9.0**
Status of site contamination and suitability of the site for the proposal, including the suitability of the Alexandria Landfill site for the St Peters interchange.	**Chapter 9.0**
An assessment of the potential disturbance of contaminated bed sediments in the Alexandra Canal, and the interception of contaminated water from the Botany Sand Beds aquifer.	**Section 5.5.5** and **9.5**.

Secretary's Environmental Assessment Requirement	Section in this report
Having reference to the assessments conducted in satisfaction of the above, consideration of whether or not the a site auditor, accredited under the *Contaminated Land Management Act 1997*, has or will be engaged to issue a site audit statement to certify on the suitability of the current or proposed uses.	**Section 9.6** A site auditor has been engaged by SMC, on behalf of Roads and Maritime, to audit the Phase 2 ESA reports completed by AECOM for the Alexandria Landfill and Roads and Maritime owned property located at 5 and 5A Canal Road, St Peters. Further investigations, remedial action plans, long term site management plans and the Alexandria Landfill Closure Plan would also be audited (Appendix D of the EIS). Subject to the identification of future intrusive site investigations, remediation and validation requirements which may arise during the land acquisition and development process for the project, a site auditor may be required to certify the suitability of the land for the current or proposed land use.

The overall objectives of the Phase 1 ESA are to:

- Identify potential areas and contaminants of concern within the project disturbance footprint;
- Provide a preliminary and qualitative assessment of contamination risk posed to the proposed future land use, environment and construction; and
- Assess where further investigation should be undertaken or appropriate management procedures should be put in place for the project.

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2.0 Methodology

The Phase 1 ESA for the project was undertaken in the following key stages:

1) A preliminary screening of potential areas of environmental concern (AECs) and assessment followed by inspection of the project footprint
2) Secondary data review based on the findings of the preliminary screening and inspection
3) Preliminary assessment of identified AECs
4) Preparation of this Phase 1 ESA Report documenting the findings

This involved the following:

- Identification of contaminated sites listed on the NSW Environment Protection Authority's (EPA) website under either Section 58 or 60 of the *Contaminated Land Management Act 1997* (CLM Act)
- Identification of properties which are listed on the NSW Government Land and Property Information (LPI) central register of restrictions
- Review of historical aerial photographs for the Project Areas
- Sourcing and review of Section 149 certificates for identified properties of concern within the Project Areas
- Review of selected historical certificates of title
- Review of published maps of the area to gain an understanding of surface and subsurface conditions (e.g. geology, hydrogeology, soil, topography etc.)
- Search and review of information readily available through the internet (e.g. historical parish maps, Department of Primary Industries (Water) (DPI (Water)) registered groundwater bore database within identified areas of concern etc.)
- A review of existing reports relevant to the Project Areas (where available)
- A walkover of the identified project areas within the project footprint to verify site conditions compared to the document review, make a record of the general conditions and land uses and to identify potential sources of contamination along the route
- A preliminary assessment of the contamination risk posed to the future land use and construction activities.
- Preparation of this Phase 1 ESA report

Investigative work was conducted with reference to relevant parts of the following guidelines:

- *Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997 (*New South Wales Environment Protection Authority (NSW EPA, 2015) – used to evaluate potential contamination issues associated with the Project Areas, where required
- *Guidelines for the Site Auditor Scheme (2nd Edition)* (NSW Department of Environment and Conservation (DEC), 2006) – used to apply the NSW EPA decision processes for assessing and redevelopment of urban Sites
- National Environment Protection (Assessment of Site contamination) Measure (NEPM), 2013*. National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013 (National Environment Protection Council)* – considered throughout the assessment
- *Guidelines for Consultants Reporting on Contaminated Sites* (OEH, 2011) – followed throughout the assessment and during preparation of this report

2.1 Project Areas

This Phase 1 ESA focuses on proposed near surface disturbance areas associated with tunnel entry and exit points, ventilation facility locations, proposed sediment disturbance areas associated with project construction and construction staging areas (hereafter referred to as Project Areas) where exposure to potentially contaminated soil and groundwater is considered most likely to occur.

Areas located above the tunnel alignments have not been assessed in depth in this report due to the generally low likelihood of significant contamination being encountered at depth in bedrock. The assessment of groundwater impacts along the tunnel alignment was completed for the Technical Working Paper: Groundwater prepared for the project, which provides an assessment of potential groundwater impacts and management measures for groundwater encountered during construction and operation of the main alignment tunnels, portals and shafts.

Project Area 5 has also been subject to separate assessments, and the key findings of those investigations have been summarised in this ESA report, in **Section 2.2**.

The five Project Areas which have been identified and referred to in this report are:

- Project Area 1: Western surface works, extending west of King Georges Road, Beverly Hills to Kingsgrove Road, Kingsgrove
- Project Area 2: Kingsgrove Road surface works
- Project Area 3: Bexley Road surface works, located in areas in the vicinity of the Bexley Road interchange
- Project Area 4: Arncliffe surface works at Kogarah Golf Course
- Project Area 5: St Peters interchange and local road upgrades in the St Peters, Alexandria and Mascot

The locations of the Project Areas are shown on **Figure 2**.

Details on each Project Area and the project works undertaken within each Project Area is provided in **Table 2**.

Table 2 Project Areas

Project Area	Project Area description	Project component	LGA	Current Land Use	~ Area (ha)	Distance from CBD (kms)
1	General alignment of existing M5 East Motorway, as well as surrounding land corridor from King Georges Road, Beverly Hills to Kingsgrove Road, Kingsgrove. This area encompasses the western surface works for the project	Western surface works, including: - The Kingsgrove motorway operations complex - The Kingsgrove North construction compound (C1) - The Kingsgrove South construction compound (C2) - The Commercial Road construction compound (C3)	City of Canterbury Hurstville City Council	Commercial, industrial and open space/recreational	23.2	13 to 14
2	Alignment of existing M5 East Motorway.	Kingsgrove Road surface works associated with the installation of tolling infrastructure within the road reserve.	City of Canterbury	Roadway	0.6	13
3	General alignment of existing M5 East Motorway and surrounding land corridor between Lundy Avenue, Kingsgrove and Bexley Road, Bexley North	Bexley Road surface works, including: - The Bexley Road North construction compound (C4) - The Bexley Road South construction compound (C5) - The Bexley Road East construction compound (C6) - The Bexley Road South motorway operations complex (MOC2) - M5 East Motorway tolling infrastructure within the road reserve.	City of Canterbury	Commercial, industrial, open space/recreational and low density residential	3.3	12 to 12.5
4	Kogarah Golf Course, Arncliffe	Arncliffe surface works consisting of the Arncliffe construction compound (C7) and Arncliffe motorway operations complex (MOC3)	Rockdale City Council	Golf course	7.8	9

Project Area	Project Area description	Project component	LGA	Current Land Use	~ Area (ha)	Distance from CBD (kms)
5	Road alignments and blocks of land within the proposed St Peters interchange within the suburbs of St Peters, Alexandria and Mascot	- St Peters interchange and local road upgrades, including permanent road and ancillary operational infrastructure and bridges. - Construction compounds: • Canal Road construction compound (C8) • Campbell Road construction compound (C9) • Landfill closure construction compound (C10) • Burrows Road construction compound(C11) • Campbell Road bridge construction compound (C12) • Gardeners Road bridge construction compound (C13) • Sydney Park construction compound (C14).	Marrickville Council City of Botany Council City of Sydney Council	Commercial, industrial, medium-high density residential and open space/recreational	48.8	5

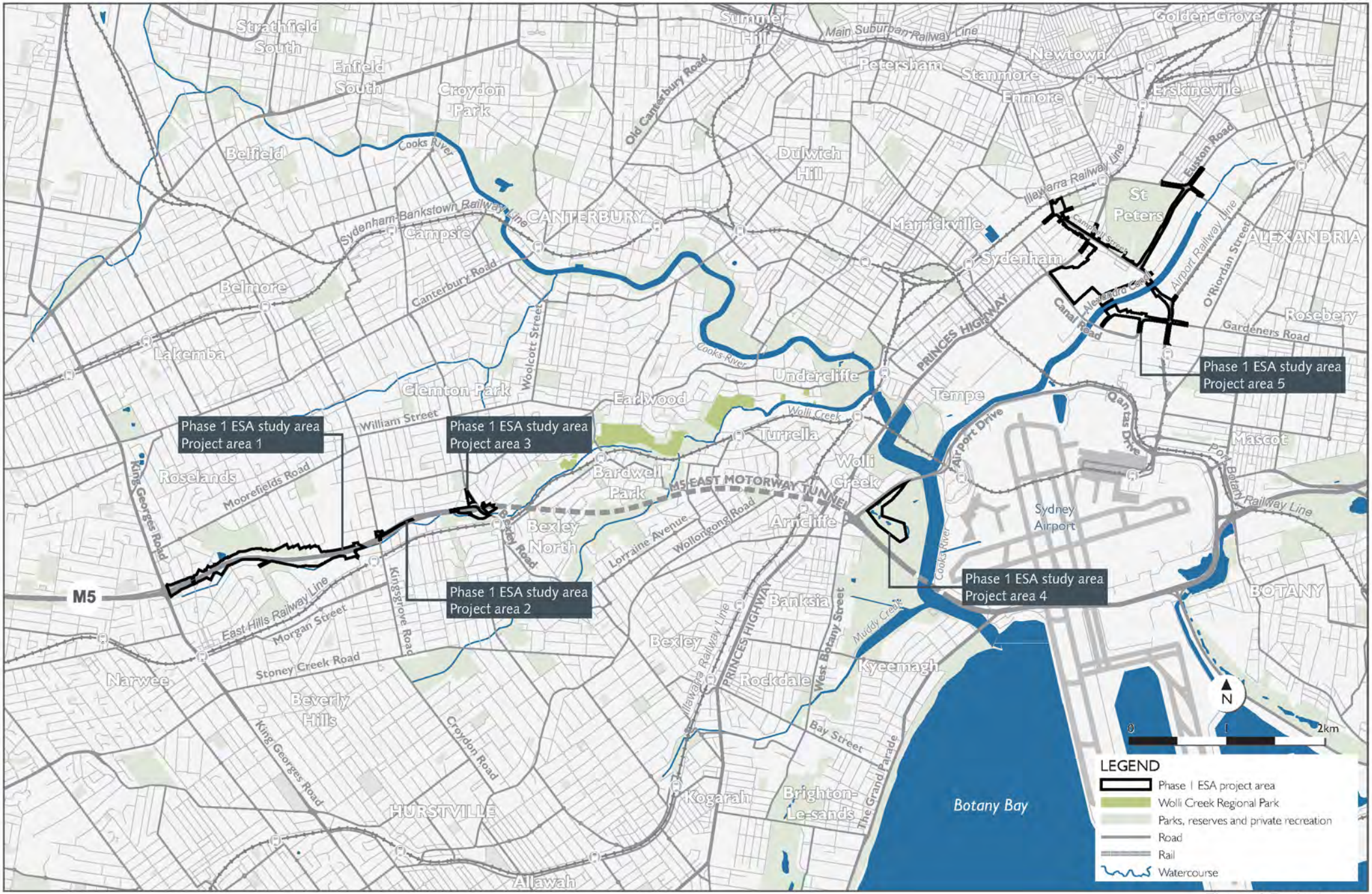

Figure 2 Project areas

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3.0 Preliminary screening assessment – Background documentation

An initial screening of available documentation relevant to the project was undertaken to obtain an overview of contamination issues within the project footprint. The documents reviewed are summarised in **Sections 3.1** and **3.2**.

3.1 Previous Environmental Reports – Project Area 1 and 3 to 5

AECOM has reviewed the following available previous environmental reports from properties located within the Project Areas 1 and 3 to 5. There were no previous environmental reports available for Project Area 2.

- AECOM, 2015a. WestConnex Stage 2: M5 KGRIU Noise Mound Stockpile, Factual Stockpile Contamination Characterisation Report. 60327128_NM_RPT01Draft_20150130_A. 30 January 2015
- AECOM, 2015b. WestConnex Stage 2: M5 Factual Contamination Assessment (Project Areas 1 and 3 to 5)

The reports are summarised below.

3.1.1 AECOM, 2015a. Report on Stockpile Contamination Characterisation

AECOM completed a soil sampling investigation on the noise mound stockpile located on the southern side of the M5 East Motorway between Ch2380 and Ch2640. This stockpile is located within Project Area 1 and within the area of the proposed King Georges Road Interchange Upgrade (KGRIU), Beverly Hills, NSW (refer to land use feature 10 in **Figure 3**, **Appendix A**). A hand auger was used to collect soil samples from 46 locations at depths ranging between 0.1 and 1.6 metres below ground surface (mbgs). Selected soil samples were analysed for PCoC including eight heavy metals, total recoverable hydrocarbons (TRH), Benzene, Toluene, Ethylbenzene, Xylene and Naphthalene (BTEXN), Poly-aromatic hydrocarbons (PAHs), organochlorine pesticides (OCPs), polychlorinated biphenyls (PCBs) and asbestos. The headspace of sub-samples were screened for volatile organic compounds (VOCs) using an isobutylene calibrated photoionisation detector (PID) in the field, and readings ranged from 0 to 1.7 parts per million (ppm).

Analytical results indicated that the soil samples met the criteria for General Solid Waste, in accordance with the NSW EPA (2014) *Waste Classification Guidelines, Part 1: Classifying Waste.* However, asbestos was identified in eight of 20 samples analysed, and hence the material met the classification of Special Waste (asbestos), in accordance with NSW EPA (2014).

AECOM recommended that additional sampling of the stockpile prior to future removal or disturbance may enable the further characterisation of the distribution of asbestos waste and other contaminants that may be present in the stockpile. Also, a further assessment would be necessary to appropriately classify materials within the stockpile at depth, which were unable to be sampled in this investigation.

3.1.2 AECOM, 2015b. WestConnex Stage 2: M5 Factual Contamination Assessment

AECOM was engaged to undertake a combined geotechnical and contamination investigation to obtain factual data along the alignment of the project. A total of 147 geotechnical boreholes were completed for this investigation. Of these, 67 boreholes were sampled and analysed for contamination parameters. A summary of boreholes and soil results for boreholes within or adjacent to Project Areas 1 and 3 to 4 is provided in **Table 3** below. For more information on the below refer to the investigation report (AECOM, 2015b).

Table 3 Summary of relevant soil data from the Stage 2: M5 Factual Contamination Assessment (AECOM, 2015b)

Boreholes	Soil Results Summary	Groundwater Results Summary
Project Area 1		
Beverly Grove Reserve (Part of M5 Linear Park) (refer to feature 11 on Figure 3): WCX_BH002 to WCXBH007 **M5 Truck Parking Bay:** WCXBH008 **Garema Circuit**: WCX_BH010 and WCX_BH011 **104 Vanessa Street**: WXCBH009 **30A Commercial Road:** WCX_BH012	- Fill depth ranged from 0.5 (BH002) to 12 metres bgs (BH007 at the top of the southern noise mound). - A mild tar/hydrocarbon odour was noted in soil from 1.5 metres to 4.95 metres in BH006 and 4.5 to 4.95 metres in BH007. Black staining was also noted at 1.5 metres in BH006. - Fill in BH003 was observed to contain friable Asbestos Containing Materials (ACM) from 0.9 to 1.45 metres bgs. - The following samples exceeded adopted screening criteria: • WCX_BH003_1.0-1.2 : 1.54 per cent Friable Asbestos • WCX_BH006_1.0-1.1: 0.001 per cent Friable Asbestos • WCX_BH012_3.75-3.8: 380 mg/kg TRH C_{10}-C_{16}	- BH006 was screened in bedrock and was measured to have a standing water level of 4.50 metres below top of casing (btoc)/20.21 metres AHD. The well was not sampled.
Project Area 3		
Roads and Maritime Vacant Land: WCX_BH072 and WCX_BH080 **Flat Rock Road**: WCX_BH083 **Kingsgrove Avenue Reserve**: WXC_BH138	- One sample from BH072 was analysed from 0.5 metres bgs. Lead (209 mg/kg) and zinc (225 mg/kg) concentrations were slightly elevated but less than the adopted screening criteria. - 2.5 metres of fill was encountered in BH072, 1.5 metres in BH080, 0.65 metres in BH083 and no fill was encountered in BH138.	- A monitoring well was installed in BH072 (MW072). The measured standing water level was 4.155 metres btoc/3.315 metres AHD and was noted to have a slight organic odour. - Concentrations of copper and zinc exceeded the ANZECC/ARMCANZ (2000) 95 per cent trigger level for marine ecosystems at seven and 0.018 mg/L respectively. - Low concentrations of TRH C10-C16 were detected at 0.35 mg/L.

Boreholes	Soil Results Summary	Groundwater Results Summary
Project Area 4		
Barton Park (located south of and adjacent to Project Area 4 footprint): WCX_BH159 WCX_BH029 WCX_BH071 WCX_BH063 WCX_BH064 WCX_BH065 WCX_BH068	- The fill varied from three to 6.7 metres deep consisting of clayey sand and silty sand with refuse in some locations and gravel sized fragments of concrete, plastic, ceramics, glass and brick. - Strong organic odours were noted in WCX_BH064 from 2.5 metres onwards. - Following results above adopted screening criteria: • WCX BH071_0.5-0.6 0.012 per cent Friable Asbestos in soil • WCX_BH159_5.0-5.45: TRH C6-C10 (90 mg/kg) and TRH C10-16 (2270 mg/kg), TRH>C16-C34 (24,200 mg/kg) • WCX_BH063_0.5-0.6: 0.005 per cent Friable Asbestos in soil • WCX_BH064_0.9: Bis(2-ethylhexyl) phthalate – 323 metres bgs	- Monitoring wells were installed and screened in bedrock in BH029 (MW029) and BH063 (MW063). - A shallow monitoring well was installed in the alluvium in BH063 (MW063A). - Standing water level ranged from 2.575 metres bgs/0.730 metres AHD (MW063A) to 6.744 metres bgs/-3.377 metres AHD (MW029). - Groundwater in MW063A was noted to have an organic odour. - Samples were analysed for TRH, BTEX, heavy metals, semi-volatile organic compounds (SVOCs), volatile organic compounds (VOCs), cations and anions. - Concentrations of zinc exceeded the ANZECC (2000) 95 per cent trigger level for marine ecosystems in the three wells (0.036 to 0.046 mg/L). All other parameters were less than the adopted assessment criteria.

3.2 Previous Environmental Reports Project Area 5

AECOM reviewed the following available previous environmental reports from properties located within the Project Area 5 footprint:

- AECOM, 2015b. WestConnex Stage 2: M5 Factual Contamination Assessment. 22 April 2015
- AECOM, 2014c. Phase 1 Environmental Site Assessment Alexandria Landfill Site Acquisition Area. 22 August 2014
- AECOM, 2015d. Phase 1 Environmental Site Assessment, Local Road Upgrades, St Peters, Mascot and Alexandria, NSW. 27 March 2015
- AECOM, 2015e. Phase 2 Environmental Site Assessment Alexandria Landfill, 5 and 5A Canal Road, St Peters, NSW. 60327128_Draft Phase 2 ESA Canal Rd_20150818_B. 18 August 2015
- AECOM, 2015f. Phase 2 Environmental Site Assessment Alexandria Landfill, 10-16 Albert Street, NSW. Final Draft, Rev B. 17 July 2015
- AECOM, 2015g. Alexandria Landfill Closure Hydrogeological Assessment, Alexandria Landfill, 10-16 Albert Street, St Peters, NSW. Draft, 30 June 2015
- AECOM, 2015h. Preliminary Waste Classification: Stockpile 21. 31 March 2015
- ENVIRON, 2015. Phase 2 Area Preliminary Stockpile Characterisation. 7 April 2015.

The reports are summarised below in **Section 3.2.1**to **3.2.8**.

AECOM has also reviewed previous environmental reports for the sediments in Alexandra Canal. There are proposed bridge crossings of the Alexandria Canal within the footprint of Project Area 5. The reports are listed below and summarised in **Section 3.2.10** to **3.2.14**:

- Woodward-Clyde (1998). *Final Report – Upper Alexandra Canal Sediment Management Study*. Prepared for Sydney Water Corporation.
- University of Queensland (2002). *Sediment-Water Column Interactions in Alexandra Canal Sydney. University of Queensland, Centre for Marine Studies*. Prepared for Woodward-Clyde
- OFS, 2002. Alexandra Canal Hydrographic Investigation, July to August 2001. Oceanographic Field Services Pty Ltd
- URS, 2003. *Sediment Remediation Options Study.* S: 18240/045/OPTIONS STUDY REPORT. April 2003
- AAJV, 2014. Green Square Stormwater Drain Project - Sediment Mobilisation Impact Assessment on Alexandra Canal

AECOM has reviewed the following available previous environmental reports for properties located adjacent to the Project Area 5 and summarised in **Sections 3.2.15** and **3.2.16**:

- GHD, 2013. *Marrickville Council, Camdenville Park, May Street, St Peters, NSW. Remedial and Construction Environmental Management Action Plan*. August 2013
- SMEC, 2012. *Advice Regarding the Contamination Status of the Property at 6A Huntley Street, Alexandria, NSW.* 12/0749C. 1 June 2012

3.2.1 AECOM, 2015b. WestConnex Stage 2: M5 Factual Contamination Assessment

As described previously in **Section 3.1.2**, AECOM was engaged to undertake a combined geotechnical and contamination investigation to obtain factual data along the alignment of the project. A summary of boreholes and soil results for boreholes within Project Area 5 is provided in **Table 4** below. Further details can be obtained from the investigation report (AECOM, 2015b).

Table 4 Summary of relevant soil data from the Stage 2: M5 Factual Contamination Assessment (AECOM, 2015b)

Boreholes	Soil Results Summary	Groundwater Results Summary
Project Area 5		
Euston Road: WCX_BH130 to WCX_BH131.	- Shallow boreholes drilled to maximum two metres bgs - No odour, staining or ACM observed	- No wells installed.
Campbell Street: WCX_BH116, WCX_BH126, WCX_BH111.	- Fill encountered to one metre in WCX_BH116 and 0.8 metres in BH111. - No odour, staining or ACM in the boreholes	- No wells installed
Campbell Road: WCX_BH121, WCX_BH122, WCX_BH128, WCX_BH123, WCX_BH049.	- Fill encountered to 0.9 metres in BH121, six metres in BH122 and 2.5 metres in BH123 and 1.1 metres in BH049. - WCX_BH049: Strong hydrocarbon odour and PID VOC field measurement of 7200 ppm from samples from one to three metres bgs. The PID was calibrated with 100 ppm Isobutylene to detect VOCs.WCXBH049_2.3-2.4 TRH C_6-C_{10} (1850 mg/kg) and C_{10}-C_{16} (160 mg/kg). - WCX_BH122_0.2-0.3: 0.21 per cent ACM in soil	- One well was installed in bedrock in BH122 (MW122). The measured standing water level was 3.90 metres bgs/1.82 metres AHD. - Concentrations of ammonia were slightly elevated, when compared to the other results in the same batch of samples, at 8.7 mg/L and the purged water had a methane odour. - Copper and zinc exceeded the ANZECC 95 per cent trigger level for marine ecosystems at three mg/L and 0.068 mg/L respectively.

Boreholes	Soil Results Summary	Groundwater Results Summary
Alexandra Canal: WCX_BH133	- Fill encountered to 2.8 metres bgs with inclusions of furnace slag. - Clayey Peat encountered from 2.8 to 4.5 metres. - Sandy Peat encountered from 4.5 to six metres bgs.	- No wells installed
Bourke Road: WXC_BH134, WCXBH135	- Shallow boreholes completed to two metres and 0.5 metres respectively.	- No wells installed
Barwon Park Road: WCX_BH113 to WXCBH115.	- Fill encountered to 28.4 metres in WCX_BH113, 7 m in WCX_BH114 and 21.25 m in WCX_BH115. - WCX_BH113_7.7-7.9: TRH C_6-C_{10} (718 mg/kg) - WCX_BH113_12.0-12.2: TRH C_{10}-C_{16} (260 mg/kg) - WCX_BH115_10.5-10.7: 0.65% ACM in soil and 0.339 per cent Friable Asbestos in soil	- One monitoring well was installed in BH115 (MW155) and the water level measured at 15.37 metres btoc/4.96 m AHD. - Concentrations of copper and zinc exceeded the ANZECC 95 per cent trigger level for marine ecosystems at 11 mg/L and 0.02 mg/L respectively. - Low concentrations of TRH C_{10}-C_{40} were detected at 0.33 mg/L.
1 Canal Road: WCX_BH110	- Fill encountered to three metres with no staining, odours or ACM observed.	- No wells installed
Alexandria Landfill: WCX_BH045 to WCXBH60	Landfill material consisted mainly of soil mixed with timber and demolition type wastes. The maximum depth of the landfill was 51 metres bgs (-44.26 metres AHD). - WCXBH047_4.5-4.95: lead (5950 mg/kg) - WCXBH049_2.3-2.4 (TRH C_6-C_{10} 1850 mg/kg and TRH C_{10}-C_{16} 160 mg/kg) - WCX_BH050_17.2-17.65:0.019 per cent Friable Asbestos in soil - WCXBH052_12.5-12.7: lead (8450 mg/kg) - WCXBH054_19.0-19.5: lead (10,900 mg/kg) - WCXBH054_22.5-23: 0.06 per cent ACM in soil - WCXBH054_36.2-36.3: TRH C_6-C_{10} (223 mg/kg) - WCXBH055_0.5-0.6: lead (1640 mg/kg) - WCXBH056_3.8-4.0: lead (2190 mg/kg) - WCXBH056_5.8-6.0: lead (2560 mg/kg) - WCXBH056_21.4-21.6: lead (3550 mg/kg); - WCXBH056_26.2-26.4: PAHs (53.6 mg/kg). - WCXBH057_0.5-0.6: TRH C_{10}-C_{16} (560 mg/kg) - WCXBH057_3.2-3.4: lead (2560 mg/kg)	- No wells installed

Boreholes	Soil Results Summary	Groundwater Results Summary
5A Canal Road: WCX_BH051	- 6.5 metres of fill encountered, no samples analysed (geotechnical borehole only)	- No wells installed

3.2.2 AECOM 2014a. Phase 1 ESA, Alexandria Landfill Site Acquisition Area, St Peters, NSW

AECOM prepared a Phase 1 ESA for the property identified as the Dial a Dump (DADI) Site Acquisition Area, located between Princes Highway, Canal Road, Burrows Road and Campbell Street in Alexandria, NSW. The assessment area is within Project Area 5. The DADI Site Acquisition Area included the Alexandria Landfill, the Roads and Maritime property located on Canal Road (Canal Road site) and several other industrial properties surrounding the Alexandria Landfill.

The assessment was undertaken to evaluate the potential for soil and/or groundwater contamination to be present in the vicinity of the St Peters interchange proposed to be constructed as part of the WestConnex project. The key findings were:

- The Alexandria Landfill was a brickworks quarry between 1908 and 1962. Shale for brick manufacturing was mined from the large quarry which comprised much of the western half of the DADI Site Acquisition Area
- The former quarry was used as a solid waste landfill owned and operated by the City of Sydney Council from 1988 to 2002. It was then acquired by Alexandria Landfill Pty Ltd. A review of information revealed that the acceptance of waste at Alexandria Landfill appears to have been less regulated during the City of Sydney Council tenure of the site and hence there is a likelihood that more contaminated material was disposed of at the site during this time, and buried at depth. Hence, there is a high risk that current and past land uses may have resulted in significant contamination of the site
- Daily capping cover has been placed over the buried waste. The base of the landfill was not lined; as such fractures and joints within the underling shale may provide migration pathways for contamination, leachate and gas to enter the Botany Aquifer
- Based on available information waste disposal at Alexandria Landfill including the following:
    - 1988 to 1996: Non-putrescible solid waste, incinerator ash, demolition waste (including asbestos), industrial and commercial waste and incinerated green waste
    - 1996: No asbestos or incinerated green waste was accepted
    - 1999: Non-approved contaminated waste accepted, some workers were fined for accepting bribes for allowing waste to be disposed of illegally at the site
    - 2002 to 2014: Licenced to accept general solid waste (non-putrescible, no garden or wood waste), shredded tyres and asbestos
    - 19 December 2014: Acquisition of landfill by WDA. Cessation of landfilling and waste transfer activities
- Landfill gases including methane, hydrogen sulphide and carbon dioxide have been detected within Alexandria Landfill. Gas mitigation measures have been implemented in the western portion of the site
- Groundwater and leachate monitoring have revealed elevated concentrations of ammonia, heavy metals and phenols
- At the Canal Road site, previous investigations identified elevated levels of heavy metals (particularly lead and zinc) in fill within the site and in the location of the former lead smelter. It was understood that some capping of contaminated materials had been undertaken in 1999, to make the property suitable for commercial/industrial land use. Stockpiles of soil and demolition waste material were observed during a site inspection
- Other properties within the site have been subject to activities that may have caused soil and groundwater contamination, including a petrol station, market gardens, demolition of buildings containing hazardous materials, importation of fill of unknown origin, workshops associated with the former brick works, manufacturing factories and logistics depots. No contamination reports were available or known to exist for these sites

- Surrounding land uses, topographically up gradient to the site, that have had the potential to act as off-site sources of contamination that could potentially migrate onto Site via groundwater or soil vapour included former landfills in Sydney Park, chemical manufacture, petrol stations, drum reconditioning and commercial dry cleaning

The following recommendations were made:

- An intrusive soil and groundwater investigation be undertaken, in accordance with ASC NEPM (2013) guidelines, to further evaluate areas and contaminants of concern identified in the Phase 1 ESA
- The Alexandria Landfill would be required to continue to be regulated under the Environmental Protection Licences (EPLs) issued under the *Protection of Environment Operations Act 1997* until stabilisation criteria set by the NSW EPA are met following landfill closure. If the site was to be redeveloped, the site would need to be investigated in accordance with NSW EPA Hazardous Ground Gas (HGG) guidelines (NSW EPA, 2012) and assessed in accordance with the ASC NEPM (2013)

3.2.3 AECOM 2015c. Phase 1 ESA: Local Roads, St Peters

AECOM prepared a Phase 1 ESA for an area consisting of up to 281 properties located along a length of proposed local road upgrades associated with the St Peters interchange located between Campbell Street, Euston Road and Bourke Road in the suburbs of Alexandria, Mascot and St Peters, NSW (the Local Roads Area). The Local Roads Area is contained within Project Area 5.

The Phase 1 was undertaken to evaluate the potential for soil and/or groundwater contamination to be present in the vicinity of the Local Roads Area. The key findings included:

- Various commercial/industrial properties were located to the northeast, southeast, south, further north and further west of the Local Roads Area. These land uses which included manufacturing and workshops were identified as potential sources of contamination
- Areas of historical landfilling within the former brick works quarries in Sydney Park, Camdenville Park and Alexandria Landfill were located adjacent to the Local Roads Area
- Alexandra Canal contains contaminated sediments from historical discharges from surrounding industrial land use and was located within the Local Roads Area
- Based on a review of the NSW EPA contaminated sites register and council searches, 16 properties were identified as being of potential contamination concern. These properties generally consisted of petrol stations, landfills, industrial properties (including waste processing facilities), previously identified contaminated sites or sites identified with a high risk of acid sulfate soils
- It was concluded that there was a high potential for localised areas of soil, fill and groundwater contamination associated with historically contaminating land uses to be encountered within the Local Roads Area and the following recommendations were made:
    - Completion of intrusive soil and groundwater investigations in the areas of concern to further evaluate the presence and extent of contamination in areas identified to be directly affected or disturbed by the proposed local road upgrade works
    - Intrusive soil investigations should be undertaken prior to disturbance of the Local Roads Area, to reduce the incidence of unexpected finds which may result in delays to construction
    - Completion of a hazardous materials audit on buildings requiring demolition, disturbance and/or alteration as a result of the works
    - Evaluation of the potential for disturbance of sediment associated with proposed bridge construction works in Alexandra Canal. If the proposed bridge construction methodology is likely to disturb contaminated sediments in the bed of the Canal, further assessment of sediment condition in proximity to the proposed bridge pile disturbance footprint is recommended
    - Preparation of an environmental management plan (EMP) incorporating unexpected finds procedure.

3.2.4 AECOM 2015d. Phase 2 ESA, 5 and 5A Canal Road, NSW

AECOM completed a Phase 2 ESA for the portion of land identified as 5/5A Canal Road, St Peters, NSW (Canal Road site). The Canal Road site is located on the southern boundary of the Alexandria Landfill. AECOM sampled 28 soil boreholes, installed and sampled six groundwater monitoring wells and one landfill gas monitoring well.

The report made the following findings:

- Fill across the Canal Road site was generally between two and four metres thick and was deeper towards the east boundary of the site, at 7.3 metres bgs (-2.7 metres AHD). The fill in the south-eastern portion of the site contained a high content, and in some locations a distinct layer, of ash and slag. Where the ash and slag was present it was overlain by fill containing demolition type waste inclusions. The fill in the north-western half of the site generally contained demolition type waste inclusions and limited ash and slag
- Evidence of a capping layer was present beneath a large stockpile (stockpile 1) as a 0.3 to 0.9 metres thick layer of high plasticity red-brown clay and orange-brown gravelly clay. The layer was observed to be generally free of contamination and anthropogenic inclusions
- Lead 'hotspots' (hotspots are results exceeding 250 per cent of the adopted assessment criteria) were distributed across all parts of the Canal Road Site, with the highest concentration (58,800 mg/kg) detected in the location of the former metal smelter. The highest concentrations of lead tended to be present in the deeper portion of the fill, between one and four metres bgs. A hotspot of arsenic (4,050 mg/kg) was present in fill at one metre bgs in the southern corner of the site. The sample was collected from fill described as dark grey and containing glass and ceramic
- Deionised water leachate analysis of five samples of varying heavy metals concentrations indicate that heavy metals, particularly chromium, copper, lead and zinc, have the potential to leach under neutral conditions and contaminate underlying groundwater
- PAH impacted fill with carcinogenic PAH (CPAH) concentrations exceeding the adopted open space criteria, were identified in Lot 14, along the south-eastern boundary of the site. A CPAH hotspot was identified at one location, BH306, at 3.2 metres bgs
- Elevated TRH C_{10}-C_{40} fractions and PCB concentrations were identified across the north-western portion of the site, beneath the large stockpile of soil and demolition waste. The elevated concentrations were associated with observations of an odour described as chemical or hydrocarbon like and dark grey to black gravelly sand and silty sand and slightly elevated PID VOC readings (>50 ppm).. The identified PCB and TRH hotspots were distributed between the location of the Ausgrid substation and the northern boundary of the site
- TRH C_{16}-C_{34} impacts were also identified along the south-eastern boundary of the Canal Road site. The impacts corresponded with the presence of ash containing fill material. TRH impacts at one location were identified at the fill/natural and groundwater interface and corresponded with observations of hydrocarbon odour
- Low concentrations of dioxins (2,3,7,8 TCDD) were detected in two samples analysed from the area of fill impacted by TRH and PCB contamination. The total dioxins as the WHO TEQ for 2,3,7,8 TCDD, slightly exceeded the US EPA (2015) Regional Screening Levels (RSLs)
- Asbestos was detected in fill along the south-eastern boundary of the site within Lot 14, in the central portion of the Canal Road site and at the north-west end of the Canal Road site. The asbestos was mainly detected in the form of friable asbestos containing material (ACM) and chrysotile fibre bundles, with limited bonded ACM identified. The detections corresponded with the presence of demolition type waste inclusions in the fill. The most extensive presence of asbestos was identified in the eastern corner of the site between 2.0 to 6.8 metres bgs. Based on the observations and analytical results, asbestos was likely to be randomly present throughout the fill across the Canal Road site and potentially concentrated in pockets of fill with high proportions of demolition waste. As most of the detections were in a friable state there is a high probability that most of the fill within the Canal Road site, particularly fill containing demolition waste could contain friable asbestos and fibres

- One large stockpile (stockpile 1) and two smaller stockpiles (stockpiles 2 and 3) were present on the site and consisted of soil with inclusions of demolition waste such as bricks, concrete, tiles, steel, timber and ACM. There was one exceedence of adopted open space land use criteria for lead in stockpile 1. All other potential contaminants of concern (PCoC) were less than the adopted human health based land use criteria. Bonded ACM and friable ACM and fibre bundles were detected in all three stockpiles
- The natural soil underlying the fill was generally free of observations of contamination with the exception of hydrocarbon and tar odours observed in two boreholes. CPAH slightly exceeded the adopted open space land use criteria just below the fill/natural interface in one location. A lead hotspot was identified at one location at four metres bgs (49,700 mg/kg), exceeding 250 per cent of the adopted assessment criteria for open space and industrial land use. A lead exceedence was detected at another location at 3.1 metres bgs (922 mg/kg), exceeding the adopted open land use criteria
- Sulfur trial results from the samples analysed exceeded the adopted ASSMAC (1998) assessment criteria, indicating that an acid sulfate soil management plan may be required if future disturbance of underlying natural soils and sediments is anticipated as part of future construction works
- The adopted ecological groundwater criteria were exceeded for ammonia (as N), cadmium, copper, lead, nickel, fluoranthene, zinc and bis(2-ethylhexyl) phthalate in groundwater. Concentrations of zinc exceeded the ANZECC (2000) 95 per cent marine trigger values. Bis(2-ethylhexyl) phthalate was detected at concentrations greater than the ANZECC (2000) marine medium to low reliability trigger values in the northwest potion of the Canal Road site
- Groundwater contamination within the site has likely migrated from nearby industrial land use as well as the leaching of contamination from the overlying fill and historical land uses on the Canal Road site and adjacent sites
- Methane was not detected in the monitoring wells monitored and PCoC were not detected at concentrations above the adopted assessment criteria in the sample analysed. It was however noted that preferential pathways could exist in the subsurface between the Alexandria Landfill and the site and future mitigation measures around the perimeter of the landfill should be considered to protect site users
- Based on the findings and review of the Conceptual Site Model (CSM), it was concluded that the Canal Road site in its current condition did not meet the proposed land use criteria; however it was considered that the Canal Road Site could be made suitable if appropriate remediation and management actions were implemented. It was recommended that a remediation action plan (RAP) detailing options for remediation and/or management of identified contamination should be prepared and submitted to an appointed NSW EPA accredited Site Auditor. The RAP should state the preferred strategy to render the Canal Road site suitable for the proposed land use(s) and detail validation requirements necessary to demonstrate successful completion of the remedial works and requirements for a long term management plan if required.

3.2.5 AECOM 2015e. Phase 2 ESA, Alexandria Landfill, NSW

AECOM completed a Phase 2 ESA for the Alexandria Landfill identified as Lot 2 DP1168612, 10-16 Albert Street, St Peters, NSW Roads and Maritime owned property identified as Lot 1 DP88087 and Lot B DP376645, Campbell Avenue, St Peters, NSW (commonly referred to as Bradshaw Mountain).

The scope of work included drilling 93 boreholes across the Alexandria Landfill and Bradshaw Mountain, installation of 12 groundwater monitoring wells and 13 landfill gas monitoring wells. The following findings were reported:

- Fill was encountered at depths from 1.3 metres bgs (BH349) in the northern portion of the landfill site to 41 metres bgs (BH343) in deepest portion of the former quarry pit. The depth of the fill in the southeast portion of the Alexandria Landfill, outside the former brick pit quarry ranged between 1.5 metres bgs to nine metres bgs, with an average depth of five metres bgs
- The thickness of natural soil underlying the fill ranged from not present within the former brick pit quarry to 9.3 metres thick in the eastern portion of the landfill site. The thickness of the natural soil in the eastern portion of the landfill site, outside the former quarry pit, was an average of 7.5 metres thick. The soils consisted of sand, sandy clay, clayey sand with shells and clay
- The general geological profile encountered beneath the site was laminite underlain by siltstone and then sandstone. The base of the quarry pit was mainly siltstone and laminate, with the exception of part of the southwest portion of the pit which was directly underlain by sandstone

- The inferred groundwater flow direction for the groundwater in the Botany Sands and landfill was towards the main leachate sump (LP1) in the southwest portion of the landfill site and flowing from all directions
- Concentrations of PCoC within the Alexandria Landfill variably exceeded the adopted human-health and ecological based assessment criteria for both the open space and commercial/industrial land use scenarios. The main PCoC identified by the assessment were lead, CPAHs, TRH, dioxins and asbestos. Contamination was mainly confined to the fill and appears randomly distributed both laterally and throughout the full depth of the landfill.
- Contamination exceeding the adopted human health and ecological assessment criteria was not identified in underlying natural soils. Natural soils were however assessed as likely to contain potential acid sulfate soils (PASS)
- A stockpile of crushed sandstone referred to as Bradshaw Mountain, met the criteria set out in the *Resource Recovery Order under Part 9, Clause 93 of the Protection of the Environment Operations (Waste) Regulation 2014* - The excavated natural material order 2014 (ENM Exemption). The sampling density met the requirements of the ENM Exemption. The fill underlying the stockpile also met the adopted human health based assessment criteria with the exception of the detection of friable asbestos in a single location and one exceedance of CPAH Based on the site methane gas concentrations and flow rates measured, the site was classified as Characteristic Gas Situation 4 (moderate to high risk) in the Modified Wilson and Card Classification (MWCC) (NSW EPA, 2012). Other landfill gases including carbon dioxide and carbon monoxide were detected at high concentrations. Concentrations of hydrogen sulfide significantly exceeded the adopted site assessment criteria. Detected concentrations of landfill gases at the locations analysed were found to be greater than the NSW EPA (1996) guideline value at the landfill site boundary
- The main PCoC identified in leachate, which significantly exceeded the adopted assessment criteria, were ammonia and TRH >C10-C34 fractions, as well as the presence of potential diesel/oil light non-aqueous phase liquid (LNAPL) identified in one monitoring well in the centre of the landfill. Heavy metal concentrations were slightly elevated in leachate and the bedrock aquifer at a similar order of magnitude. Ammonia concentrations were considerably less in the Botany Sands and bedrock aquifers; however, still exceeded the adopted ecological assessment criteria
- Based on the findings and review of the CSM, it was concluded that the landfill site in its current condition did not meet the proposed land use criteria of motorway interchange and open space parkland; however, it was considered that the landfill site could be made suitable if appropriate remediation and management actions were adopted and implemented. It was recommended that further delineation and monitoring of landfill gases was required and that a RAP and Landfill Closure Plan be prepared for the site.

3.2.6 AECOM, 2015f. Alexandria Landfill Closure Hydrogeological Assessment, Alexandria Landfill, 10-16 Albert Street, St Peters, NSW

AECOM was engaged to conduct hydrogeological assessment to investigate the hydraulic interactions between the Alexandria Landfill comprising of Lot 2 in DP 1168612 (referred to as the landfill site) and surrounding environment, including groundwater within the Ashfield Shale, Botany Sands aquifer and surface water within Alexandra Canal. The following findings were made:

- Groundwater at the landfill site is located within the fill, Ashfield Shale surrounding the landfill and Botany Sands
- Leachate is pumped from the landfill in accordance with the EPL, treated and discharged to sewer under a trade waste agreement (TWA). As part of the project, the existing leachate management system is to be replaced by a new leachate treatment plant. The leachate pumping system is required to be pumped continuously to maintain the appropriate leachate level within the landfill
- Pumping the leachate from the landfill artificially lowers the groundwater levels within the fill and Ashfield Shale
- Inflow to the landfill that creates leachate includes groundwater in order of the major contributor is by rainfall infiltration, inflow from the Botany Sands and inflow from the Ashfield Shale
- Rainfall recharge to the Alexandria Landfill would be significantly reduced where a landfill cap is to be installed and rainfall across much of the footprint is to be directed off site via drainage to be constructed as part of the future interchange

- Two groundwater extraction systems, (BS1 and BS2) located on the southern side of the landfill, extracted groundwater from the Botany Sands to reduce inflow to the pit. Both these extraction points are unlicensed with DPI (Water)
- A water balance conducted by IGGC (2012) indicated that rainfall via infiltration (63 per cent) was the main contributor to leachate generation followed by inflow from the Botany Sands (36 per cent) and shale (one per cent)
- The interpretation of hydrographs generated during the investigation indicated the fill, shale and Botany Sands respond quickly to rainfall recharge, although the levels in the shale respond and decline rapidly whereas the decline in the Botany Sands and fill is slower. Superimposed over the hydrographs for shale and Botany Sands were cyclic tidal influences
- Groundwater gauging and plotting groundwater levels confirmed there was radial drainage within the fill and shale (surrounding the landfill) centred on the leachate pump. Groundwater levels and survey level indicated that flow within the Botany Sands was discharging into the landfill and Alexandra Canal indicating there was a groundwater mound between the edge of the landfill and Alexandra Canal
- Calculations of groundwater flow to the landfill using the derived hydraulic conductivity values, hydraulic gradients and saturated aquifer thicknesses from the investigation confirmed the leachate generating inflow calculated by IGGC (2012)
- During construction of the project, piles are to be constructed which would require dewatering. During construction significant dewatering is not expected to be required as long as the leachate pumping system remains operational. There may be some localised perched groundwater that may require dewatering
- Leachate generation after the construction of the interchange would be reduced by the reduction of rainfall infiltration by the construction of a landfill cap and drainage associated with the future interchange that would direct rainfall runoff off-site
- Leachate generation can be further reduced by restricting the flow within the Botany Sands entering the landfill.

The report concluded that the leachate pumping system would be required to remain in operation during the construction and operation of the future St Peters interchange to maintain groundwater levels within the fill and shale below the finished road levels. Leachate would continue to be generated and would require treatment during the construction and operations of the interchange. Leachate generation via rainfall recharge is expected to be significantly reduced once the interchange is constructed, as the landfill cap would be installed and drainage would direct water off-site. It was recommended that leachate generation from the Botany Sands can be further reduced by either the extension of the groundwater abstraction system or the construction of a cut-off wall socketed into the weathered shale. The cut-off wall has the advantage of locally reversing groundwater flows causing groundwater to naturally discharge into the Alexandra Canal, negating the requirement for permanent dewatering licensing and having no running costs and minimal maintenance.

Since this report was completed, the existing leachate treatment plant is currently being upgraded as part of an effluent improvement program that has been agreed to with Sydney Water. The existing leachate treatment plant is to be fully compliant with the treatment/discharge requirements of the Sydney Water trade waste agreement.

3.2.7 AECOM, 2015g. Preliminary Waste Classification: Stockpile 21

AECOM completed the *Preliminary Waste Classification: Stockpile 21, 10-16 Albert Street, Alexandria Landfill, St Peters, NSW* (AECOM, 2015d) report using soil results obtained as part of the Phase 2 ESA (AECOM,2015d). The objective of the report was to provide an indication of the likely waste classification of Stockpile 21.

Stockpile 21 was located in the western corner of the Alexandria Landfill within the licensed recycling premises. Stockpile 21 was subject to a number of NSW EPA issued clean-up notices (1128662 dated 8 June 2011, 1500750 dated 2 September 2011, 1502233 dated 2 November 2011 and 1507165 dated 3 August 2012) issued to Boiling Pty Ltd under Environment Protection Licence (EPL) number 12,594 on 1 August 2011. The clean-up notice was in relation to asbestos and black sludgy material observed during a site inspection by the NSW EPA of stockpiles identified as 246, 247 and 21 on the Vekta Pty Ltd volumetric survey dated 22 June 2011. The volumetric survey, which was completed on behalf of the licensee, reported that there was 164,995 cubic metres of material in the stockpiles.

The document concluded that the Stockpile 21 met the General Solid Waste / Special Waste (Asbestos) classification with the exception of the following:

- One sample, BH378_9.0-9.1, which exceeded the SCC1 threshold criteria for lead and is therefore classified as Restricted Solid Waste
- One sample, WCXBH048_10.6-10.8, which exceeded the SCC1 threshold criteria for benzo(a)pyrene and is therefore classified as Restricted Solid Waste

Although the number of samples collected did not meet the sampling density recommended in the ASC NEPM (2013), the reported data was considered adequate to provide an indicative waste classification of material comprising the Stockpile 21 at the locations sampled.

3.2.8 AECOM 2015h. Alexandra Landfill: Landfill Closure Management Plan

AECOM was engaged to prepare a Landfill Closure Management Plan (LCMP) for the Alexandria Landfill, St Peters Site. The LCMP was prepared to provide a landfill closure and environmental management and monitoring framework to be implemented both during and post landfill closure. The LCMP documents the proposed final landform, capping detail, leachate, gas management and monitoring protocols proposed to be adopted as part of the landfill closure process.

The LCMP documented protocols designed to set out a program for reducing environmental harm after closure, including the following:

- An indicative program for the closure and stabilisation of the landfill
- Development of a final indicative capping design (and landform) for implementation at the site
- Specification of post-closure management and monitoring measures for leachate, stormwater, landfill gas, odour, dust, litter and final cap integrity
- Consideration of and consistency with applicable conditions of the development consent or other planning approvals that apply to the premises
- Development of a contact register of persons in the event of site issues (for example, odour emissions)

In addition to the above, the LCMP also includes mitigation, monitoring and measurement measures relating to:

- Asbestos management
- Groundwater and leachate monitoring
- Leachate extraction management
- Landfill gas extraction management
- The proposed location of landfill gas and leachate management infrastructure, including the location of the gas flare

It is noted that the monitoring and management plans provided in the LCMP were indicative and subject to change based on finalisation of the detailed design for St Peters interchange.

It is noted that NSW EPA provided general endorsement of the LCMP on 8 July 2015. Some updates to the LCMP have occurred since this date as part of the St Peters interchange design development. The updated LCMP is provided as an appendix to the EIS (Appendix F). The finalisation and approval of the LCMP would be undertaken as part of the planning consent for the project.

3.2.9 ENVIRON, 2015. Phase 2 Area Preliminary Stockpile Characterisation

ENVIRON Australia Pty Ltd (ENVIRON) prepared the *Phase 2 Area Preliminary Stockpile Characterisation, Alexandria Landfill, 10 Albert Street, St Peters, New South Wales* (ENVIRON, 2015) report. The report was a preliminary characterisation of all identified stockpiles (with the exception of stockpiles 21a and 21b) located in Alexandria Landfill for the potential re-use under existing Resource Recovery Orders and or for off-site disposal. The sampling and analysis was undertaken in March 2015 and included sampling of all stockpiles. A summary of the classifications is provided in **Table 5** below.

Table 5 Environ (2015) stockpile classification summary

Classification	Stockpiles
Resource Recovery Orders	
Potentially suitable for re-use under the Recovered Aggregates Order or are suitable for re-use under the Order with further grading/sizing of material	SP290a, SP350, SP365, SP378.1, SP381, SP404 and SP412c
Potentially suitable for re-use under the Recovered Fines Order (batch process/ continuous process) or are suitable for re-use under the Order with further grading/sizing of material	SP396 and SP290a
Not considered suitable due to the presence of asbestos	SP290c, SP349, SP406 and SP412a
Require further processing and/or screening to meet chemical or physical attributes as specified under the relevant Resource Recovery Orders	All other stockpiles not listed above
Waste Classification	
Preliminary classified as Hazardous Waste	SP246, SP294, SP409 and SP416
Special Waste Asbestos/General Solid Waste	SP349
Special Waste Asbestos/Restricted Solid Waste	SP290c, SP406, SP412c
General Solid Waste (non-putrescible)	All other stockpiles not listed above

Friable asbestos was identified in stockpile SP290c, SP406 and SP412a and bonded ACM was identified in SP349.The waste classifications exceeding the NSW EPA (2014) threshold values for general solid waste (CT1), were due to concentrations of either lead, benzo(a)pyrene, total PAHs.

3.2.10 Woodward-Clyde, 1998. Upper Alexandra Canal Sediment Management Study

The Upper Alexandra Canal Sediment Management Study was prepared for the Sydney Water Corporation (Woodward-Clyde, 1998). The purpose of the report was to use existing information obtained from the University of Sydney studies to:

- Characterise the type of contamination present in sediments in the Upper Canal and assess the potential impact on water quality
- Develop on-going sediment management options and identify costs and timeframes for the options

Information on the contamination status of the sediments at the time contained within the report is summarised below.

- Heavy metals particularly copper, lead and zinc were at concentrations reported to be among the highest recorded in NSW estuarine sediments. Other contaminants detected included PCBs, HCBs, aldrin, chlordane, DDT, DDE, DDD, PAHs and oil and grease
- The range of concentrations of contaminants in the Alexandra Canal reported for the stretch of canal between Ricketty Street Bridge and the footbridge near Campbell Road and in the vicinity of the proposed WestConnex Local Roads bridges are summarised in **Table 6** below

The range of concentrations of contaminants in the Alexandra Canal reported for the stretch of canal between Ricketty Street Bridge and the Cooks River and in the vicinity of the likely crossings required for the future Sydney Gateway project are summarised in **Table 6** and **Table 7**

A summary of the findings and recommendations are provided below.

- The canal was likely to act as a sink for catchment derived contamination due to low flow velocities, however under high flow velocities during intense rainfall events, the high flows generated may act as a source of contamination to Botany Bay due to re-suspension of sediments from scouring of the bed sediments
- Identified data gaps included that an extended analytical suite had not been undertaken for a full range of potential industrial contaminants and there had been no vertical delineation of contamination
- The sediment management options described included the 'do nothing' option or remediation of up to 470 000 cubic metres of contaminated sediments by:
    - Capping *in-situ*
    - Excavation and disposal to landfill
    - Excavation and treatment and then beneficial re-use
    - Excavation, placement on land and then capping
- It was suggested that stormwater and groundwater inputs into the canal should be improved prior to sediment remediation due to the potential of ongoing sediment pollution input from surrounding urban and industrial sources
- Investigations recommended to be undertaken included:
    - A hydraulic study to inform options and stormwater quality improvements
    - Comprehensive analysis including SVOC scan, leachability testing and acid sulfate soil generation testing
    - Evaluation of bed load re-suspension and evaluation of processes of contaminant desorption into the canal water
    - Targeted investigations into the nature and extent of contamination entering the canal via drains.

Table 6 Summary of concentrations of contaminants in samples collected between the stretch of Alexandra Canal between Ricketty Street Bridge and the footbridge north of Campbell Road [data from Woodward-Clyde (1998)]

Parameter	ANZECC (2000) values sediment quality criteria		Sample identification				
	Low	High	CC13	CC15	CC27	CC34	CC35
Latitude	-	-	-33.91764	-33.92038	-33.91722	-33.91951	-33.922243
Longitude	-	-	151.18668	151.17995	151.18642	151.18256	151.17760
Gravel %	-	-	2.3	2.1	10.8	6.7	0.1
Sand %	-	-	94.6	8.3	76.3	30.5	20.6
Mud%	-	-	3.1	39.6	12.9	62.8	79.3
Copper (µg/g)	65	**270**	100	**900**	**950**	**630**	**570**
Lead (µg/g)	50	**220**	**1500**	**930**	**1750**	**1690**	**1260**
Zinc (µg/g)	200	**410**	**4900**	**3200**	**4150**	**3950**	**3350**
Nickel (µg/g)	21	**52**	**91**	**58**	**98**	**64**	**54**
Manganese (µg/g)	-	**-**	258	143	235	167	138
Cobalt (µg/g)	-	**-**	19.2	16.7	13.6	13.5	11.9
Cadmium (µg/g)	1.5	**10**	**10.3**	**16.1**	9.4	**11.7**	**12.8**
Iron (%)	-	**-**	3.2	1.6	3.4	2	2.3

Parameter	ANZECC (2000) values sediment quality criteria		Sample identification				
	Low	High	CC13	CC15	CC27	CC34	CC35
PCB (µg/g)	23	-	84.2	0	-	-	-
Heptachlor (µg/kg)	-	-	2.6	0	-	-	-
Aldrin (µg/kg)	-	-	2.4	0	-	-	-
HCB (µg/kg)	-	-	12.9	33.4	-	-	-
g-CHL (µg/kg)	-	-	122	56.9	-	-	-
a-CHL (µg/kg)	-	-	4.1	21	-	-	-
DDE+DDT+DDD (µg/kg)	1.6	**46**	33.8	**184**	-	-	-
Dieldrin (µg/kg)	0.002	**8**	3.5	0	-	-	-

Notes: - not analysed or reported or not applicable; underline – result greater than low value; **bold-** result greater than high value.

Table 7 Summary of concentrations of contaminants in samples collected between the stretch of Alexandra Canal between Ricketty Street Bridge and the Cooks River [data from Woodward-Clyde (1998)]

Parameter	ANZECC (2000) values sediment quality criteria		Sample identification			
	Low	High	CC16	CC17	CC18	CC36
Latitude	-	-	-33.9272705	-33.92944	-33.93217	-33.92850
Longitude	-	-	151.17294	151.16662	151.16251	151.16934
Gravel %	-	-	2.1	7.5	2.5	1.8
Sand %	-	-	32.2	70.3	12.2	81.4
Mud%	-	-	65.7	22.2	85.3	16.8
Copper (µg/g)	65	**270**	**560**	**460**	**540**	**550**
Lead (µg/g)	50	**220**	**1170**	**1000**	**1164**	**1200**
Zinc (µg/g)	200	**410**	**3000**	**2450**	**2800**	**3100**
Nickel (µg/g)	21	**52**	**53**	**51**	**58**	**59**
Manganese (µg/g)	-	-	137	134	138	132
Cobalt (µg/g)	-	-	10.4	9.6	10.6	11.4
Cadmium (µg/g)	1.5	**10**	**14.7**	**10.5**	**13.6**	**14.9**
Iron (%)	-	-	2.1	2.9	2.6	2.4
PCB (µg/g)	23	-	**250.5**	**151.4**	**160.6**	-
Heptachlor (µg/kg)	-	-	0	0	3.4	-
Aldrin (µg/kg)	-	-	0	0	3.5	-
HCB (µg/kg)	-	-	31.6	14.6	5.1	-
g-CHL (µg/kg)	-	-	49.1	353	84.3	-

Parameter	ANZECC (2000) values sediment quality criteria		Sample identification			
	Low	High	CC16	CC17	CC18	CC36
a-CHL (µg/kg)	-	-	21.3	12.7	31.6	-
DDE+DDT+DDD (µg/kg)	1.6	**46**	**107.1**	**54.2**	**263**	-
Dieldrin (µg/kg)	0.002	**8**	**15.9**	5	0	-

Notes: - not analysed or reported or not applicable; underline – result greater than low value; bold- result greater than high value.

3.2.11 University of Queensland, 2002.Sydney Water Sediment – Water Column Interactions in Alexandra Canal, Sydney

The Sydney Water *Sediment – Water Column Interactions in Alexandra Canal, Sydney* study was prepared for Sydney Water Corporation focussed on the following four study sites along the canal:

- Lower Canal (LC): located between Sydney Airport and Tempe Reserve
- Middle Canal (MC): located near Rickety Street Bridge
- Upper Canal North (UCN): located at the outlet of Sheas Creek at the northern most extent of the Canal
- Upper Canal South (UCS): located 100 metres down-gradient/south of UCN

Samples were collected at the surface, 0.05 metres, 0.2 metres and 0.45 metres below the surface. The following results were reported for the Middle Canal study site which is in closest proximity to the Project Area:

- Concentrations of contaminants were highest in the bottom 0.45 metres sample, with the exception of Total (Kjeldahl) Nitrogen (TKN) which was highest in the samples collected at less than 0.05 metres. The following contaminant ranges were reported and variably exceeded the ANZECC (2000) low and high reliability trigger values:
    - Total organic carbon (TOC) ranged between 14 per cent and 18 per cent
    - TKN ranged between 2400 and 4500 mg/kg
    - Total iron ranged between 26,000 and 32,000 mg/kg
    - Zinc ranged from between 2100 and 4900 mg/kg
    - Lead ranged from between 750 mg/kg and 2100 mg/kg
    - Copper ranged from 450 to 1600 mg/kg
    - Arsenic ranged from 15 to 40 mg/kg
    - Total PAHs ranged from 38,000 µg/kg to 54,876 µg/kg
    - Benzo(a)pyrene ranged from 2000 to 4000 µg/kg
    - PCBs ranged from 1500 to 7350 µg/kg
    - Dieldrin ranged from 100 to 2900 µg/kg
    - DDD ranged from 0 to 12,400 µg/kg
- The concentrations of metals in sediment pore water were highest in the near surface samples and lowest in the deepest sample depth of 0.45 metres. The following contaminant ranges were reported:
    - iron concentrations ranged from 0.33 to 0.68 mg/L
    - arsenic concentrations ranged from 0.01 to 0.02 mg/L
    - mercury concentrations ranged from 0.00015 to 0.0006 mg/L
    - copper concentrations ranged from 0.0105 to 0.024 mg/L

- Ammonia (as N) concentrations ranged from 8.8 to 80.5 mg/L and generally increased with depth. Soluble Reactive Phosphorus (SRP) concentrations ranged from 0.123 to 4.147 mg/L and were highest in the middle sample depth of 0.15 metres.
- The oxygen consumption rate was 25 mg/m^2/hr. There was no difference in oxygen flux rates measured under light or dark conditions which indicated there was no primary production of oxygen in the benthic community.
- Average flux rates were 138 mg/m^2/day for ammonium and -58 mg/m^2/day for nitrate
- Average flux rates were 3.1 mg/m^2/day for nitrite and -5 mg/m^2/day for SRP
- Metal flux rates were 472 mg/m^2/day for iron and 0 mg/m^2/day for copper

3.2.12 OFS, 2002. Alexandra Canal Hydrographic Investigation July to August 2001

A hydrodynamic study titled Alexandra Canal Hydrographic Investigation July to August 2001 by Oceanographic Field Services Pty Ltd (OFS, 2002) was completed and attached as an appendix in the report. The report concluded:

- Waters within the Canal largely oscillate within the canal and only have limited exchange with the Cooks River. Sediments from the Cooks River migrate into the canal on the flood tide
- Stormwater accumulates at the head of the canal on the flood tide and moves downstream as a captive pool as the current retreats, causing bottom recirculation of saline water in the Woolshed Reach
- Water discharged from the North Pond and Mascot west can be traced 1 km upstream at the surface, which indicates that contaminants from these sources could be dispersed over the middle as well as lower reaches of the canal
- A minimum flushing rate of between two and four days was estimated for 99 per cent removal of suspended material from the middle and lower reaches of the canal under dry weather

3.2.13 URS, 2003. Sediment Remediation Options Study, NSW

URS prepared a Remediation Options Assessment for the Alexandra Canal. The report contained the following relevant information:

- In August 2000, the NSW EPA issued a draft ‘remediation site’ declaration for the canal. Part of the NSW EPA declaration requires that there be “no disturbance of sediments”. Due to the increased pressure for the re-development of the area and the canal, Sydney Water Corporation (SWC) requested a remedial options study for the contaminated sediments
- The analysis of sediment samples reported high concentrations of trace metals, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAH) and organochlorine pesticides (OCPs)
- Sediment in the upper reaches contained intertidal sandbars and mud deposits. The canal was subject to numerous alterations and dredging, possibly for flood mitigation measures or odour control purposes. Some reaches of the Canal are now lined with cement rendering or ‘fabricon’ material
- The canal is located within a Commercial Industrial Zone and has limited recreational, residential or commercial utilisation
- Sediment grain size is related to the variable flow velocities within the canal and generally decreases downstream from muddy sand near Sheas Creek to sandy mud near the confluence with the Cooks River. The contaminant concentrations of sediment reflect the ambient grain size – the coarser the sediment, the lower the contaminant concentrations, with the exception of nickel, cobalt, zinc and copper that decreased in concentrations downstream from Sheas Creek, with increasing grain size
- URS recommended two broad categories of remediation for the contaminated sediment, to be undertaken prior to carrying out any works that would result in the disturbance of bed sediment in the canal:
    - *in-situ* treatment, including stabilisation and capping
    - dredging and off-site disposal/reuse of sediments

3.2.14 AAJV, 2014. Green Square Stormwater Drain Project – Sediment Mobilisation Impact Assessment on Alexandra Canal

Aurecon and AECOM Joint Venture (AAJV) undertook a Sediment Mobilisation Impact Assessment on the Alexandra Canal in 2014 (AAJV, 2014). The objective of the investigation was to assess the potential risks associated with mobilisation of contaminated sediments in Alexandra Canal that may require consideration and/or management during the future stages of the Green Square Stormwater Drain project. The assessment made the following key findings:

- Sediment present in the Alexandra Canal was already moving under the existing conditions
- The tidal influence is a major contributor to the net accumulation of sediment in the canal
- Under existing conditions the canal has very low sediment transport capacity, so while there is potential for most sediment to mobilise, supporting anecdotal evidence that sediment deposition is actually occurring in the canal
- Due to the increase in peak flows as a result of the proposed GSSD, sediments would be mobilised more frequently under the GSSD than under existing conditions
- Sediment mobilised from the upper reaches of the canal would continue to deposit in the middle reaches (similar to existing conditions) as this area is trapping most of the sediments and would continue to do so due to the influence of the Cooks River flows pushing into the canal
- As the Alexandra Canal flows will increase the area of maximum sediment accumulation will move downstream
- There could be an acceleration of the fine material being flushed out from behind the rock protecting the banks mostly in the upper reaches, based on the increase in flows and velocities in these reaches.

Further assessment works including hydraulic modelling, survey and sampling of sediments at outlets and review of discharge outlet designs were recommended. Management and mitigation measures recommended included energy dissipaters at the discharge outlet, management and ongoing monitoring of sedimentation, erosion and deposition in the channel.

3.2.15 GHD, 2013. Camdenville Park, May Street, St Peters NSW

GHD prepared a Remedial and Construction Environmental Management Action Plan (RCEMAP) for Camdenville Park located at 63 May Street, St Peters. The objective of the report was to:

- Confirm the site was suitable for ongoing recreational use
- Achieve Site Auditor sign off
- Rehabilitate the Camdenville Park to reduce the risk to human health and the environment.

Camdenville Park is located at the western extent of and within the Project Area 5. The report noted that thepark comprised a former clay/shale quarry (1800s to 1930s), waste incinerator and landfill (circa 1922-1955), until it was redeveloped into Camdenville Park for public recreation.

Previous contamination investigations identified the following:

- Surface and near surface soils contaminated with asbestos, copper, lead, TPH, and PAHs
- Accumulated surface water contaminated with arsenic, copper, lead, zinc, ammonia, TPH and PAHs
- Methane and carbon dioxide gas concentrations were assessed as a moderate to low risk, based on GHD's review of a previous landfill gas assessment that compared results to NSW EPA (2012) Hazardous Ground Gas guidance
- At the time of reporting, Marrickville Council was planning to refurbish the public recreation areas to incorporate upgrades to the surface/subsurface drainage and stormwater system (including a detention basin and wetland treatment system) and construction of additional recreational facilities
- No capping, containment or leachate collection systems associated with the former landfill were known to be present at Camdenville Park

- The geological profile encountered at Camdenville Park generally comprised up to 0.5 metres of topsoil, underlain by fill containing glass, brick and metal wire (up to 19 m bgl). Fill material was noted to decrease with depth in the detention basin area (up to nine metres bgl) and railway corridor (up to 0.4 metres bgl).The fill was underlain by the base of the former quarry which consisted of clay and/or shale
- The park sloped in a westerly direction and a detention basin was reportedly constructed in the south-western corner in 1964 to mitigate flood risks to surrounding homes. Groundwater was inferred to be saline and low yielding with a north westerly flow direction
- A remedial and validation strategy was presented for Camdenville Park as well as preliminary guidance for construction site management.

The outcomes of the report also included recommendations for the development of an EMP, including capping, additional waste characterisation, preparation of a feasibility assessment on upgrading the detention basin to meet ANZECC/ARMCANZ (2000) guidelines for discharged water, installation of a stormwater harvesting tank and ongoing gas monitoring.

3.2.16 SMEC, 2012. 6A Huntley Street, Alexandria.

SMEC prepared a report following a request for advice regarding contamination at the property 6A Huntley Street, Alexandria, NSW, located adjacent to Project Area 5. The site is located on the eastern bank of the Alexandra Canal and contains unoccupied warehouses that were former wool stores and constructed during the 1940s. The site was proposed to be re-developed for ongoing commercial/industrial use potentially involving the demolition of some buildings and retrofitting some other existing buildings.

Numerous environmental investigations were carried out for the property between 1996 and 2011. The site is also subject of a Site Audit, with a Site Audit Report (SAR) and Site Audit Statement (SAS) being issued by Mr Graeme Nyland.

Potential contaminant sources included above ground and underground storage tanks (ASTs and USTs) (PAHs, TPHs), hazardous building materials (lead and asbestos) fluorescent light fittings (PCBs) and synthetic fibres in roof insulation materials.

SMEC reported the following:

- Concentrations of contaminants in soil analysed were below the adopted commercial/industrial land use criteria, with the exception of asbestos, which was identified around and beneath the site buildings
- Groundwater on site in the vicinity of the ASTs and USTs reported elevated concentrations petroleum hydrocarbons. Low detections of copper and zinc were also reported
- The following recommendations were made in the report:
    - The site was expected to be suitable for an ongoing commercial/industrial land use provided the asbestos impacted soil was remediated, by methods such as capping, containment and/or ongoing management
    - An EMP should be prepared to ensure that workers were adequately protected should subsurface works be required at the site in the future, such as installing or repairing underground services. The EMP should guide the implementation of a remedial strategy of containment
    - Covering unsealed areas with 0.5 metres of clean imported soil, after laying orange or red plastic sheeting as a marker layer
    - Notify the NSW Office of Environment and Heritage (OEH) of the groundwater contamination under the provisions of the CLM Act 1997
    - Remove the underground petroleum storage system (UPSS) infrastructure on site and validate resulting excavations
    - Remove ACM at the time of redevelopment by a licensed contractor in accordance with WorkCover, NSW requirements. Roof insulation, containing synthetic mineral fibres and electrical capacitors in light fittings should be removed in accordance with regulatory requirements. The removal of lead based paints should be done by an experienced contractor and collected and disposed of to a licenced landfill facility or waste transfer station.

3.3 NSW EPA Records

3.3.1 Listed contaminated sites

Review of the NSW EPA website was undertaken to evaluate if the Project Areas or surrounding properties were listed under Section 58 of the CLM Act 1997. Information recorded on the NSW EPA website includes the following:

- A record of written notices issued by NSW EPA under the CLM Act, including preliminary investigation orders
- Names of the property, owners or occupiers at the time of any NSW EPA action in relation to the project
- Copies of SASs provided to NSW EPA under Section 52 of the CLM Act 1997 and relating to significantly contaminated land

Twelve properties with current or former notices located within one kilometre of the Project Area footprint were identified on the website. A summary of the properties and their proximity to the Project Area is provided in **Table 8** below and **Figure 12** in **Appendix A**. Copies of searches are provided in **Appendix G**.

Table 8 NSW EPA contaminated land records within one kilometre of the Project Areas

Local government area	Property address	Proximity to the Project Area	Notice summary
Botany Bay City Council	Pioneer Plating Works 25-29 Ricketty Street, Mascot	Outside the Project Area and 100 metres west of the western boundary of Project Area 5	The site has one current notice. - N26033: Voluntary Remediation Proposal EPA Agreement 20 February 2003. Site declared to have soil and groundwater contaminated with TPH, BTEX, total cyanide and heavy metals.
Botany Bay City Council	Shell Mascot 754 Botany Road, Mascot	Outside the Project Area and 725 metres east of the eastern boundary of Project Area 5	The site has six current notices: - 20094404: Amendment Notice, 5 January 2011 - 20094405: Amendment Notice, 5 January 2011 - 20094406: Amendment Notice, 5 January 2011 - 26068: Voluntary Remediation Proposal - 26096: Agreement not to issue order, 28 March 2008 Site declared to have groundwater contaminated with TPH and BTEX, including phase separated hydrocarbons. Dissolved phase petroleum hydrocarbon contamination extends off-site beyond the western site boundary.

Local government area	Property address	Proximity to the Project Area	Notice summary
Botany Bay City Council	Metal Galvaniser 336-348 King Street, Mascot	Outside the Project Area and 730 metres south of the southern boundary of Project Area 5	The site has five current and two former notices: - 435: Notice Under Section 35, 13 January 1997. - 552: Revocation of notice, 17 August 2007 - 21002: Declaration of Remediation Site, 24 January 2000 - 23002: Remediation Order, 17 October 2001 - 23013: Remediation Order, 20 August 2003 - 23014: Remediation Order, 5 January 2004 - 23017: Remediation Order, 17 August 2004 Site declared to have soil and groundwater contaminated with zinc, lead and chromium and groundwater reported a low pH. Groundwater is migrating off-site causing contamination of the local groundwater which ultimately discharges to Botany Bay. The EPA states that the contamination is presenting a significant risk of harm to the groundwater system.

Local government area	Property address	Proximity to the Project Area	Notice summary
Botany Bay City Council	Rosebery Service Station 395 Gardeners Road, Rosebery	Outside the Project Area and 910 metres east of the eastern boundary of Project Area 5	The site has six former notices: - 20101713: Notice of Approval of Voluntary Management Proposal, 4 June 2010 - 20101713a: Extension of the deadlines under the approved VMP for Rosebery Service Station at 395 Gardeners Road, Rosebery (No. 20101713) - 20121704: Notice of Approval of Voluntary Management Proposal, 1 May 2012 - 20124413: Notice of completion of approved voluntary management proposal, 1 May 2012 - 20154403: Notice of completion of voluntary management proposal, 27 January 2015 - 20154404: Notice to end significantly contaminated land declaration, 27 January 2015 - 20091110: End of Declaration of significantly contaminated land, 27 January 2015 The site was contaminated with TPH and BTEX in soil, groundwater and ambient air and had the potential to affect human health.
Marrickville Council	Former Drum Reconditioning Facility, 53 Barwon Park Road, St Peters Lot 1 in DP 223531	Outside the Project Area and adjacent to northern boundary of Project Area 5	The site has two current notices: - 21094: Declaration of Remediation Site, September 2006. Site declared to have soil contaminated with PAHs, TPH and BTEX and groundwater contaminated with naphthalene and TPH migrating off-Site. - 20124408: Clarifies the address of the Site as 53 Barwon Park Road, St Peters, NSW.

Local government area	Property address	Proximity to the Project Area	Notice summary
Marrickville Council	Tempe Tip, Swamp Road and other lots, Tempe	Outside the Project Area and 750 metres south west of southern boundary of Project Area 5	The site has five current and one former notices: - GN35C: Site Audit Statements 27 Sept 2005 - GN35B: Site Audit Statements 30 Aug 2004 - 26050: Agreed Voluntary Remediation Proposal 19 March 2003 - GN35: Site Audit Statements 26 Nov 2001 - 21005:Declaration of Remediation Site 25 July 2000 - 23003: Former Remediation Order 22 March 2001 The site was declared a remediation Site by the NSW EPA due to leachate migrating off Site towards the adjoining Alexandra Canal via groundwater flow, causing the Canal to be further contaminated, in particular due to elevated ammonia concentrations markedly exceeding criteria. A remediation system was implemented and consisted of a soil bentonite cut-off wall and leachate extraction and treatment system. Ongoing groundwater monitoring was a required condition in the Site Audit Statements.
Marrickville Council, City of Botany Bay & City of Sydney Council	Alexandra Canal off Swamp Road, Tempe, Coward Street, Mascot and Huntley Street, Alexandria	Inside the Project Area and up to 240 metres north west, south and east of eastern boundary of Project Area 5.	The canal has been declared a remediation site due to contamination of bed sediments with chlorinated hydrocarbons including organochlorine pesticides (chlordane, total DDT and dieldrin), polychlorinated biphenyls (PCBs) and metals (“the contaminants”) in such a way as to present a significant risk of harm to human health and the environment. The canal has also formed the subject of a remediation order.

Local government area	Property address	Proximity to the Project Area	Notice summary
Rockdale Council	Solvent Recycler and Distributer 61 Turella Street, Turella NSW 2205	Outside Project Area and one kilometre north west of north western boundary of Project Area 5	The site has two current notices: - 20101114: Declaration of significantly contaminated land, 27 July 2011. - N20131718: Notice of Approval of Voluntary Management Proposal, 16 October 2013. The site declared to be contaminated with chlorinated solvents (tetrachloroethene, trichloroethene, cis-1,2-dichloroethene and dichloromethane) and petroleum hydrocarbons (C_6-C_9 and C_{10}-C_{36}) in groundwater and there is a potential for contaminated groundwater to be migrating off-site.
City of Sydney Council	Land Adjacent to Australia Post 2 Doody Street, Alexandria NSW	Outside Project Area and 600 metres north east of eastern boundary of Project Area 5	The site has one current notice: - 20101101: Declaration of significantly contaminated land, 10 June 2010 The site declared to be contaminated with TPH C_6-C_{36}, naphthalene, phenol and aluminium that pose a risk to human health.
City of Sydney Council	Australia Post 10-24 Ralph Street, Alexandria, NSW	Outside Project Area and 600 metres north east of eastern boundary of Project Area 5	The site has one current notice: - 20101101: Declaration of significantly contaminated land, 10 June 2010. The site declared to be contaminated with TPH C_6-C_{36}, naphthalene, phenol and aluminium and pose a risk to human health.
City of Sydney Council	Cadbury Schweppes site 49-59 O'Riordan Street, Alexandria, NSW	Outside Project Area and 500 metres north east of eastern boundary of Project Area 5	The site has one former notice: - N26034: Voluntary remediation proposal: EPA Agreement, 27 November 2002. The site is contaminated with highly leaching zinc, sourced from imported fill material. Groundwater is contaminated with arsenic from an off-site source and zinc from fill on site.

3.3.2 Notified sites

Review of the NSW EPA website (www.epa.nsw.gov.au) was undertaken to evaluate if properties within a one kilometre radius of the project had been previously notified to the NSW EPA under Section 60 (duty to report) of the CLM Act 1997. The properties that were notified are listed in **Table 9** below and illustrated on **Figure 12** in **Appendix A**.

Table 9 Notified properties under CLM Act Duty to Report within a one kilometre radius of the Project Areas

Site	Proximity to Project Areas	Status
Shell Coles Express Service Station 137 Kingsgrove Road Kingsgrove	680 metres north of Project Area 1	The EPA has completed an assessment of the contamination and decided that regulation under the CLM Act 1997 is not required.
Former Waste Disposal Site 60 Lynwen Crescent (and surrounding properties) Banksia	840 metres southwest of Project Area 5	The EPA has completed an assessment of the contamination and decided that regulation under the CLM Act 1997 is not required.
7 Eleven Arncliffe 28 Princes Highway Arncliffe	320 metres northwest of Project Area 5	The contamination is being assessed by the EPA to determine whether regulation is required. The EPA may require further information to complete the assessment.
BP Express service station, 2 Princes Highway, St Peters	Outside Project Area and 250 metres up-gradient and north of northern boundary of Project Area 5	The site is currently undergoing initial assessment by the NSW EPA. *'This is a premises with an operational underground petroleum storage system, such as a service station or fuel depot. The contamination of this Site is managed under the POEO Act 1997 and the Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation 2008'.*
Camdenville Park (former landfill and waste incineration) May Street, St Peters	Inside Project Area - north western extent of Project Area 5	An initial assessment has been completed by the NSW EPA. *'Based on the information made available to the EPA to date, the contamination of this Site is considered by the EPA to be not significant enough to warrant regulatory intervention under the Contaminated Land Management Act 1997'*
Cooks River Rail Terminal 20 Canal Road, St Peters	Outside Project Area and 25 metres down-gradient and south west of southern boundary of Project Area 5	An initial assessment was completed by the NSW EPA: *'Based on the information made available to the EPA to date, the contamination of this Site is considered by the EPA to be not significant enough to warrant regulatory intervention under the Contaminated Land Management Act 1997'*
Australian Refined Alloys 202-212 Euston Rd, Alexandria	Outside Project Area and adjacent to eastern boundary of Project Area 5	An initial assessment was completed by the NSW EPA. '*The contamination of this Site is or was regulated under the POEO Act 1997. Based on the information made available to the EPA to date, the contamination of this Site is considered by the EPA to be not significant enough to warrant regulatory intervention under the Contaminated Land Management Act 1997.'*

3.4 National Pollutant Inventory

Review of the Australian Government Department of the Environment National Pollutant Inventory (NPI) website (http://www.npi.gov.au/home) was undertaken to evaluate if properties within or surrounding the Project Areas listed as emitting toxic substances that may affect human health or the environment. The *National Environment Protection (National Pollutant Inventory) Measure* (NPI NEPM) is the legislative framework and all Australian industrial facilities which meet the reporting criteria are required to submit annual reports of their emissions and transfers of NPI substances in waste.

Sites that are excluded from reporting, and hence have not been included in this section for the Phase 1 assessment, include:

- A mobile emission source (for example, an aircraft in flight or a ship at sea) operating outside the boundaries of a facility
- A petroleum retaining facility engaged in the retail sale of fuels
- A dry cleaning facility employing less than 20 persons
- A scrap metal handling facility trading in metal that is not engaged in the reprocessing of batteries or the smelting of metal
- A facility, or those parts of facility, solely engaged in agricultural production including the growing of trees, aquaculture, horticulture or livestock raising, unless it is engaged in the processing of agricultural produce or intensive livestock production (e.g. a piggery or cattle feedlot)
- A facility for which an ANZSIC code is not published on the NPI website http://www.npi.gov.au/reporting/industry-reporting-materials/anzsic-code-list.

Four properties located within one kilometre of the Project Areas were identified on the website. A summary of the properties and their proximity to the Project Area is provided **Table 10** below and **Figure 12** in **Appendix A**.

Table 10 National Pollutant Inventory (NPI) tracked sites within one kilometre of the Project Areas

Site	Address	Proximity to Project Areas	Status
Shell Aviation Australia (Sydney Airport)	258 Link Road Mascot NSW	Outside Project Area and 200 metres east of eastern boundary of Project Area 5.	Petroleum product wholesaling
Rail Corporation NSW	Sydney Trains Sydenham Maintenance Centre Way Street Sydenham NSW 2204	Outside Project Area and 560 metres west of western boundary of Project Area 5.	Maintenance and fuelling of long distance passenger trains
Australian Refined Alloys Pty	202-212 Euston Road Alexandria NSW 2015	Outside Project Area and adjacent to eastern boundary of Project Area 5.	Secondary lead smelting from recycled feed sources (used lead-acid batteries and other lead waste)
Monroe Springs (Australia) Pty Ltd	52 O'Riordan Street Alexandria NSW 2015	Outside Project Area and 500 metres south east of the eastern boundary of Project Area 5.	Manufacture of automotive springs, metal coating and finishing

3.5 Environmental Protection Licence Search

3.5.1 EPLs within the vicinity of Project Areas

A search of the public register of sites with licences under the POEO Act 1997 was undertaken. The following table lists sites with current EPL licences within or in the vicinity of the Project Areas. These sites are shown on **Figure 3** and **Figure 12** in **Appendix A**.

Table 11 Sites with licences under the POEO Act 1997 within or in the vicinity of the Project Areas

Site	Address	Proximity to Project Area	Activity/Status
Alexandria Landfill	10 Albert Street, St Peters	Inside the Project Area 5	Alexandria Landfill is licensed by the EPA under the *Protection of the Environment Operations Act 1997* for the following scheduled activities: - Environment Protection Licence No. 4627: Waste Disposal (Application to Land). - Environment Protection Licence No. 12594: Recovery of General Waste and Waste Storage. Roads and Maritime is presently operating Alexandria Landfill in accordance with the provisions of these EPLs and the conditions of consent previously provided for the premises by City of Sydney Council (consent to development application reference D2003/635) and by Marrickville Council (consent to development application reference 200300514). Typical operations include: - Sorting through the various stockpiles of waste and materials stored for resource recovery. - Evaluating opportunities to recycle and/or recover materials for reuse. - Processing of materials scheduled for reuse. - Removing and disposing of waste materials assessed to be unsuitable for recycling/reuse, to the landfill, or to another suitably licensed landfill facility in accordance with EPA requirements. - Stabilisation of a cliff face landslip. The activities do not involve any excavation of the land and/or landfilled waste and involve dealing with the stockpiles of materials stored across the premises. Where asbestos waste is identified within the stockpiled materials, Roads and Maritime contractors manage and remove the materials in accordance with the *Work Health and Safety Act 2011*, an asbestos management plan and asbestos removal control plan. A formal application to transfer the licence to Roads and Maritime has been made.

Site	Address	Proximity to Project Area	Activity/Status
The Council of the City of Sydney, Materials Recycling Depot	25 Burrows Road, St Peters	Inside Project Area 5	EPL 5923: Recovery of general waste and waste storage (other types of waste).
Alexandria Recycling Centre (part of Alexandria Landfill)	10-16 Albert Street St Peters	Inside Project Area 5	EPL 12594: Recovery of general waste and waste storage (other types of waste). This EPL has been transferred to Roads and Maritime following acquisition of the landfill.
Jalco Pharmaceuticals	19A Garema Circuit, Kingsgrove, 2208	Outside the Project Area 150 metres north east and up gradient to northern boundary of Project Area 1.	EPL 6689. Chemical storage, waste generation and pharmaceutical and veterinary products production.
Good River Properties Pty Ltd	33 Burrows Road (also known as 53-57 Campbell Road), St Peters	Inside Project Area 5	EPL 10350. Non thermal treatment of general waste, waste storage (hazardous, restricted solid, liquid, clinical and related waste and asbestos waste) and waste storage (other types of waste)
Australian Refined Alloys Pty Ltd	202-212 Euston Rd, Alexandria	Outside Project Area and adjacent to eastern boundary of Project Area 5.	EPL 1108. Non-ferrous metal production (scrap metal) Non-thermal treatment of hazardous and other waste Recovery of hazardous and other waste Waste storage - hazardous, restricted solid, liquid, clinical and related waste and asbestos waste
Metropolitan Demolitions And Recycling Pty Limited	396 Princes Highway, St Peters	Outside the Project Area and 250 metres southwest of and topographically cross gradient to western boundary of Project Area 5.	EPL 11483. Non-thermal treatment of general waste Recovery of general waste. Waste storage – other types of waste

Site	Address	Proximity to Project Area	Activity/Status
Boral Recycling Pty Limited South Burrows Road, St Peters	South Burrows Road, St Peters	Outside the Project Area and 300 metres south and topographically down gradient to southern boundary of Project Area 5.	EPL 12418. Recovery of general waste. Waste storage - other types of waste
Visy Paper Pty Ltd and SPRC Pty Ltd	6-10 Burrows Road South, St Peters	Outside the Project Area, down gradient and 20 metres south of southern boundary of Project Area 5.	EPL 13069. Recovery of general waste. Waste storage - other types of waste.
SITA Alexandria Pty Ltd	33 Burrows Road, St Peters	Located inside Project Area 5	EPL 13432. Non-thermal treatment of general waste. Waste storage - other types of waste

3.5.2 EPL Non Compliance, Clean Up Notices and Licence Variations

As reported in AECOM (2015a) records of non-compliances, clean up notices and licence variations for the three licensed premises within the Project Area (EPL4627, EPL12594 and EPL5923) were sourced from the NSW EPA website. Management of the materials subject to outstanding clean-up notice's would be undertaken by Roads and Maritime as part of the project construction works. A summary of these are provided in **Table 12**.

Based on Table 12, it is understood there is one outstanding clean up notice for Alexandria Recycling Centre (Notice No. 1500750, varied by No. 1502233 and 1520084), which is currently being actioned at the site by Roads and Maritime.

Table 12 Summary of Project Area EPL non-compliance, clean up notice and licence variations

Date	Number	Summary of non-compliance, notice or variation
EPL 4627 – Alexandria Landfill, 10 Albert Street, St Peters		
31 May 2002 6 June 2002	1017904	Clean up notice regarding removal of pooled leachate in the waste disposal area of the facility through off-site disposal to a licenced waste facility to accept liquid waste.
18 June 2002	1017963	Clean up notice regarding removal of 540,000 litres of leachate through off-site disposal to a licenced waste facility to accept liquid waste and all practical measures to be taken to prevent emission of hydrogen sulfide from the premises.
21 June 2002	1018247	Clean up notice regarding removal of 1,000,000 litres of leachate through off-site disposal to a licenced waste facility to accept liquid waste and all practical measures to be taken to prevent emission of hydrogen sulfide from the premises.

Date	Number	Summary of non-compliance, notice or variation
9 July 2002	1018386	Notice of variation to licence: - Licensee advised EPA that it cancelled its trade waste agreement with Sydney Water and prepared an Odour Management Strategy which was ineffective in controlling odour. - EPA varied the licence to reflect leachate management controls and issued a Pollution Reduction Program (PRP) to upgrade and improve environmental standards at the premises.
7 January 2003	1018818	Variation to licence regarding leachate management system.
4 July 2003	1024148	Variation to licence including changes to tyre disposal, changes to analytical suite for discharge points and removal of groundwater monitoring program.
2 September 2004	1028703	Variation to licence – issue of PRP for removal of any stockpile containing smouldering waste located within the landfill premises by 15 October 2004.
29 September 2004	1040317	Variation to licence – removal of PRP regarding removal of any stockpile containing smouldering waste located within the landfill premises by 15 October 2004.
30 September 2005	1041133	Variation to licence including: - Five groundwater monitoring points named 2 to 6 (MW01, MW02s, MW02d, MW03 and MW04b) and leachate monitoring point 7 added to licence. - Filling and capping of quadrants – filling and capping of one quadrant at a time. - Capping material must be VENM or approved alternative daily cover consisting of VENM and crushed bricks/concrete. - Stormwater bunding and leachate management/disposal. - Amendment to monitoring and analytical suite. - Issue of nine PRPs relating to the leachate riser, stormwater pathways, sediment/erosion control, discharge monitoring, filling plan, water balance review, capping, subsurface gas and leachate migration and wood waste stockpiles.
31 March 2006	1042998	Variation to licence – removal of wood waste stockpile PRP
2 November 2006	105971	Variation to licence including: - Requirement for an Annual Return to be issued to the EPA. - Leachate level and measurement. - Wood waste stockpile management. - Removal of eight previous PRPs. - Issue of two new PRPs relating to gas relief along north eastern wall of the premises in accordance with Douglas Partners recommendation dated 26 May 2006 and landfill gas mitigation works (report not received by AECOM).
4 December 2006	1061862	Variation to licence including: - Proposed trial of timber covers in place of alternative daily cover
21 June 2007	1067504	Variation to licence including: - Financial assurance - Issue of new survey plan
31 October 2008	1068196	Variation to licence including: - Change of fee based activity from' Solid Waste Landfilling' to 'Waste disposal (application to land)' - Waste types changed to general solid waste (non-putrescible), waste tyres and asbestos waste
30 March 2009	1093194	Variation to licence – insignificant changes

Date	Number	Summary of non-compliance, notice or variation
15 April 2011	1099148	Clean up notice relating to offensive odours from garden waste and leachate. All vegetation and garden waste was ordered to be removed from the affected area and the related leachate disposed to a lawful facility.
28 April 2011	1127043	Clean up notice - variation to notice 1127043
3 May 2011	1127781	Clean up notice - variation to notice 1127043
21 June 2011	1128035	Notice of clean up action relating to: - Absence of cover on the tip face and strong hydrogen sulfide odours - Use of demolition waste including ACM as daily cover from an adjoining property (TF Group Pty Ltd – 5A Canal Road, St Peters) - Specification for use of appropriate daily cover (VENM or approved other VENM/brick-concrete rubble mix)
3 August 2012	1128694	Variation to licence relating to asbestos disposal.
16 July 2012	1507165	The following improvements to the design of active cell were requested by the EPA: *'By 16 August 2012 the licensee must install the leachate drainage system (leachate sump, interception drain and injection trench) in accordance with the document titled 'Filling Plan' dated May 2012 prepared by Genesis. Within two weeks of installing the leachate drainage system the licensee must submit to the EPA as built design drawings'.* *'By 16 August 2012 the licensee must install the new stormwater drain and dam system in accordance with the document titled 'Filling Plan' dated May 2012 prepared by Genesis. Within two weeks of installing the stormwater drain and dam the licensee must submit to the EPA as built design drawings'*
EPL 12594 – Alexandria Recycling Centre, 10-16 Albert Street		
31 October 2008	1093242	Licence variation - no disposal or landfilling of waste to occur on the premises, changes to tonnage limits of accepted waste
30 March 2009	1099150	Minor change
2 March 2010	1110780	Issue of PRP for a Dust Management Plan
11 February 2011	1123991	Licence variation - change to premises details
8 June 2011 2 September 2011 2 November 2011	1128662 1500750 1502233	Clean up notices regarding stockpiles (from sorting process) containing fragments of asbestos cement sheeting and foundry sands with elevated concentrations of benzo(a)pyrene, lead, pH and nickel (restricted waste classification). The four impacted stockpiles were located in the south western portion of the project. Special waste and restricted waste as defined in the POEO Act 1997 could not be lawfully stored or transferred or recovered by ways of separating or processing at the premises. Clean up order included the delineation and quantification of asbestos impacts by a suitably qualified expert/consultant and preparation of a waste classification report.
15 March 2012	1504464	Licence variation relating to acceptance under Resource Recovery soil (general solid waste – CT1) and foundry sands and PRP for stockpile height marker.
8 August 2012	1507603	Licence variation relating to PRP for improvements to the stormwater system drain and dam system in accordance with the document titled 'Filling Plan' dated May 2012 prepared by Genesis
3 July 2014	1520084	Variation to clean up notice - removal of all asbestos containing material subject to Clean-Up Notice (Notice No. 1500750).

Date	Number	Summary of non-compliance, notice or variation
EPL 5923 - The Council of the City of Sydney, Materials Recycling Depot (Roads and Maritime Burrows Road Lot)		
16 August 2001 21 September 2005 20 February 2009 10 December 2010 23 February 2012	1008992 1050956 1095661 1122609 1504273	Minor variations to licence including maximum amount of material allowed to be stockpiled and maximum stockpile heights

4.0 Project Area inspection

An inspection of the project footprint, focusing on individual Project Areas, was undertaken by AECOM on 30 April 2015. The following sites were inspected, based on potentially contaminated land uses determined during preliminary findings from the desk top review. The inspection of the individual sites was undertaken to inform and refine which sites were to be the subject of further investigation to determine the potential for a contamination risk to be present.

The results of the inspections are summarised in **Table 13**. Photographs taken during the inspection are included in **Appendix D**.

4.1 Project Area 1 – Western surface works

A large portion of the Project Area 1 footprint is occupied by the existing M5 East Motorway, associated noise mounds and the M5 Linear Park. The M5 Linear Park is the open space easement along parts of either side of the existing M5 East Motorway between Kingsgrove Road and Bexley Road. It consists of a series of public reserves and a shared pedestrian and cyclist pathway. The public reserves within Project Area 1, that form part of the overall M5 Linear Park area includes part of Tallawarra Street Reserve and Beverly Grove Park. Several noise mounds are located between the motorway and reserves, and the part of Beverly Grove Park on the south side of the existing motorway forms part of a large noise mound.

The noise mounds along the existing M5 East Motorway, as shown on **Figure 3**, have been reported as potential sources of asbestos contaminated fill (AECOM, 2015a and AECOM, 2015d) (refer to **Section 2.1**).

The topography of Project Area 1 is relatively flat, and the site contains a walled noise barrier along the southern and south-eastern boundary with native trees, shrubs and grasses present. Based on the results of previous investigations conducted in proximity to Project Area 1 (AECOM 2015d), it is likely the landscape has been artificially filled with uncontrolled material which may contain asbestos containing materials.

A summary of the site inspection is provided in **Table 13** and sites are shown on **Figure 3**. Photographs are shown in the plates in **Appendix D**.

Table 13 Project Area Inspection Summary - Project Area 1

Area Inspected	Observations
27-31 Garema Circuit, Kingsgrove (SP 37275) (Refer to feature 6 in **Figure 3**)	- The property was located within a light industrial/commercial district. - According to signage at the entry to the complex, the warehouses within the property at 27-31 Garema Circuit were occupied by The Christmas Company and Bactor Industries (see Plate 7 and Plate 8) - The neighbouring property to the east looked partially vacant (as indicated by the presence of uncollected mail). However, signage at the entry to the complex indicated a refrigeration company and seafood wholesaler occupied the warehouses (see Plate 9 and Plate 10)
30A and 32 Commercial Road, Kingsgrove (Lot 1 and 2, DP 566805) (Refer to feature C in **Figure 3**)	- The property was located within a light industrial/commercial district. - The property at 30A Commercial Road is occupied by a coach tour company (Condor Tours). It is unknown whether coaches are serviced or maintained on site. At the time of the inspection, a banner was attached to the front boundary fence, inscribed with “City Wide Civil Engineering” (see Plate 11) - The property at 32 Commercial Road was occupied by 32 Hundred Lighting, a company that delivers lighting and audio services - The property adjacent to the east, at 30 Commercial Road, was a furniture manufacturer and wholesaler, followed by a car dealership (see Plate 12 and 13). - The property adjacent to 32 Commercial Road, to the south, was occupied by a sub-station, followed by a furniture warehouse

4.2 Project Area 2 – Kingsgrove Road surface works

Project Area 2 primarily comprises the existing M5 East Motorway and associated infrastructure. A thin strip of vegetated and potentially filled land is located adjacent to the south side of the M5 East Motorway at this location.

4.3 Project Area 3 – Bexley Road surface works

A summary of the site inspection is provided in **Table 14** and photographs are shown in the plates in **Appendix D**.

Table 14 Project Area Inspection Summary – Project Area 3

Area Inspected	Observations
Roads and Maritime Vacant Land, Bexley Road, Kingsgrove (Lot 9 to 18, DP 1069225)	- Reserve, adjacent to Bexley Road , forming part of the M5 Linear Park (see Plate 14), referred to Roads and Maritime Vacant Land for the purposes of this assessment - Ground cover was grassed only - No stressed vegetation, staining or unnatural surface features were noted
Eastern side of Bexley Road, Kingsgrove (Lot 1 DP 123745 and Lot 3 to 7, DP 1070237)	- Fenced M5 East Motorway infrastructure (see Plate 15 to 17) used for existing motorway operations
Land between Bexley Road and Kingsgrove Avenue and M5 East Motorway (Lot and DP unknown)	- Artificially filled, undulating land comprised Kingsgrove Avenue Reserve and the artificially channelled Wolli Creek - Land is publically accessible and a public pathway was noted (see Plate 18 and 19) - Vegetation generally comprised native trees and shrub. No stressed vegetation was noted

4.4 Project Area 4 – Arncliffe surface works

Project Area 4 comprises a portion of Kogarah Golf Club. Green and Golden Bell Frog breeding ponds are located to the west of the Project Area. This location is characterised by landscaped and grassed open space fairway sand greens (to support the golf course land use) with pocket of trees, shrubs, water bodies and sand bunkers. No observations of stressed vegetation or other signs of possible contamination were noted. Marsh Street demarcates the northern boundary of the Project Area, with the Eve Street cycleway followed by the M5 East Motorway located to the southwest and the Cooks River to the east.

4.5 Project Area 5 – St Peters interchange and local roads upgrades surface works

A summary of the site inspection is provided in **Table 15** and photographs are shown in the plates in **Appendix E** (refer AECOM 2014a, 2015a, 2015b, 2015c).

Table 15 Project Area inspection summary – Project Area 5

Area inspected	Observations
Alexandria Landfill, 10-16 Albert Street, St Peters (Lot 2 DP1168612)	- Vehicular access to Alexandria Landfill was via Albert Street with fencing on all sides limiting access to the property - Alexandria Landfill was loosely divided into two areas comprising the eastern portion which has been filled to capacity and the western portion which is in the process of being filled - Eastern portion: • The landfill entry was characterised by office buildings and a weighbridge. • Two bunded diesel ASTs and a water treatment system was observed to the rear of the weigh bridge • The ground surface at the landfill entry was paved with concrete • The eastern section was used for the stockpiling and separation of waste materials including plastics, timber, green waste and demolition materials for sorting and waste transfer • Topography was generally flat with ground level elevation generally at street level (with the exception of stockpiled materials) as a result of historical filling activities • Ground surface comprised compacted fill material • Timber and various grades of crushed rubble stockpiles were scattered around the north-eastern portion of Alexandria Landfill • Steel waste bins used for transporting waste materials were located in proximity to stockpiles • A raised and vegetated fill mound formed a visual barrier between the southern boundary of Alexandria Landfill and the adjacent commercial properties on Burrows Road - Western portion: • The western portion of the landfill was topographically lower than the eastern portion as a result of less historical filling in this portion of Alexandria Landfill. • A number of large stockpiles of crushed rubble were visible on the south-western portion of the landfill • A large vegetated fill mound was located near the north-western landfill boundary. This stockpile reportedly contains asbestos containing materials (ACM) and forms the subject of an EPA notice for removal • Exposed shale forming the wall of the Ralford Pit was visible on the northern boundary. A drain pipe extending from the commercial properties located between Alexandria landfill and the Princes Highway was visible on the wall of the pit • A depression located at the topographic low point of the landfill collected runoff. It is understood this liquid was treated prior to discharge under licence
Albert Street Lot opposite Alexandria Landfill (Lot 1 DP1010128)	- The lot was vacant - The majority of the lot was paved with brick pavers with the exception of the northern portion of the lot which was grassed - A brick substation was located in the south east portion of the lot fronting Albert Street - No stressed vegetation was observed
Dynamo Lot, 318 Princes Highway St Peters (Lot A DP335583)	- The lot contained a small brick mechanics garage on the north eastern side of the lot and a battery repair shed on the eastern side of the lot - The western half of the lot consisted of hardstand concrete with nine dip and fill points (indicating approximately 5 USTs) and two concrete filled rectangles which appeared to look like former fuel dispensing pump locations. Some of the fill and dip points appeared to be filled with concrete

Area inspected	Observations
1 Holland Street , St Peters (Lot 1 DP1168612 and Lot 1 DP129280)	- Lot 1 DP1168612 was bound by the walls of an old brick building. The roof of the building had been removed and was being used to stockpile soil with excavators actively working on the stockpiles - A sweet solvent like odour was noted when walking down Holland Street past the lot and the neighbouring property to the east - Lot 1 DP129280 formed part of a gravel driveway entry to the Alexandria Landfill
Commercial Strata Units 1 Canal Road, St Peters Strata Unit Lot (SP35749)	- The lot was occupied by the following businesses: JPC Kitchens; Artist Guitars; Natal Kitchens; The Australian Trellis Door Co Pty Ltd; Bundanoon Sandstone International; Swain Knife Service; Seating Solutions, UY Installations and Ultratech Refrigeration - The lot was mainly paved in hardstand concrete with garden beds along Canal Road. - No stressed vegetation was observed
Roads and Maritime, 5 and 5A Canal Road, St Peters (Lot B DP394647, Lot A DP391775, Lot X DP421363 and Lot 14 DP606737)	- Lot 14 in DP606737 was unoccupied and had a concrete surface with vegetated stockpiles on the western side and a two storey temporary building - Lot B DP394647and Lot A DP391775 was unoccupied and appeared to be concrete paved and contained large (greater than four to five metres high) mostly vegetated stockpiles - A substation was located between Lot A DP391775 and Canal Road
Goodman, Burrows Road Industrial Estate, 1-3 Burrows Road, St Peters (Lot 11 DP606737 and Lot 12 DP606737)	- The lot consisted of the Goodman Burrows Industrial Estate which contained the following four businesses: Qantas Freight; Coca-Cola Amatol; Staging Rentals and Sealed Air Australia - The buildings appeared to be constructed of brick and galvanised steel and the ground sealed by hardstand concrete
City of Sydney Recycling Depot 19-25 Burrows Road, St Peters, NSW (Lot 13 DP606737)	- The lot contained the City of Sydney Council Burrows Road Recycling Depot - The lot was partially paved with concrete and contained stockpiles of road works waste including bitumen, road base and concrete
12-18 Burrows Road, St Peters Lot 2120 DP 591060	- Trogan Transport Services shipping container depot
Roads and Maritime Bradshaw Mountain Campbell Avenue, St Peters, NSW (Lot 1 DP88087 and Lot B DP376645)	- The northern and eastern boundary of the lot was bound by brick walls of the former brick works - The Lot contained sandstone boulders and was mostly vegetated - Refuse had appeared to be dumped in certain places on the Lot
North side of Campbell Road (outside Project Area)	- There were several low to medium density residential properties located between the Project Area and Sydney Park
South side of Canal Road, St Peters	- St Peters Business Park, vacant land, Cooks River Rail Terminal, office warehouses and Southern Cross Hotel were located to the south of the Project Area along southern side of Canal Road
West side of Alexandra Landfill, St Peters	- A commercial dry cleaners, paint shop, fast food restaurants, Ibis Motel, City Link Business Park, MSK Service Centre and retail shops - The MSK Service Centre may have also formerly been a petrol station

Area inspected	Observations
Campbell Street between Unwin's Bridge Road and the Princes Highway, St Peters	- A stormwater detention basin was located on the eastern side of Campbell Street within Camdenville Park. The basin was vegetated by grass and enclosed by security fencing - A vacant lot of land was located at the corner of Campbell Street and St Peters Street, St Peters (Lot 1 DP65466). The lot was grassed and the perimeter fenced. - A vacant lot of land was located at the on the corner of Campbell Street and Church Street, St Peters (Lot A and B DP349446). The lot was grassed and the perimeter fenced - A vacant lot of land was located at the on the corner of Campbell Street and Princes Highway, St Peters. The lot was grassed and the perimeter fenced - Commercial properties including a smash repair business were located on the northern side of Campbell Street between Simpson Park and the Princes Highway - The remaining properties along the Campbell Street comprised medium density residential dwellings, with the exception of the Town and Country Hotel located at the intersection of Unwin's Bridge Road
Princes Highway, St Peters	- Nine two storey mixed commercial shop/residential terraces were located on the eastern side of the Princes Highway within the Project Area. It was not apparent what businesses formerly or currently occupied these dwellings.
Campbell Road between Princes Highway and Barwon Park Road, St Peters	- An industrial property with a faded sign 'Winden Cleaning Products' was located at 62-64 Campbell Road (Lot 19 DP73532). The property appeared to be vacant at the time of the inspection and was advertised for sale - A row of eight terrace houses were located between 24 and 62 Campbell Street. - 19 to 25 Albert Street (Lot 1 DP906751 and Lot 1 DP921970) appeared to be used for storage (mainly sandstone masonry blocks) - 18 to 20 Campbell Road (Lot 1 DP921124 and Lot1/2 DP921124) on Campbell Road (between Barwon Park Road and Crown Street) appeared to be used as a storage yard/workshop - A new four storey block of units was being constructed on the corner of Barwon Park Road and Campbell Road (53 Barwon Park Road), which is subject to a NSW EPA notice under the CLM Act 1997
Campbell Road between Barwon Park Road and Woodley Street, St Peters	- Sydney Park was located along the northern side of the road - A smash repair workshop was located on the corner of Woodley Street and Campbell Road (Lot 1 and 2 DP219746) - The remaining lots were low density residential properties located along the south side of Campbell Road
Campbell Road between Woodley Street and Harber Street, St Peters	- All lots were occupied commercial/industrial properties with the exception of a vacant lot on the corner of Woodley Street and three low density residential properties - The businesses included a dog day care centre and a metal engineering workshop
Holland Street, St Peters	- All lots were commercial/industrial properties including a pie factory, a workshop, a truck yard, and Sims Metal Management – large warehouse and yard
Campbell Road between Harbor and Burrows Road, St Peters	- Number 47-49 Campbell Street (Lot 1 DP560154/DP316359) was operating as a large food factory (Real Foods Pty Ltd) - 53-57 Campbell Road (Lot 102 DP 871150) was a large vehicle smash repair business - 34 Burrows Road (Lot 13 DP 32332) appeared to be a smash repairs business. - Australian Refined Alloys factory was located on the north side of Campbell Street, between Euston Road and Burrows Road

Area inspected	Observations
Euston Road	- The eastern side of Euston Road between Campbell Road and Sydney Park Road was occupied Sydney Park, Goodman Euston Business Park multi-storey offices, Sydney City Council Works and Services Depot/Stone Masons Depot (No. 201), Euston Road Smash Repairs (No. 199), Overseas Disaster Resources (No. 197), Metromix Concrete batching plant (No. 167-169) and a Transgrid cable tunnel portal building (corner of Sydney Park Road) - The western side of Euston Road between Campbell Road and Sydney Park Road was occupied by Australian Refined Alloys, Grace Fashions Pty Ltd warehouse (No. 168), a vacant plastic container manufacturing factory (formerly Cinqplast Plastop Pty Ltd) with substation (No.154), Specialty Fashion Group (No. 150), Technicolor Pty Ltd warehouse/office , Holcim Pty Ltd concrete batch plant (No. 132), Florabelle Pty Ltd warehouse (No. 122), Recall Pty Ltd warehouse (No. 112), , demolished site (No. 106-110) Plasta Master Pty Ltd warehouse (No. 100), Manitou Australia Pty Ltd parts supplier warehouse (No. 92-96), HTV Smash Repairs (former taxi depot) (No. 92) and Huntley Business Park warehouse/offices (No. 90) - Euston Road between Sydney Park Road and Maddox Street included Euston Business Centre (corner of Huntley Street), PRG Pty Ltd warehouse and Sydney Park Business Centre (former Frank G Spurway screw factory) on the eastern side and multi-storey residential apartments on the western side
Sydney Park Road	- The north side of Sydney Park Road at the Euston Road intersection included ThyssenKrupp Elevator business followed by residential high-rise apartments
Huntley Street	- Mr K & Co fashion manufacturing (No. 35) adjacent to Euston Business Centre (corner of Huntley Street) and opposite Huntley Business Park warehouse/offices (No. 90 Euston Road)
Bourke Street, Mascot	- Delta Group Civil and Demolition depot was located at 83b Bourke Street - 81A Bourke Road (Lot 5 DP248721) was occupied by Alfasi Hire plant and equipment hire which contained a number of temporary (demountable) buildings. - 81 Bourke Road contained Suprema Food factory - A Bunnings Warehouse hardware store was located on the corner of Gardeners Road and Bourke Street - The following properties on the western side of Bourke Street, south of the Gardeners Road intersection: • Britz camper van hire depot (No 653 Gardeners Road) • Offices/warehouses in 1940s aged large brick building (42 Church Avenue) • Residential high rise apartments from Church Avenue to Coward Street. - The following properties on the eastern side of Bourke Street, south of the Gardeners Road intersection: • Warehouse/office unit complex (639 Gardeners Road) • Residential high rise apartments and Mascot (Underground) Train Station
Gardeners Road, Mascot	- A Thrifty Car Rental Business was located at 532-536 Gardeners Road on the corner of Bourke Road. There appeared to be a fuel dispensing pump and UST within the eastern portion of the property. - Other businesses between Bourke Road and the Alexandra Canal included: • Fuji Xerox factory/warehouse (No. 546), • Beaurepairs tyre and battery replacement workshop and factory/warehouse units (No. 562 to 564) • ABW Engineering (Transformer Manufacturing), Metal Centre Pty Ltd, (No. 683) • ING Heritage Business Centre (no. 691) containing warehouses and offices • Goodman Southend Distribution Centre, containing Livingedge, Fuji Xerox, Recall and DRD warehouse/factories (No. 697)

5.0 General environmental conditions of the Project Area and surrounding lands

The focus for this ESA is where surface disturbance works are proposed to be undertaken as part of the project within the Project Areas. It is these areas that required an evaluation for the potential presence of soil and/or groundwater contamination that would need to be appropriately managed during the construction of the project.

The following table summarises the general environmental condition of the project and surrounding areas. Additional details are provided in **Sections 4.1** to **4.6** below:

Table 16 A summary of the general environmental condition of the project and surrounding areas

Project Area	Topography and drainage	Geology and soils	Acid Sulfate Soils (Risk maps provided in Appendix D)
1 and 2	Project Area 1 and 2 slope gently to the east and southeast towards Wolli Creek. The project areas have also been variably altered, most recently to form part of M5 Linear Park, which lies along the length of the existing M5 motorway from Project Area 1 to Project Area 3; and the creation of noise mounds and for the construction of the M5 East Motorway.	Ashfield shale. Consists of dark grey laminate and sideritic siltstone. Ironstone bands of up to 100 millimetres thick are also present within the sideritic siltstone. The weathered profile is generally four to six metres thick and consists of lateritic mottled and pallid (grey clay) zones. The Ashfield shale is underlain by the Hawkesbury Sandstone at an unknown depth.	Class: 5. Works within 500 metres of adjacent Class 1 to 4 require an acid sulfate soil management plan (ASSMP). Risk: No known occurrence.
3	Project Area 3 comprises unpaved and paved/hardstand surfaces depending on land use. Surface water infiltration would occur primarily in the unpaved sections of the Project Area. In all other hardstand areas, stormwater is expected to drain to on-site stormwater drains that would primarily discharge to Wolli Creek.	Quaternary sediments consisting of alluvium (gravel, sand, silt and clay). The alluvial soils are underlain by Hawkesbury Sandstone of the Wianamatta Group. The Hawkesbury Sandstone within the Project Area consists of quartz with some shale. The Hawkesbury Sandstone is underlain by the undifferentiated sandstone of the Narrabeen Group.	Class: 5. Works within 500 metres of adjacent Class 1 to 4 require an acid sulfate soil management plan (ASSMP). Risk: No known occurrence.
4	Project Area 4 comprises a golf course, with undulating, unpaved surfaces. Surface water infiltration would occur. Stormwater is expected to drain into Cooks River.		Class: 3. Works beyond one metre below ground surface require an ASSMP. Risk: High probability of occurrence and disturbed terrain.

Project Area	Topography and drainage	Geology and soils	Acid Sulfate Soils (Risk maps provided in Appendix D)
5	As a result of historical quarrying activities and landfilling, the Alexandria Landfill contains the lowest point of Project Area 5. The western portion of the pit sits at around – 10 metres above AHD. Project Area 5 and surrounds to the west of Alexandra Canal generally slope gently to the south east, while Project Area 5 and surrounds located on the east of the Canal generally slope gently to the north west. Project Area 5 comprises largely paved surfaces; hence stormwater is expected to drain on to roadways and into stormwater drains, ultimately to Alexandra Canal and Cooks River. Within the landfill, surface water that accumulates within the operational areas in the eastern portion drains to stormwater drains (with sediment control). Surface water that accumulates within the active filling area of the landfill collects in the leachate pond which is transferred to the leachate treatment system and is subsequently discharged to the trade waste system.		Class: Class = 1, 2, 3 and 5. For areas with Class 1, all works require an ASSMP. For areas with Class 2, works below natural ground surface require an ASSMP. For areas with Class 3, works beyond one metre below natural ground surface require an ASSMP. For areas with Class 5, works within 500 metres of adjacent Class 1, 2, 3 and 4 require an ASSMP. Risk: Disturbed terrain, high probability of occurrence and no known occurrence.

5.1 Project Area 1 – Western surface works

5.1.1 Current Land Use

Project Area 1 is around 23 hectares and currently used for reserve/open space, including the M5 Linear Park, which lies along the length of the M5 East Motorway from Project Area 1 to Project Area 3; and noise mounds adjacent to the existing M5 East Motorway, sporting field and numerous commercial/industrial properties. Project Area 1 and neighbouring land use is illustrated on **Figure 3** in **Appendix A**.

5.1.2 Surrounding Land Use

Land use surrounding the Project Area 1 at the time this report was being prepared comprised the following:

- North: Along the western portion of Project Area 1 residential properties of Roselands and Clemton Park and recreational open space, residential properties, recreational open space followed by light industrial properties along King Georges Road. Beverly Hills North Public School is located 130 metres north of the site, on King Georges Road. A couple of petrol stations were located about 800 metres north, on King Georges Road. Along the central portion, Canterbury Golf Course and residential properties. Towards the eastern extent, light industrial/commercial properties. A refrigeration service and supply company was located beyond and adjacent to the Project Area. Additionally, located within 150 metres north east of the Project Area was Jalco Pharmaceuticals (which holds Environmental Protection Licence # 6689, as reported in **Section 3.5**). Other properties to the north of Project Area 1 included King Mountford Reserve that included tennis courts and a children's playground
- East: M5 East Motorway, commercial/industrial properties and residential properties of Kingsgrove. There was one petrol station located about 50 metres west of the Project Area, and an additional one located around 150 metres south east from the Project Area

- South: Along the western and central portion, residential properties of Narwee, Beverly Hills and Kingsgrove and Wolli Creek. Along the eastern portion, commercial/industrial properties of Kingsgrove, along Commercial Road, The Crescent and Vanessa Street and commercial properties along Kingsgrove Road
- West: M5 South West Motorway and M5 East Motorway, as well as the residential properties of Roselands and Narwee.

Based on current land uses, potential off-site sources of contamination, which have the potential to migrate (via groundwater or surface water) onto the Project Area include:

- Various commercial/industrial properties located to the northeast, southeast and south of the Project Area
- Areas of historical landfilling to the north and south of Project Area 1, in areas of the golf course and reserves
- Wolli Creek to the south of the Project Area

5.1.3 Hydrogeology

Registered groundwater bore information was obtained from the DPI (Water). Seven bores were located within a two kilometre radius surrounding Project Area 1. A summary of the bores depths, SWL, proximity to the Project Area, purpose and geology is tabulated and provided with copies of the bore licences in **Appendix B**. The bores were registered for the following purposes:

- Water supply (six bores)
- Unknown (one bore)

Based on the information obtained from the review of registered bores in **Appendix B**, shallow groundwater is present in the area in alluvial sediments consisting primarily of sands at depths ranging from 4.27 to 5.45 metres bgl.

5.2 Project Area 2 – Kingsgrove Road surface works

5.2.1 Current Land Use

Project Area 2 currently comprises road reserve, of the M5 East Motorway. Project Area 2 and neighbouring land is illustrated on **Figure 3** in **Appendix A**.

5.2.2 Surrounding Land Use

- North: Light industrial followed by residential properties of Kingsgrove
- South: Light industrial followed by residential properties of Kingsgrove
- East: M5 East Motorway, followed by Project Area 3
- West: M5 East Motorway, followed by Project Area 1

5.2.3 Hydrogeology

Given the proximity of Project Area 1, the registered groundwater bore information for this area also pertains to Project Area 2.

5.3 Project Area 3 – Bexley Road surface works

5.3.1 Current Land Use

Project Area 3 is around 3.5 hectares in area and is currently used for reserve/open space adjacent to the junction of the existing M5 East Motorway and Bexley Road, M5 East Motorway infrastructure and for a sporting ground on Kingsgrove Avenue. Project Area 3 and neighbouring land use is illustrated on **Figure 5** in **Appendix A**.

5.3.2 Surrounding Land Use

Land use surrounding the Project Area at the time this report was being prepared comprised the following:

- North: residential properties of Clemton Park, Beaumont Park, Earlwood Animal Hospital, followed by Clemton Park Public School located 350 metres north of the site on Bexley Road
- East: M5 East Motorway tunnel, Wolli Creek, Illoura Park and Stotts Reserve
- South: M5 Linear Park, which lies along the length of the M5 East motorway from Project Area 1 to Project Area 3; and Wolli Creek, followed by the train line and Bexley North Station and residential and commercial properties of Bexley North, including one service station located about 250 metres south east
- West: M5 East Motorway, followed by Project Area 3, located about 500 metres along the M5 East Motorway

Based on current land uses, potential off-site sources of contamination, which have the potential to migrate (via groundwater or surface water) onto the Project Area include:

- Various commercial properties located to the south of the Project Area 3
- Areas of historical landfilling to the north and south of the Project Area; in areas of reserve
- Wolli Creek to the south of the Project Area 3

5.3.3 Hydrogeology

Registered groundwater bore information was obtained from the DPI (Water). One registered groundwater bore was identified within the Project Area and five bores were located within a two kilometre radius surrounding the Project Area 3. A summary of the bores depths, SWL, proximity to Project Area 3, purpose and geology is tabulated and provided with copies of the bore licences in **Appendix B**. The bores were registered for the following purposes:

- Monitoring (four bores)
- Recreation (one bore)

AECOM installed one groundwater monitoring well within Project Area 3 (MW072) and one around 50 metres to the northeast of Project Area 3 (MW084). Both were screened in the bedrock and the measured standing water levels were 4.155 metres BTOC/3.315 metres AHD (MW072) and 34.495 metres BTOC/-4.475 metres AHD (MW084).

5.4 Project Area 4 – Arncliffe surface works

5.4.1 Current Land Use

Project Area 4 is around eight hectares in area and is occupied by Kogarah Golf Course. Neighbouring land use is illustrated on **Figure 7** in **Appendix A**. The area is used by a population of Green and Golden Bell Frog (refer to Technical Working Paper: Biodiversity (Eco Logical Australia, 2015). This key population uses breeding ponds constructed as part of the M5 East Motorway. The area within and surrounding the Project Area consists of green spaces such as golf courses, playing fields, residential development and along major transport and infrastructure routes.

The Southern and Western Suburbs Ocean Outfall Sewer Number 1 (SWSOOS No.1) is located around 80 metres south west of Project Area 4. According to the Sydney Water heritage register (https://www.sydneywater.com.au/SW/water-the-environment/what-we-re-doing/Heritage-search) SWSOOS No.1 comprises two major interlinked trunk sewers in reinforced concrete which carry sewage from a merging chamber at Arncliffe (adjacent to the Kogarah Golf Course) through to the Malabar Sewage Treatment Plant.

5.4.2 Surrounding Land Use

Land use surrounding Project Area 4 at the time this report was being prepared comprised the following:

- North: Marsh Street, followed by residential properties of Arncliffe and Cahill Park, followed by the Cooks River, then Tempe Recreation Reserve. Alexandra Canal enters the Cooks River at the northern extent of the Project Area. Wolli Creek enters the Cooks River about 900 metres north of the Project Area
- East: The eastern extent of Kogarah Golf Course, Cooks River, followed by Kingsford Smith Sydney International Airport
- South: M5 East Motorway, followed by a driving range, lake, cycleway and a sporting field. Muddy Creek and Saint George Soccer Stadium were located around 400 metres south of the Project Area
- West: Eve Street Cycleway, the SWSOOS No.1, M5 East Motorway and road reserve, Marsh Street and wetlands followed by residential properties of Arncliffe

Based on current land uses, potential off-site sources of contamination, which have the potential to migrate (via groundwater or surface water) onto the Project Area include:

- Commercial/industrial properties located to the east of the Project Area, including Kingsford Smith Sydney International Airport
- Areas of historical landfilling to the north, south, east and west of the Project Area
- Sediments and dissolved phase contaminants originating from Alexandra Canal and Wolli Creek
- Sediments and dissolved phase contaminants sourced from Cooks River to the east of the Project Area

5.4.3 Hydrogeology

Registered groundwater bore information was obtained from the DPI (Water). One registered groundwater bore was identified within the Project Area 4 and 12 bores were located within a one kilometre radius surrounding the Project Area. Dense clusters of groundwater bores were located within Project Areas 4 and 5. Sufficient information was available from groundwater bores located within one kilometre, therefore search results have been summarised from groundwater bores located within this reduced search radius. A summary of the bores depths, SWL, proximity to the Project Area, purpose and geology is tabulated and provided with copies of the bore licences in **Appendix B**. The bores were registered for the following purposes:

- Water supply (nine bores)
- Monitoring (one bore)
- Irrigation (one bore)
- Other (one bore)

Based on the information obtained from the review of registered bores in **Appendix B**, shallow groundwater is present in the area in alluvial sediments consisting primarily of sands and clays at depths ranging from 0.7 metres to 14.0 metres m bgs.

AECOM installed two groundwater monitoring wells in bedrock approximately 200-300 metres northwest of Project Area 4 as part of geotechnical investigations. The measured standing water levels were 1.395 metres BTOC/-0.035 metres AHD (MW168) and 2.380 m BTOC/-0.798 m AHD (MW036).

5.5 Project Area 5 – St Peters Interchange and local roads upgrades

5.5.1 Current Land Use

The lots comprising Project Area 5 total around 49 hectares. The majority of the Project Area 5 footprint is occupied by Alexandria Landfill. Other land uses include mechanical and engineering workshops, commercial warehouses, transport and equipment depots, medium density residential, open space (Sydney Park) and stormwater detention (Camdenville Park). These are also illustrated on **Figure 12** in **Appendix A**.

5.5.2 Surrounding Land Use

Land use surrounding the Project Area at the time this report was being prepared comprised the following:

- North: Project Area 5 is bounded to the north by Sydney Park Road, Princes Highway and Euston Road. Hence, the northern boundaries surround Sydney Park, a former quarry and landfill. Other properties to the north of the site include various commercial/industrial properties including a service station and waste recycling facility. Mixed density residential properties are located to the north (west, north and south of Sydney Park)
- East: Project Area 5 is bounded to the east by Euston Road on the western side of Alexandra Canal and Bourke Street on the eastern side of Alexandra Canal, at the intersection of Gardeners Road. Various commercial/industrial properties are located to the east of the site. See **Section 3.5** for the list of sites located outside and to the east of the Project Area 5 footprint that are subject to EPLs
- South: Canal Road, followed by commercial/industrial properties including the Cooks River Terminal, Boral Recycling and various petrol stations and automatic workshops. Alexandra Canal is located about 100 metres south east of Project Area 5
- West: residential properties of St Peters and St Peters Public School are located about 100 metres west of the western boundary of Project Area 5. Camdenville Park, a former quarry and landfill, now public open space is located at and within the western extent of Project Area 5.

Based on current land uses, potential off-site sources of contamination, which have the potential to migrate (via groundwater or surface water) onto Project Area 5 include:

- Various current and historical commercial/industrial properties located to the north, south and east and west of Project Area 5
- Areas of historical landfilling within, to the north, south and to the west of Project Area 5
- Alexandra Canal to the south.

5.5.3 Geology and Soils

In addition to the Ashfield Shale of the Wianamatta Group discussed in **Table 16**, a former Holocene shoreline runs through the area encompassed by Project Area 5, in an orientation parallel to the current Alexandra Canal (McNally and Branagan, 1998) located between Alexandra Canal and Barwon Park Road. The Holocene sediments located along the Alexandra Canal have been described to consist of the following layers (from ground surface):

- Fine sand, yellow and grey with shell and charcoal fragments
- Shell band, with quartz sand and carbonised wood
- Sand with abundant fine shell fragments
- Sand increasing with clay content with depth
- Clay, dark grey with yellow staining
- Discontinuous peat beds (0.2-0.3 metres thick)
- Clay, grey-blue, plastic, slightly sandy

5.5.4 Hydrogeology

Registered groundwater bore information was obtained from the DPI (Water) and reported in AECOM (2014a). No registered groundwater bores were identified within Project Area 5 and 87 bores were located within a two kilometre radius surrounding Project Area 5. A summary of the bores depths, SWL, proximity to the Project Area, purpose and geology is tabulated and provided in **Appendix B**. The bores were registered for the following purposes:

- Domestic (five bores)
- Industrial (six bores)
- Irrigation (one bore)
- Monitoring (70 bores)

- Groundwater remediation (three bores)
- Recreation (one bore)

AECOM completed a hydrological assessment of the Alexandria Landfill, located in Project Area 5 (AECOM, 2015g). The report included interpretation of historical data, data obtained from AECOM investigations (AECOM, 2015e and 2015f) and additional hydrogeological testing. The findings are summarised below:

- Leachate is generated from groundwater derived from the Botany Sands, Ashfield Shale and surface water runoff percolating through the fill. Groundwater as leachate is pumped from the pit from the main leachate sump (LP1) and treated before being discharged off-site to trade waste, under the site's TWA with Sydney Water (TWA No. 29304)
- Groundwater is present within the Botany Sands as a shallow unconfined aquifer perched on top of the Ashfield Shale. Groundwater levels are variable but would be expected to be at just above sea level in an undisturbed environment
- The Ashfield Shale is a semi confined fractured rock aquifer where the dominant groundwater movement is along secondary structural features rather than the rock mass. Natural groundwater levels would be expected to be close to sea level with regional groundwater flow to the south. Locally groundwater flow is expected to be radial flow towards the centre of the landfill due to the influence of the leachate pumping
- The interpretation of hydrographs generated during the investigation indicated the fill, shale and Botany Sands respond quickly to rainfall recharge, although the levels in the shale respond and decline rapidly whereas the decline in the Botany Sands and fill is slower. Superimposed over the hydrographs for shale and Botany Sands were cyclic tidal influences
- Groundwater gauging and plotting groundwater levels confirmed there was radial drainage within the fill and shale (surrounding the landfill) centred on the leachate pump. Groundwater levels and survey level indicated that flow within the Botany Sands was discharging into the landfill and Alexandra Canal indicating there was a groundwater mound between the edge of the landfill and Alexandra Canal

Project Area 5 is located within Zone 2 of the Botany Groundwater Management Zone. Residents within Zone 2 are advised that domestic groundwater use is banned. The ban includes use of the water for drinking, watering gardens, washing windows and cars, bathing, or to fill swimming pools.

5.5.5 Alexandra Canal

Alexandra Canal was originally identified as Sheas Creek, which formed a small tributary of the Cooks River. The creek was excavated into a navigational canal (Alexandra Canal) between 1887 and 1899. The canal was excavated to three metres below the ground surface at the time to give the canal a total depth of six metres below mean low tide level. The land use along the banks of the canal has historically included heavy industrial uses and market gardens which have contributed to the discharge of contaminants, primarily via stormwater into the canal. Contaminants have subsequently been identified within bed sediments within the canal.

Alexandra Canal was declared a remediation site (number 21008) on 25 August 2000 by the NSW EPA, due to bed sediments contaminated with chlorinated hydrocarbons including OCPs, PCBs and metals. A Remediation Order (number 23004) was also issued by the NSW EPA to Sydney Water on 10 May 2004.

The requirements of the Remediation Order includes not allowing *'any works or activities on the bed sediments of the site that would result in the disturbance, or further disturbance, of the bed sediments'* except as provided by the order. The Remediation Order states that works disturbing the bed sediments require a plan to be submitted to the NSW EPA for approval prior to commencement of the works and plans for investigation or remediation must be prepared in accordance with the *Guidelines for Consultants Reporting on Contaminated Sites (*NSW EPA, 1997 and revised OEH, 2011).

Existing stormwater features identified within Alexandra Canal include:

- Shea's Creek Outlet, where large sediment banks protrude during low tide periods
- Three open drains (at 150 metres, 750 metres and 2180 metres downstream from Sheas Creek headwater)
- 16 local council stormwater outlets
- Direct stormwater drainage outlets from private properties
- Sydney Airport Corporation Limited (SACL) North Pond weir located on southeast side of Botany Goods Railway Bridge.

A recent example of similar infrastructure recently constructed at the head of the canal which illustrates the potential worst case impacts to sediment mobilisation within the canal is the Green Square Trunk Drain, which comprises a 2.4 kilometre long culvert drain up to 6.5 metres wide and 1.8 metres high, which is planned to transfer stormwater from Green Square, to the Alexandra Canal. The impacts identified for the Green Square Trunk Drain are summarised as follows:

- Peak flows were estimated to increase by up to 50 per cent
- Changes to flow velocities were estimated to be up to 20 per cent
- Due to the increase in peak flows as a result of the proposed stormwater drain, sediments could be mobilised more frequently than under existing conditions
- Sediment mobilised from the upper reaches of the canal would continue to deposit in the middle reaches (similar to existing conditions) as it is trapping most of the sediments and would continue to do so due to the influence of the Cooks River flows into pushing into the canal. As the flows are increased, the area of maximum sediment accumulation could move downstream. The sediment movement towards the Cooks River would be a gradual process due to the low sediment transport rate.

Flows causing sediment entrainment of various particle sizes, has been estimated (AAJV, 2014). The estimates were calculated using data from previous flood studies and are listed in **Table 17** below.

Table 17 Sediment mobilisation in Alexandra Canal estimates based on maximum peak flows and velocities (Data Source: AAJV, 2014)

Flow condition	Estimated Maximum Peak Flow at Head of canal	Sediment size
Normal tidal current	10 m^3/s	< 0.4 mm
2 year AYI flood	55 m^3/s	<5 mm
20 year AYI flood	80 m^3/s	<10 mm
100 year ARI flood	100 m^3/s	<20 mm

The AAJV (2014) report made the following conclusions regarding sediment deposition within the canal:

- Tidal influence is a major contributor to the net accumulation of sediment in the canal and under existing conditions the canal has a very low sediment transport capacity, so while there is potential for most sediment to mobilise it is unlikely to travel far, supporting the anecdotal evidence that the canal can generally be described as accreting rather than eroding and therefore the canal can generally be described as a depositional environment.
- Potential scour depths under existing conditions for different events were determined and it was found that normal tidal currents (up to 10 m^3/s) would cause no movement of median sediment (>0.5 millimetres size), while a 100 year Average Recurrence Interval (ARI) design storm event could result in scour of up to 0.3 metres.
- Fine grained sediments (<0.4 millimetres) would be mobilised and transported during normal tidal currents.
- The sediment present in canal is mobile under existing conditions (tides and floods) and sediment from the canal is found at the confluence with the Cooks River under existing conditions.

The potential risks to the disturbance of contaminated sediments by the project are discussed in **Section 9.5**.

6.0 Evaluation process for selecting sites for further investigation

A staged approach was adopted in order to determine the likelihood of sites within the Project Areas to be affected by contamination.

Information was gathered in the review of land zoning maps, EPA records, general walkover of the Project Areas and an inspection by Six Viewer to assess the land uses in the Project Areas (reported in **Chapter 2** to **Chapter 4**). From this review of information, eight sites of interest, comprising 20 lots were identified as requiring further assessment. These lots are listed in **Section 6.1** to **6.5** below and are shown as 'Areas of Concern' on the figures in **Appendix A**.

These lots were further investigated by obtaining Section 149(2) and Section 149(5) certificates and obtaining and reviewing historical certificates of title, to further determine the potential for a contamination risk to be present.

6.1 Project Area 1 - Western surface works

There were three lots identified in Project Area 1 with the potential for contamination from current or historical commercial/industrial land uses, and requiring additional desktop assessment. The three lots are listed below.

- 27-31 Garema Circuit, Kingsgrove, NSW (SP 37275) – commercial/industrial estate
- 30A Commercial Road, Kingsgrove, NSW (Lot 1 DP 566805) – bus parking and tour company - commercial/industrial
- 32 Commercial Road, Kingsgrove, NSW (Lot 2 DP 566805) – lighting warehouse – commercial/industrial

These three areas of concern are in addition to M5 Linear Park, and the associated noise mounds, located in Project Area 1. The M5 Linear Park and noise mounds were not further evaluated through the review of Section 149 certificates and historical certificates of title.

6.2 Project Area 2 – Kingsgrove Road surface works

Whilst it is noted that potentially contaminated fill material may be present beneath and adjacent to the M5 East Motorway, given the limited nature of the proposed non-intrusive land use activities proposed to be undertaken in Project Area 2 within the road corridor, no further desktop investigation in Project Area 2 was considered necessary.

6.3 Project Area 3 – Bexley Road surface works

There were 11 lots identified in Project Area 3 with the potential for contamination from current or historical commercial/industrial land uses, and requiring additional desktop assessment. The lots are listed below.

- Roads and Maritime Vacant Land, Bexley Road, Bexley North, NSW (Lot 9 to 18 in DP 1069255) (refer to feature 1 in **Figure 5**, **Appendix A**)
- Kingsgrove Avenue Reserve, Kingsgrove, NSW– open space/recreation (refer to feature 4 in **Figure 5**, **Appendix A**)

6.4 Project Area 4 – Arncliffe surface works

There were four lots identified in Project Area 4 with the potential for contamination from current or historical commercial/industrial land uses, and requiring additional desktop assessment. The four lots are listed below.

- 19 Marsh Street, Arncliffe, NSW (Lot 1 DP 329283) – Kogarah Golf Club
- 19 Marsh Street, Arncliffe, NSW (Lot 1 DP 108492) – Kogarah Golf Club
- 19 Marsh Street, Arncliffe, NSW (Lot 14 DP 213 314) – Kogarah Golf Club

6.5 Project Area 5 – St Peters interchange and local roads upgrades

Land identified within Project Area 5 which has the identified potential for contamination from current or historical commercial/industrial land uses, includes the following:

- Areas west of Princes Highway:
    - Stormwater detention basin in Camdenville Park on corner the of Bedwin Road and May Street, St Peters (Part Lot 9 DP879483)
- Areas between the Princes Highway to Alexandra Canal
- Alexandria Landfill, 10-16 Albert Street, St Peters (Lot 2 DP1168612);Bradshaw Mountain, Corner of Woodley Street and Campbell Avenue, St Peters, NSW (Lot 1 DP88087 and Lot B DP376645)
    - 1 Holland Street, St Peters, NSW (Lot 1 DP1168612 and Lot 1 DP129280)
    - 2 Holland Street, St Peters (Lot 1 to 6 DP 976191)
    - 8 A Holland Street, St Peters (Lot 7 to 8 DP 976191)
    - 10 Holland Street, St Peters (Lot 1 DP 783704)
    - 12 Holland Street, St Peters (Lot 1 to 2 DP234704)
    - Sydney Park, Campbell Street, St Peters (Part of Lot 1 DP995509)
    - 14 to 18 Holland Street (Lot 3 to 5 DP234704)
    - 4-16 Campbell Street, St Peters, NSW (Lot 1 DP1010128 and Lot 1 DP321348)
    - 18 to 24 Campbell Street (Lot 1 DP906751, Lot 1 DP921970, Lot 1 and 2 DP921124 and Lot 1 DP2543)
    - 25 Campbell Road (Lot 1 DP 1072060, Lot 1 and 2 DP 219746)
    - Vacant lot on corner of Campbell Road and Woodley Street, St Peters (Lot 26 DP 976191)
    - 27 to 35 Campbell Road, St Peters (Lot 1 DP567186)
    - 13 Burrows Road, St Peters, NSW (Lot 12 DP606737)
    - 19-25 Burrows Road, St Peters, NSW (Lot 13 DP606737)
    - 29 Burrows Road (Lot 102 DP 871150 and Lot 101 DP 845651)
    - 12-18 Burrows Road, St Peters NSW (Lot 2120 DP 591060)
    - 34 Burrows Road, St Peters (Lot 13 DP 32332)
    - 47-49 Campbell Road, St Peters (Lot 1 and Lot 2 DP560154 and Lot 2 DP316359)
    - 5 and 5A Canal Road, St Peters, NSW (Lot B DP394647, Lot A DP391775, Lot X DP421363, Lot 14 DP606737)
    - 1 Canal Road, St Peters, NSW (SP35749)
    - 318 Princes Highway, St Peters, NSW (Lot A DP335583)
- Alexandra Canal

- Areas east of Alexandra Canal:
    - 67 Bourke Road, Alexandria (Lot 16 DP 270785)
    - 81 and 81A Bourke Road, Alexandria (Lot 3 and 5 DP248721)
    - 520-530 Gardeners Road, Mascot NSW (Lot 100 DP 864502)
    - 532 Bourke Road, Alexandria NSW (Lot 1 DP 405527)
    - 538 Gardeners Road, Alexandria NSW (Part SP67995)
    - 566 Gardeners Road, Mascot NSW (SP36878)
    - 558 Gardeners Road, Alexandria (SP45388)
    - 697 Gardeners Road, Mascot NSW (Lot 1 DP 91123)
    - 1-3B, Ricketty Street, St Peters (Part 1 Lot DP 551509)

The locations are shown on **Figure 12** in **Appendix A**.

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7.0 Secondary data review – Project Area history and observations

The following sections summarise the information obtained during the Project Area background review.

7.1 Zoning and Land use

The Project Areas contain properties with the current zoning:

Table 18 Land use zoning

Project Area	Local Environmental Plan	Zoning
Project Area 1	*Hurstville Local Environmental Plan 2012*	Light Industrial (IN2)
	Canterbury Local Environmental Plan 2012	Light Industrial (IN2)
Project Area 2	*Canterbury Local Environmental Plan 2012*	Zone Infrastructure (SP2)
Project Area 3	*Canterbury Local Environmental Plan 2012*	Zone Infrastructure (SP2)
	Rockdale Local Environmental Plan 2011	Public Recreation (RE1)
Project Area 4	*Sydney Regional Environmental Plan No.33 – Cooks Cove*	Open Space Special Uses Zone Trade and Technology
Project Area 5	*Marrickville Local Environment Plan 2011*	General Industrial (IN1) Light Industrial (IN2) General Industrial (R1) Public Recreation (RE1) Neighbourhood Centre (B1) Mixed Use (B4) Enterprise Corridor (B6) Classified Road (SP2)
	Sydney Local Environment Plan 2012	General Industrial (IN1) Classified Road (SP2) (RE1) Southern Employment Lands
	Botany Bay Local Environment Plan 2013	Mixed Use (B4) Classified Road (SP2)

7.2 Local government information

Copies of the Planning Certificates from four councils, issued under Section 149 and Section 5 of the *EP&A Act,* were obtained for the following land parcels, selected based on current land use which may contain potentially contaminating activities, within the Project Areas. Copies of the planning certificates are provided in **Appendix E**. The planning certificates provided the following relevant information.

7.2.1 Project Area 1

Copies of the Planning Certificates from Canterbury City Council and Hurstville City Council, issued under Section 149 and Section (5) of the EP&A Act, were obtained for the following land parcels within or directly adjacent to Project Area 1:

1) 30A Commercial Road, Kingsgrove, NSW (Lot 1 DP 566805) – bus parking and tour company.
    - Hurstville City Council records do not have sufficient information about the uses (including previous uses) of the Project Area on Section 149 certificates to confirm that the land has not been used for a purpose which would be likely to have contaminated land. Parties should make their own enquires as to whether the land may be contaminated
    - Hurstville City Council has adopted by resolution and in accordance with Section 72 of the EP&A Act a development control plan (DCP) incorporating council's policy on contaminated land. The plans were prepared substantially in accordance with SEPP 55and the Contaminated Land Planning Guidelines. This policy may affect development of land as per item 1) above
2) 32 Commercial Road, Kingsgrove, NSW (Lot 2 DP 566805) – lighting warehouse
    - Hurstville City Council records do not have sufficient information about the uses (including previous uses) of the Project Area on Section 149 certificates to confirm that the land has not been used for a purpose which would be likely to have contaminated land. Parties should make their own enquires as to whether the land may be contaminated
    - Hurstville City Council has adopted by resolution and in accordance with Section 72 of the EP&A Act, a DCP incorporating council's policy on contaminated land. The plans were prepared substantially in accordance with SEPP 55 and the Contaminated Land Planning Guidelines
3) 27-31 Garema Circuit, Kingsgrove, NSW (SP 37275) – commercial/industrial estate
    - Canterbury City Council records do not have sufficient information about the uses (including previous uses) of the Project Area on Section 149 certificates to confirm that the land has not been used for a purpose which would be likely to have contaminated land. Parties should make their own enquires as to whether the land may be contaminated
    - Canterbury City Council has adopted by resolution and in accordance with Section 72 of the EP&A Act a DCP incorporating council's policy on contaminated land. The plans were prepared substantially in accordance with SEPP 55 and the Contaminated Land Planning Guidelines

7.2.2 Project Area 2

Given the location of Project Area 2 within the existing M5 road corridor, no Section 149 certificates were obtained for this Project Area.

7.2.3 Project Area 3

Copies of the Planning Certificates from Canterbury City Council and Rockdale Council, issued under Section 149 and Section (5) of the EP&A Act, were obtained for the following land parcels within or directly adjacent to Project Area 3:

1) Roads and Maritime Vacant Land, Bexley Road, Bexley North, NSW (Lot 9 to 18 DP 1069255)
    - Canterbury City Council records do not have sufficient information about the uses (including previous uses) of the Project Area on Section 149 certificates to confirm that the land has not been used for a purpose which would be likely to have contaminated land. Parties should make their own enquires as to whether the land may be contaminated
    - Canterbury City Council has adopted by resolution and in accordance with Section 72 of the EP&A Act, a DCP incorporating council's policy on contaminated land. The plans were prepared substantially in accordance with SEPP 55 and the Contaminated Land Planning Guidelines

2) Kingsgrove Avenue Reserve, Kingsgrove, NSW (Lot 5 DP 1069225) – open space/recreation

- Rockdale City Council records do not have sufficient information about the uses (including previous uses) of the Project Area on Section 149 certificates to confirm that the land has not been used for a purpose which would be likely to have contaminated land. Parties should make their own enquires as to whether the land may be contaminated
- Rockdale City Council has adopted by resolution and in accordance with Section 72 of the EP&A Act a DCP incorporating council's policy on contaminated land. The plans were prepared substantially in accordance with SEPP 55 and the Contaminated Land Planning Guidelines. This policy may affect development of land:
  - Which is affected by contamination
  - Which has been used for certain purposes
  - In respect of which there is not sufficient information about contamination
  - Which is proposed to be used for certain purposes
  - In other circumstances contained in the development control plan and policy
- The land is affected by a tree preservation order. The objective is to preserve trees and vegetation within the area by requiring consent or a permit to prune or remove any tree or other vegetation
- The land does not include or comprise critical habitat within the meaning of the *Threatened Species Conservation Act 1995*
- The land is not affected by a policy adopted by the Council that restricts the development of land because of the likelihood of land slip, bushfire, tidal inundation, subsidence, or any other risk
- The Council is aware of information that suggests the land may be affected by the one per cent annual exceedance probability (AEP) flood. The Council is unaware of the accuracy of this information, although further enquiries may be made with the Council's City Services Department
- The land has not been identified as properties that comprise, or on which there is, an item that is listed on the State Heritage Register under the *Heritage Act 1977* or that is subject to an interim heritage order under the *Heritage Act 1977* or is listed under the LEP
- The land has not been identified as subject to the risk of acid sulfate soils
- The land has not been identified as the subject of a site audit statement (SAS) within the meaning of the CLM Act 1997. The land was not declared to be significantly contaminated, subject to a management order or an approved voluntary maintenance order
- The land is on the 25 Annual Noise Exposure Forecast (ANEF) (2033) contour. This level may restrict the development of the land due to the risk of exposure to aircraft noise

7.2.4 Project Area 4

Copies of the Planning Certificates from Rockdale Council, issued under Section 149 and Section (5) of the EP&A Act, were obtained for the following land parcels within or directly adjacent to Project Area 4:

- 19 Marsh Street, Arncliffe, NSW (Lot 1 DP 329283) – Kogarah Golf Club
- 19 Marsh Street, Arncliffe, NSW (Lot 1 DP 108492) – Kogarah Golf Club
- 19 Marsh Street, Arncliffe, NSW (Lot 11 DP 570900) – Kogarah Golf Club
- 19 Marsh Street, Arncliffe, NSW (Lot 14 DP 213 314) – Kogarah Golf Club

The *Rockdale Local Environment Plan 2011* does not apply to the land impacted by Project Area 4 by virtue of the application of the *Sydney Regional Environmental Plan No.33 – Cooks Cove*. Nonetheless, the information provided by the planning certificates for the land is summarised below:

- Rockdale City Council records do not have sufficient information about the uses (including previous uses) of the Project Area on Section 149 certificates to confirm that the land has not been used for a purpose which would be likely to have contaminated land. Parties should make their own enquires as to whether the land may be contaminated

- Rockdale City Council has adopted by resolution and in accordance with Section 72 of the EP&A Act, a DCP incorporating council's policy on contaminated land. The plans were prepared substantially in accordance with SEPP 55 and the Contaminated Land Planning Guidelines. This policy may affect development of land:
    - Which is affected by contamination
    - Which has been used for certain purposes
    - In respect of which there is not sufficient information about contamination
    - Which is proposed to be used for certain purposes
    - In other circumstances contained in the development control plan and policy
- The land is not affected by a tree preservation order
- The land does not include or comprise critical habitat within the meaning of the *Threatened Species Conservation Act 1995*
- The land is not affected by a policy adopted by the Council that restricts the development of land because of the likelihood of land slip, bushfire, tidal inundation, subsidence, or any other risk
- The development of the land or part of the land for such a purpose may be subject to flood related development controls. The Council is aware of various information that suggests the land may be affected by the one per cent AEP flood. The Council is not aware of the accuracy of this information, although further enquiries may be made with the Council's City Services Department
- The land has not been identified as properties that comprise, or on which there is, an item that is listed on the State Heritage Register under the *Heritage Act 1977* or that is subject to an interim heritage order under the *Heritage Act 1977* or is listed under the LEP
- The land has not been identified as the subject of a site audit statement (SAS) within the meaning of the CLM Act 1997. The land was not declared to be significantly contaminated, subject to a management order or an approved voluntary maintenance order
- The land is on the 25 Annual Noise Exposure Forecast (ANEF) (2033) contour. This level may restrict the development of the land due to the risk of exposure to aircraft noise

7.2.5 Project Area 5

Copies of the Planning Certificates from Marrickville and City of Sydney Councils, issued under Section 149 and Section (5) of the EP&A Act, were obtained for the following land parcels within or directly adjacent to Project Area 5. The following sites are previously listed in **Section 5.0** as sites identified as potential areas of contamination concern following historical or current commercial/industrial land uses. The following sites were further evaluated:

- 1-3 Burrows Road, St Peters, NSW (Lot 11 and 12 DP606737) - Burrows Road Industrial Estate (outside Project Area)
- Canal Road site – 5 and 5A Canal Road, St Peters, NSW (Lot A DP391775) – Canal Road site (Roads and Maritime vacant property and former brickworks, smelter and waste recycling site)
- 19-25 Burrows Road, St Peters, NSW (Lot 13 DP 606737) – City of Sydney Materials Recycling Depot
- 10-16 Albert Street, St Peters, NSW (Lot 2 DP1168612) – Alexandria Landfill
- 1 Woodley Street, St Peters (Lot 1 DP 88087) – Roads and Maritime owned land (Bradshaw Mountain)
- 53 Barwon Park Road, St Peters NSW (Lot 1 DP 1186016) - former drum reconditioning facility and current residential development
- 34 and 34A Burrows Road, St Peters NSW (Lot 13 DP 32332 and Lot 20 DP 32332) – Dial- A-Dump property
- 19 Albert St, St Peters NSW (Lot 1 DP921970) – storage yard
- 171A Euston Road, Alexandria NSW (Lots 1, 2 and 3, DP 543708) – concrete batch plant
- 520-530 Gardeners Road, Mascot NSW (Lot 100 DP 864502) – Bunnings Mascot

- 532 Bourke Road, Alexandria NSW (Lot 1 DP 405527) – Thrifty Car Rental
- 538 Gardeners Road, Alexandria NSW (SP67995) –warehouse strata units
- 546-548 Gardeners Road, Mascot NSW (Lot 2 DP547069) – Fuji Xerox
- 562-564 Gardeners Road, Mascot NSW (SP45388) - warehouse strata units
- 566 Gardeners Road, Mascot NSW (SP36878)- warehouse strata units
- 697 Gardeners Road, Mascot NSW (Lot 1 DP 91123) – wholesale warehouse
- 685 Gardeners Road, Mascot NSW (Lot 2 DP 529177) - wholesale warehouse
- 12-18 Burrows Road, St Peters NSW (Lot 2120 DP 591060) – shipping container logistics

The planning certificates provided the following relevant information:

- Council records do not have sufficient information about the uses (including previous uses) of the land which is the subject of this section 149 certificate to confirm that the land has not been used for a purpose which would be likely to have contaminated land. Parties should make their own enquires as to whether the land may be contaminated
- The councils have adopted by resolution and in accordance with Section 72 of the EP&A Act a DCP incorporating council's policy on contaminated land. The Plan has been prepared substantially in accordance with SEPP 55 and the Contaminated Land Planning Guidelines. This policy may affect development of land:
    - Which is affected by contamination
    - Which has been used for certain purposes
    - In respect of which there is not sufficient information about contamination
    - Which is proposed to be used for certain purposes
    - In other circumstances contained in the development control plan and policy
- The land does not include or comprise critical habitat within the meaning of the *Threatened Species Conservation Act 1995*
- The land is not affected by a policy adopted by the Council that restricts the development of land because of the likelihood of land slip, bushfire, flooding, tidal inundation, subsidence, or any other risk
- The land has not been identified as properties that comprise, or on which there is, an item that is listed on the State Heritage Register under the *Heritage Act 1977* or that is subject to an interim heritage order under the *Heritage Act 1977* or is listed under the LEP
- Marrickville and City of Sydney councils have adopted a Tree Preservation Order which applies to all land within the council areas. The objective is to preserve trees and vegetation within the area by requiring consent or a permit to prune or remove any tree or other vegetation
- Lot 13 DP 32332 (34 Burrows Road, St Peters), Lot 20 DP 32332 (34A Burrows Road, St Peters), Lots 1-52 SP 36878 and Lot 1 DP 80506 (566-590 Gardeners Road, Alexandria) are identified as either Class 1 or Class 2 Acid Sulfate Soils. Lot 1 DP 1186016 (1 Campbell Street, St Peters) and Lot 1 DP 921970 (19 Albert St Peters) have been identified as subject to the risk of acid sulfate soils
- Lot 2 DP21168645 and Lot 2 DP1168612 (10 – 16 Albert Street, St Peters) are identified on an acid sulfate soils map as being Class 2 and being land reserved for acquisition under the Marrickville LEP 2012.
- Lot A DP 391775(5 and 5A Canal Road, St Peters) is the subject of a site audit statement (SAS) within the meaning of the CLM Act 1997, a copy of which has been provided to council. The land was not declared to be significantly contaminated, subject to a management order or an approved voluntary maintenance order
- Lot 1 DP 84041 and Lots 1-19 SP 67995 (538 Gardeners Road, Alexandria) is the subject of a Site audit statement (SAS) within the meaning of the CLM Act 1997, a copy of which has been provided to council. The land was not declared to be significantly contaminated, subject to a management order or an approved voluntary maintenance order

- SP91219 (1 Campbell St, St Peters) has been declared as significantly contaminated land by the EPA; however it is not the subject of a SAS. It is understood that this site has subsequently been redeveloped for medium density residential land use and is not contemplated further herein

Copies of the planning certificates are provided in **Appendix E**.

7.3 Certificates of Title

Copies of the historical certificates of title were obtained for the 19 land parcels within the Project Areas, selected based on current land use which may contain potentially contaminating activities. Copies of the certificates are provided in **Appendix F**. A summary of the information is provided below:

7.3.1 Project Area 1

1) 30A Commercial Road, Kingsgrove, NSW (Lot 1 DP 566805)

Former land uses included laundering, blacksmith, orchards, market gardening, followed by land use associated with the Council of the Municipality of Hurstville. Most recently, the land was being used for tour bus storage. It is not known if maintenance was being undertaken on site.

2) 32 Commercial Road, Kingsgrove, NSW (Lot 2 DP 566805)

Former land uses included laundering, farming, orchards, market gardening, blacksmith, plumbing, followed by land use associated with the Council of the Municipality of Hurstville. Most recently, the land was being used for warehousing lighting products.

3) 27-31 Garema Circuit, Kingsgrove, NSW (SP 37275)

Former land uses included fertiliser supply, brick and pipe works followed by land use associated with various commercial companies. Most recently, the land was owned by a strata owner's corporation and being used for warehousing and light industrial purposes.

7.3.2 Project Area 2

Project Area 2 did not require further investigation.

7.3.3 Project Area 3

1) Roads and Maritime Vacant Land, Bexley Road, Bexley North, NSW (Lot 9 to 18 DP 1069255).

Former land uses included boiler making, carpentry, warehousing followed by land use associated with the Roads and Traffic Authority of NSW from about 1998.

2) Kingsgrove Avenue Reserve, Kingsgrove, NSW (Lot 5 DP 1069225).

Former land uses included public housing (owned by the Housing Commission of NSW), followed by land use associated with Rockdale City Council.

7.3.4 Project Area 4

1) 19 Marsh Street, Arncliffe, NSW (Lot 1 DP 329283) (Kogarah Golf Club).

2) 19 Marsh Street, Arncliffe, NSW (Lot 1 DP 108492) (Kogarah Golf Club).

3) 19 Marsh Street, Arncliffe, NSW (Lot 11 DP 570900) (Kogarah Golf Club).

4) 19 Marsh Street, Arncliffe, NSW (Lot 14 DP 213 314) (Kogarah Golf Club).

Former land uses included market gardening, then land for the Commissioner for Main Roads, the Minister for Public Works, followed by land for the Metropolitan Water Sewerage and Drainage Board. The land use currently comprises a golf course owned by the Council of the Municipality of Rockdale.

7.3.5 Project Area 5

1) 10-16 Albert Street, St Peters (Lot 1 DP101028 and Lot 2 DP 1168612) (Alexandria Landfill) – former land uses were landfill (Sydney City Council) and brick works operated by The Austral Brick Company Proprietary Limited (1908-1962) Central Brick and Tile Company Pty Limited (1918 -1951).

2) 1 Holland Street , St Peters (Lot 1 DP1168612) (Leased area owned by DADI Industries Pty Ltd) – former land uses were logistics (Brambles Australia Limited and Altrans Storage Pty Limited), fishing line manufacturing (Francis Holbeach) and laminated veneer (Ralph Symonds Pty Limited).

3) 19-25 Burrows Road, St Peters (Lot 13 DP606737) (City of Sydney Council Recycling Depot) – formerly brick works operated by The Austral Brick Company Proprietary Limited (1908-1962) Central Brick and Tile Company Pty Limited (1918 -1951).

4) 1 Canal Road, St Peters (SP 35749) (various commercial strata warehouse units) – formerly brick works (as above) and workshops.

5) 5 and 5A Canal Road, St Peters (Lot A DP 391775) (Roads and Maritime vacant land/former waste recycling site) – formerly metal smelter (Consolidate Metal Products Limited).

6) 1-3 Burrows Road, St Peters (Lot 11 DP606737) (Goodman Burrows Road Industrial Estate) – formerly used by water heater manufacturer (Rheem, 1972-1979), flexible packaging manufacturer (A. Abrahams & Sons Pty Limited – 1940 to 1972) and Council of the Municipality of Alexandria (1876 to 1940).

7) 33 Burrows Road, St Peters (Lot 102 DP871150) (SIMs metals and Taxi depot/repair workshop/scrap yard) - formerly used by logistics companies (TNT Australia Pty Ltd, Alltrans Storage Ptd Ltd and Rudders Ltd 1959 to 1999), timber veneer manufacturing (Ralph Symonds Pty Ltd, 1942 to 1959) and agriculture (Pig Farmer – 1933 to 1942 and unspecified farmer – 1916 to 1932).

8) 202-212 Euston Road, Alexandria (Lot C DP 162050) (Australian Refined Alloys Pty Ltd) – formerly used for manufacturing (1940 to 1958), council and roads authority (1958 to 1977) and metal smelter (Sims Consolidated Ltd – 1977 to 2012).

9) 34 Burrows Road, St Peters (Lot 13 DP32332) (Ian Raymond Malouf – leased to Greyhound bus depot) – logistics depot (Mayne Nickless Pty Ltd – 1954 to 1984), precious metal manufacturing (Garrett Davidson & Matthey Pty Limited – 1943 to 1954).

10) 34A Burrows Road, St Peters (Lot 20 DP 32332) (Belle and Lily Pty Limited) – formerly owned by the Minister for Public Works of NSW (1889 to 2006).

11) Camdenville Park, May Street, St Peters (Lot 9 DP 879483) (open space/sports field) – owned by the Council of the Municipality of Marrickville since 1924 and farmers prior to 1924. Former land uses include a clay/shale quarry, waste incinerator and landfill. The site is currently used for recreational land use.

12) 53 Barwon Park Road, St Peters (Lot 1 DP 1186016) (residential apartments) – formerly used for manufacturing (Lewis Derrick Howden – 1966 to 2009).

13) Alexandra Canal (Lot 13 DP 1050464) (man-made canal) – owned by Sydney Water Corporation since 1993. Formerly owned by The Minister for Public Works in the Colony of New South Wales since 1894.

14) 538 Gardeners Road, Alexandria (CP SP 67995) (commercial strata units) – flock manufacturing (1939 to 1957) and other companies (business use unknown).

7.4 Historical Photograph Review

The information in **Table 18** below was derived from reviewing historical aerial photographs for the Project Area and the surrounding area. The photographs were obtained from the project GIS system (http://giswebapps.aecomonline.net/westconnex/WestConnex_Project/map.html). Enlarged sections of the selected aerial photographs are included in in **Appendix A**.

Table 19 Historical aerial photograph review

Project Area	Photograph details	Project Area observations	Surrounding land observations
Project Area 1 and Project Area 2	1943 WDA, GIS B&W (**Figure 4**)	The following was observed in the 1943 aerial: - The project area was largely vacant with the exception of roads, Wolli Creek tributary channel and a total of eight low density residential housing lots.	- The immediate surrounding land was sparsely developed with low density residential land developments. The surrounding streets appeared to have been constructed for planned housing developments. The land had been cleared with patches of shrub/bushland. - Bexley Road (running north/south) was noted, in addition to the railway line (running east/west) and Wolli Creek. - A quarry was located 250 metres north of the eastern half of the disturbance area (current location of industrial units in 6 – 8 Garema Circuit). - A gas holder was located 350 metres northeast of the eastern end of the disturbance area.
Project Area 3	1943 WDA, GIS B&W (**Figure 6**)	The following was observed in the 1943 aerial: - Kingsgrove Avenue Reserve was present. - Many of the residential buildings noted in present day appeared in 1943. - A WWII anti-aircraft battery site consisting of up to 40 small sheds and several buildings was located between Wolli Creek, Flatrock Road and Bexley Road covering an area of approximately 2 hectares. - Wolli Creek was noted flowing through site in a natural channel.	- The surrounding land use was medium density residential land use – more dense residential properties to the north east, east, south east and south. There were fewer properties to the north west and west, with more open space/undeveloped areas, most likely used for agriculture. - Wolli Creek and the train line were observed. - A gas holder/gasometer was located 370 metres northwest of the disturbance area.

Project Area	Photograph details	Project Area observations	Surrounding land observations
Project Area 4	1930 Run18 B&W (**Figure 8**)	The following was observed in the 1930 aerial: - The Project Area was being used for agricultural land use – plots resemble cropping and/or orchards. - Cooks River path varies from present day. The river does not run along the entire eastern boundary of the Project Area and instead loops further to the east.	- Medium density residential properties are evident to the northwest, west and south west of the Project Area. - The site that is currently occupied by Sydney International Airport was largely a vacant, estuarine area, with Cooks River flowing through here and further east before entering Botany Bay.
	1943 WDA, GIS B&W (**Figure 9**)	Little change was observed from the 1930 aerial.	Little change was observed from the 1930 aerial.
	1970 7 July 1970 Run 20 B&W (**Figure 10**)	The following changes were observed when compared to the 1943 aerial: - Golf course with ponds and what seems to resemble sand bunkers. Trees have been removed. - In the western corner of the Project Area, plots of land than resemble cropping fields are present. - A tree-lined roadway or man-made waterway was noted running through the middle of the Project Area, from the plots that resembled cropping fields, to the Cooks River. This may have been for the purposes of irrigation.	- The Cooks River is present to the east of the site. Beyond this, the Sydney International Airport was evident. - The Cooks River was flowing as per present day. The construction and in-filling of the land occupying the airport, has diverted the river, to flow along the eastern boundary of the Project Area and south to Botany Bay. - Medium density residential properties were evident to the north, west and southwest of the Project Area. - Commercial/industrial properties were also noted to the northwest, west and south west of the Project Area.
	1982 Run 25 Colour (Figure 11)	There were little changes observed when compared to the 1970 aerial.	There were little changes observed when compared to the 1970 aerial.

Project Area	Photograph details	Project Area observations	Surrounding land observations
Project Area 5	1930 20 February Run 17 B&W (**Figure 13**)	The following was observed in the 1930 aerial: - A quarry with an area of ponded water (around 250 square metres) was located in the current location of Camdenville Park in May Street St. Peters - Industrial buildings on the western side of Bedwin Road. - Residential housing was located on both sides of Campbell Street, between May and Hutchinson Streets - A large factory (around100 metres by 80 metres) was located on the north side of Campbell Street at the intersection of the Princes Highway (No. 129) - Undeveloped land, and residential sized buildings were on the on either side of Campbell Street between Hutchinson Street and Barwon Park Road - Two brick pits were located between Princes Highway and Burrows Road (now Alexandria Landfill). The remainder of the block was undeveloped with the exception of market gardens located off Burrows Road near Campbell Road in the northeast portion. Potential land filling near the corner of Canal Road and Burrows Road appeared to be occurring - Alexandra Canal is visible with undeveloped levelled land on either side of the banks. There appeared to be bridges crossing the Canal at Ricketty Street/Canal Road - Market gardens with several small buildings were located east of the Alexandra Canal and along Gardeners Road and Bourke Street and Kent Road - Factories and warehouse were present on several lots along Euston Road	- To the north, the current location of Sydney Park was occupied by six separate quarries and six brick manufacturing sites. Two large gas holders were located in the southeast section of what is now Sydney Park - Another quarry and brick works manufacturing sites was located on the north side of Sydney Park Road. - Land reclamation and levelling appeared to be occurring south of Canal Road - The Botany Goods Railway line appeared to present. - The land to the southwest includes Canal Road, followed by around 40 hectares of cleared disturbed ground potentially undergoing reclamation and levelling works - Two other quarries were visible to the west of the Alexandria Landfill, a pit located on between the Illawarra Railway and Unwin's Bridge Road (around 450 metres and a pit located between Rolf and Albion Lane in St Peters (around 280 metres)

Project Area	Photograph details	Project Area observations	Surrounding land observations
	1943 B&W (**Figure 14**)	The following changes were observed when compared to the 1930 aerial: - Factories/warehouse had been constructed along parts of the land between Burrows Road and Alexandra Canal - The pits and brick works buildings within what is now Alexandria Landfill had expanded and factories had been constructed on Holland Street and at the corner of Burrows and Campbell Roads - Wool stores had been constructed along the eastern side of Alexandra Canal, extending from Gardeners Road to Huntley Street - Industrial buildings constructed between Alexandra Canal and Euston Road, and along Gardener's Road and Bourke Street. - A building constructed adjacent to the two gasholders within what now is Sydney Park - A building with a smoke stack was present on 5 and 5A Canal Road	The following changes were observed when compared to the 1930 aerial: - Increased industrial development to the northeast - Increased industrial development to the southeast - Wool stores had been constructed on the southern side of Canal Road - Expansion of the industrial buildings between the train line and Unwins Bridge Road
	1951 (B&W) (**Figure 15**)	The following changes were observed when compared to the 1943 aerial: - A potential pit full of water (around 80 metres by 60 metres) was located within Lot 12 DP606737at 3 Burrows Road - The market gardens in Burrows Road were no longer visible. - A large factory was constructed within 1 Holland Street (Lot 1 DP1168612) - Expansion of the industrial area along Alexandra Canal, Bourke Street and Gardeners Road - Increased activity in the quarry bordered by Barwon Park Road, Campbell Road, Euston Road and Sydney Park Road	The following changes were observed when compared to the 1943 aerial: - Factory buildings had been constructed at the intersection of Canal Road and Burrows Road within 1-3 Burrows Road - Extensive increased industrial development to the northeast - Extensive increased industrial developments east of Alexandra Canal, areas of increased vegetation between properties bordered by Gardeners Road and O'Riordan Street

Project Area	Photograph details	Project Area observations	Surrounding land observations
	1970 7 July Run 19 B&W (**Figure 16**)	The following changes were observed when compared to the 1963 aerial: - The previous quarry and pond area within Camdenville Park on May Street had been levelled and redeveloped as recreational fields - The quarries within Alexandria Landfill had formed on large pit. - Industrial development had occurred along all lots on Burrows Road including a large open storage area on what is now the City of Sydney Recycling Depot - The brick works buildings on the corner of Campbell Lane and Woodley Street (now Bradshaw Mountain) undergoing demolition	The following changes were observed when compared to the 1951 aerial: - Within Sydney Park there was one open pit (around 700 square metres), which now forms part of Sydney Park - The quarry pit on the corner of Campbell Road and Barwon Park Road (now Sydney Park) had been filled in and the ICI (now Orica) building had been constructed adjacent to the filled in pit and the gas holders - Six of the wool store warehouses adjacent to Alexandra Canal were demolished and a long industrial building was constructed - Two of the wool store warehouses were demolished and replaced with an industrial building and a car park - The Cooks Rover Rail Terminal had been constructed

7.5 Dangerous Good Search

At the time this Phase 1 ESA was in preparation, discussions concerning property acquisition had not yet commenced with private property owners. As such, a search of the WorkCover NSW records for licensed dangerous goods could not be undertaken with the exception of the following Roads and Maritime owned properties within Project Area 5:

- 5 and 5A Canal Road, St Peters NSW
- 1 Campbell Lane, St Peters NSW
- 19-25 Burrows Road, St Peters NSW

Results of the WorkCover NSW search for records for licensed dangerous goods which may have been stored on the Project Area indicated that no records were held.

7.6 Unexploded Ordnance Contamination

A search of the Australian Department of Defence Unexploded Ordnance (UXO) Contamination database (www.defence.gov.au/uxo/) was conducted on 8 May 2015 to evaluate whether the Project Area or surrounding areas were listed. There were no records of UXO contamination at or near the Project Area.

It is however noted that based on review of the 1943 aerial photographs, there appeared to be a potential ammunition storage site in Project Area 3 in the area bound by Flat Rock Road, Wolli Creek and Bexley Road. There was limited information on the site, with the only information found suggested there was an anti-aircraft battery located near Homer Street and Bexley Road, Kingsgrove during WWII (http://www.canterburycommons.net/index.php?title=Kingsgrove_NSW). The site appears to be now occupied by the existing M5 East Motorway, residential properties and Roads and Maritime's Vacant Land.

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8.0 Findings

A total of five discrete Project Areas were identified within the project footprint where surface works and ground disturbance works are proposed to occur. The Phase 1 ESA for the project was undertaken in four key stages comprising a preliminary screening and assessment followed by a site inspection, secondary data review and preparation of this document.

The findings of the Phase 1 ESA are summarised as follows:

- The Project Areas are located in a predominantly industrial area (based on aerial photographs and certificates of land title) and encompass a range of land uses ranging from landfilling to warehousing, storage, manufacturing and automotive workshop, which indicate there is a potential for contaminated soil, fill and groundwater to be present within the Project Areas
- Potential sources of contamination identified within the Project Areas and immediate vicinity included:
    - various commercial/industrial properties with potentially contaminating land use activities
    - areas of historical landfilling
    - Wolli Creek, Alexandra Canal and Cooks River
- Based on the background data reviewed, AECOM identified 20 individual lots for Section 149 and historical certificates of land title searches and obtained the following information:
    - With regards to acid sulfate soils, all 20 lots were identified as Class 5 acid sulfate soils with no known occurrence of acid sulfate soil risk, with the exception of the four lots located at Kogarah Golf Club (19 Marsh Street, Arncliffe, NSW: Lot 1 DP 329283; Lot 1 DP 108492; Lot 11 DP 570900; Lot 14 DP 213 314) (Project Area 4), which were classed as Class 4 acid sulfate soils and disturbed terrain with high probability of occurrence of acid sulfate soil risk. Furthermore, Project Area 5 was classified 1, 3 and 5 acid sulfate soils with disturbed terrain, high probably of occurrence (restricted to the Alexandra Canal) and no known occurrence of acid sulfate soil risk
    - With reference to sites that have been notified to the EPA, under the CLM Act 1997, none of the 20 properties had been reported as the subject of a Site Audit Statement (SAS) nor declared to be significantly contaminated, subject to a management order or an approved voluntary maintenance order
    - Based on a review of a NSW EPA and council searches, 32 properties located within or adjacent to the Project Area footprint including a number of properties within Project Area 5, were identified as being of potential contamination concern. This should be considered as part of construction planning for the project. These properties generally comprise sites that had been the subject of site audit statements, subject to previous uncontrolled filling, various potentially contaminating commercial/industrial land uses including brick works and fertiliser supply, market gardening, laundering and various public utility and/or council works sites. More recently, these sites have been subject to various warehousing and commercial/industrial uses

Based on the review of available information, a preliminary risk assessment of the areas of potential contamination concern was undertaken using the risk matrix in **Table 20** below. The risk was assigned to each identified area of contamination concern in **Table 21**.

Table 20 Preliminary contamination risk assessment matrix

Consequence	Likelihood of soil or groundwater contamination to be present				
	Very unlikely to be present at concentrations above the relevant assessment and limited in extent.	**Potentially present at concentrations above the relevant assessment and limited in extent.**	**Potentially present at concentrations above the relevant assessment and widespread.**	**Most likely present at concentrations above the relevant assessment and widespread.**	**Known to be present at concentrations above the relevant assessment criteria and widespread.**
No or unlikely exposure pathway for human or ecological receptor's either now or during or post construction*.	Low	Low	Low	Medium	Medium
Exposure pathway for human or ecological receptors likely to be present and complete either now, during or post construction*.	Low	Medium	Medium	High	High
Exposure pathway for human or ecological receptors present and are complete either now, during or post construction*.	Medium	Medium	High	High	High

Notes: * without implementation of appropriate controls or remediation.

Table 21 Areas of Potential Contamination Concern

Area of Concern within proximity to the Project Area		Proximity to Project Area	Potential source of contamination	Potential contaminants	Comments	Intended land use	Preliminary Risk Evaluation
Site Address	Lot and DP						
M5 Linear Park	Various	Inside Project Area 1, 2 and 3.	Fill material used for noise mound creation along the M5 East Motorway.	Asbestos	A recent soil sampling investigation (AECOM, 2015c), detected asbestos within the noise mounds located in the M5 Linear Park on the southern side of the existing M5 East Motorway, between Ch2380 and Ch2640.	Western surface works would be undertaken in this area as part of the project. Construction activity including earthworks and associated plant movement, construction of additional noise walls, road realignment, tolling infrastructure and portal construction. Following this, land not required for the motorway would be returned to open space land use as a public reserve (footpath and cycleway).	High
27-31 Garema Circuit, Kingsgrove	SP 37275	Inside Project Area 1.	Former fertiliser manufacture and/or storage, brick and pipe works, and potential uncontrolled filling and various commercial/ industrial land use including warehousing.	Calcium phosphate, calcium sulfate, copper chloride, sulphur, sulphuric acid, metals (boron, cadmium, copper, magnesium, molybdenum), herbicides, fungicides, asbestos, TPH, BTEX, PAH, OCPs, OPPs, PCBs		Western surface works would be undertaken in this area as part of the project. The property would be occupied during construction as the Kingsgrove North construction compound and returned for industrial use following the completion of construction. Activities at the site would include construction of a shaft, tunnelling and stockpiling of spoil from tunnelling activities, water treatment plant, substation, fuel and chemical storage and staff offices and amenities.	Medium

Area of Concern within proximity to the Project Area		Proximity to Project Area	Potential source of contamination	Potential contaminants	Comments	Intended land use	Preliminary Risk Evaluation
Site Address	Lot and DP						
30A Commercial Road, Kingsgrove	Lot 1 DP 566805	Inside Project Area 1.	Laundering, market gardens, public and council works site, various commercial/ industrial land uses including bus storage.	TPH, BTEX, PAH, OCPs, OPPs, Metals (cadmium, arsenic, copper, lead, mercury, magnesium, aluminium and iron)	It is not certain if bus maintenance is conducted on site.	Western surface works would be undertaken in this area as part of the project. The property would be occupied during construction as the Commercial Road construction compound and returned for industrial use following the completion of construction. Activities at the site would include construction of a shaft, tunnelling and stockpiling of spoil from tunnelling activities, water treatment plant, substation, fuel and chemical storage and staff offices and amenities.	Medium
32 Commercial Road, Kingsgrove	Lot 2 DP 566805	Inside Project Area 1.	Laundering, market gardens, public and council works site, various commercial/ industrial land uses including warehousing.	TPH, BTEX, PAH, OCPs, OPPs, Metals (cadmium, arsenic, copper, lead, mercury, magnesium, aluminium and iron)	-	Western surface works would be undertaken in this area as part of the project. The property would be occupied during construction as the Commercial Road construction compound and returned for industrial use following the completion of construction. Activities at the site would include construction of a shaft, tunnelling and stockpiling of spoil from tunnelling activities, water treatment plant, substation, fuel and chemical storage and staff offices and amenities.	Medium

Area of Concern within proximity to the Project Area Site Address	Lot and DP	Proximity to Project Area	Potential source of contamination	Potential contaminants	Comments	Intended land use	Preliminary Risk Evaluation
M5 East Motorway at Kingsgrove	Lot 3, 4, 5,6,7 and Lot 14 to 22 DP27079 and M5 East	Inside and adjacent to Project Area 3.	Former ammunition storage for WWII Anti-Aircraft Battery unit located between Flat Rock Road, Bexley Road and Wolli Creek	Unexploded ordnance	Over 40 potential ammunition stores were observed on historical aerial photos reviewed for the site.	Bexley Road surface works. Site of tolling gantry for M5 East Motorway. Earthworks, construction of conduits for underground utilities to service the tolling infrastructure and pavement works. The project would include compound infrastructure, including tunnelling from Bexley Road North compound. Activities at the construction compound would include construction of a shaft, tunnelling and stockpiling of spoil from tunnelling activities, water treatment plant, substation, fuel and chemical storage and staff offices and amenities.	Medium
Vacant Roads and Maritime property, west of Bexley Road, M5 Linear Park (Figure 5)	Lot 9 to 18, DP 1069225	Inside and adjacent to Project Area 3.	Vacant grassed land with potential uncontrolled filling.	Uncontrolled fill material (asbestos, heavy metals TRH, BTEX, PAHs)		Bexley Road surface works. Location of the Bexley Road North compound. Activities at the construction compound would include construction of a shaft, tunnelling and stockpiling of spoil from tunnelling activities, water treatment plant, substation, fuel and chemical storage and staff offices and amenities.	Low

Area of Concern within proximity to the Project Area Site Address	Lot and DP	Proximity to Project Area	Potential source of contamination	Potential contaminants	Comments	Intended land use	Preliminary Risk Evaluation
Kingsgrove Avenue Reserve	Various	Adjacent to Project Area 3.	Open space with potential uncontrolled filling.	Uncontrolled fill material (asbestos, heavy metals, TRH, BTEX, PAHs)		Bexley Road surface works. Site of Bexley Road South construction compound. Activities at the construction compound would include construction of a shaft, tunnelling and stockpiling of spoil from tunnelling activities, water treatment plant, substation, fuel and chemical storage and staff offices and amenities.	Low
19 Marsh Street, Arncliffe	Lot 1 DP 329283; Lot 1 DP 108492; Lot 11 DP 570900; Lot 14 DP 213314	Inside Project Area 4	Market gardening, public works including sewerage board. Potential uncontrolled filling for golf course creation, current pesticide and herbicide use. Cooks River and Alexandra Canal also lie within the immediate vicinity of this Project Area.	TPH, BTEX, PAH, OCPs, OPPs, Metals (cadmium, arsenic, copper, lead, mercury, magnesium, aluminium and iron), TPH, BTEX, PAH, OCPs, OPPs, PCBs, herbicides, fungicides, asbestos	-	Arncliffe surface works. The four lots fall within the construction footprint, however only the western extent would be permanently occupied as part of this project. The site would be occupied by the Arncliffe construction compound and motorway operations complex. This would include construction of shafts, tunnelling, spoil handling and the construction of permanent infrastructure	Medium

Area of Concern within proximity to the Project Area		Proximity to Project Area	Potential source of contamination	Potential contaminants	Comments	Intended land use	Preliminary Risk Evaluation
Site Address	Lot and DP						
All of Project Area 5	Various	Inside Project Area 5	Landfills and uncontrolled filled quarries: - Alexandria Landfill - Sydney Park Former Landfill - Camdenville Park - Former Landfill, 3-7 Unwin's Bridge Road (Lot 1 DP1002775)	Landfill gases (methane, carbon dioxide, carbon monoxide, hydrogen sulphide, VOCs), TPH, BTEX, PAH, SVOCs, VOCs, nutrients, metals (cadmium, arsenic, copper, lead, mercury, magnesium, aluminium, zinc and iron), herbicides, fungicides, asbestos, biological hazards.	Potential for other hazards such as subsidence/settlement, buried dangerous goods containers such as compressed gas bottles and other potentially hazardous items. Phase 2 ESA completed for the Alexandria Landfill (Lot 2 DP1168612) and Bradshaw Mountain (Lot 1 DP88087 and Lot B DP376645). Recommendations for Alexandria Landfill closure and associated monitoring and remediation have been made in AECOM (2015e).	St Peters interchange and local roads. Project Area 5 would be the site of the interchange, eastern portal, construction compounds, motorway operations complexes and ancillary operational facilities (such as drainage infrastructure).	High
All of Project Area 5	Various	Inside Project Area 5 or within 100 metres of Project Area 5	Metal smelter sites: - 5/5A Canal Road - 34 Burrows Road, St Peters (Lot 13 DP32332)	Heavy metals (cadmium, chromium, arsenic, copper, lead, mercury, magnesium, aluminium, zinc and iron), PAHs, TRH, asbestos and dioxins/furans	Phase 2 ESA completed for 5/5A Canal Road (Lot B DP394647, Lot A DP391775, Lot X DP421363 and Lot 14 DP606737) (refer to **Section 3.2.4**). Recommendations for remediation of this Site in accordance with a site specific RAP has been made in AECOM (2015d).	St Peters interchange and local roads. Project Area 5 would be the site of the interchange, eastern portal, construction compounds, motorway operations complexes and ancillary operational facilities (such as drainage infrastructure).	High

Area of Concern within proximity to the Project Area Site Address	Lot and DP	Proximity to Project Area	Potential source of contamination	Potential contaminants	Comments	Intended land use	Preliminary Risk Evaluation
		Inside Project Area 5 or within 100 metres of Project Area 5	Manufacturing sites including: - Dial a Dump Industries, 1 Holland Street , St Peters (Lot 1 DP1168612) - Burrows Industrial Estate, 1-3 Burrows Road, St Peters (Lot 11 DP606737)	Heavy metals, TRH, BTEX, PAHs, SVOCs, PCBs, Dioxins	No intrusive investigations completed.	St Peters interchange and local roads. Project Area 5 would be the site of the interchange, eastern portal, construction compounds, motorway operations complexes and ancillary operational facilities (such as drainage infrastructure).	High

Area of Concern within proximity to the Project Area		Proximity to Project Area	Potential source of contamination	Potential contaminants	Comments	Intended land use	Preliminary Risk Evaluation
Site Address	Lot and DP						
		Inside Project Area 5 or within 100 metres of Project Area 5	Waste transfer, processing or storage sites including: - SIMS Metal and Taxi Depot, 33 Burrows Road, St Peters (Lot 102 DP871150) - Good River Properties Pty Ltd,33 Burrows Road, St Peters (also known as 53-57 Campbell Road), St Peters - SITA Alexandria, 33 Burrows Road, St Peters Pty Ltd	Heavy metals, TRH, BTEX, PAHs, SVOCs, PCBs, Dioxins, asbestos, leachate.		St Peters interchange and local roads. Project Area 5 would be the site of the interchange, eastern portal, construction compounds, motorway operations complexes and ancillary operational facilities (such as drainage infrastructure).	High

Area of Concern within proximity to the Project Area		Proximity to Project Area	Potential source of contamination	Potential contaminants	Comments	Intended land use	Preliminary Risk Evaluation
Site Address	Lot and DP						
		Inside Project Area 5 or within 100 metres of Project Area 5	Fuel storage and dispensing: - Dynamo Workshop, 318 Princes Highway (Lot A DP335583) - City of Sydney Recycling Depot, 19-25 Burrows Road, St Peters, NSW (Lot 13 DP606737) - Greyhound Bus Depot (also former metal smelter), 34 Burrows Road, St Peters (Lot 13 DP32332) - Shipping Container Logistics, 12-18 Burrows Road, St Peters - Car rental outlet, 532-536 Gardeners Road, Mascot	Lead, TRH, BTEX	TRH C6-C10/BTEX contamination identified at 2.3-2.4 m bgs within 34 Burrows Road, St Peters (Lot 13 DP32332) at WCX_BH049 completed during AECOM (2015f).	St Peters interchange and local roads. Project Area 5 would be the site of the interchange, eastern portal, construction compounds, motorway operations complexes and ancillary operational facilities (such as drainage infrastructure).	High

Area of Concern within proximity to the Project Area		Proximity to Project Area	Potential source of contamination	Potential contaminants	Comments	Intended land use	Preliminary Risk Evaluation
Site Address	Lot and DP						
		Inside Project Area 5 or within 100 metres of Project Area 5	Uncontrolled filing for land reclamation and levelling (all areas within the Project Area 5 footprint)	Heavy metals (cadmium, chromium, arsenic, copper, lead, mercury, magnesium, aluminium, zinc and iron), PAHs, TRH, BTEX, OCPs, PCBs, asbestos	There has been widespread use of fill across the Project Area particularly areas close to Alexandra Canal where land reclamation occurred due to previous low-lying swamp environment.	St Peters interchange and local roads. Project Area 5 would be the site of the interchange, eastern portal, construction compounds, motorway operations complexes and ancillary operational facilities (such as drainage infrastructure).	Medium
		Inside Project Area 5 or within 100 metres of Project Area 5	Acid sulfate soils	Acid generation	Due to the presence of Holocene sediments within the area, potential acid sulfate soils are likely to be present.	St Peters interchange and local roads. Project Area 5 would be the site of the interchange, eastern portal, construction compounds, motorway operations complexes and ancillary operational facilities (such as drainage infrastructure).	High
		Inside Project Area 5 or within 100 metres of Project Area 5	Pioneer Plating Works 25-29 Ricketty Street, Mascot	TPH, BTEX, total cyanide and heavy metals.	Listed under CLM Act 1997 Section 58.	St Peters interchange and local roads. Project Area 5 would be the site of the interchange, eastern portal, construction compounds, motorway operations complexes and ancillary operational facilities (such as drainage infrastructure).	High

Area of Concern within proximity to the Project Area Site Address	Lot and DP	Proximity to Project Area	Potential source of contamination	Potential contaminants	Comments	Intended land use	Preliminary Risk Evaluation
Former Drum Recondition-ing Facility, 53 Barwon Park Road, St Peters, NSW	Lot 1 DP 1186016	Within 100 metres of Project Area 5	Drum reconditioning works, including thermal oxidation treatment washing process and drum painting.	Soil contaminated with PAHs, TPH, BTEX and groundwater contaminated with naphthalene and TPH migrating off-site.	Listed under CLM Act 1997 Section 58.	St Peters Interchange and local roads. Project Area 5 would be the site of the interchange, eastern portal, construction compounds, motorway operations complexes and ancillary operational facilities (such as drainage infrastructure).	Medium
Cooks River Terminal, 20 Canal Road, St Peters, NSW	Various	Within 100 metres of Project Area 5	Railway depot and empty container park where containers are delivered to, to be cleaned, stored and repaired prior to being transported to regional freight centres or re-exported.	TRH, BTEX, PAHs, asbestos, heavy metals, OCP, OPPs and PCBs.	Listed under CLM Act 1997 Section 60. Initial assessment considered by the EPA to be not significant enough to warrant regulatory intervention under the CLM Act 1997.		Low

Area of Concern within proximity to the Project Area		Proximity to Project Area	Potential source of contamination	Potential contaminants	Comments	Intended land use	Preliminary Risk Evaluation
Site Address	Lot and DP						
Australian Refined Alloys, 202-212 Euston Road Alexandria, NSW	Lot C in DP 162050	Within 100 metres of Project Area 5	Non-thermal treatment of hazardous and other waste Recovery of hazardous and other waste. Site also stores waste - hazardous, restricted solid, liquid, clinical and related waste and asbestos waste.	TRH, BTEX, PAHs, asbestos, heavy metals, OCP, OPPs, PCBs, waste leachate.	Listed under CLM Act 1997 Section 60 and on National Pollutant Inventory register. Initial assessment considered by the EPA to be not significant enough to warrant regulatory intervention under the CLM Act 1997.		Medium
Visy Paper Pty Ltd and SPRC Pty Ltd, 6-10 Burrows Road South, St Peters, NSW	Part Lot 2 in DP802342	Within 100 metres of Project Area 5	Site used for recovery of general waste and waste storage.	TRH, BTEX, PAHs, asbestos, heavy metals, OCP, OPPs, PCBs, waste leachate.	Listed under POEO Act 1997.		Low
Alexandra Canal	Lot 1 DP 532493, Lot 1 DP749404 and Lot 3 DP878489	Within Project Area 5	Industrial inputs into the canal via drainage and illegal waste disposal	OCPs (chlordane, total DDT and dieldrin), PCBs and metals	The bed sediments within the canal have been found to be contaminated in such a way as to present a significant risk of harm to human health and the environment	Drainage infrastructure would be constructed which would discharge into the canal	High (if significantly disturbed)

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9.0 Discussion

Based on the information summarised in , this section provides an assessment of the need for additional investigative works to be undertaken to further evaluate the contamination risk associated with the identified areas of environmental concern.

It is noted that the additional investigations recommended herein would further evaluate the risk of potential contaminant exposure to workers during the construction phase and provide guidance on waste management in the event that excavated materials require offsite disposal or classification for potential reuse. The scope of any additional investigations will require confirmation of the nature and extent of the final disturbance activity by the preferred contractor.

9.1 Project Area 1 – Western surface works

M5 Linear Park and Noise Mounds

The construction of infrastructure, earthworks, construction of noise barriers and associated plant movement during the construction would involve surface disturbance at these locations. Following construction, the land would consist of open space and infrastructure land uses.

Following findings gathered in a recent report (AECOM, 2015d), and the detection of friable asbestos within a soil noise mound on the southern side of the M5 East Motorway and the presence of uncontrolled fill beneath the other fill mounds and Beverly Grove Park reserve, it is recommended that further characterisation of the fill is undertaken, prior to the disturbance of these locations by construction, in accordance with the process outlined in **Section 9.6**.

27-31 Garema Circuit, Kingsgrove

The completion of infrastructure for the Kingsgrove North construction compound includes the installation of a shaft and underground services or utilities, such as electrical sub-station, AusGrid and sewer for office and amenities buildings. These construction works would involve ground disturbance and excavation of potentially contaminated soil and fill materials. Following construction the land will be used as road infrastructure and commercial/industrial land uses.

Following the site's previous commercial/industrial land use, including a former fertiliser manufacture and/or storage, brick and pipe works, and potential uncontrolled filling and various commercial/industrial land uses including warehousing, it is recommended that additional investigations (including waste characterisation) are before construction commences in this area, in accordance with the process outlined in **Section 9.6**.

32 Commercial Road, Kingsgrove and adjacent property 30A Commercial Road, Kingsgrove

The completion of infrastructure for the Commercial Road construction compound, including the installation of a shaft and underground services or utilities, would involve ground disturbance of potentially contaminated soil and fill materials. Following completion of construction the land will be returned for commercial/industrial land use.

Following the previous commercial/industrial land use including laundering, market gardens, public and council works site, various commercial/industrial land uses including bus storage and warehousing, it is recommended that additional investigations (including waste characterisation) are undertaken before construction commences in this area, in accordance with the process outlined in **Section 9.6**.

9.2 Project Area 2 – Kingsgrove Road surface works

The land within Project Area 2 would be road infrastructure at completion of the project. Based on the nature of the construction activities within Project Area 2 and the proposed land use, no further investigations are considered necessary. However an unexpected finds procedure would be prepared in the event that unexpected contamination is encountered and a pre-construction waste classification could be completed to minimise temporary stockpiling of spoil.

Soil and fill materials requiring off-site disposal would need to be assessed in accordance with the NSW EPA (2014) Waste Classification or a Resource Recovery Exemption (if applicable). As outlined in **Section 9.6** below, this may be undertaken prior to or during construction.

9.3 Project Area 3 – Bexley Road surface works

Project Area 3 would consist of a mixture of road infrastructure, commercial/industrial, and open space land uses at the completion of construction.

The review of aerial photographs identified a potential ammunition storage sites that may have been associated with an anti-aircraft battery located near Homer Street and Bexley Road during WWII. The site appeared to contain over 40 small sheds relatively evenly spread across two hectares. No further information could be found about the site during this Phase 1 ESA. It appears that most of the site would have been excavated for the existing M5 East Motorway construction in the late 1990s and remaining parts developed as residential housing, surface works, or remains vacant (owned by Roads and Maritime).

An explosive ordinance due diligence assessment should be undertaken for the affected area to further assess the risk posed to future ground disturbance in the area. Subject to the findings of the EO assessment, additional investigations may be warranted.

No further investigations are considered necessary in other parts of Project Area 3, however an unexpected finds procedure would be prepared in the event that unexpected contamination is encountered and a pre-construction waste classification could be completed to minimise temporary stockpiling of spoil.

Soil and fill materials requiring off-site disposal would need to be assessed in accordance with the NSW EPA (2014) Waste Classification or a Resource Recovery Exemption (if applicable). As outlined in **Section 9.6**, this may be undertaken prior to or during construction.

9.4 Project Area 4 – Arncliffe surface works

The construction of infrastructure associated with the Arncliffe construction compound and Arncliffe motorway operations complex is anticipated to involve surface disturbance. This includes the installation of shafts, underground services and utilities, the construction of the water treatment plant and associated sub-surface water infrastructure. Historical and current land use activities include market gardening, public works including sewerage board, potential uncontrolled filling for golf course creation, current pesticide and herbicide use. The site is also in the proximity of the site to the Cooks River and Alexandra Canal and has a likelihood of acid sulfate soil.

Following completion of construction, Project Area 4 would consist of a commercial/industrial land use (New M5 operations infrastructure) and land temporarily required for construction of the project would be rehabilitated and returned to its original land use (possibly reconfigured within the construction footprint). Any change in land use beyond open space would be subject to a separate planning process.

Subject to confirmation of the extent of disturbance, it is recommended that additional intrusive investigations are undertaken prior to the commencement of construction in this area, in accordance with the process outlined in **Section 9.6**.

A Construction Environmental Management Plan (CEMP) would also need to be implemented to minimise disturbance to the existing landscape and manage potential soil and groundwater contamination, waste and acid sulfate soil concerns. This would need to be considered in conjunction with the Green and Golden Bell Frog Plan of Management with respect to any enhancement works within the buffer corridor.

9.5 Project Area 5 – St Peters Interchange and local roads upgrades

Unwins Bridge Road, May Street, Bedwin Road, St Peters

A stormwater retention basin located within Camdenville Park on the corner of Bedwin and May Streets contains a formerly filled quarry. Following construction the land would continue to be used as a stormwater detention basin.

The land has been subject to previous investigations (GHD, 2013). The investigations identified surface and near surface soils contaminated with asbestos, copper, lead, TPH, and PAHs and accumulated surface water contaminated with arsenic, copper, lead, zinc, ammonia, TPH and PAHs. Methane and carbon dioxide gas concentrations were assessed as a moderate to low risk, based on GHD's review of a previous landfill gas assessment that compared results to NSW EPA (2012) Hazardous Ground Gas guidance.

A filled former quarry was also located adjacent to the Project Area on Unwin's Bridge Road and a former industrial property was located on the corner of Bedwin and Unwins Bridge Road. They are potential off-site sources of contamination.

It is recommended that targeted intrusive investigation works are undertaken within this area of the Project Area 5, before construction commences to evaluate the risk of potential contaminant exposure to workers during the construction phase, and for potential receptors on future land uses, and provide guidance on waste management. The assessment process should be undertaken in accordance with the process outlined in **Section 9.6**.

Campbell Street, St Peters

The properties within the footprint of Project Area 5 in Campbell Street mainly contain and have historically consisted of low to medium density residential properties with the exception of:

- 4-16 Campbell Street, St Peters, NSW (Lot 1 DP1010128 and Lot 1 DP321348);
- 18 to 24 Campbell Street (Lot 1 DP906751, Lot 1 DP921970, Lot 1 and 2 DP921124 and Lot 1 DP2543); and
- 62 Campbell Street, St Peters (Lot 1 DP 721609 and Lot 19 DP73532).

Following completion of construction the land would consist of a mixture of open space and road infrastructure.

The above properties have been used historically for commercial/industrial land uses. Number 4-16 Campbell Street formed part of the St Peters former bricks works and was most recently used by Dial-a-Dump and contains a distribution cottage substation. Industrial and commercial land uses have also occurred on the north side of Campbell Street between Simpson Park and Princes Highway which are potential off-site sources of contamination.

It is recommended that an intrusive ESA is undertaken within these commercial/industrial sites that fall within the Project Area 5 footprint before construction works commence, in accordance with the process outlined in **Section 9.6**. An ESA would aim to confirm the risk of potential contaminant exposure to workers during the construction, and for potential receptors on future land uses, and provide guidance on waste management.

Alexandria Landfill, 10-16 Albert Street, St Peters

Following completion of construction project, the Alexandria Landfill would consist of road infrastructure with areas of open space.

A Phase 2 ESA was completed by AECOM for the Alexandria Landfill (Lot 2 DP1168612) (AECOM, 2015b). The landfill was a former brick works quarry which had been excavated down to at least 51 metres below ground surface and then landfilled with a mixture of mainly soil, timber and demolition type waste including asbestos. The main contaminants in soil exceeding adopted assessment criteria were identified to be lead, asbestos, PAHs, dioxins and TRH. Friable asbestos was also identified to be present in surface soils and the fill mound identified as 'Stockpile 21'. ENVIRON (2015) also undertook stockpile sampling for waste classification purposes of the remaining recycling stockpiles within the Alexandria Landfill in March 2015. Four of the stockpiles were classified as Hazardous Waste, three were Restricted Solid Waste (Special Waste Asbestos), one was General Solid Waste (Special Waste Asbestos) and the remaining were classified as General Solid Waste (non-putrescible) in accordance with the NSW EPA (2014) guidelines. Friable asbestos was identified in three of the recycling stockpiles.

Leachate within the landfill was found to have elevated concentrations of chromium, nickel, zinc, TRH, benzene and ammonia. Concentrations of contaminants were significantly lower in the Botany Sands aquifer and bedrock aquifer, but ammonia and heavy metals still exceeded the assessment criteria. The hydrological assessment undertaken by AECOM (2015d) stated the leachate pumping system would be required to remain in operation during the construction and operational of the St Peters Interchange works to maintain groundwater levels within the fill and shale below the finished road levels. Additionally, the report recommended that leachate generated from the Botany Sands can be further reduced by either the extension of the groundwater abstraction system or the construction of a cut-off wall socketed into the weathered shale. This would negate the requirement for permanent dewatering licensing and having no running costs and minimal maintenance.

Subsurface landfill gas monitoring of 12 newly installed landfill gas wells and two groundwater monitoring wells was conducted on 24 February 2015 with an infrared landfill gas analyser. The detected landfill gas monitoring results are summarised in **Table 22**.

Table 22 Landfill gas monitoring results

Peak CH_2 (%)	Stable CH_2 (%)	CO_2 (%)	O_2 (%)	LEL (%)	H_2S (ppm)	CO (ppm)	Flow (L/hr)	Barometric Pressure
0.0 -70.5	0.0 - 70.4	0.4 - 36.9	0.0 - 19.8	0.0 – 51.5	0.0 - 1194	0.0 - 15	-2.6 - 7.2	1010 - 1011

Elevated concentrations of methane, carbon monoxide, carbon dioxide and hydrogen sulfide were detected in wells installed around and in the landfill in the Phase 2 ESA. Trace gases 1,2,4-trimethylbenzene and dichlorodifluoromethane were also detected at concentrations greater than the adopted assessment criteria.

Based on the reported results, the Modified Wilson and Card classification for the site was Characteristic Gas Situation '4' (moderate to high risk) based on measured methane concentrations and flow rates in accordance with the NSW EPA (2012) guidelines. Based on the reported concentrations measured close to the landfill site boundary there is potential for off-site migration of landfill gas outside of the landfill boundary. Identified landfill gas migration pathways include underground service trenches, unsaturated permeable fill, soil and bedrock. Gases can also potentially accumulate in below and above ground buildings and structures where landfill gas is present.

Potential human receptors of landfill gas contamination were identified in AECOM (2015b) to include current workers, contractors and visitors on the site, including those on neighbouring sites. Future receptors include construction and maintenance workers and members of the public visiting the site. Migrating landfill gases also have the potential to accumulate in below and above ground buildings and structures. As there are buildings and underground services in and adjacent to the site boundary, this pathway is considered complete.

The Phase 2 ESA (AECOM, 2015b) concluded that the landfill site did not meet the proposed motorway land use criteria condition. However, it was considered that the landfill site could be made suitable if appropriate remediation and management actions were adopted and implemented.

It was recommended that further delineation and monitoring of landfill gases was required and that a RAP and Landfill Closure Plan be prepared for the site. A LCMP (AECOM, 2015h) has been prepared which details the landfill closure and ongoing management controls post closure. The landfill closure is proposed to be carried out as part of the project (refer to Chapter 5 and Appendix D of the EIS) and is discussed further in **Section 9.6**.

Bradshaw Mountain, Corner of Woodley Street and Campbell Avenue, St Peters

Following completion of construction for the project, the land would contain a mixture of road infrastructure and open space.

AECOM completed a Phase 2 ESA for (Lot 1 DP88087 and Lot B DP376645) concurrently with the Alexandria Landfill. The stockpile of crushed sandstone on Bradshaw Mountain was found to meet the ENM Exemption guidelines with the exception of: one exceedence of the ASC NEPM (2013) Health Investigation Level (HIL) C for CPAHs was detected within the fill underlying the Bradshaw Mountain stockpile; and friable ACM was detected in one sample from the fill underlying the Bradshaw Mountain stockpile. The main inclusions in the fill were observed to be brick and ceramic materials and some ash layers, which is consistent with the historical use of the site as brickworks. No landfill waste was identified within the footprint of Bradshaw Mountain at the locations and depths sampled.

The 95 per cent upper confidence limit (UCL) was calculated for the sample results and the CoPC met the adopted assessment criteria. Based on this the presence of asbestos in fill material detected below the Bradshaw Mountain stockpile is the main soil contamination issue. The land would also be impacted be landfill gases migrating from the Alexandria Landfill.

The management of soil, groundwater and ground gas issues would be addressed in a RAP to be prepared for to make it suitable for the proposed land use, by the process outlined in **Section 9.6**.

Canal Road Properties, St Peters

The Canal Road properties consist of:

- 1 Canal Road currently contains warehouse units, however was historically used for brick manufacturing and workshops.
- 318 Princes Highway (Lot A DP 335583) is located on the corner of Canal Road and contained an active workshop and redundant USTs from the service station which formerly operated on the site.
- 5/5A Canal Road in which a Phase 2 ESA (AECOM, 2015d) was completed (Lot B DP394647, Lot A DP391775, Lot X DP421363 and Lot 14 DP606737).

Following completion of construction for the project, the subject land would contain a mixture of road infrastructure and open space.

5/5A Canal Road was a former metal smelter, waste recyclers and had been filled with uncontrolled fill. The Phase 2 ESA (AECOM, 2015d) identified that fill was contaminated with heavy metals, asbestos, PAHs, PCBs, TRH and dioxins. Heavy metals, particularly zinc, were found to be leaching into groundwater. It was concluded that the site in its current condition did not meet the proposed land use criteria; however was considered that the site could be made suitable if appropriate remediation and management actions were implemented. It was recommended that a remediation action plan (RAP) detailing options for remediation and/or management of identified contamination should be prepared and submitted to an appointed NSW EPA accredited Site Auditor. The RAP should state the preferred strategy to render the site suitable for the proposed land use(s) and detail validation requirements necessary to demonstrate successful completion of the remedial works and requirements for a long term management plan if required.

5/5A Canal Road was also recommended to be notified to the NSW EPA and in accordance with the NSW EPA (2015) Duty to Report guidelines under the Section 60 of the CLM Act 1997, and is as such in the process of being notified.

It is recommended that an intrusive investigation is undertaken on the above sites not yet investigated in accordance with the process outlined in **Section 9.6**, before construction works commence at this location. An ESA would aim to confirm the risk of potential contaminant exposure to workers during the construction phase, and for potential receptors on future land uses, and provide guidance on waste management.

The USTs and associated underground petroleum infrastructure located within the lot at 318 Princes Highway would also require to be decommissioned in accordance with NSW guidelines.

Holland Street Properties, St Peters

The following properties are located in Holland Street between the Alexandria Landfill and Sydney Park:

- 1 Holland Street, St Peters, NSW (Lot 1 DP1168612 and Lot 1 DP129280)
- 2 Holland Street, St Peters (Lot 1 to 6 DP 976191)
- 8 A Holland Street, St Peters (Lot 7 to 8 DP 976191)
- 10 Holland Street, St Peters (Lot 1 DP 783704)
- 12 Holland Street, St Peters (Lot 1 to 2 DP234704)
- 14 to 18 Holland Street (Lot 3 to 5 DP234704)

The properties would form part of the St Peters interchange and be used during the construction phase as a compound. Following construction the land would be used as open space consisting of landscaping and basins.

They have historically been used for commercial or industrial land uses since at least the 1930s and subject to historical filling. The property at 1 Holland Street was part of a larger manufacturing site and directly adjacent to the Alexandria Landfill. The remainder of the properties formed smaller scale commercial/industrial manufacturing or engineering workshops.

It is recommended that an intrusive ESA is undertaken, before construction works commence at these properties, in accordance with the process outlined in **Section 9.6**. An ESA would aim to confirm the risk of potential contaminant exposure to workers during the construction phase, and for potential receptors on future land uses, and provide guidance on waste management.

Campbell Road and Sydney Park, St Peters

The following properties are located in Campbell Road, between the Alexandria Landfill and Sydney Park:

- 25 Campbell Road (Lot 1 DP 1072060, Lot 1 and 2 DP 219746)
- Vacant lot on corner of Campbell Road and Woodley Street, St Peters (Lot 26 DP 976191)
- 27 to 35 Campbell Road, St Peters (Lot 1 DP567186)
- 47-49 Campbell Road, St Peters (Lot 1 and Lot 2 DP560154 and Lot 2 DP316359)

Following construction the land would be used as infrastructure as well as open space consisting of landscaping and basins.

The land has historically been used for commercial or industrial land uses since at least the 1930s and subject to historical filling as per the Holland Street properties. Number 47 -49 Campbell Street is currently used for food processing and packaging however was likely formerly used for other historical industrial uses.

It is recommended that these sites be included in intrusive ESAs, before construction works commence in accordance with the process outlined in **Section 9.6**. An ESA would aim to confirm the risk of potential contaminant exposure to workers during the construction phase, and for potential receptors on future land uses, and provide guidance on waste management.

Burrows Road Properties, St Peters

The properties within the Project 5 Area are within the footprint of the St Peters interchange and local roads upgrades within Project Area 5 in Burrows Road:

- 13 Burrows Road, St Peters, NSW (Lot 12 DP606737)
- 19-25 Burrows Road, St Peters, NSW (Lot 13 DP606737)
- 29 Burrows Road (Lot 102 DP 871150 and Lot 101 DP 845651)
- 12-18 Burrows Road, St Peters NSW (Lot 2120 DP 591060)
- 34 Burrows Road, St Peters (Lot 13 DP 32332)

All of the properties are topographically down-gradient of the Alexandria Landfill, have been filled as part of land reclamation and have contained potentially contaminating land uses such a market gardens, fuel and chemical storage (logistics/transport depots), a timber mill and manufacturing. Some of the sites potentially have or have had USTs for fuel or chemical storage. Soil results from one borehole (WCX_BH049) during the AECOM (2015b) completed in geotechnical factual investigation at 34 Burrows Road, contained high concentrations of volatile TRH fractions and BTEX at the approximate groundwater interface (at around two to three metre bgs).

Following construction the land would be a mixture of road infrastructure, open space and commercial/industrial land uses.

It is recommended that an intrusive ESA is undertaken, before construction works commence at these locations, in accordance with the process outlined in **Section 9.6**. An ESA would aim to confirm the risk of potential contaminant exposure to workers during the construction phase, and for potential receptors on future land uses, and provide guidance on waste management.

Alexandra Canal

New drainage discharge points would be constructed as part of the project and consideration must be given to the potential impact of the new infrastructure on bed sediments within the canal. Works within Project Area 5 would likely involve the construction of new stormwater drainage infrastructure that would collect and direct surface water runoff from the St Peters interchange and local roads area and ultimately drain into the canal. The new drainage infrastructure comprises two additional discharge outlets into Alexandra Canal with the following indicative specifications (subject to detailed design):

- A 3300 x 2400 millimetre open channel discharging immediately to the south west of Gardeners Road Bridge
- A 525 millimetre reinforced concrete pipe (RCP) discharging immediately to the south east of Gardeners Road Bridge

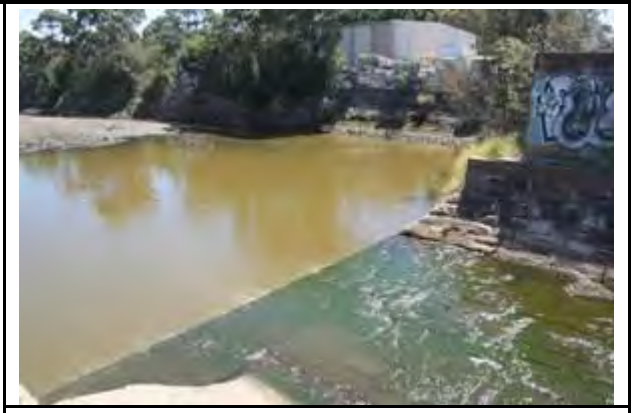
The new stormwater discharge outlets would be constructed upstream of Rickettys Street bridge. The Rickettys Street bridge is located over two kilometres from the junction of the canal with the Cooks River.

During periods of discharge, runoff has the potential to cause localised erosion and scour in the vicinity of the stormwater discharge points which could potentially mobilise contaminated sediments which may already be present within the canal or contributed as discharge through the stormwater drain. This is consistent with observations of canal bed features in proximity to existing stormwater infrastructure, which are characterised by scour pools at the point of discharge. The pools appear to be generally surrounded by coarser sediment as a result of the winnowing of fines which are typically transported to a lower energy environment outside the main zone of influence of the discharge point.

The addition of new stormwater outlets along the canal is likely to cause localised mobilisation of sediment, however, as demonstrated in historic studies undertaken for existing stormwater drains within the canal (summarised in **Section 3.2.14**), it is considered unlikely that sediments mobilised as a result of the impact of the new outlets would extend a significant distance from the stormwater discharge point given that the canal has a very low sediment transport capacity. Consequently, any localised sediment disturbance which may occur as a result of the construction and operation of additional discharge outlets is considered unlikely to result in an increased risk to human health or the environment given that:

- The canal is not permitted to be used for recreational purposes and fishing and contact with the sediment is banned
- It is understood that there is currently very little or no viable benthic ecological communities present within the canal (given the existing toxicity of the sediment) which could be adversely impacted by localised sediment disturbance
- Sediment disturbance which is likely to occur during construction and operation of the new stormwater outlets would be localised and limited in extent and therefore unlikely to have an additional impact on downstream water bodies (eg. Cooks River or Botany Bay)
- A large number of stormwater discharge points/outlets and in channel anthropogenic features (refer **Table 23**) with the potential to disrupt sediment movement are already present within and along the banks of the canal.

Table 23 Alexandra Canal – existing features

Summary of Existing Features of Alexandra Canal	
Sheas Creek Outlet The Sheas Creek outlet is lined with sandstone blocks. The lined section of the canal potentially extends to greater than 115 metres downstream of the Sheas Creek outlet (AAJV, 2014). The water appears to be turbid and large sediment banks protrude during low tide periods as seen in Plate 1 and 3.	 Plate 1 Sheas Creek outlet at Alexandra Canal at low tide (28 January 2015)

Summary of Existing Features of Alexandra Canal	
Stormwater Outlets The following stormwater and surface water outlets discharge directly into the canal: - Three open drains (at 150 metres, 750 metres and 2180 metres downstream from Sheas Creek headwater); - 16 local council stormwater outlets; - Direct stormwater drainage outlets from private properties; and - Sydney Airport Corporation North Pond weir located on southeast side of Botany Goods Railway Bridge. Stormwater drain outlets are typically 300 to 900 millimetres in diameter as shown in Plate 2. Sediment deposition evident on the downstream side at each stormwater drain outlet.	 Plate 2 Stormwater outlet on east side of Alexandra Canal near Sheas Creek at low tide (28 January 2015)
Concrete Overpass A concrete bridge with four pylons within the bed sediments is located around 430 metres downstream from the Sheas Creek outlet. The bridge is a conduit for electrical cables from the Transgrid Beaconsfield Substation in Burrows Road to the east side of the canal.	 Plate 3 Sedimentation in upper Alexandra Canal and concrete overpass bridge in background at low tide (28 January 2015)
Ricketty Street Bridge Ricketty Street bridge is located around 1.6 kilometres downstream of Sheas Creek outlet. The bridge consists of two pylons within the canal, each consisting of an elongated oval shaped pylon on three circular pylons and orientated horizontal to the canal bank. Pylons are also located both banks of the canal. The water was observed to be turbid (refer to Plate 4) during an inspection conducted by AECOM on 26 June 2015. Entrained sediment along with a surface sheen was observed moving upstream within the water column during the low incoming tide. It is noted that there had been over 68.6 millimetres of rain recorded over the seven days previous to 26 June.	 Plate 4 Ricketty Street Bridge over Alexandra Canal at low tide (26 June 2015)

Summary of Existing Features of Alexandra Canal	
Botany Goods Railway Line Bridge The Botany Goods Railway Bridge is located around 2.3 kilometres downstream of Sheas Creek outlet. The bridge consists of four elongated oval shaped pylons orientated horizontal to the canal bank. The canal water was observed to be turbid on the incoming tide on the 27 June 2015 at the bridge.	 Plate 5 Botany Goods Railway Bridge over Alexandra Canal at incoming tide (27 June 2015)
Sydney Airport bridge A new bridge connecting Qantas Drive to the northern side of the canal at Tempe (2.7 kilometres downstream of Sheas Creek) was being constructed in June and July 2015. The bridge is a single span structure with no piers within the canal. The bridge would therefore be expected to have negligible impact on sediments under a normal two ARI flood. Pile sheeting was observed to have been driven into either side of the bank walls for the bridge footings.	 Plate 6 SACL single span road bridge connecting Tempe northern lands to Qantas Drive at Mascot (24 June 2015).
Sydney Airport landing lights pier Two small pylons form a pier for airport runway landing lights in the canal at around 2.8 kilometre downstream of the Sheas Creek outlet. The water appeared less turbid at this location compared to at the Botany Goods Railway Bridge 340 metres upstream.	 Plate 7 Sydney airport landing lights pier in Alexandria Canal at the end of the north-south runway (27 June 2015).
Pedestrian/Shell pipeline bridge at Tempe Reserve The bridge is located 300 metres from the confluence with the Cooks River. The bridge sits on seven pylons consisting of three piles each.	**No photo is available**

Notwithstanding the above considerations, it is anticipated that scour protection measures would be installed at the discharge outlets to further minimise the potential for sediment disturbance caused by the construction and operation of new outlets. The design of the outlets, including discharge velocities and scour protection measures, would be confirmed during detailed design and supported appropriate drainage modelling (refer to Section 7.3.3 of the Technical Working Paper: Surface Water). This may also include energy dissipaters, if required. Further, the Construction Environmental Management Plan would detail specific methodologies and management measures for the outlet construction works which would detail the control measures to satisfy the requirements of the existing Remediation Order for the Alexandria Canal.

The detailed design of the outlets and corresponding Construction Environmental Management Plan would be provided to Sydney Water and NSW EPA for approval in accordance with the requirements of the Remediation Order.

East of Alexandra Canal

The following properties to the east of the Alexandra Canal and within the footprint of Project Area 5:

- 67 Bourke Road, Alexandria (Lot 16 DP 270785)
- 81 and 81A Bourke Road, Alexandria (Lot 3 and 5 DP248721)
- 538 Gardeners Road, Mascot NSW
- 566 Gardeners Road, Mascot NSW (SP36878)
- 546-558, Gardeners Road, Alexandria (Part Lot 1 DP91123)
- 1-3B, Ricketty Street, St Peters (Part 1 Lot DP 551509).

These properties have been historically used for market gardens, commercial/industrial manufacturing, warehouses or workshops or wool stores. They are also likely to have undergone a degree of filling as part of land reclamation. They are also surrounded by current and former industrial land uses which may be off-site sources of contamination.

Following construction the subject land would be used as road infrastructure and excess land returned to commercial/industrial land use.

It is recommended that an intrusive ESA is undertaken within the footprint, before construction commences at these properties, in accordance with process outlined in **Section 9.6**. An ESA would aim to confirm the risk of potential contaminant exposure to workers during the construction phase, and for potential receptors on future land uses, and provide guidance on waste management.

9.6 Contamination Assessment, Remediation and Management Process for the project

The following outlines how known or potentially contaminated land within the Project Area would be managed in accordance with the CLM Act 1997 and the POEO Act 1997.

9.6.1 Dangerous Goods Searches

Following acquisition of the properties within the footprint of the project areas, dangerous goods searches of WorkCover NSW records would be undertaken on properties that contain or are suspected of formerly containing USTs and associated underground infrastructure. The properties requiring assessment are those in Project Area that are listed in Section 9.5, excluding:

- 5 and 5A Canal Road, St Peters NSW
- 1 Campbell Lane, St Peters NSW
- 19-25 Burrows Road, St Peters NSW.

The dangerous goods searches would be completed prior to commencement of the intrusive site investigations.

9.6.2 Explosive Ordnance Assessment

An Explosive Ordnance (EO) Due Diligence would be undertaken for the portion of Project Area 3 that was identified on the historical aerials as potentially containing former ammunition stores. The EO assessment would entail a further desktop review of historical information including aerial photographs, historical certificates of title and a search of available government records. This would be completed by a consultant experienced in under taking EO assessments.

The EO assessment would provide advice on the likelihood of whether the subject site was used for storage of ordnance and whether there is a potential risk of ordnance remaining that would require either additional investigations or control measures during construction. The EO Due Diligence would occur prior to the commencement of construction in this Project Area so that recommendations can be adopted into WHS plans if required.

9.6.3 Intrusive Site Investigations

Areas of land within the Project Area footprint identified as areas of potential concern in this report would be assessed and managed by the following process:

1) The areas would be investigated for contamination in accordance with the ASC NEPM (2013) by an appropriately experienced and qualitied consultant. A Sampling, Analysis and Quality Plan (SAQP) would be prepared for each investigation area. The SAQP includes development of a preliminary conceptual site model which assists in identifying appropriate sampling media (soil, groundwater, leachate or ground gas), analytical parameters (based on contaminants of concern) and assessment criteria based on the future land use, human and ecological receptors and exposure pathways. A NSW accredited site auditor would be engaged to provide an independent review of the SAQP, prior to the completion of the investigations.
2) Based on the findings of the investigations the subject land would either be assessed as suitable for the proposed land use or not suitable for the proposed land use.
3) If the land is assessed as not suitable, based on the findings, recommendations would be made to undertake one or all of the following:
    - Undertake further investigations or risk assessment
    - Development of a RAP to make the site suitable for the proposed land use
    - Notify the site to the NSW EPA in accordance with Section 60 of the CLM Act 1997 if required
    - Development and implementation of a site management plan to manage risks to future land uses
4) The appointed NSW Auditor would review the investigation report and either approve or make further recommendations.

The preparation of SAQPs and the completion of the investigations would be undertaken in accordance with the guidelines approved by the NSW EPA at the time of the investigation works.

9.6.4 Site Remediation

RAPs would be developed for the following areas of the Project Area:

- Alexandria Landfill and Bradshaw Mountain, St Peters
- 5 and 5A Canal Road, St Peters
- Sites identified as an outcome of the investigation process in **Section 9.6.1** above as requiring remediation to make suitable for the proposed land use.

RAPs would be developed in accordance with the relevant NSW EPA approved guidelines at the time of preparation. RAPs would be reviewed and approved by the appointed NSW Site Auditor prior to submission for approval to the required planning authorities.

9.6.5 Landfill Closure

The Alexandria Landfill would be closed and managed long term in accordance with the requirements of the Landfill Closure Management Plan (LCMP) which would be finalised during detailed design.

A draft Landfill Closure Management Plan (draft LCMP) has been prepared and is provided in **Appendix F** of the environmental impact statement and has been prepared with consideration to the design of the St Peters interchange. The draft LCMP provides a landfill closure and environmental management and monitoring framework to be implemented both during and post landfill closure. The draft LCMP outlines the key landfill closure activities to be undertaken and documents the proposed final landform, capping system, as well as the leachate and gas management and monitoring protocols to be adopted for the landfill closure process.

The draft LCMP has been developed in accordance with the requirements of the POEO Act 1997 and in consultation with the NSW EPA and the Site Auditor accredited under the CLM Act 1997. Construction and operation of the project would be carried out in accordance with the LCMP once finalised.

The key components of the landfill closure works would include:

- Final landfill cap
- Landfill gas management
- Leachate management
- Groundwater cut-off wall
- Landfill monitoring and management requirements.

Further information on the landfill closure activities is provided in the environmental impact statement and Appendix F of that report.

9.6.6 Management of Sites not requiring investigation

Areas of land identified as not being areas of potential concern and not requiring investigation would be managed by procedures in the construction EMP. Potential contamination within these areas would be managed by:

- Implementation of unexpected finds procedures
- Implementation of appropriate occupational health and safety controls
- Management of fill and soil off-site disposal as per **Section 9.6.7** below

The unexpected finds procedure would include procedures for when suspected chemical, asbestos or other potentially hazardous substances which could be potentially uncovered during earth works. The procedure would include requirements for inspections and testing of suspected contamination by an appropriately qualified hygienist and/or contaminated lands consultant.

9.6.7 Waste management

Excavated materials requiring off-site disposal would be classified in accordance with either:

- NSW EPA (2014) *Waste Classification Guidelines*; or
- An applicable resource recovery exemptions and orders under the *POEO (Waste) Regulation 2014*

In order to minimise temporary spoil storage volumes or to minimise delays to the construction, soil may be sampled *in situ* for pre- classification for off-site disposal prior to commencement of earthworks.

In situ waste classification would be undertaken as part of investigations for areas of potential or known areas concern, but may also be undertaken in other areas of the Project Area which require off-site disposal of excavated fill or soil.

Waste classification sampling, analysis and reporting would be undertaken in accordance with the requirements of the ASC NEPM (2013) and other NSW EPA approved guidelines.

9.6.8 Acid sulfate soils

The risk of acid sulfate soils occurring within the Project Areas was identified in **Chapter 5.0** of this report and the following Project Areas were identified as requiring Acid Sulfate Soil Management Plans (ASSMPs):

- Project Area 4: Mapped as Class 3. Works beyond one metre below ground surface require an ASSMP
- Project Area 5: Mapped as Class 1, 2 and 3. All works for Class 1 require an ASSMP, areas with Class 2, where works are below natural ground surface require an ASSMP and for Class 3, works beyond 1 m below natural ground surface require an ASSMP

The documents are to be prepared in accordance with the Acid Sulfate Soils Management Advisory Committee (ASSMAC) (1998) *Acid Sulfate Soils Assessment Guidelines.* The ASSMPs would include protocols for the off-site disposal of acid sulfate soils and potential acid sulfate soils in accordance with the NSW EPA (2014) *Waste Classification Guidelines: Part 4; Acid sulfate soils.*

The documents would form part of the Construction EMP for sites not requiring remediation and under the RAP for sites requiring remediation.

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10.0 Conclusions and recommendations

Based on the information reviewed, AECOM concludes that there is a potential for localised areas of ground gas, soil, ASS, fill and groundwater contamination associated with historically contaminating land uses to be encountered during construction of the project at selected locations within Project Areas 1 to 5 and further assessment is warranted in some instances. The discovery of contaminated materials is considered most likely to occur during near surface excavation works associated with road and tunnel construction activities.

Based on the findings of the Phase 1 ESA, AECOM recommends the following:

- Intrusive leachate, ground gas, soil, fill and groundwater investigations should be undertaken in the specific areas of environmental concern, outlined in **Chapter 8** (where investigations have not been previously conducted), to further evaluate and manage the presence and extent of contamination in areas identified to be directly affected/disturbed by the proposed construction works.
- Subject to the nature of the activities proposed to be carried out on relevant properties, sampling activities should be undertaken prior to disturbance of these areas to minimise the potential for identifying unexpected finds and project delays during construction. The investigations should be undertaken in accordance with ASC NEPM (2013) guidelines. Findings of the investigation should be used to inform appropriate remediation and management options (if required) for the proposed future road upgrades. All future investigations and remedial planning should be undertaken in the context of the proposed design plans for the Project Areas. The involvement of a site auditor would be dependent on the nature of the investigation works and/or remediation works that may be required.
- An environmental management plan incorporating an unexpected finds procedure/ should be in place to manage potentially contaminated materials which may be encountered in areas not identified/anticipated as part of this Phase 1 ESA. The procedure should outline the process for the identification and assessment of potentially contaminated material in the event that previously unidentified contamination is discovered during construction or excavation activities. The information obtained as part of the intrusive investigation program should be used to inform appropriate health and safety risk mitigation measures and waste management and off-site disposal of excavated material.

With respect to Alexandra Canal, the Construction Environmental Management Plan would detail specific methodologies and management measures for the outlet construction works which would detail the control measures to satisfy the requirements of the existing Remediation Order for the Alexandria Canal. The detailed design of the outlets and corresponding Construction Environmental Management Plan would be provided to Sydney Water and NSW EPA for approval in accordance with the requirements of the Remediation Order.

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Appendix A

Figures

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Figure 3 Project areas 1 and 2 areas of potential contamination concern

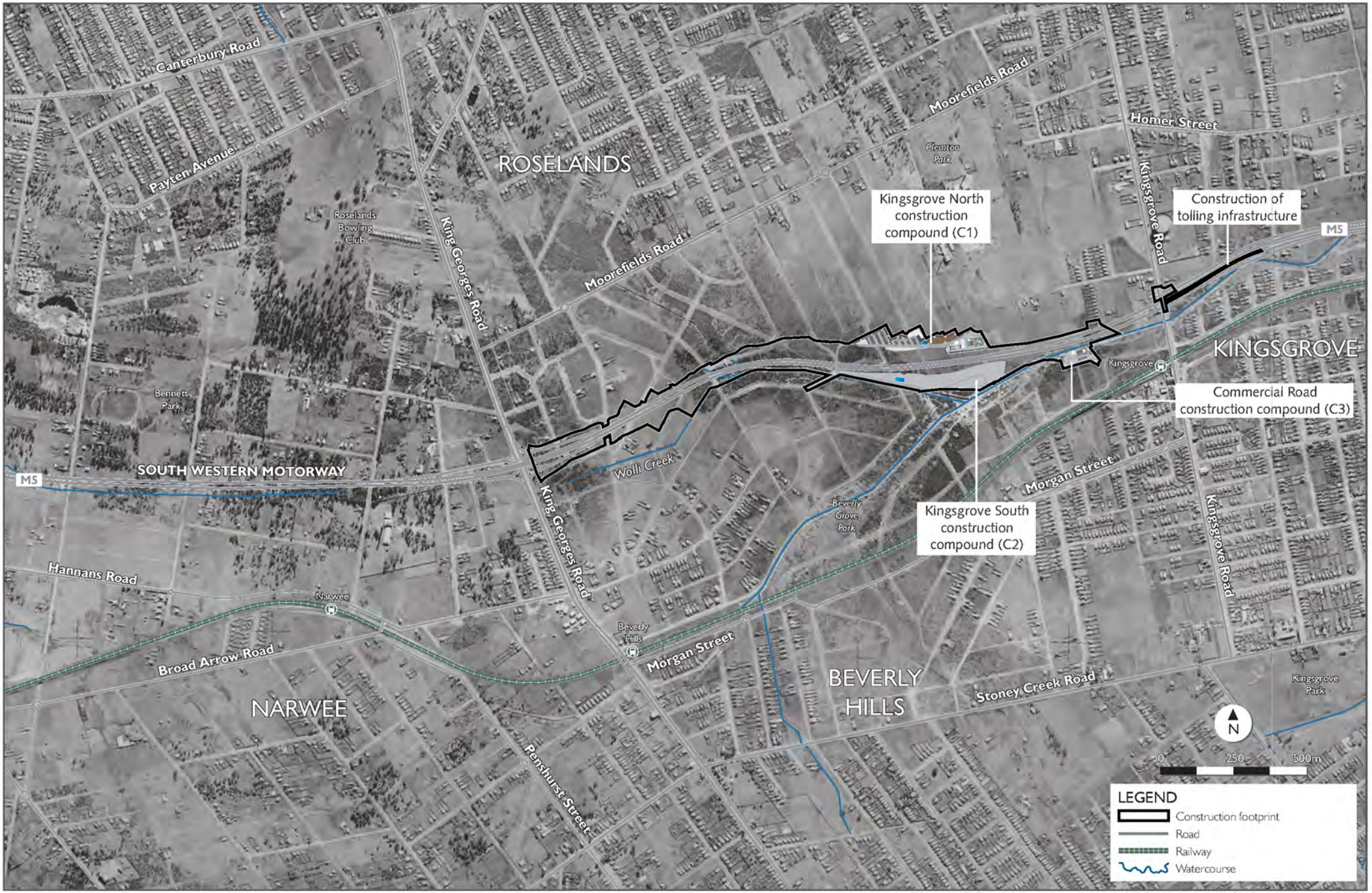

Figure 4 Project areas 1 and 2 historic aerial photograph 1943

Figure 5 Project area 3 areas of potential contamination concern

Figure 6 Project area 3 historical aerial photograph 1943

Figure 7 Project area 4 areas of potential contamination concern

Figure 8 Project area 4 historical aerial photograph 1930

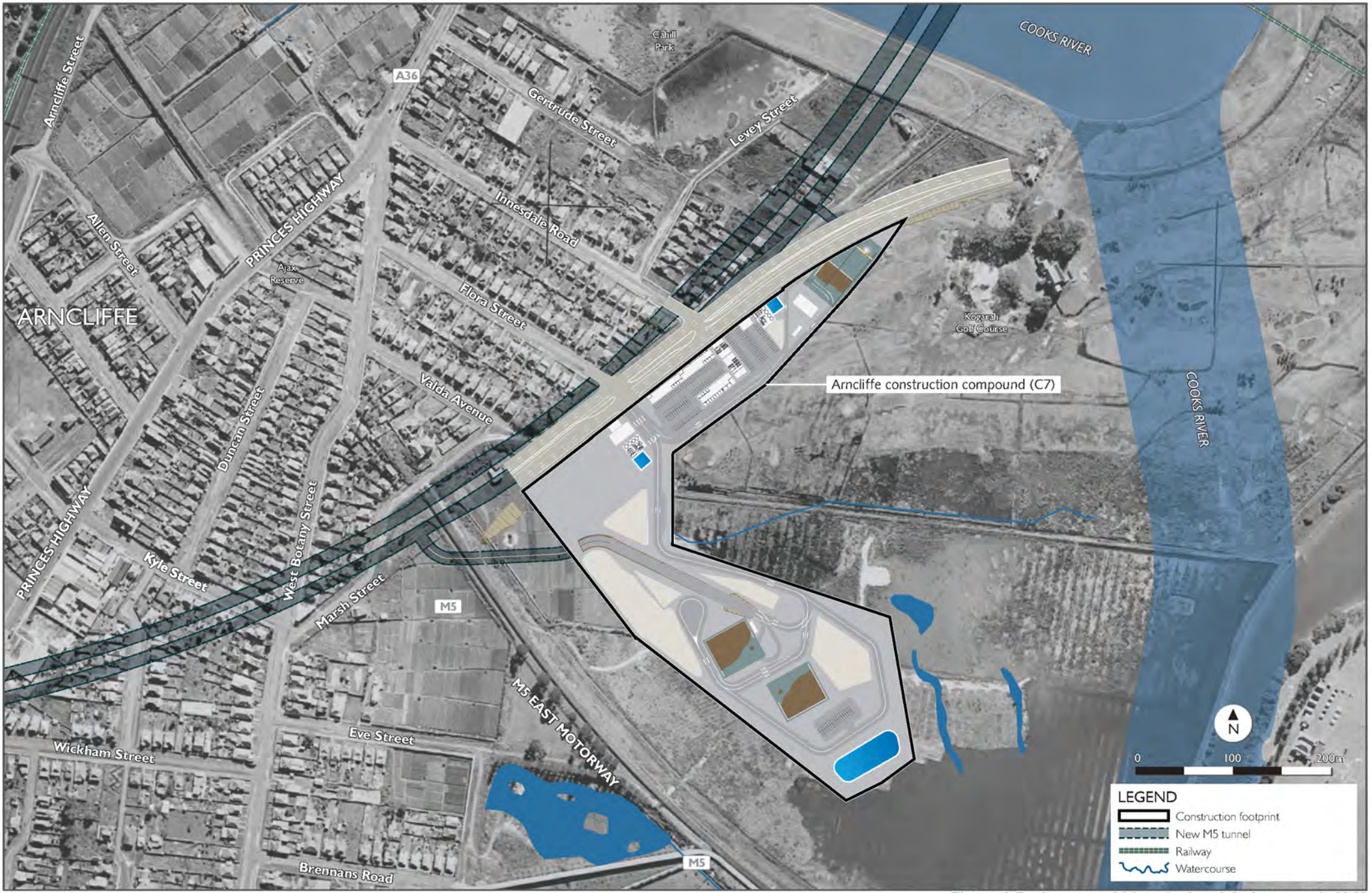

Figure 9 Project area 4 historical aerial photograph 1943

Figure 10 Project area 4 historical aerial photograph 1970

Figure 11 Project area 4 historical aerial photograph 1982

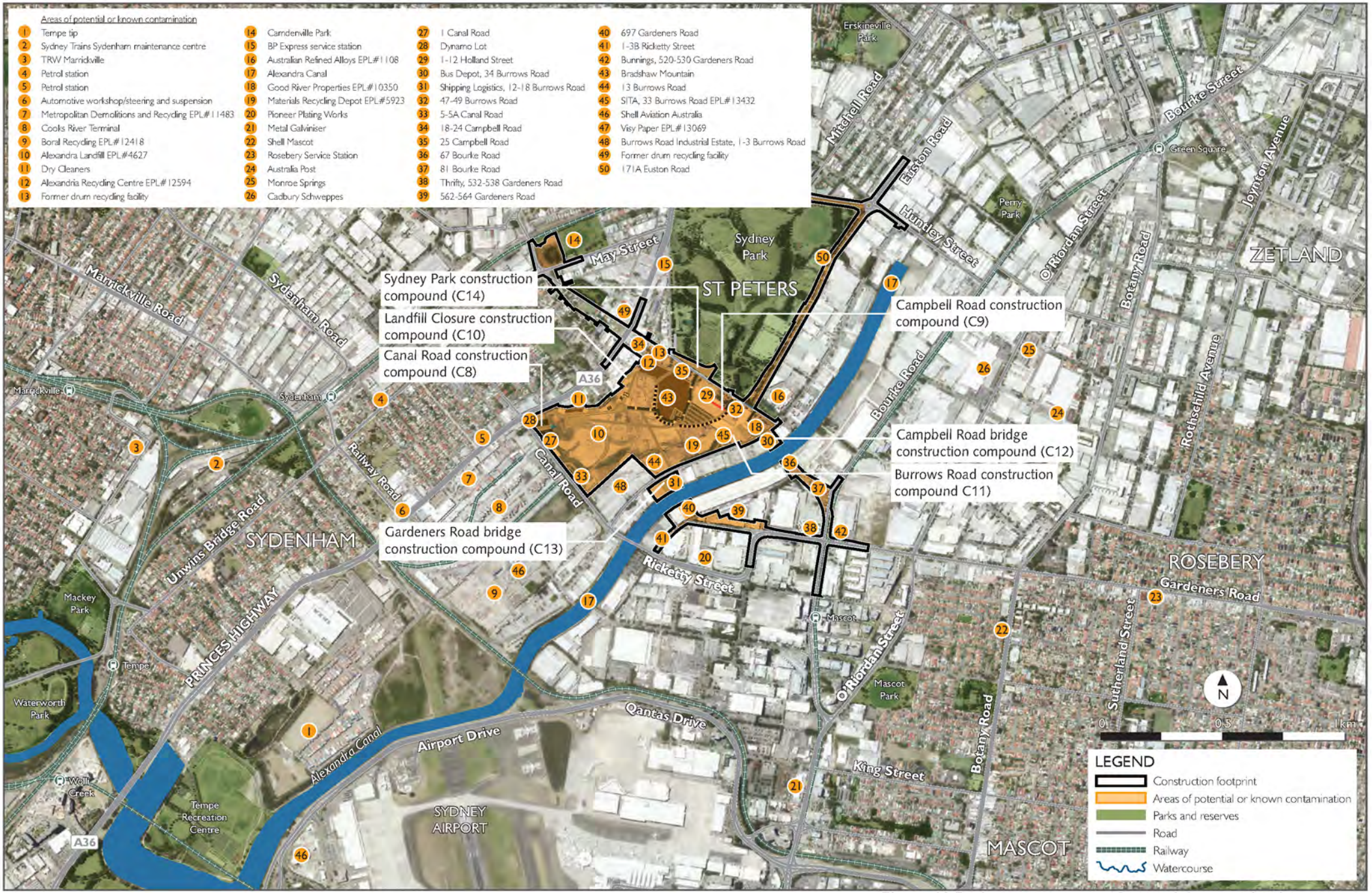

Figure 12 Project area 5 areas of potential contamination concern

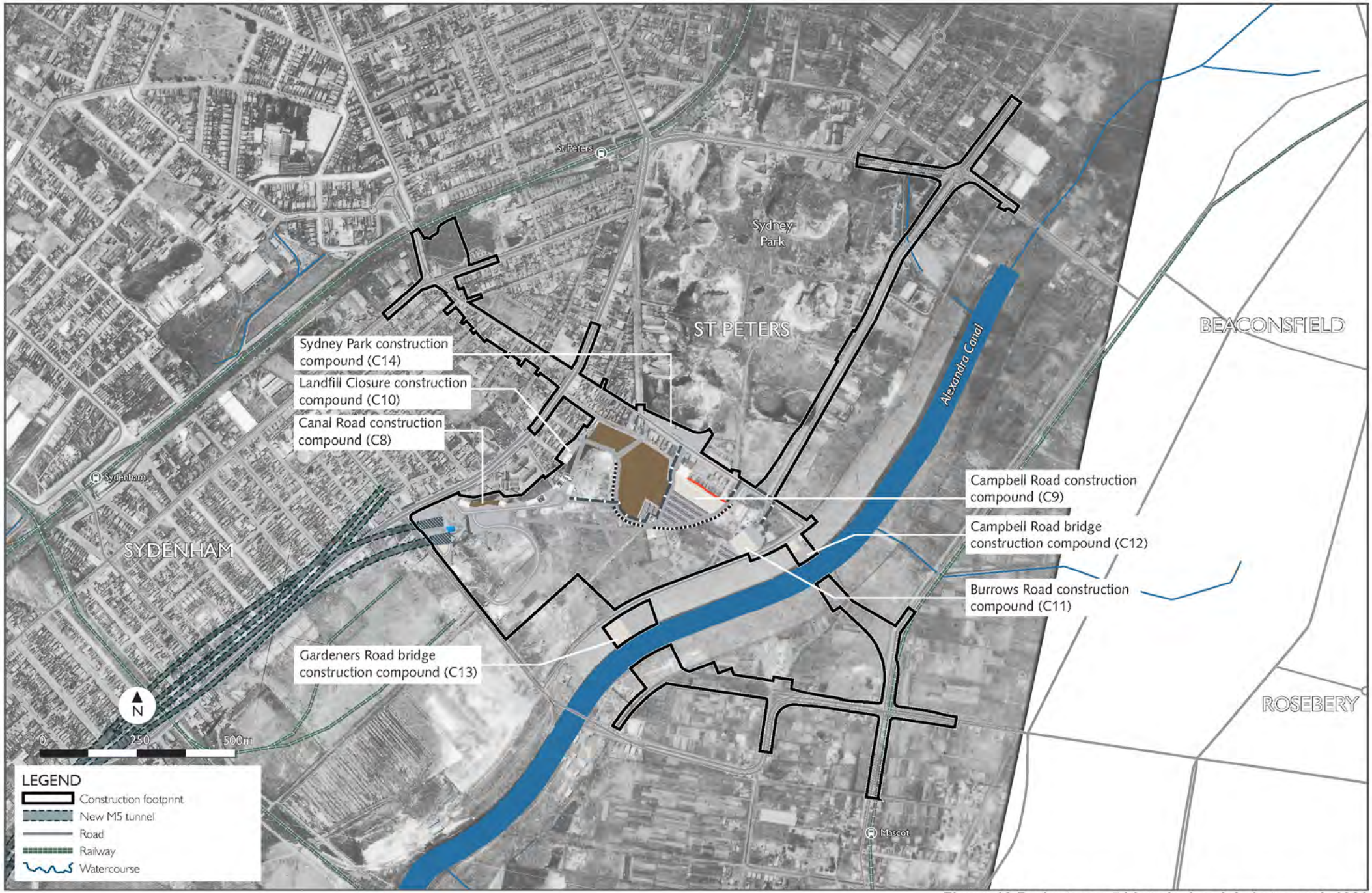

Figure 13 Project area 5 historical aerial photograph 1930

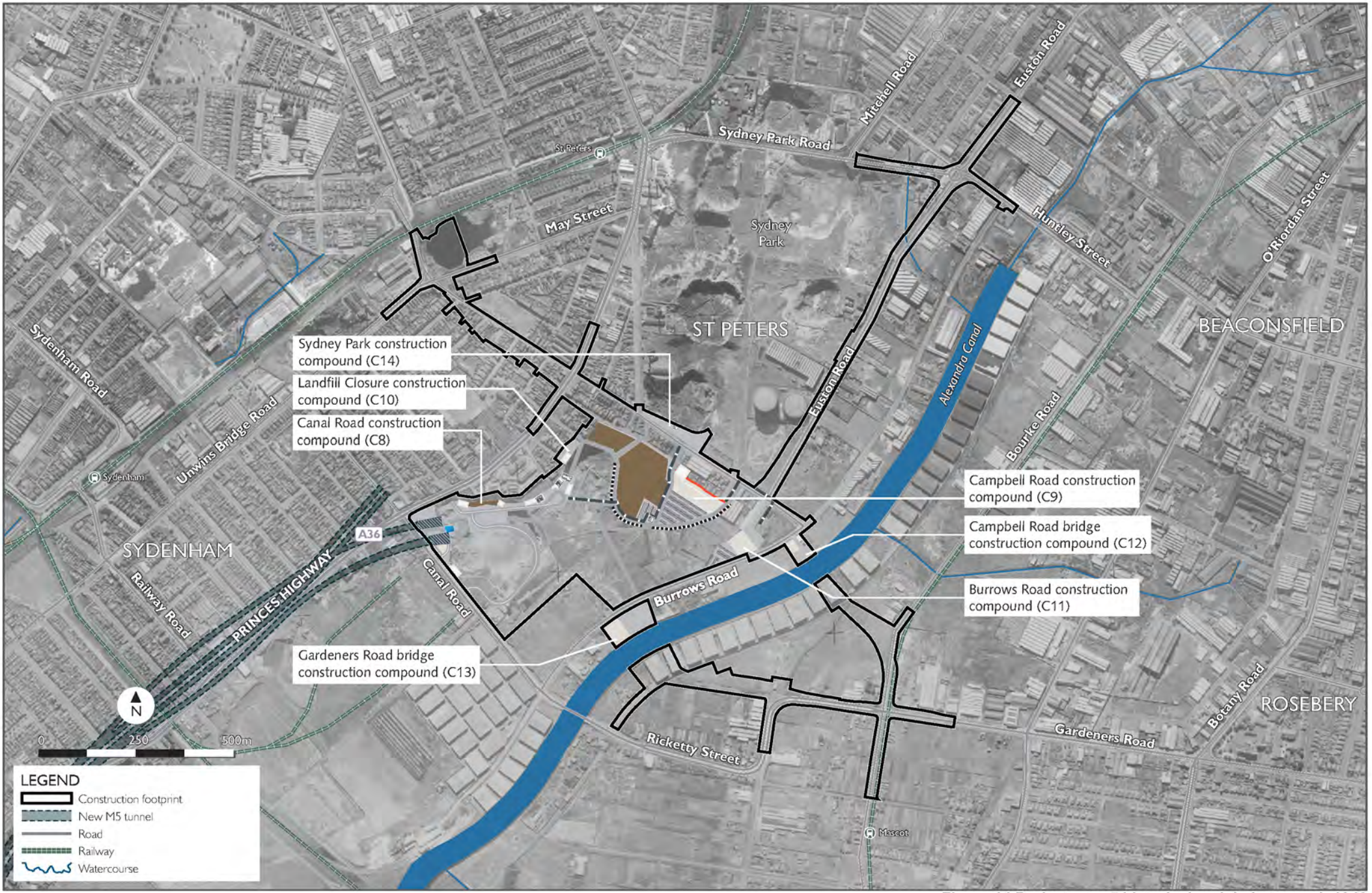

Figure 14 Project area 5 historical aerial photograph 1943

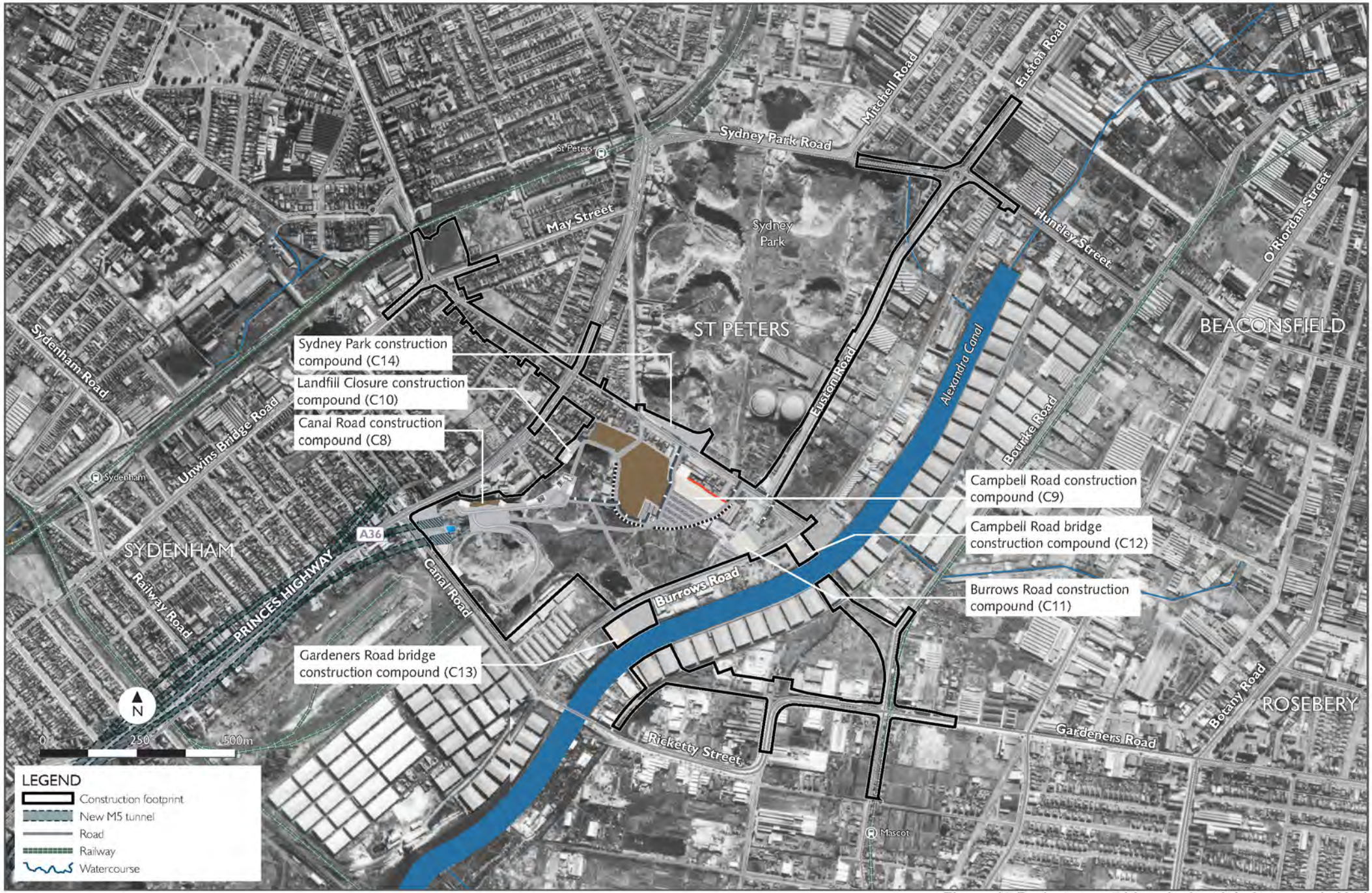

Figure 15 Project area 5 historical aerial photograph 1951

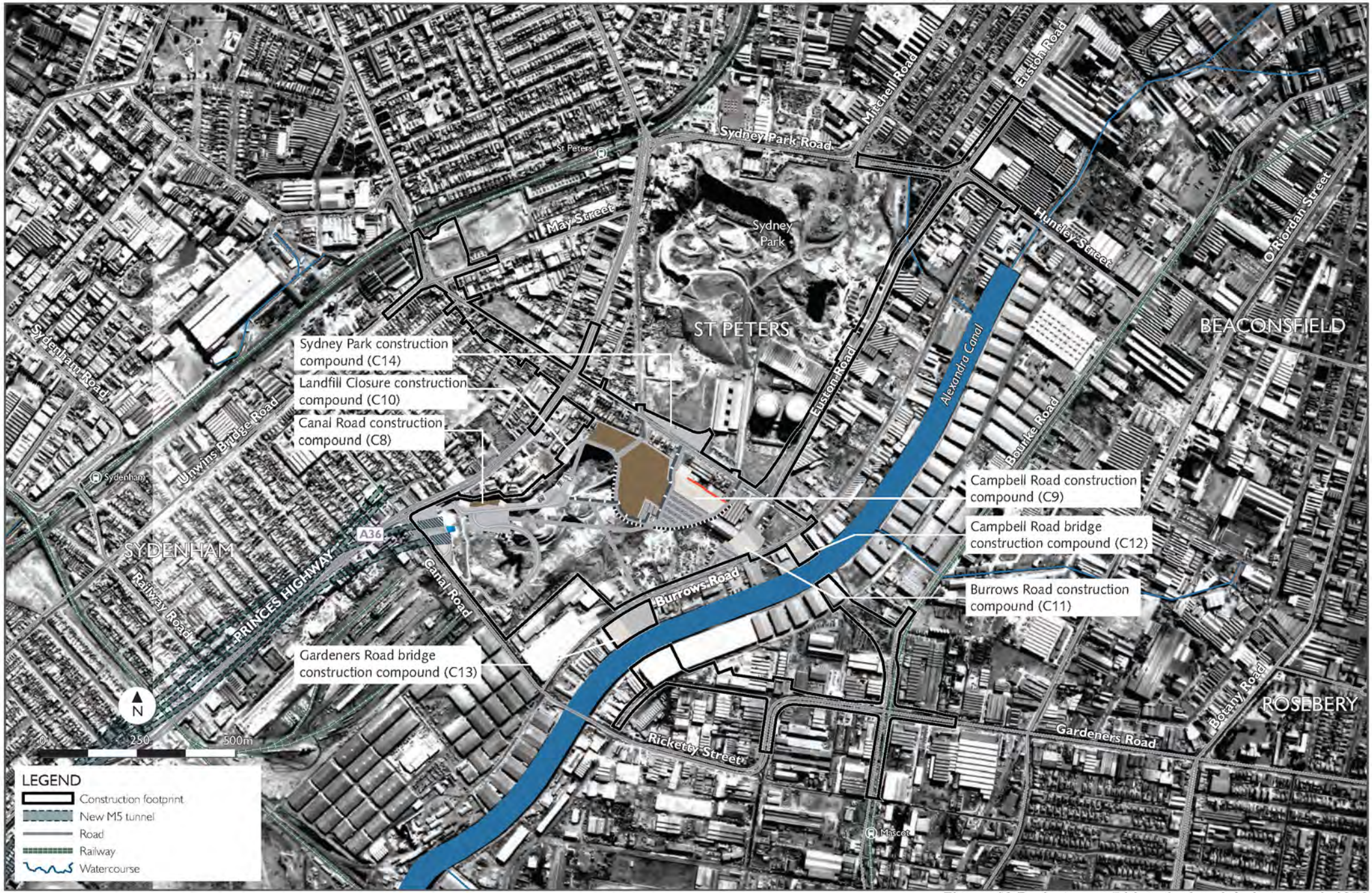

Figure 16 Project area 5 historical aerial photograph 1970

Appendix B

Groundwater Bore Search

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Appendix B - Bore Summary Table

Bore ID	Depth of Bore (m)	Standing Water Level (m)	Distance to study area	Closest study area	Purpose	Geology (m BGL)		
GW106830	7.00	-	400m south	Project Area 2 2D The Crescent, Kingsgrove	Water Supply	-	-	-
GW024673	4.20	-	900m north west	Project Area 2 (27-31 Garema Circuit, Kingsgrove)	Water Supply	0.00	4.26	Sand
GW100068	7.30	4.27	1700m south east	Project Area 2 2D The Crescent, Kingsgrove	Water Supply	0.00	7.30	Sand (with seashells)
GW100504	9.15	-	1700m south east	Project Area 2 2D The Crescent, Kingsgrove	Unknown	-	-	-
GW100580	9.15	-	1700m south east	Project Area 2 2D The Crescent, Kingsgrove	Water Supply	0.00	9.15	Sand (with seashells)
GW100668	7.95	5.45	1700m south east	Project Area 2 2D The Crescent, Kingsgrove	Water Supply	0.00	7.95	Sand (with seashells)
GW100808	3.66	-	1700m south east	Project Area 2 2D The Crescent, Kingsgrove	Water Supply	0.00 1.52 1.72	1.52 1.72 6.10	Sand (yellow) Sea shells Sand (yellow)
GW109191	186.00	40.00	50m east	Project Area 3 (Kingsgrove Avenue Reserve)	Other (Recreation)	0.00 1.00 4.00 7.00 9.00 9.50 31.00 40.00 41.00 131.00 135.50 148.00	1.00 4.00 7.00 9.00 9.50 31.00 40.00 41.00 131.00 135.50 148.00 159.00	Clay (sandy) Clay Sandstone (soft) Sandstone (light brown) Sandstone Sandstone (grey) Sandstone/shale Sandstone Sandstone (grey) Sandstone Sandstone (grey) Sandstone/shale

Bore ID	Depth of Bore (m)	Standing Water Level (m)	Distance to study area	Closest study area	Purpose	Geology (m BGL)		
						159.00	186.00	Sandstone (grey)
GW109958	5.20	-	2000m south east	Project Area 3 (Kingsgrove Avenue Reserve)	Monitoring	0.00 0.20 0.50 0.70 1.50 2.50 4.00 4.50	0.20 0.50 0.70 1.50 2.50 4.00 4.50 5.20	Concrete Fill (clayey gravel) Gravel (clayey) Clay Shale (with clay) Shale Clay Clay (with shale)
GW109959	5.90	-	2000m south east	Project Area 3 (Kingsgrove Avenue Reserve)	Monitoring	0.00 0.30 0.50 1.00 3.00 3.50 5.80	0.30 0.50 1.00 3.00 3.50 5.80 5.90	Concrete Concrete/gravel Gravel (clayey) Shale (with clay) Shale Shale (with clay) Clay
GW109960	8.00	-	2000m south east	Project Area 3 (Kingsgrove Avenue Reserve)	Monitoring	0.00 0.20 0.50 1.00 2.50 4.00 6.00 7.80	0.20 0.50 1.00 2.50 4.00 6.00 7.80 8.00	Concrete Concrete/clayey gravel Clay Shale (with clay) Shale Shale (with clay) Shale (with sand) shale (with clay)
GW109961	5.80	-	2000m south east	Project Area 3 (Kingsgrove Avenue Reserve)	Monitoring	0.00 0.20 0.40 1.70 2.50 4.00	0.20 0.40 1.70 2.50 4.00 5.60	Concrete Sand (gravelly) Clay Shale (with clay) Shale Clay

Bore ID	Depth of Bore (m)	Standing Water Level (m)	Distance to study area	Closest study area	Purpose	Geology (m BGL)		
						5.60	5.80	Shale
GW100209	108.00	-	0m (located within property boundary)	Project Area 4* (19 Marsh Street, Arncliffe)	Water Supply (Abandoned)	0.00 31.00 38.00 45.00 73.00 82.00 93.00 102.00 104.00	31.00 38.00 45.00 73.00 82.00 93.00 102.00 104.00 108.00	Sandstone (white, fine grained) Shale Shale/sandstone Sandstone (grey, coarse grained) Sandstone/shale Sandstone (grey, fine grained) Sandstone (medium grained) Sandstone (grey, coarse grained) Sandstone (grey, fine grained)
GW108406	8.00	-	50m north	Project Area 4* (19 Marsh Street, Arncliffe)	Water Supply	0.00	8.00	sand
GW108588	8.00	-	50m north	Project Area 4* (19 Marsh Street, Arncliffe)	Water Supply	-	-	-
GW109963	8.00	-	50m north	Project Area 4* (19 Marsh Street, Arncliffe)	Water Supply	0.00	8.00	Sand
GW109964	8.00	-	75m north	Project Area 4* (19 Marsh Street, Arncliffe)	Water Supply	0.00	8.00	Sand
GW027664	6.00	0.70	100m north	Project Area 4* (19 Marsh Street, Arncliffe)	Irrigation	0.00 0.30 2.43 2.74 3.04 6.09	0.30 2.43 2.74 3.04 6.09 6.11	Loam Sand Peat Sand Sand Rock
GW072161	90.50	14.00	100m north	Project Area 4* (19 Marsh Street, Arncliffe)	Other	0.00 16.00 18.00 20.50 28.50 31.00	16.00 18.00 20.50 28.50 31.00 32.50	Clay (sandy) Sandstone clay (sandy) Sandstone (with silt) Sandstone (white) Sandstone

Bore ID	Depth of Bore (m)	Standing Water Level (m)	Distance to study area	Closest study area	Purpose	Geology (m BGL)		
						32.50 35.50 68.00 71.00 72.00 89.00	35.50 68.00 71.00 72.00 89.00 90.50	Sandstone (with clay) Sandstone (white) Shale bands Sandstone (with clay) Sandstone (white) Shale/sandstone
GW109965	8.00	-	100m north	Project Area 4* (19 Marsh Street, Arncliffe)	Water Supply	0.00	8.00	Sand
GW109966	3.00	-	150m north	Project Area 4* (19 Marsh Street, Arncliffe)	Water Supply	0.00	3.00	Clay
GW024109	2.10	2.10	200m north	Project Area 4* (19 Marsh Street, Arncliffe)	Water Supply	0.00	2.13	Sand
GW023194	4.80	3.30	450m south west	Project Area 4* (19 Marsh Street, Arncliffe)	Water Supply	0.00 0.91	0.91 4.87	Sand Sand (white)
GW111316	162.00	4.00	600m west	Project Area 4* (19 Marsh Street, Arncliffe)	Monitoring	0.00 37.00 45.00	37.00 45.00 162.00	Sand Sandstone Sandstone
GW109824	20.70	4.51	450m east	Project Area 5* (455-466 Prince Highway, Sydenham)	Monitoring	0.00 4.50 9.00 17.00	4.50 9.00 17.00 20.70	Fill Laterite Shale Sandstone
GW109825	22.00	14.90	800m north east	Project Area 5* (455-466 Prince Highway, Sydenham)	Monitoring	0.00 4.50	4.50 22.00	Fill Shale
GW109822	10.45	3.00	850m east	Project Area 5* (455-466 Prince Highway, Sydenham)	Monitoring	0.00 2.60 3.80 8.20	2.60 3.80 8.20 10.45	Fill Sand (clayey) Sand Clay
GW109823	29.00	12.50	850m east	Project Area 5* (455-466 Prince Highway, Sydenham)	Monitoring	0.00 3.00 6.00	3.00 6.00 8.11	Fill Sand (clayey) Sand

Bore ID	Depth of Bore (m)	Standing Water Level (m)	Distance to study area	Closest study area	Purpose	Geology (m BGL)		
						8.11 11.50	11.50 29.00	Clay (sandy) Shale
GW104448	3.50	-	900m south east	Project Area 5* (455-466 Prince Highway, Sydenham)	Monitoring	-	-	-
GW104449	3.50	-	900m south east	Project Area 5* (455-466 Prince Highway, Sydenham)	Monitoring	-	-	-
GW104450	3.50	-	900m south east	Project Area 5* (455-466 Prince Highway, Sydenham)	Monitoring	-	-	-
GW109821	35.00	14.50	1000m north east	Project Area 5* (455-466 Prince Highway, Sydenham)	Monitoring	0.00 2.20	2.20 35.00	Fill Ashfield shale

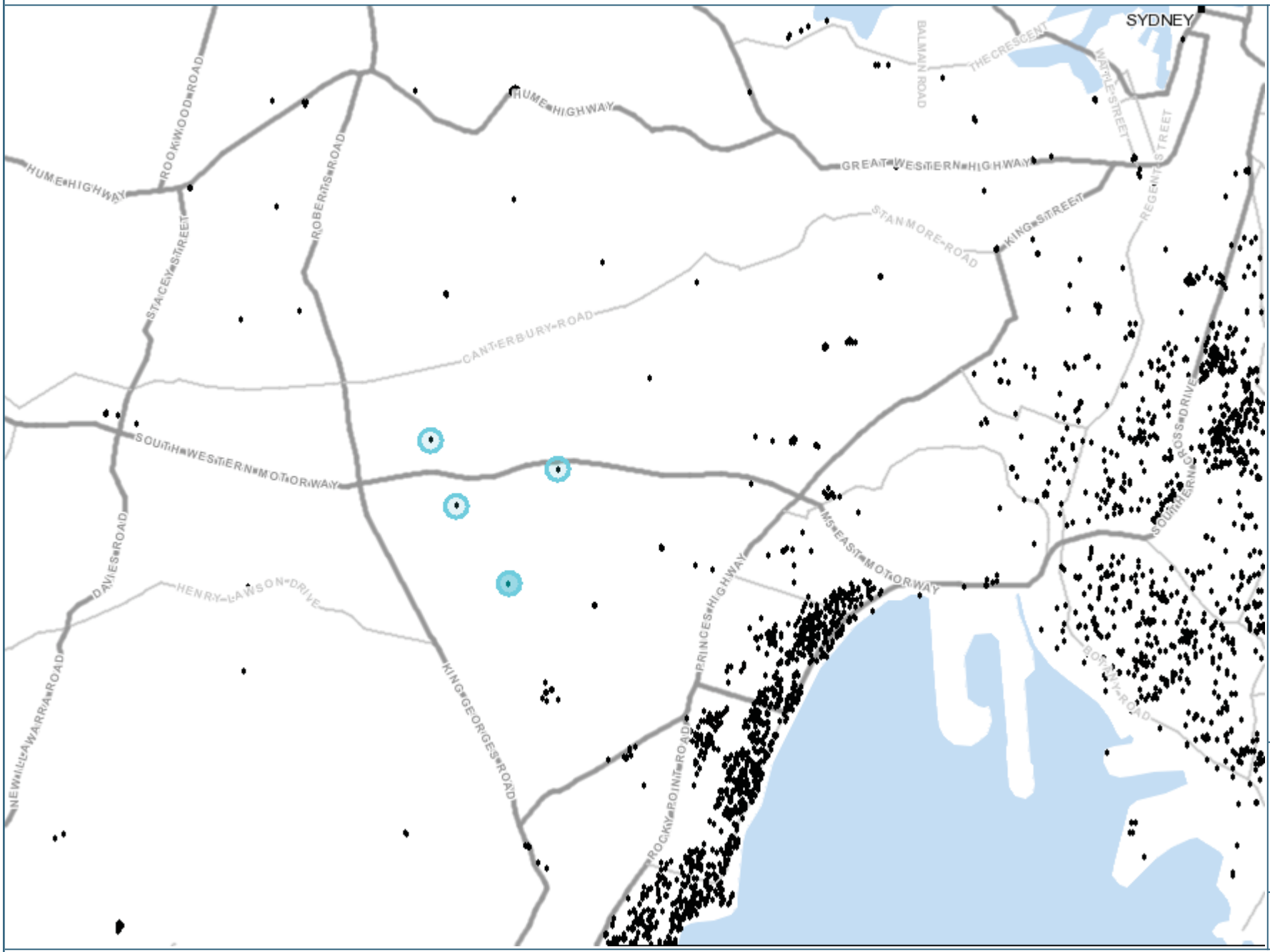
Notes:

m = metres
mBGL = metres below ground level
*= Dense clusters of groundwater bores were located within Project Areas 4 and 5. Sufficient information was available from groundwater bores located within 1km, therefore search results have been summarised from groundwater bores located within this reduced search radius.

Australian Government
Bureau of Meteorology

20 The Crescent, 27-31 Garema Circuit, 30A & 32 Commercial Road

Groundwater Bores within 2km



Bore density per 10km2

- 1-20
- 21-40
- 41-60
- 61-80
- 81-120
- 121-150
- 151-300
- >301

All bores

- Bore

N

1:83,261

Kilometres 2

Data Source: Bureau of Meteorology, Geoscience Australia and State/Territory lead water agencies. Refer to metadata for further information: Click here

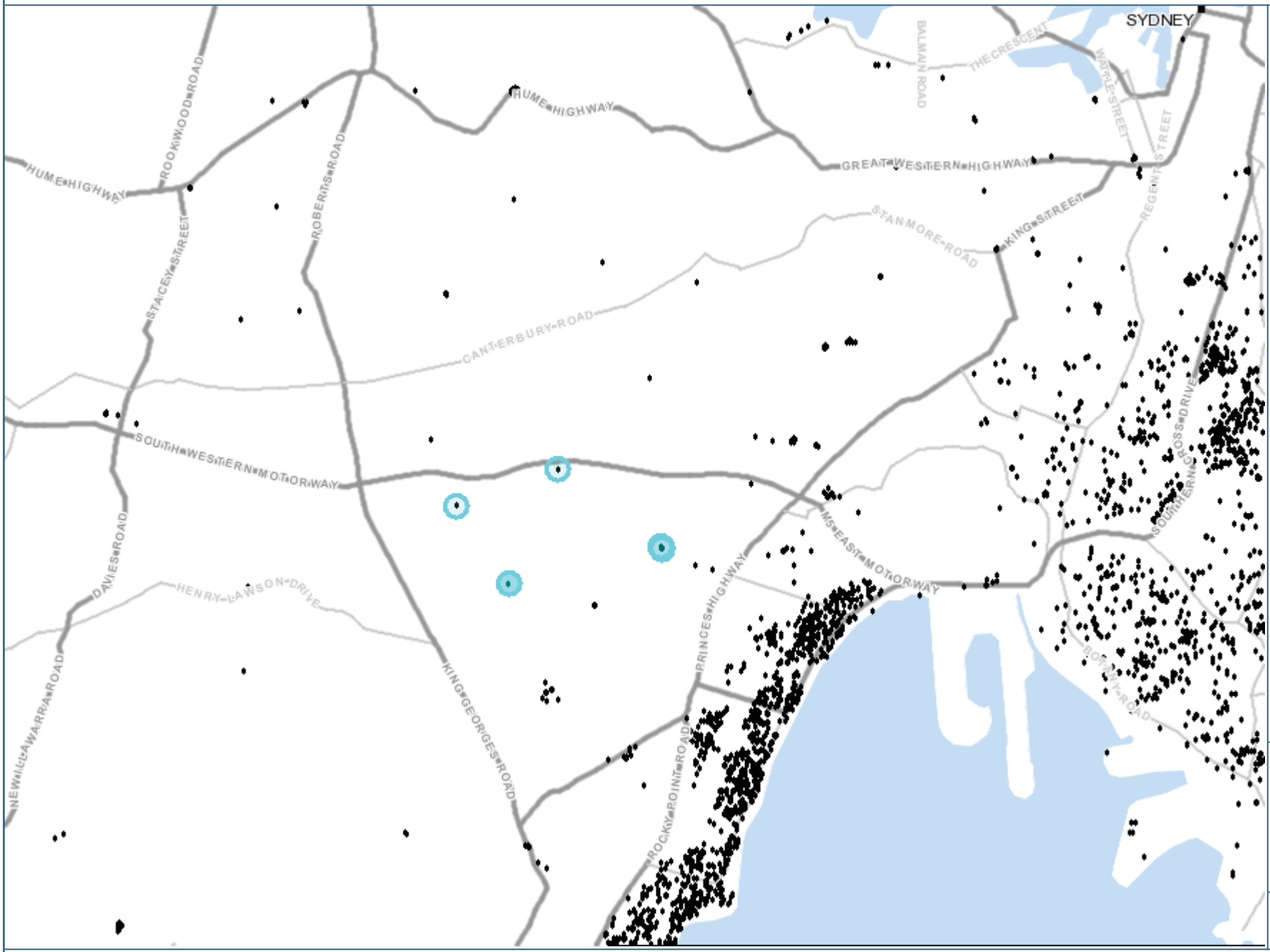
Australian Albers GDA94

Date: 12 May, 2015

Australian Government
Bureau of Meteorology

Linear Park, Kingsgrove Avenue Reserve

Groundwater Bores within 2km



Bore density per 10km2

- 1-20
- 21-40
- 41-60
- 61-80
- 81-120
- 121-150
- 151-300
- >301

All bores

- Bore

N

1:83,261

Kilometres 2

Data Source: Bureau of Meteorology, Geoscience Australia and State/Territory lead water agencies. Refer to metadata for further information: Click here

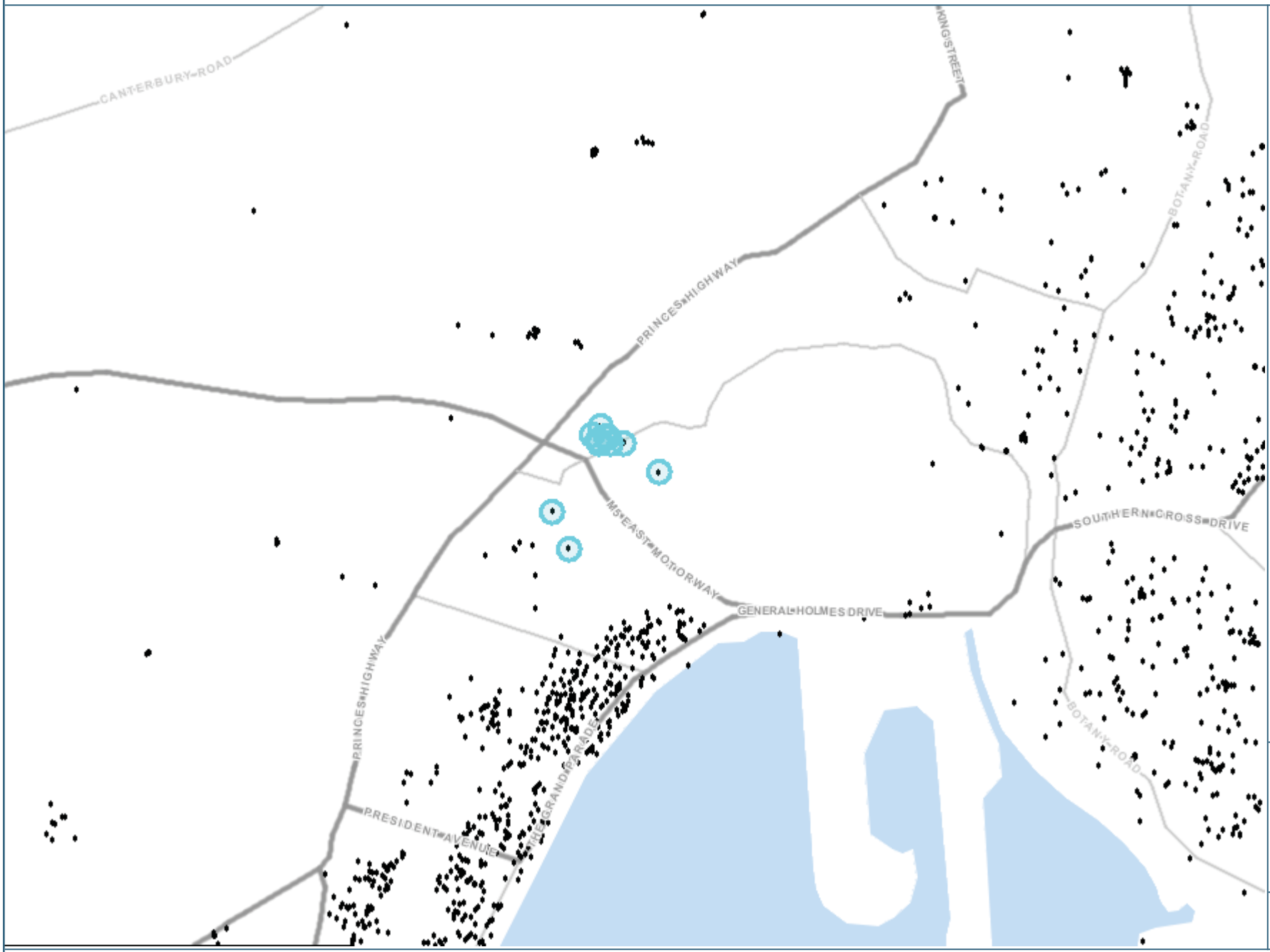
Australian Albers GDA94

Date: 12 May, 2015

Australian Government
Bureau of Meteorology

Kogarah Golf Course

Groundwater Bores within 1km



Bore density per 10km2

- 1-20
- 21-40
- 41-60
- 61-80
- 81-120
- 121-150
- 151-300
- >301

All bores

- Bore

N

1:42,852

Kilometres 1

Data Source: Bureau of Meteorology, Geoscience Australia and State/Territory lead water agencies. Refer to metadata for further information: Click here

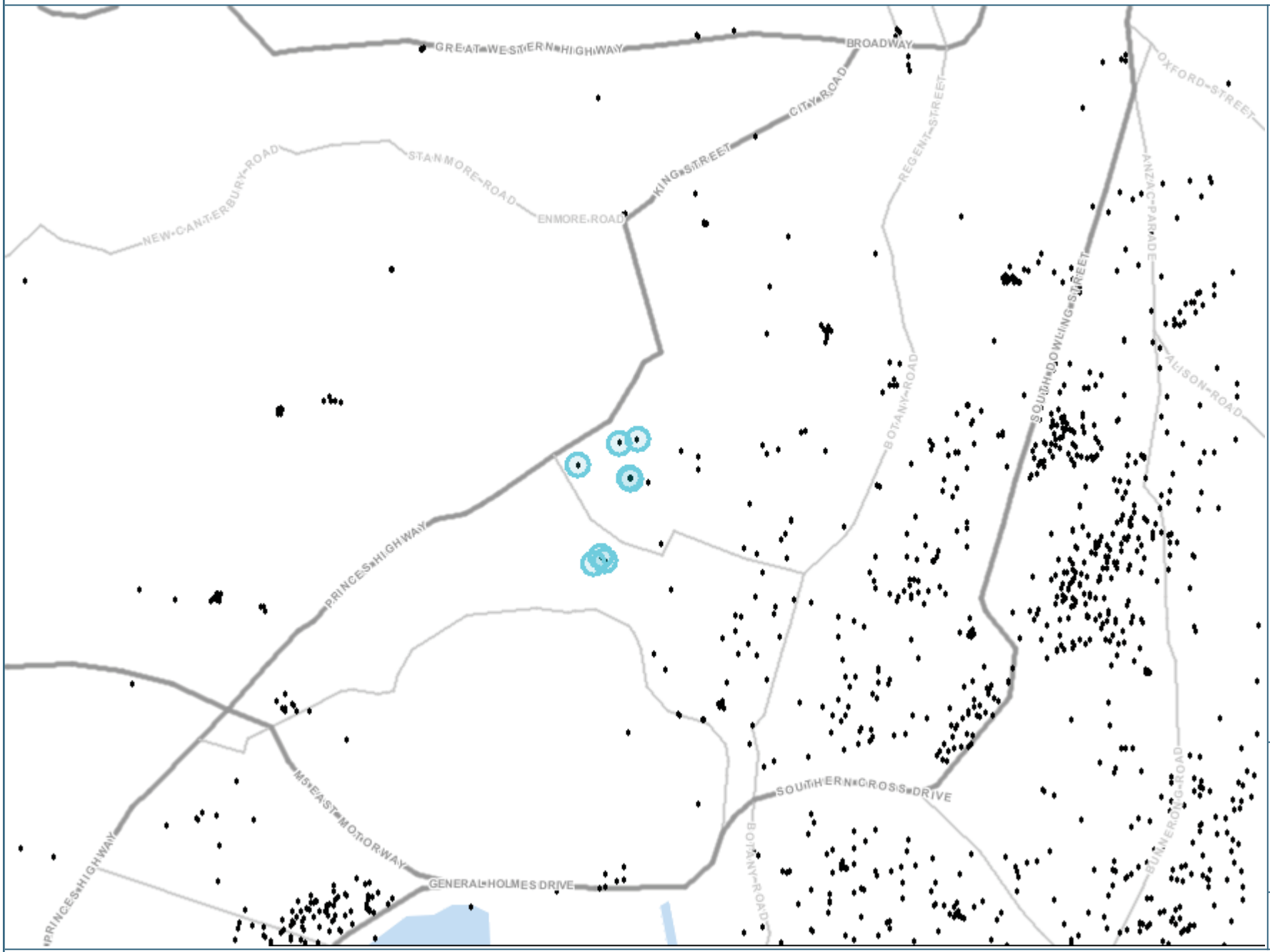
Australian Albers GDA94

Date: 12 May, 2015

Australian Government
Bureau of Meteorology

455-466 Princes Highway

Groundwater Bores within 1km



Bore density per 10km2

- 1-20
- 21-40
- 41-60
- 61-80
- 81-120
- 121-150
- 151-300
- >301

All bores

- Bore

N

1:41,630

Kilometres 1

Data Source: Bureau of Meteorology, Geoscience Australia and State/Territory lead water agencies. Refer to metadata for further information: Click here

Australian Albers GDA94

Date: 12 May, 2015

NSW Office of Water
Work Summary

GW023194

Licence: | **Licence Status:**

Authorised Purpose(s):
Intended Purpose(s): 04

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

Commenced Date: | **Final Depth:** 4.80 m
Completion Date: 01/11/1965 | **Drilled Depth:** 4.90 m

Contractor Name:
Driller:
Assistant Driller:

Property: | **Standing Water Level:**
GWMA: | **Salinity:** good
GW Zone: | **Yield:**

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	CUMBE	CUMBE.046	99999
Licensed:			

Region: 10 - Sydney South Coast | **CMA Map:** 9130-3S
River Basin: 213 - SYDNEY COAST - GEORGES RIVER | **Grid Zone:** ? | **Scale:**
Area/District:

Elevation: 0.00 m (A.H.D.) | **Northing:** 6242811.0 | **Latitude:** 33°56'28.8"S
Elevation Source: Unknown | **Easting:** 329156.0 | **Longitude:** 151°09'05.0"E

GS Map: - | **MGA Zone:** 56 | **Coordinate Source:** GPS Satell.

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	1	Casing	Corrugated Galvanised Iron	0.00	4.20	31			driven into
1	1	Opening	Perforations	4.20	4.80	31		1	Mechanically Slotted, A: 15.87mm
1	1	Opening	Screen - Gauze/Mesh	4.20	4.80	57		2	Copper Alloy, A: 0.17mm

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)
4.80	4.80	0.00	Unconsolidated	3.30		0.35			

Geologists Log
Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	0.91	0.91	Sand	Sand	
0.91	4.87	3.96	Sand White Water Supply	Sand	

Remarks

19/02/1975: SITED 4 ENGLAND ST. 2216

***** End of GW023194 *****

NSW Office of Water
Work Summary

GW024109

Licence:
Licence Status:

Authorised Purpose(s):
Intended Purpose(s): 04

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

Commenced Date:
Completion Date: 01/03/1966

Final Depth: 2.10 m
Drilled Depth: 2.10 m

Contractor Name:
Driller:
Assistant Driller:

Property:
GWMA:
GW Zone:

Standing Water Level:
Salinity:
Yield:

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	CUMBE	CUMBE.046	99999
Licensed:			

Region: 10 - Sydney South Coast
River Basin: 213 - SYDNEY COAST - GEORGES RIVER
Area/District:

CMA Map: 9130-3S
Grid Zone: ?
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown

Northing: 6243538.0
Easting: 329430.0

Latitude: 33°56'05.3"S
Longitude: 151°09'16.2"E

GS Map: -
MGA Zone: 56
Coordinate Source: GPS Satell.

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	1	Casing		0.00	2.10	38			

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)
2.10	2.10	0.00	Unconsolidated	2.10		0.13			

Geologists Log

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	2.13	2.13	Sand Water Supply	Sand	

Remarks

07/08/1974: SITED 29 INNESDALE ST. ARNCLIFFE

***** End of GW024109 *****

NSW Office of Water
Work Summary

GW024673

Licence:
Licence Status:

Authorised Purpose(s):
Intended Purpose(s): 04

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

Commenced Date:
Completion Date: 01/04/1942
Final Depth: 4.20 m
Drilled Depth: 4.30 m

Contractor Name:
Driller:
Assistant Driller:

Property:
GWMA:
GW Zone:
Standing Water Level:
Salinity:
Yield:

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	CUMBE	CUMBE.046	99999
Licensed:			

Region: 10 - Sydney South Coast
River Basin: 213 - SYDNEY COAST - GEORGES RIVER
Area/District:
CMA Map: 9130-3S
Grid Zone: ?
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown
Northing: 6243332.0
Easting: 323244.0
Latitude: 33°56'08.3"S
Longitude: 151°05'15.2"E

GS Map: -
MGA Zone: 56
Coordinate Source: GPS Satell.

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	1	Casing	Corrugated Galvanised Iron	0.00	0.00	38			
1	1	Casing	Drilled	0.00	0.00	922			

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	4.26	4.26	Soil Nominal Water Supply	Soil	
0.00	4.26	4.26	Sand Nominal	Sand	

Remarks

19/02/1975: SITED 5 MITCHELL ST. ARNCLIFFE

***** End of GW024673 *****

NSW Office of Water
Work Summary

GW027664

Licence: **Licence Status:**

Authorised Purpose(s):
Intended Purpose(s): I

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

Commenced Date: **Final Depth:** 6.00 m
Completion Date: 01/06/1966 **Drilled Depth:** 6.10 m

Contractor Name:
Driller:
Assistant Driller:

Property: **Standing Water Level:**
GWMA: **Salinity:**
GW Zone: **Yield:**

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	CUMBE	CUMBE.046	99999
Licensed:			

Region: 10 - Sydney South Coast **CMA Map:** 9130-3S
River Basin: 213 - SYDNEY COAST - GEORGES RIVER **Grid Zone:** ? **Scale:**
Area/District:

Elevation: 0.00 m (A.H.D.) **Northing:** 6243417.0 **Latitude:** 33°56'09.3"S
Elevation Source: Unknown **Easting:** 329535.0 **Longitude:** 151°09'20.2"E

GS Map: - **MGA Zone:** 56 **Coordinate Source:** GPS Satell.

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	1	Casing		-0.30	3.00	152			
1	1	Opening	Perforations & Gauze	3.00	6.00	152		1	Copper Alloy

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)
3.00	6.00	3.00	Unconsolidated	0.70		1.01			

Geologists Log
Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	0.30	0.30	Loam Sand	Loam	
0.30	2.43	2.13	Sand Clean	Sand	
2.43	2.74	0.31	Peat Wood Bands	Peat	
2.74	3.04	0.30	Sand	Sand	
3.04	6.09	3.05	Sand White Water Supply	Sand	
6.09	6.11	0.02	Rock	Rock	

Remarks

07/08/1974: SITE KOGARAH GOLF CLUB ARNCLIFFE

***** End of GW027664 *****

NSW Office of Water
Work Summary

GW072161

Licence: 10BL153838 **Licence Status:** CANCELLED

Authorised Purpose(s): RECREATION (GROUNDWATER)
Intended Purpose(s): Y

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

Commenced Date: **Final Depth:** 90.50 m
Completion Date: 24/02/1994 **Drilled Depth:** 90.50 m

Contractor Name:
Driller:
Assistant Driller:

Property: N/A NSW **Standing Water Level:** 14.000
GWMA: **Salinity:**
GW Zone: **Yield:** 7.700

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	CUMBE	CUMBE.46	14//213314
Licensed:	CUMBERLA	STGEORGE	Whole Lot 14//213314

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

Elevation: 0.00 m (A.H.D.) **Northing:** 6243437.0 **Latitude:** 33°56'08.7"S
Elevation Source: **Easting:** 329636.0 **Longitude:** 151°09'24.1"E

GS Map: - **MGA Zone:** 56 **Coordinate Source:**

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	1	Casing	Steel	-0.50	36.00	168	163		driven into, Welded

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)
18.00	20.50	2.50	Unknown			0.50	24.00		1300.00
30.00	32.50	2.50	Unknown			6.00	36.00		9800.00
71.00	72.00	1.00	Unknown	14.00		1.20	90.50	03:00:00	1600.00

Geologists Log
Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	16.00	16.00	SANDY, MARINE CLAYS	Sandy Clay	
16.00	18.00	2.00	SANDSTONE (WEATHERED)	Sandstone	
18.00	20.50	2.50	SANDY CLAY BAND	Sandy Clay	
20.50	28.50	8.00	SANDSTONE, SILT BANDS	Sandstone	
28.50	31.00	2.50	WHITE SANDSTONE	Sandstone	
31.00	32.50	1.50	MEDIUM / LARGE SANDSTONE	Sandstone	
32.50	35.50	3.00	SANDSTONE, CLAY BANDS	Sandstone	
35.50	68.00	32.50	FINE / MEDIUM WHITE SANDSTONE	Sandstone	
68.00	71.00	3.00	SHALE BANDS	Shale	
71.00	72.00	1.00	MEDIUM / LARGE BANDS CLAY SANDSTONE	Sandstone	
72.00	89.00	17.00	WHITE SANDSTONE	Sandstone	
89.00	90.50	1.50	SHALE BANDS & GREY SANDSTONE	Sandstone	

Remarks

10/10/2011: Adjusted Inside, Outside Diameter and Thickness due to data entry errors with advice from Madhwan Keshwan. GDS Data Cleanup project 2011.
09/01/2013: Nat Carling, 9-Jan-2013; Added rock type codes to driller's log & added missing information (based on existing data).

***** End of GW072161 *****

NSW Office of Water
Work Summary

GW100068

Licence: 10WA108351 **Licence Status:** CURRENT

Authorised Purpose(s): DOMESTIC
Intended Purpose(s): J

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

Commenced Date: **Final Depth:** 7.30 m
Completion Date: 20/06/1995 **Drilled Depth:** 7.30 m

Contractor Name:
Driller:
Assistant Driller:

Property: VELISSARIS 128 BARTON ST MONTEREY 2217 NSW **Standing Water Level:** 4.270
GWMA: **Salinity:** good
GW Zone: **Yield:** 1.000

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	CUMBE	CUMBE.46	13//9774
Licensed:	CUMBERLA	STGEORGE	Whole Lot 1//35819

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

Elevation: 0.00 m (A.H.D.) **Northing:** 6241326.0 **Latitude:** 33°57'14.3"S
Elevation Source: **Easting:** 324767.0 **Longitude:** 151°06'13.0"E

GS Map: - **MGA Zone:** 56 **Coordinate Source:**

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	1	Opening	Screen	0.00	6.00	50		1	Stainless Steel, Screwed, A: 6.00mm

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)
0.00	4.27	4.27	Unknown	4.27		1.00			

Geologists Log
Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	7.30	7.30	ALL SAND UNCONSOLIDATED SAND WITH SMALL SEASHELLS	Sand	

Remarks

15/01/2013: Nat Carling, 15-Jan-2013; Added rock type codes to driller's log & added missing information (based on existing data).

***** End of GW100068 *****

NSW Office of Water
Work Summary

GW100209

Licence: 10BL152038 **Licence Status:** ABANDONED

Authorised Purpose(s): DOMESTIC,STOCK
Intended Purpose(s): J, C

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

Commenced Date:
Completion Date: 16/04/1993
Final Depth: 108.00 m
Drilled Depth: 108.00 m

Contractor Name:
Driller:
Assistant Driller:

Property: N/A NSW
GWMA:
GW Zone:
Standing Water Level:
Salinity:
Yield: 0.790

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	CUMBE	CUMBE.46	11//570900
Licensed:	CUMBERLA	STGEORGE	Whole Lot

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

Elevation: 0.00 m (A.H.D.)
Elevation Source:
Northing: 6243253.0
Easting: 329946.0
Latitude: 33°56'14.9"S
Longitude: 151°09'36.1"E

GS Map: -
MGA Zone: 56
Coordinate Source: Unidentified Location

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	1	Casing	Steel	-0.50	11.50	168	163		seated on bo

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)
42.00	43.00	1.00	Unknown			0.13	43.00		
66.00	68.00	2.00	Unknown			0.16	68.00		
102.00	108.00	6.00	Unknown			0.50	108.00	01:00:00	8000.00

Geologists Log
Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	31.00	31.00	FINE WHITE SANDTONE	Sandstone	
31.00	38.00	7.00	GREY SHALE	Shale	
38.00	45.00	7.00	GREY SHALE & COARSE GREY SANDSTONE	Shale	
45.00	73.00	28.00	COARSE GREY SANDSTONE	Sandstone	
73.00	82.00	9.00	COARSE GREY SANDSTONE & GREY SHALE	Sandstone	
82.00	93.00	11.00	FINE GREY SANDSTONE	Sandstone	
93.00	102.00	9.00	MED GRAIN SANDSTONE	Sandstone	
102.00	104.00	2.00	COARSE GREY SANDSTONE	Sandstone	
104.00	108.00	4.00	FINE GREY SANDSTONE	Sandstone	

Remarks

29/08/1997: Bore abandoned and capped.
12/09/2008: Nat Carling, 12-Sept-2008: Added missing coordinates, based on cadastre information.
10/10/2011: Adjusted Inside, Outside Diameter and Thickness due to data entry errors with advice from Madhwan Keshwan. GDS Data Cleanup project 2011.

***** End of GW100209 *****

NSW Office of Water
Work Summary

GW100504

Licence: 10WA108399 **Licence Status:** CURRENT

Authorised Purpose(s): DOMESTIC
Intended Purpose(s):

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

Commenced Date: **Final Depth:**
Completion Date: 11/03/1997 **Drilled Depth:**

Contractor Name:
Driller:
Assistant Driller:

Property: STRATA PLAN 18908 17-21 GORDON ST BRIGHTON -LE- SANDS 2216 NSW **Standing Water Level:**
GWMA: **Salinity:**
GW Zone: **Yield:**

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	CUMBE	CUMBE.46	13//9774
Licensed:	CUMBERLA	STGEORGE	Whole Lot/18908

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

Elevation: 0.00 m (A.H.D.) **Northing:** 6241326.0 **Latitude:** 33°57'14.4"S
Elevation Source: **Easting:** 324768.0 **Longitude:** 151°06'13.1"E

GS Map: - **MGA Zone:** 56 **Coordinate Source:**

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

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

Remarks

***** End of GW100504 *****

NSW Office of Water
Work Summary

GW100580

Licence: 10WA108399 **Licence Status:** CURRENT

Authorised Purpose(s): DOMESTIC
Intended Purpose(s): J

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

Commenced Date:
Completion Date: 11/03/1997
Final Depth:
Drilled Depth:

Contractor Name:
Driller:
Assistant Driller:

Property: STRATA PLAN 18908 17-21 GORDON ST BRIGHTON -LE- SANDS 2216 NSW
GWMA:
GW Zone:
Standing Water Level:
Salinity:
Yield:

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	CUMBE	CUMBE.46	13//9774
Licensed:	CUMBERLA	STGEORGE	Whole Lot/18908

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

Elevation: 0.00 m (A.H.D.)
Elevation Source:
Northing: 6241326.0
Easting: 324768.0
Latitude: 33°57'14.3"S
Longitude: 151°06'13.1"E

GS Map: -
MGA Zone: 56
Coordinate Source:

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

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)
6.00	9.15	3.15	Unknown			1.00			

Geologists Log
Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	9.15	9.15	UNCONSOLIDATED ALL SAND WITH SMALL SEA SHELLS	Sand	

Remarks

11/03/1997: Form A Remarks:
PROPERTY ADDRESS IS 17-21, GORDON STREET. BRIGHTON-LE-SANDS.
22/01/2013: Nat Carling, 22-Jan-2013; Added rock type codes to driller's log & added missing information (based on existing data).

***** End of GW100580 *****

NSW Office of Water
Work Summary

GW100668

Licence: 10WA108384 **Licence Status:** CURRENT

Authorised Purpose(s): DOMESTIC
Intended Purpose(s): J

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

Commenced Date:
Completion Date: 09/10/1996
Final Depth: 7.95 m
Drilled Depth: 7.95 m

Contractor Name:
Driller:
Assistant Driller:

Property: STRATA PLAN 40628 57-61 BANKS ST MONTEREY 2217 NSW
GWMA:
GW Zone:
Standing Water Level: 5.450
Salinity: good
Yield: 1.000

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	CUMBE	CUMBE.46	13//9774
Licensed:	CUMBERLA	STGEORGE	Whole Lot/40628

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

Elevation: 0.00 m (A.H.D.)
Elevation Source:
Northing: 6241326.0
Easting: 324768.0
Latitude: 33°57'14.4"S
Longitude: 151°06'13.1"E

GS Map: -
MGA Zone: 56
Coordinate Source:

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	1	Opening	Screen	0.60	7.95	50		1	Stainless Steel, Screwed, A: 0.01mm

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)
5.45	7.95	2.50	Unknown	5.45		1.00			

Geologists Log
Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	7.95	7.95	Unconsolidated all Sand with Small Seashells	Sand	

Remarks

23/01/2013: Nat Carling, 23-Jan-2013; Added rock type codes to driller's log & added missing information (based on existing data).

***** End of GW100668 *****

NSW Office of Water
Work Summary

GW100808

Licence: 10BL156230 **Licence Status:** CONVERTED

Authorised Purpose(s): DOMESTIC
Intended Purpose(s): J

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

Commenced Date:
Completion Date: 01/01/1991
Final Depth: 3.66 m
Drilled Depth: 6.10 m

Contractor Name:
Driller:
Assistant Driller:

Property: HARDY 2 GANNON AVE DOLLS POINT 2219 NSW
GWMA:
GW Zone:
Standing Water Level: 1.520
Salinity: Other
Yield:

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	CUMBE	CUMBE.46	13//9774
Licensed:	CUMBERLA	STGEORGE	Whole Lot 23//11259

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

Elevation: 0.00 m (A.H.D.)
Elevation Source:
Northing: 6241325.0
Easting: 324767.0
Latitude: 33°57'14.4"S
Longitude: 151°06'13.1"E

GS Map: -
MGA Zone: 56
Coordinate Source:

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	1	Casing	Galvinised Steel	0.00	3.66	32			

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	1.52	1.52	CLEAN YELLOW SAND	Sand	
1.52	1.72	0.20	SEA SHELL	Sand	
1.72	6.10	4.38	CLEAN YELLOW SAND, THEN GREYISH SMELLY MUD AT 6.10 metres	Sand	

Remarks

01/01/1991: Form A Remarks:
BORE IS SPEARPOINT. BORE DATA OBTAINED FROM LETTER FROM OWNER. NO "AG" OR "A" FORM.
19/03/2013: Nat Carling, 19-Mar-2013; Added rock type codes to driller's log & added missing information (based on existing data).

***** End of GW100808 *****

NSW Office of Water
Work Summary

GW104448

Licence: 10BL160854 **Licence Status:** ACTIVE

Authorised Purpose(s): MONITORING BORE
Intended Purpose(s): V1

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

Commenced Date: **Final Depth:** 3.50 m
Completion Date: 25/11/2002 **Drilled Depth:**

Contractor Name: Macquarie Drilling
Driller:
Assistant Driller:

Property: TENIX 296 COWARD ST MASCOT 2020 **Standing Water Level:**
GWMA: **Salinity:**
GW Zone: **Yield:** 1.000

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	CUMBE	CUMBE.005	LT 1 DP 230307
Licensed:	CUMBERLA	BOTANY	Whole Lot 1//230307

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

Elevation: 0.00 m (A.H.D.) **Northing:** 6244936.0 **Latitude:** 33°55'21.3"S
Elevation Source: **Easting:** 331715.0 **Longitude:** 151°10'46.1"E

GS Map: - **MGA Zone:** 56 **Coordinate Source:** Map Interpretation

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	1	Casing	P.V.C.	0.00	0.00	50			

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

Remarks

25/11/2002: Form A Remarks:
Very poor information only from from AG.

***** End of GW104448 *****

NSW Office of Water
Work Summary

GW104449

Licence: 10BL160854 **Licence Status:** ACTIVE

Authorised Purpose(s): MONITORING BORE
Intended Purpose(s): V1

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

Commenced Date:
Completion Date: 01/01/2002
Final Depth: 3.50 m
Drilled Depth:

Contractor Name: Macquarie Drilling
Driller:
Assistant Driller:

Property: TENIX 296 COWARD ST MASCOT 2020
GWMA:
GW Zone:
Standing Water Level:
Salinity:
Yield: 1.000

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	CUMBE	CUMBE.005	LT 1 DP 230307
Licensed:	CUMBERLA	BOTANY	Whole Lot 1//230307

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

Elevation: 0.00 m (A.H.D.)
Elevation Source:
Northing: 6244959.0
Easting: 331677.0
Latitude: 33°55'20.5"S
Longitude: 151°10'44.6"E

GS Map: -
MGA Zone: 56
Coordinate Source: Map Interpretation

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	1	Casing	P.V.C.	0.00	0.00	50			

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

Remarks

01/01/2002: Form A Remarks:
Very poor information from form AG.

***** End of GW104449 *****

NSW Office of Water
Work Summary

GW104450

Licence: 10BL160854 **Licence Status:** ACTIVE

Authorised Purpose(s): MONITORING BORE
Intended Purpose(s): V1

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

Commenced Date:
Completion Date: 01/01/2002
Final Depth: 3.50 m
Drilled Depth:

Contractor Name: Macquarie Drilling
Driller:
Assistant Driller:

Property: TENIX 296 COWARD ST MASCOT 2020
GWMA:
GW Zone:
Standing Water Level:
Salinity:
Yield: 0.500

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	CUMBE	CUMBE.005	LT 1 DP 230307
Licensed:	CUMBERLA	BOTANY	Whole Lot 1//230307

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

Elevation: 0.00 m (A.H.D.)
Elevation Source:
Northing: 6244904.0
Easting: 331630.0
Latitude: 33°55'22.3"S
Longitude: 151°10'42.8"E

GS Map: -
MGA Zone: 56
Coordinate Source: Map Interpretation

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	1	Casing	P.V.C.	0.00	0.00	50			

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

Remarks

01/01/2002: Form A Remarks:
Very poor information from AG form.

***** End of GW104450 *****

NSW Office of Water
Work Summary

GW106830

Licence: 10BL161327 **Licence Status:** CONVERTED

Authorised Purpose(s): DOMESTIC
Intended Purpose(s): J

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

Commenced Date: **Final Depth:** 7.00 m
Completion Date: 15/01/2005 **Drilled Depth:** 7.00 m

Contractor Name:
Driller:
Assistant Driller:

Property: N/A **Standing Water Level:**
GWMA: **Salinity:**
GW Zone: **Yield:**

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	CUMBE	CUMBE.5	B 355146
Licensed:	CUMBERLA	BOTANY	Whole Lot B//355146

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

Elevation: 0.00 m (A.H.D.) **Northing:** 6242387.0 **Latitude:** 33°56'39.3"S
Elevation Source: **Easting:** 323792.0 **Longitude:** 151°05'35.8"E

GS Map: - **MGA Zone:** 56 **Coordinate Source:** Google Earth

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	1	Casing	Lining	0.00	0.00				

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	7.00	7.00	sand	Sand	

Remarks

01/02/2010: updated from original form a

***** End of GW106830 *****

NSW Office of Water
Work Summary

GW108406

Licence: 10BL600707 **Licence Status:** CONVERTED

Authorised Purpose(s): DOMESTIC
Intended Purpose(s): J

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

Commenced Date: **Final Depth:**
Completion Date: 28/11/2006 **Drilled Depth:**

Contractor Name:
Driller:
Assistant Driller:

Property: DEBATTISTA 34 FLORA STREET ARNCLIFFE 2205 NSW **Standing Water Level:**
GWMA: **Salinity:**
GW Zone: **Yield:**

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	CUMBE	CUMBE.46	29/1/4059
Licensed:	CUMBERLA	STGEORGE	Whole Lot 29/1/4059

Region: 10 - Sydney South Coast **CMA Map:** 9130-3S
River Basin: 213 - SYDNEY COAST - GEORGES RIVER **Grid Zone:** ? **Scale:**
Area/District:

Elevation: 0.00 m (A.H.D.) **Northing:** 6243455.0 **Latitude:** 33°56'08.1"S
Elevation Source: **Easting:** 329510.0 **Longitude:** 151°09'19.2"E

GS Map: - **MGA Zone:** 56 **Coordinate Source:** Google Earth

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

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	8.00	8.00	sand	Sand	

Remarks

22/02/2010: updated from original form a

***** End of GW108406 *****

NSW Office of Water
Work Summary

GW108588

Licence: 10BL601050 **Licence Status:** CONVERTED

Authorised Purpose(s): DOMESTIC
Intended Purpose(s): J

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

Commenced Date: **Final Depth:**
Completion Date: 03/02/2007 **Drilled Depth:**

Contractor Name:
Driller:
Assistant Driller:

Property: GOW 35 FLORA STREET ARNCLIFFE 2205 NSW,GOW 35 FLORA STREET ARNCLIFFE 2205 **Standing Water Level:**
GWMA: **Salinity:**
GW Zone: **Yield:**

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	CUMBE	CUMBE.46	14/2/4059
Licensed:	CUMBERLA	STGEORGE	Whole Lot 14/2/4059

Region: 10 - Sydney South Coast **CMA Map:** 9130-3S
River Basin: 213 - SYDNEY COAST - GEORGES RIVER **Grid Zone:** ? **Scale:**
Area/District:

Elevation: 0.00 m (A.H.D.) **Northing:** 6243429.0 **Latitude:** 33°56'08.9"S
Elevation Source: **Easting:** 329440.0 **Longitude:** 151°09'16.5"E

GS Map: - **MGA Zone:** 56 **Coordinate Source:** Google Earth

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

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	8.00	8.00	Sand	Sand	

Remarks

03/03/2010: updated from original form A

***** End of GW108588 *****

NSW Office of Water
Work Summary

GW109191

Licence: 10WA114753 **Licence Status:** CURRENT

Authorised Purpose(s): RECREATION (GROUNDWATER)
Intended Purpose(s): Y

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

Commenced Date: **Final Depth:** 186.00 m
Completion Date: 08/08/2008 **Drilled Depth:** 186.00 m

Contractor Name:
Driller:
Assistant Driller:

Property: KINGSGROVE AVENUE RESERVE KINGSGROVE AVENUE KINGSGROVE 2208 NSW **Standing Water Level:** 93.000
GWMA: **Salinity:**
GW Zone: **Yield:** 0.050

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	CUMBE	CUMBE.46	7 1069225
Licensed:	CUMBERLA	STGEORGE	Whole Lot 7//1069225

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

Elevation: 0.00 m (A.H.D.) **Northing:** 6243188.0 **Latitude:** 33°56'14.2"S
Elevation Source: **Easting:** 325255.0 **Longitude:** 151°06'33.4"E

GS Map: - **MGA Zone:** 56 **Coordinate Source:**

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	1	Casing	Pvc Class 9	-0.40	23.60	140			suspended in, Screwed and Glued
1	1	Casing	Steel	-0.40	5.60	158	148		driven into

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)
9.00	9.50	0.50	Unknown			0.05			620.00
40.00	41.00	1.00	Unknown	93.00		0.20			4750.00
131.00	135.50	4.50	Unknown			0.05			3950.00

Geologists Log
Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	1.00	1.00	SANDY CLAY	Sandy Clay	
1.00	4.00	3.00	CLAY	Clay	
4.00	7.00	3.00	SANDSTONE SOFT	Sandstone	
7.00	9.00	2.00	SANDSTONE L/BROWN	Sandstone	
9.00	9.50	0.50	SANDSTONE AND FINE QUARTZ	Sandstone	
9.50	31.00	21.50	SANDSTONE GREY	Sandstone	
31.00	40.00	9.00	SANDSTONE AND SHALE BEDDING	Sandstone	
40.00	41.00	1.00	SANDSTONE AND FINE QUARTZ	Sandstone	
41.00	131.00	90.00	SANDSTONE GREY	Sandstone	
131.00	135.50	4.50	SANDSTONE AND FINE QUARTZ	Sandstone	
135.50	148.00	12.50	SANDSTONE GREY	Sandstone	
148.00	159.00	11.00	SANDSTONE AND SHALE BEDDING	Sandstone	

159.00	186.00	27.00	SANDSTONE GREY	Sandstone	

Remarks

08/08/2008: Previous Lic No:10BL601292

***** End of GW109191 *****

NSW Office of Water
Work Summary

GW109821

Licence: 10BL164967 **Licence Status:** ACTIVE

Authorised Purpose(s): MONITORING BORE
Intended Purpose(s): V1

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

Commenced Date: **Final Depth:** 35.00 m
Completion Date: 03/04/1997 **Drilled Depth:** 35.00 m

Contractor Name: Macquarie Drilling
Driller:
Assistant Driller:

Property: ALEXANDRIA LANDFILL ALBERT ST ST PETERS 2044,ALEXANDRIA LANDFILL PRINCES HIGHWAY ST PETERS 2044 NSW **Standing Water Level:** 14.500
GWMA: **Salinity:**
GW Zone: **Yield:**

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	CUMBE	CUMBE.39	11//1013168
Licensed:	CUMBERLA	ALEXANDR	Whole Lot 11//1013168

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

Elevation: 0.00 m (A.H.D.) **Northing:** 6245899.0 **Latitude:** 33°54'50.1"S
Elevation Source: **Easting:** 331819.0 **Longitude:** 151°10'50.8"E

GS Map: - **MGA Zone:** 56 **Coordinate Source:**

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		Annulus	Waterworn/Rounded	0.00	0.00				Graded
1	1	Casing	Pvc Class 18	0.00	29.00	63			Screwed
1	1	Opening	Slots - Horizontal	29.00	35.00	63		1	PVC, SL: 6.0mm, A: 0.40mm

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)
29.00	35.00	6.00	Unknown	14.50					4400.00

Geologists Log
Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	2.20	2.20	FILL	Fill	
2.20	35.00	32.80	ASHFIELD SHALE	Ash	

Remarks

***** End of GW109821 *****

NSW Office of Water
Work Summary

GW109822

Licence: 10BL164967 **Licence Status:** ACTIVE

Authorised Purpose(s): MONITORING BORE
Intended Purpose(s): V1

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

Commenced Date: **Final Depth:** 10.45 m
Completion Date: 04/04/1997 **Drilled Depth:** 10.45 m

Contractor Name: Macquarie Drilling
Driller:
Assistant Driller:

Property: ALEXANDRIA LANDFILL ALBERT ST ST PETERS 2044,ALEXANDRIA LANDFILL PRINCES HIGHWAY ST PETERS 2044 NSW **Standing Water Level:** 3.000
GWMA: **Salinity:**
GW Zone: **Yield:**

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	CUMBE	CUMBE.1	11//1013168
Licensed:	CUMBERLA	ALEXANDR	Whole Lot 11//1013168

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

Elevation: 0.00 m (A.H.D.) **Northing:** 6245594.0 **Latitude:** 33°54'60.0"S
Elevation Source: **Easting:** 331806.0 **Longitude:** 151°10'50.1"E

GS Map: - **MGA Zone:** 56 **Coordinate Source:**

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		Annulus	Waterworn/Rounded	0.00	0.00				Graded
1	1	Casing	Pvc Class 18	0.00	5.00	63			seated on bo, Screwed
1	1	Opening	Slots - Horizontal	5.00	8.00	63		1	Stamped, PVC, SL: 3.0mm, A: 0.40mm

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)
3.00	10.45	7.45	Unknown	3.00					958.00

Geologists Log
Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	2.60	2.60	FILL	Fill	
2.60	3.80	1.20	CLAYEY SAND	Clayey Sand	
3.80	8.20	4.40	SAND	Sand	
8.20	10.45	2.25	CLAY	Clay	

Remarks

***** End of GW109822 *****

NSW Office of Water
Work Summary

GW109823

Licence: 10BL164967 **Licence Status:** ACTIVE

Authorised Purpose(s): MONITORING BORE
Intended Purpose(s): V1

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

Commenced Date: **Final Depth:** 29.00 m
Completion Date: 23/10/2000 **Drilled Depth:** 29.00 m

Contractor Name: Macquarie Drilling
Driller:
Assistant Driller:

Property: ALEXANDRIA LANDFILL ALBERT ST ST PETERS 2044,ALEXANDRIA LANDFILL PRINCES HIGHWAY ST PETERS 2044 NSW **Standing Water Level:** 12.500
GWMA: **Salinity:**
GW Zone: **Yield:** 0.100

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	CUMBE	CUMBE.1	11//1013168
Licensed:	CUMBERLA	ALEXANDR	Whole Lot 11//1013168

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

Elevation: 0.00 m (A.H.D.) **Northing:** 6245594.0 **Latitude:** 33°54'60.0"S
Elevation Source: **Easting:** 331819.0 **Longitude:** 151°10'50.6"E

GS Map: - **MGA Zone:** 56 **Coordinate Source:**

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		Annulus	Waterworn/Rounded	0.00	0.00				Graded
1	1	Casing	Pvc Class 18	0.00	23.00	63			Screwed
1	1	Opening	Screen	23.00	29.00	63		1	PVC Class 18, Screwed, A: 0.40mm

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)
22.00	29.00	7.00	Unknown	12.50		0.10		00:09:00	10600.00

Geologists Log
Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	3.00	3.00	FILL	Fill	
3.00	6.00	3.00	CLAYEY SAND	Clayey Sand	
6.00	8.11	2.11	SAND	Sand	
8.11	11.50	3.39	SANDY CLAY	Sandy Clay	
11.50	29.00	17.50	SHALE	Shale	

Remarks

***** End of GW109823 *****

NSW Office of Water
Work Summary

GW109824

Licence: 10BL164967 **Licence Status:** ACTIVE

Authorised Purpose(s): MONITORING BORE
Intended Purpose(s): V1

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

Commenced Date: **Final Depth:** 20.70 m
Completion Date: 05/04/2005 **Drilled Depth:** 20.70 m

Contractor Name: Macquarie Drilling
Driller:
Assistant Driller:

Property: ALEXANDRIA LANDFILL ALBERT ST ST PETERS 2044,ALEXANDRIA LANDFILL PRINCES HIGHWAY ST PETERS 2044 NSW **Standing Water Level:** 4.510
GWMA: **Salinity:**
GW Zone: **Yield:**

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	CUMBE	CUMBE.39	11//1013168
Licensed:	CUMBERLA	ALEXANDR	Whole Lot 11//1013168

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

Elevation: 0.00 m (A.H.D.) **Northing:** 6245635.0 **Latitude:** 33°54'58.4"S
Elevation Source: **Easting:** 331393.0 **Longitude:** 151°10'34.0"E

GS Map: - **MGA Zone:** 56 **Coordinate Source:**

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		Annulus	Waterworn/Rounded	0.00	0.00				Graded
1	1	Casing	Pvc Class 18	0.00	13.40	63			Screwed
1	1	Opening	Slots - Horizontal	13.40	18.40	63		1	PVC, SL: 6.0mm, A: 0.40mm

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)
13.00	20.00	7.00	Unknown	4.51					4350.00

Geologists Log
Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	4.50	4.50	FILL	Fill	
4.50	9.00	4.50	LAMINITE	Laterite	
9.00	17.00	8.00	SHALE	Shale	
17.00	20.70	3.70	SANDSTONE	Sandstone	

Remarks

***** End of GW109824 *****

NSW Office of Water
Work Summary

GW109825

Licence: 10BL164967 **Licence Status:** ACTIVE

Authorised Purpose(s): MONITORING BORE
Intended Purpose(s): V1

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

Commenced Date:
Completion Date: 10/02/2005
Final Depth: 22.00 m
Drilled Depth: 22.00 m

Contractor Name:
Driller:
Assistant Driller:

Property: ALEXANDRIA LANDFILL ALBERT ST ST PETERS 2044,ALEXANDRIA LANDFILL PRINCES HIGHWAY ST PETERS 2044 NSW
Standing Water Level: 14.900
GWMA:
GW Zone:
Salinity:
Yield:

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	CUMBE	CUMBE.39	11//1013168
Licensed:	CUMBERLA	ALEXANDR	Whole Lot 11//1013168

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

Elevation: 0.00 m (A.H.D.)
Elevation Source:
Northing: 6245853.0
Easting: 331689.0
Latitude: 33°54'51.5"S
Longitude: 151°10'45.7"E

GS Map: -
MGA Zone: 56
Coordinate Source:

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		Annulus	Waterworn/Rounded	0.00	0.00				Graded
1	1	Casing	Pvc Class 18	0.00	16.00	62			Screwed
1	1	Opening	Screen	16.00	22.00	62		1	PVC Class 18, Screwed, A: 0.40mm

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)
17.50	22.00	4.50	Unknown	14.90					1800.00

Geologists Log
Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	4.50	4.50	FILL	Fill	
4.50	22.00	17.50	SHALE	Shale	

Remarks

***** End of GW109825 *****

NSW Office of Water
Work Summary

GW109958

Licence: 10BL601848 **Licence Status:** ACTIVE

Authorised Purpose(s): MONITORING BORE
Intended Purpose(s): V1

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

Commenced Date:
Completion Date: 12/04/2007
Final Depth: 5.20 m
Drilled Depth: 5.20 m

Contractor Name:
Driller:
Assistant Driller:

Property: MOUSTAFA 306-312 FOREST ROAD BEXLEY 2207 NSW,MOUSTAFA 306-312 FOREST ROAD BEXLEY 2072 NSW
GWMA:
GW Zone:
Standing Water Level:
Salinity:
Yield:

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	CUMBE	CUMBE.46	1//727973
Licensed:	CUMBERLA	STGEORGE	Whole Lot 1//727973

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

Elevation:
Elevation Source:
Northing:
Easting:
Latitude:
Longitude:

GS Map: -
MGA Zone:
Coordinate Source:

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	1	Casing	Pvc Class 18	0.00	0.00	50			

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	0.20	0.20	CONCRETE	Conglomerate	
0.20	0.50	0.30	CLAYEY GRAVEL (FILL),MOIST, L/PLASTICITY,D/GREY, CLAY	Clayey Sand	
0.50	0.70	0.20	CLAYEY GRAVEL,STIFF,LOOSE SAND,MOIST,L/PLASTICITY	Clayey Sand	
0.70	1.50	0.80	CLAY,MEDIUM STIFF,LOOSE SAND,MOIST,HIGH PLASTICITY,ORANGE BROWN	Clay	
1.50	2.50	1.00	CLAYEY SHALE. WEATHERED,STIFF,MEDIUM LOW PLASTICITY,BROWN GREY	Clayey Sand	
2.50	4.00	1.50	SHALE.WEATHERED.STIFF,DRY,MEDIUM LOW PLASTICITY,BROWN GREY	Shale	
4.00	4.50	0.50	CLAY,SOFT,DRY,LOW PLASTICITY,BROWN,GREY	Clay	
4.50	5.20	0.70	CLAY,MEDIUM STIFF,SHALE MOIST,M/L/PLASTICITY,RED BROWN	Clay	

Remarks

***** End of GW109958 *****

NSW Office of Water
Work Summary

GW109959

Licence: 10BL601848 **Licence Status:** ACTIVE

Authorised Purpose(s): MONITORING BORE
Intended Purpose(s): V1

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

Commenced Date: **Final Depth:** 5.90 m
Completion Date: 13/04/2007 **Drilled Depth:** 5.90 m

Contractor Name:
Driller:
Assistant Driller:

Property: MOUSTAFA 306-312 FOREST ROAD BEXLEY 2207 NSW,MOUSTAFA 306-312 FOREST ROAD BEXLEY 2072 NSW **Standing Water Level:**
GWMA: **Salinity:**
GW Zone: **Yield:**

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	CUMBE	CUMBE.46	1//323069
Licensed:	CUMBERLA	STGEORGE	Whole Lot 1//727973

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

Elevation: **Northing:** **Latitude:**
Elevation Source: **Easting:** **Longitude:**

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

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	1	Casing	Pvc Class 18	0.00	0.00	50			

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	0.30	0.30	CONCRETE	Conglomerate	
0.30	0.50	0.20	CONCRETE, GRAVEL,LOOSE SAND MOIST,L/PLASTICITY,DARK BROWN	Conglomerate	
0.50	1.00	0.50	CLAYEY GRAVEL,LOOSE SAND,MOIST L/PLASTICITY,DARK BROWN	Clayey Sand	
1.00	3.00	2.00	CLAYEY SHALE,STIFF,WEATHERED SHALE,DRY,M/L/PLASTICITY	Clayey Sand	
3.00	3.50	0.50	SHALE,SOFT,WEATHERED SHALE,DRY,MEDIUM LOW PLASTICITY	Shale	
3.50	5.80	2.30	CLAYEY SHALE,STIFF,SOFT,WEATHERED,DRY,CLAY BECOMES SOFT	Clayey Sand	
5.80	5.90	0.10	CLAY VERY SOFT,SATURATED,MEDIUM LOW PLASTICITY,BROWN	Clay Loam	

Remarks

***** End of GW109959 *****

NSW Office of Water
Work Summary

GW109960

Licence: 10BL601848 **Licence Status:** ACTIVE

Authorised Purpose(s): MONITORING BORE
Intended Purpose(s): V1

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

Commenced Date: **Final Depth:** 8.00 m
Completion Date: 13/04/2007 **Drilled Depth:** 8.00 m

Contractor Name:
Driller:
Assistant Driller:

Property: MOUSTAFA 306-312 FOREST ROAD BEXLEY 2207 NSW,MOUSTAFA 306-312 FOREST ROAD BEXLEY 2072 NSW **Standing Water Level:**
GWMA: **Salinity:**
GW Zone: **Yield:**

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	CUMBE	CUMBE.46	1//727973
Licensed:	CUMBERLA	STGEORGE	Whole Lot 1//727973

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

Elevation: **Northing:** **Latitude:**
Elevation Source: **Easting:** **Longitude:**

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

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	1	Casing	Pvc Class 18	0.00	0.00				

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	0.20	0.20	CONCRETE	Conglomerate	
0.20	0.50	0.30	CONCRETE AND CLAYEY GRAVEL,SAND LOOSE,DARK BROWN	Conglomerate	
0.50	1.00	0.50	CLAY,SOFT SIGHTLY MOIST,HIGH PLASTICITY,ORANGE BROWN	Clay	
1.00	2.50	1.50	CLAYEY SHALE,WEATHERED,STIFF,DRY,M/L/PLASTICITY,BROWN GREY	Clayey Sand	
2.50	4.00	1.50	SHALE,STIFF,WEATHERED,DRY,M/L/PLASTICITY,BROWN GREY	Shale	
4.00	6.00	2.00	CLAYEY SHALE,STIFF,WEATHERED,SOME IRONSTONE AND GRAVEL	Clayey Sand	
6.00	7.80	1.80	SANDY SHALE,VERY LOOSE,MOIST,M/L/ PLASTICITY,GREY	Sandy Shale	
7.80	8.00	0.20	CLAYEY SHALE VERY SOFT CLAY,SOME SHALE,DARK GREY BROWN	Clayey Sand	

Remarks

***** End of GW109960 *****

NSW Office of Water
Work Summary

GW109961

Licence: 10BL601848 **Licence Status:** ACTIVE

Authorised Purpose(s): MONITORING BORE
Intended Purpose(s): V1

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

Commenced Date: **Final Depth:** 5.80 m
Completion Date: 12/04/2007 **Drilled Depth:** 5.80 m

Contractor Name:
Driller:
Assistant Driller:

Property: MOUSTAFA 306-312 FOREST ROAD BEXLEY 2207 NSW,MOUSTAFA 306-312 FOREST ROAD BEXLEY 2072 NSW **Standing Water Level:**
GWMA: **Salinity:**
GW Zone: **Yield:**

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	CUMBE	CUMBE.46	1//727973
Licensed:	CUMBERLA	STGEORGE	Whole Lot 1//727973

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

Elevation: **Northing:** **Latitude:**
Elevation Source: **Easting:** **Longitude:**

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

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	1	Casing	Pvc Class 18	0.00	0.00				

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	0.20	0.20	CONCRETE	Conglomerate	
0.20	0.40	0.20	GRAVELLY SAND,LOOSE,LOW PLASTICIY,DARK GREY	Gravelly Sandstone	
0.40	1.70	1.30	CLAY.,EDOI, STOFF.SJA;E.DRU.M/L/PLASTICITY,ORANGE,BROWN,GREY	Clay	
1.70	2.50	0.80	CLAYEY SHALE,VERY STIFF,DRY,M/L/PLASTICITY,BROWN GREY	Clayey Sand	
2.50	4.00	1.50	SHALE, MEDIUM STIFF,WEATHERED,DRY, BROWN GREY	Shale	
4.00	5.60	1.60	CLAY,VERY SOFT,WEATHERED SHALE,DRY,GREY BROWN	Clay	
5.60	5.80	0.20	SHALE HARD DRY LOW PLASTICITY,GREY	Shale	

Remarks

***** End of GW109961 *****

NSW Office of Water
Work Summary

GW109963

Licence: 10WA114261 **Licence Status:** CURRENT

Authorised Purpose(s): DOMESTIC
Intended Purpose(s): J

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

Commenced Date: **Final Depth:** 8.00 m
Completion Date: 28/11/2006 **Drilled Depth:** 8.00 m

Contractor Name:
Driller:
Assistant Driller:

Property: RICHARDSON 37 FLORA ST ARNCLIFFE 2205 NSW **Standing Water Level:**
GWMA: **Salinity:**
GW Zone: **Yield:**

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	CUMBE	CUMBE.46	15/2/4059
Licensed:	CUMBERLA	STGEORGE	Whole Lot 15/2/4059

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

Elevation: 0.00 m (A.H.D.) **Northing:** 6243406.0 **Latitude:** 33°56'09.6"S
Elevation Source: **Easting:** 329446.0 **Longitude:** 151°09'16.7"E

GS Map: - **MGA Zone:** 56 **Coordinate Source:**

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	1	Casing	Lining	0.00	0.00				

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	8.00	8.00	SAND	Sand	

Remarks

***** End of GW109963 *****

NSW Office of Water
Work Summary

GW109964

Licence: 10WA114260 **Licence Status:** CURRENT

Authorised Purpose(s): DOMESTIC
Intended Purpose(s): J

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

Commenced Date:
Completion Date: 28/11/2006
Final Depth: 8.00 m
Drilled Depth: 8.00 m

Contractor Name:
Driller:
Assistant Driller:

Property: CHRISTOFIDES 33 FLORA ST ARNCLIFFE 2205 NSW
GWMA:
GW Zone:
Standing Water Level:
Salinity:
Yield:

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	CUMBE	CUMBE.46	13/2/4059
Licensed:	CUMBERLA	STGEORGE	Whole Lot 13/2/4059

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

Elevation: 0.00 m (A.H.D.)
Elevation Source:
Northing: 6243419.0
Easting: 329426.0
Latitude: 33°56'09.2"S
Longitude: 151°09'15.9"E

GS Map: -
MGA Zone: 56
Coordinate Source:

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	1	Casing	Lining	0.00	0.00				

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	8.00	8.00	SAND	Sand	

Remarks

***** End of GW109964 *****

NSW Office of Water
Work Summary

GW109965

Licence: 10BL601646 **Licence Status:** CONVERTED

Authorised Purpose(s): DOMESTIC
Intended Purpose(s): J

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

Commenced Date: **Final Depth:**
Completion Date: 28/11/2006 **Drilled Depth:**

Contractor Name:
Driller:
Assistant Driller:

Property: LESLIE 30 FLORA STREET ARNCLIFFE 2205 NSW **Standing Water Level:**
GWMA: **Salinity:**
GW Zone: **Yield:**

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	CUMBE	CUMBE.46	31/1/4059
Licensed:	CUMBERLA	STGEORGE	Whole Lot 31/1/4059

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

Elevation: 0.00 m (A.H.D.) **Northing:** 6243467.0 **Latitude:** 33°56'07.7"S
Elevation Source: **Easting:** 329489.0 **Longitude:** 151°09'18.4"E

GS Map: - **MGA Zone:** 56 **Coordinate Source:**

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

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	8.00	8.00	SAND	Sand	

Remarks

***** End of GW109965 *****

NSW Office of Water
Work Summary

GW109966

Licence: 10BL601239 **Licence Status:** CONVERTED

Authorised Purpose(s): DOMESTIC
Intended Purpose(s): J

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

Commenced Date: **Final Depth:**
Completion Date: 17/03/2009 **Drilled Depth:**

Contractor Name:
Driller:
Assistant Driller:

Property: MATTHEWS 21 FLORA STREET ARNCLIFFE 2205 NSW,MATTHEWS 21 FLORA STREET ARNCLIFFE 2205 **Standing Water Level:**
GWMA: **Salinity:**
GW Zone: **Yield:**

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	CUMBE	CUMBE.46	8/2/4059
Licensed:	CUMBERLA	STGEORGE	Whole Lot 8/2/4059

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

Elevation: 0.00 m (A.H.D.) **Northing:** 6243465.0 **Latitude:** 33°56'07.7"S
Elevation Source: **Easting:** 329373.0 **Longitude:** 151°09'13.9"E

GS Map: - **MGA Zone:** 56 **Coordinate Source:**

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

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	3.00	3.00	CLAY	Clay	

Remarks

***** End of GW109966 *****

NSW Office of Water
Work Summary

GW111316

Licence: 10BL604791 **Licence Status:** CONVERTED

Authorised Purpose(s): IRRIGATION,RECREATION (GROUNDWATER)
Intended Purpose(s): I, Y

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

Commenced Date:
Completion Date: 01/03/2010
Final Depth: 162.00 m
Drilled Depth: 162.00 m

Contractor Name: Fico Group Pty Ltd
Driller:
Assistant Driller: Ian

Property: KOGARAH GOLF CLUB 210 WEST BOTANY ST ARNCLIFFE 2205 NSW,KOGARAH GOLF CLUB 210 WEST BOTANY ST ARNCLIFFE 2205
Standing Water Level: 4.000
GWMA:
GW Zone:
Salinity:
Yield: 2.000

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	CUMBE	CUMBE.46	1 576148
Licensed:	CUMBERLA	STGEORGE	Whole Lot 1//576148

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

Elevation: 0.00 m (A.H.D.)
Elevation Source:
Northing: 6242538.0
Easting: 329333.0
Latitude: 33°56'37.7"S
Longitude: 151°09'11.7"E

GS Map: -
MGA Zone: 56
Coordinate Source:

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		Annulus	Bentonite/Grout	0.00	61.00				
1	1	Casing	Steel	-0.10	37.00	203			cemented, Welded - Butt

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)
40.00	45.00	5.00	Unknown	4.00		8.00			
133.00	142.00	9.00	Unknown	4.00		2.00			

Geologists Log
Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	37.00	37.00	SAND	Sand	
37.00	45.00	8.00	SANDSTONE FRACTURED	Sandstone	
45.00	162.00	117.00	SANDSTONE	Sandstone	

Remarks

***** End of GW111316 *****

Appendix C

Photographs

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PHOTOGRAPHIC LOG

Site Name: WCX New M5, Worst Case Surface Disturbance Footprint	**Site Location:** Project Area 1, The Crescent, Kingsgrove, NSW	**Project No:** 60327128

Plate No.	**Date:**
1	30 April 2015

Direction Photo Taken:
North east

Description:

Project Area 1:

Photograph of property 2D The Crescent, Kingsgrove (Lot 1837, DP 1200226), located within worst case surface disturbance footprint in Project Area 2. Site is a vacant, fenced property, apart from two skip bins. Site is covered with hard stand and gravel.

Plate No.	**Date:**
2	30 April 2015

Direction Photo Taken:

North

Description:

Project Area 1:

Photograph of a vacant fenced site at 2D The Crescent, Kingsgrove (Lot 1837, DP 1200226).

PHOTOGRAPHIC LOG

Site Name: WCX New M5, Worst Case Surface Disturbance Footprint	**Site Location:** Project Area 1, The Crescent, Kingsgrove, NSW	**Project No:** 60327128

Plate No.	**Date:**
3	30 April 2015

Direction Photo Taken:

East

Description:

Project Area 1:

Photograph of commercial property adjacent to 2D The Crescent (Lot 201, DP 1030293). Allied Mills is a manufacturer and distributor of bakery premixes, flour and semi-finished products.

Plate No.	**Date:**
4	30 April 2015

Direction Photo Taken:

North west

Description:

Project Area 1:

Photograph of commercial property adjacent (to west) of 2D The Crescent, Kingsgrove (Lot M, DP 30731). Property is occupied by Air Grilles Pty Ltd, an air control manufacturing company. One AST and multiple skip bins and pallets were noted to be stored on the adjacent property.

PHOTOGRAPHIC LOG

Site Name: WCX New M5, Worst Case Surface Disturbance Footprint	**Site Location:** Project Area 1, The Crescent, Kingsgrove, NSW	**Project No:** 60327128

Plate No.	**Date:**
5	30 April 2015

Direction Photo Taken:

South

Description:

Project Area 1:

Photograph showing commercial property on opposite side of the road to 2D The Crescent. Property is occupied by CBC: Bearings, Power Transmission and Engineered Solutions.

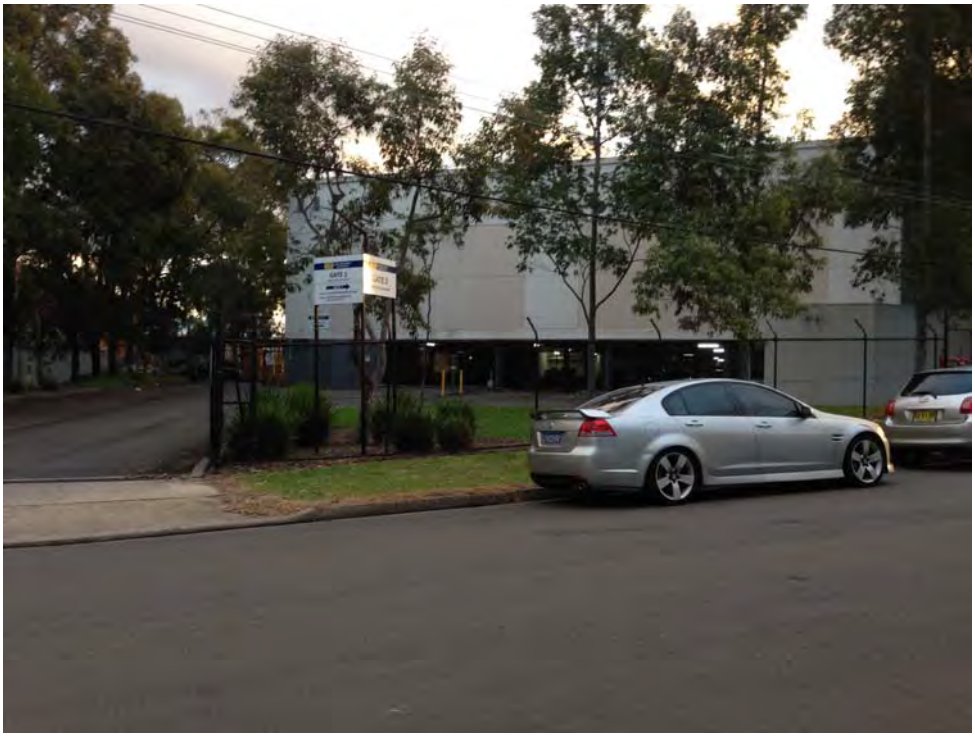


Plate No.	**Date:**
6	30 April 2015

Direction Photo Taken:

South

Description:

Project Area 1:

Photograph showing light industrial/commercial properties on The Crescent, opposite 2D The Crescent, Kingsgrove.

PHOTOGRAPHIC LOG

Site Name:	Site Location:	Project No:
WCX New M5, Worst Case Surface Disturbance Footprint	Project Area 1, Garema Circuit, Kingsgrove	60327128

Plate No.	Date:
7	30 April 2015

Direction Photo Taken:

South

Description:

Project Area 1:

Photograph showing the commercial property at 27-31 Garema Circuit (SP 37275). The property was occupied by The Christmas Company, Bactor Industries.

Plate No.	Date:
8	30 April 2015

Direction Photo Taken:

South

Description:

Project Area 1:

Photograph showing the commercial property at 27-31 Garema Circuit (SP 37275).

PHOTOGRAPHIC LOG

Site Name: WCX New M5, Worst Case Surface Disturbance Footprint	**Site Location:** Project Area 1, Garema Circuit, Kingsgrove	**Project No:** 60327128

Plate No.	**Date:**
9	30 April 2015

Direction Photo Taken:

South

Description:

Project Area 1:

Photograph showing the commercial property at 27-31 Garema Circuit (SP 37275). The property was occupied by The Christmas Company, Bactor Industries.

Plate No.	**Date:**
10	30 April 2015

Direction Photo Taken:

South east

Description:

Project Area 1:

Photograph showing the commercial property to the east and adjacent to 27-31 Garema Circuit. The property is occupied by a refrigeration maintenance company and seafood wholesaler.

PHOTOGRAPHIC LOG

Site Name: WCX New M5, Worst Case Surface Disturbance Footprint	**Site Location:** Project Area 1, Commercial Road, Kingsgrove	**Project No:** 60327128

Plate No.	**Date:**
11	30 April 2015

Direction Photo Taken:

West

Description:

Project Area 1:

Photograph showing the commercial property 30A and 32 Commercial Road, Kingsgrove (Lot 1 and 2, DP 566805). The property is occupied by a furniture manufacturing company. The property adjacent to the south is a sub-station.

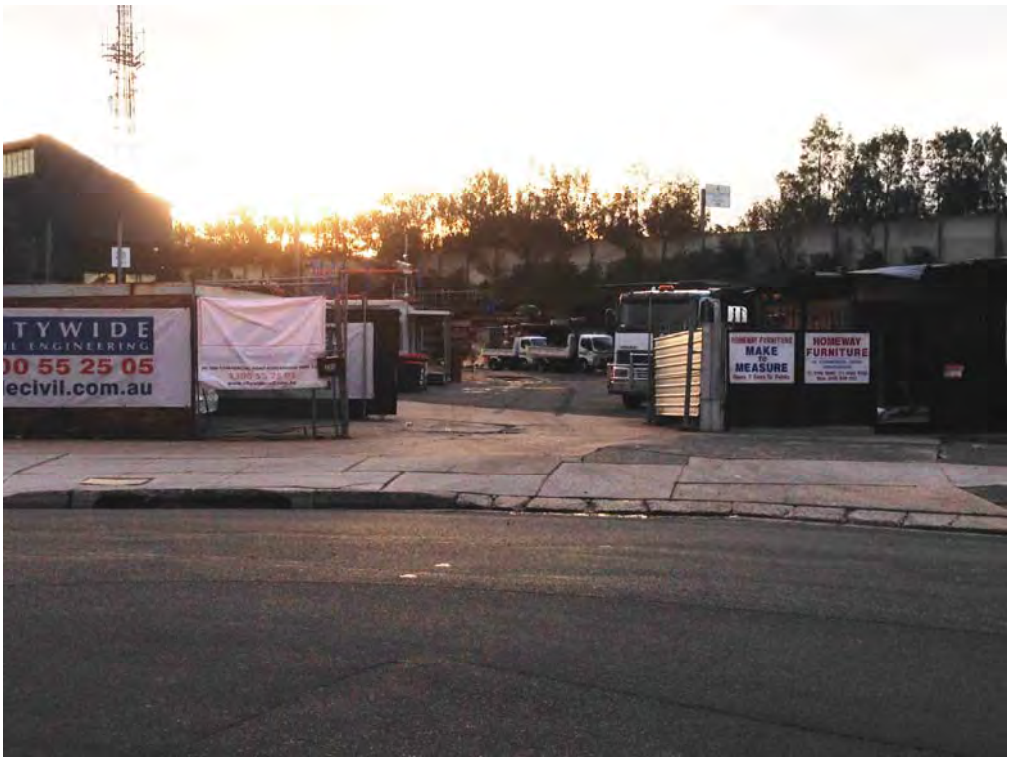


Plate No.	**Date:**
12	30 April 2015

Direction Photo Taken:

North west

Description:

Project Area 1:

Photograph showing the commercial property at 30A and 32 Commercial Road, Kingsgrove.

PHOTOGRAPHIC LOG

Site Name:	Site Location:	Project No:
WCX New M5, Worst Case Surface Disturbance Footprint	Project Area 1, Commercial Road, Kingsgrove and Project Area 3, Bexley Road, North Bexley.	60327128

Plate No.	Date:
13	30 April 2015

Direction Photo Taken:

North west

Description:

Project Area 1:

Photograph showing the commercial property to the east of 30-32 Commercial Road. Property is occupied by a car dealership.

Plate No.	Date:
14	30 April 2015

Direction Photo Taken:

North west

Description:

Project Area 3:

Photograph shows the M5 Linear Park (in background) on western side of Bexley Road (Lot 9 to 18, DP 1069225).

PHOTOGRAPHIC LOG

Site Name:	Site Location:	Project No:
WCX New M5, Worst Case Surface Disturbance Footprint	Project Area 3, Bexley Road, North Bexley.	60327128

Plate No.	Date:
15	30 April 2015

Direction Photo Taken:

South

Description:

Project Area 3:

Photograph shows existing M5 infrastructure on the corner of Bexley Road and M5 East Freeway (Lot 1 DP 123745 and Lot 3 to 7, DP 1070237).

Plate No.	Date:
16	30 April 2015

Direction Photo Taken:

East

Description:

Project Area 3:

Photograph shows existing M5 infrastructure on the corner of Bexley Road and M5 East Freeway (Lot 1 DP 123745 and Lot 3 to 7, DP 1070237).

PHOTOGRAPHIC LOG

Site Name:	**Site Location:**	**Project No:**
WCX New M5, Worst Case Surface Disturbance Footprint	Project Area 3, Bexley Road, North Bexley.	60327128

Plate No.	**Date:**
17	30 April 2015

Direction Photo Taken:

North

Description:

Project Area 3:

Photograph shows existing M5 infrastructure on the corner of Bexley Road and M5 East Freeway (Lot 1 DP 123745 and Lot 3 to 7, DP 1070237).

Plate No.	**Date:**
18	30 April 2015

Direction Photo Taken:

South

Description:

Project Area 3:

Photograph shows Kingsgrove Avenue Reserve that encapsulates the artificially channelled Wolli Creek.

PHOTOGRAPHIC LOG

Site Name: WCX New M5, Worst Case Surface Disturbance Footprint	**Site Location:** Project Area 3, Bexley Road, North Bexley	**Project No:** 60327128

Plate No.	**Date:**
19	30 April 2015

Direction Photo Taken:

West

Description:

Project Area 3:

Photograph shows Kingsgrove Avenue Reserve that encapsulates the artificially channelled Wolli Creek.

Plate No.	**Date:**
20	15 July 2014

Direction Photo Taken:
South

Description:
Photograph of the northwest portion of Alexandria Landfill, with the leachate treatment system shed (located behind the green shed) in the background.

PHOTOGRAPHIC LOG

Site Name: WCX New M5, Worst Case Surface Disturbance Footprint	**Site Location:** Project Area 5	**Project No:** 60327128

Plate No.	**Date:**
21	15 July 2014

Direction Photo Taken:
South

Description:
Photograph of the weighbridge area and diesel AST in the Alexandria Landfill (north west part of the Site).

Plate No.	**Date:**
22	15 July 2014

Direction Photo Taken:

Southwest

Description:

Photograph showing timber and green waste stockpiles in the central portion of the Alexandria Landfill.

PHOTOGRAPHIC LOG

Site Name: WCX New M5, Worst Case Surface Disturbance Footprint	**Site Location:** Project Area 5	**Project No:** 60327128

Plate No.	**Date:**
23	15 July 2014

Direction Photo Taken:
Southwest

Description:
Photograph showing the central portion of the former landfilled area in the Alexandria Landfill.

Plate No.	**Date:**
24	15 July 2014

Direction Photo Taken:

West

Description:

Photograph showing the central portion of the former landfilled area within Alexandria Landfill and the shale wall along the western boundary of the Site.

PHOTOGRAPHIC LOG

Site Name: WCX New M5, Worst Case Surface Disturbance Footprint	**Site Location:** Project Area 5	**Project No:** 60327128

Plate No.	**Date:**
25	14 August 2014

Direction Photo Taken:

East

Description:

Photograph showing the recycling stockpiles in Alexandria Landfill in the southern part of the Site and the Goodman Property in the background.

Plate No.	**Date:**
26	14 August 2014

Direction Photo Taken:

South

Description:

Photograph showing the southwest portion of the Site including the southern extent of the Alexandria Landfill (showing top of Stockpile 21) and the rear wall of the strata unit lot building. Shipping containers in the Cooks River Rail Terminal are visible in the background.

PHOTOGRAPHIC LOG

Site Name: WCX New M5, Worst Case Surface Disturbance Footprint	**Site Location:** Project Area 5, Albert Street, St Peters	**Project No:** 60327128

Plate No.	**Date:**
27	14 August 2014

Direction Photo Taken:

South

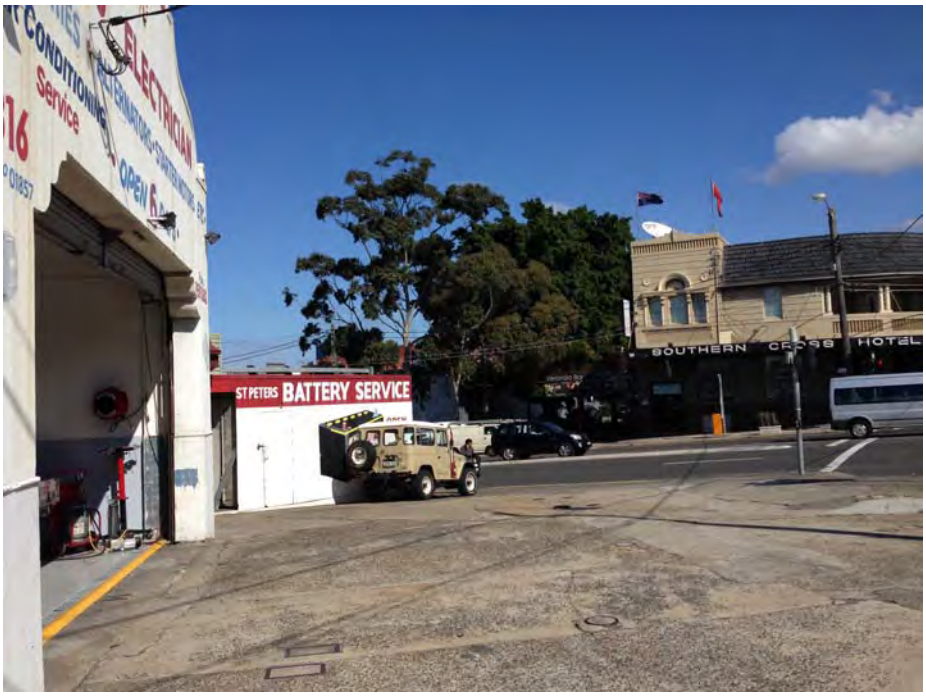
Description:
Photograph of the Albert Street Lot (Lot 1 DP1010128) owned by Alexandria Landfill Pty Ltd and a brick distribution cottage substation.

Plate No.	**Date:**
28	14 August 2014

Direction Photo Taken:

South

Description:
Photograph of the Dynamo Auto Electrician garage (left) and the location of the former petrol station USTs and associated underground infrastructure. Located on the corner of Canal Road and Princes Highway.



PHOTOGRAPHIC LOG

Site Name: WCX New M5, Worst Case Surface Disturbance Footprint	**Site Location:** Project Area 5, Holland Street, St Peters	**Project No:** 60327128

Plate No. 29	**Date:** 14 August 2014

Direction Photo Taken:
South

Description:

Photograph of the Holland Street Lot (Lot 1 DP129280) owned by Carlewie Pty Ltd and used as a driveway for the Alexandria Landfill. The end of Lot 1 DP1168612 is on the left side and Bradshaw Mountain is on the right side of the photograph.

Plate No. 30	**Date:** 14 August 2014

Direction Photo Taken:

North west

Description:
Photograph of the commercial Strata Unit lot (SP35749) in the southern portion of the Site at 1 Canal Road, St Peters.

PHOTOGRAPHIC LOG

Site Name: WCX New M5, Worst Case Surface Disturbance Footprint	**Site Location:** Project Area 5, Canal Road, St Peters	**Project No:** 60327128

Plate No. 31	**Date:** 14 August 2014

Direction Photo Taken:

North

Description:
Photograph of the RMS Canal Road Lot (Lot 14 DP606737) formerly occupied by Sin Bins and Tipfast waste recyclers.

Plate No. 32	**Date:** 14 August 2014

Direction Photo Taken:
North

Description:
Photograph of the RMS Canal Road Lots (Lot B DP394647 and Lot A DP391775) from Canal Road.

PHOTOGRAPHIC LOG

Site Name:	Site Location:	Project No:
WCX New M5, Worst Case Surface Disturbance Footprint	Project Area 5, Burrows Road St Peters	60327128

Plate No.	Date:
33	14 August 2014

Direction Photo Taken:

West

Description:
Photograph of the entry to the Goodman Property – Burrows Road Industrial Estate (Lot 11 DP606737 and Lot 12 DP606737) located in the southeast corner of the Site.

Plate No.	Date:
34	14 August 2014

Direction Photo Taken:
West

Description:
Photograph of the entry and truck girds in the RMS Burrows Road Lot (Lot 13 DP606737) - occupied by the City of Sydney Burrows Road Depot. Alexandria Landfill stockpiles are visible in the background.

PHOTOGRAPHIC LOG

Site Name:	Site Location:	Project No:
WCX New M5, Worst Case Surface Disturbance Footprint	Project Area 5, Campbell Lane and Woodley Street, St Peters	60327128

Plate No. 35	Date: 14 August 2014

Direction Photo Taken:

South west

Description:

Photograph showing the northeast corner of Bradshaw Mountain (RMS owned lots Lot 1 DP88087 and Lot B DP376645) taken from Holland Street.

Plate No. 36	Date: 14 August 2014

Direction Photo Taken:

North

Description:

Photograph showing a monitoring well (spray painted BH24) on the east side of Albert Street to the north of the Alexandria Landfill main entry. The construction site in the background is the former drum reconditioners site (NSW EPA declared Remediation Site) and Sydney Park is on the right.

PHOTOGRAPHIC LOG

Site Name: WCX New M5, Worst Case Surface Disturbance Footprint	**Site Location:** Project Area 5, Burrows Road, St Peters	**Project No:** 60327128

Plate No.	**Date:**
37	14 August 2014

Direction Photo Taken:

North

Description:

Photograph of Sims Metal Management (part of Good River Properties with EPL 10350)

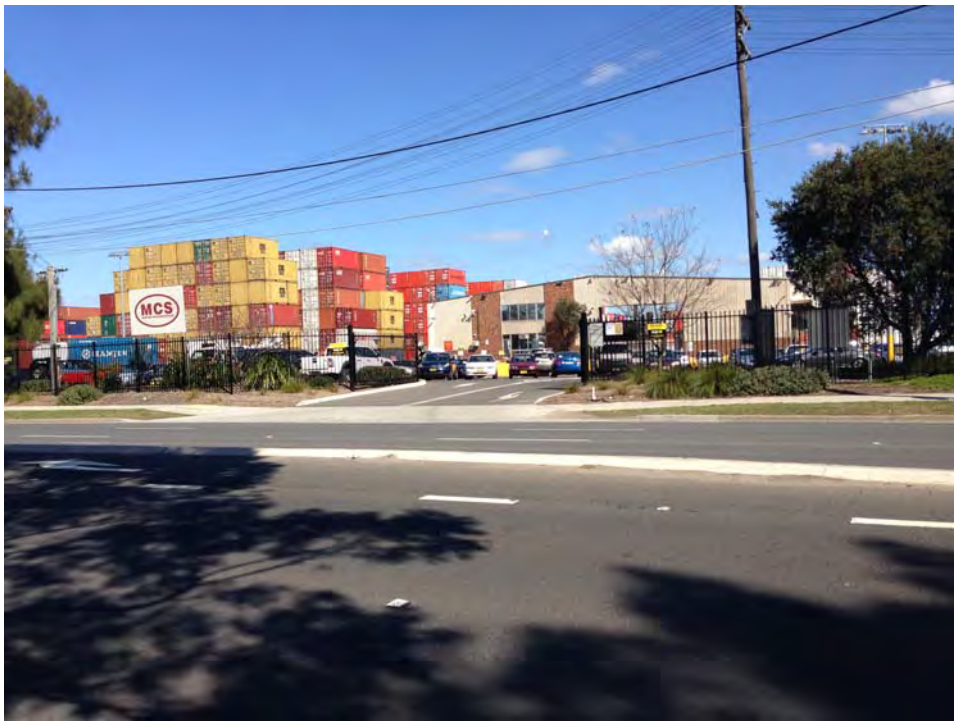
Plate No.	**Date:**
38	14 August 2014

Direction Photo Taken:

South

Description:

Photograph of Canal Road and then Cooks River Rail Terminal to the south of Project Area 5.



PHOTOGRAPHIC LOG

Site Name: WCX New M5, Worst Case Surface Disturbance Footprint	**Site Location:** Project Area 5, 156 Princes Highway, St Peters	**Project No:** 60327128

Plate No.	**Date:**
39	14 August 2014

Direction Photo Taken:

Southeast

Description:

A mechanics workshop on the corner of Victoria Street and Princes Highway on the west side of Project Area 5, that appears to may have formerly also been petrol station.

Plate No.	**Date:**
40	26 June 2015

Direction Photo Taken:

East

Description:

Alexandra Canal and the north side of Ricketty Street Bridge. Industrial properties in background are fronting onto Ricketty Street.

PHOTOGRAPHIC LOG

Site Name: WCX New M5, Worst Case Surface Disturbance Footprint	**Site Location:** Project Area 5, Campbell Street, St Peters	**Project No:** 60327128

Plate No. **41**	**Date:** 11 Nov 2014

Direction Photo Taken:
North-west

Description:
Photograph of Unwin's Bridge Road and Campbell Street intersection with Camdenville Park flood detention basin in the background in St Peters.

Plate No. **42**	**Date:** 11 Nov 2014

Direction Photo Taken:

West

Description:
Photograph of a vacant fenced site near the corner of Campbell Street and St Peters Street, St Peters (Lot 1 DP65466) and opposite Simpson Park.

PHOTOGRAPHIC LOG

Site Name:	Site Location:	Project No:
WCX New M5, Worst Case Surface Disturbance Footprint	Project Area 5, Campbell Street, St Peters	60327128

Plate No.	Date:
43	11 Nov 2014

Direction Photo Taken:

North east

Description:
Photograph of commercial properties and a smash repair business on the northern side of Campbell Street, St Peters (located between Princes Highway and St Peters Street)

Plate No.	Date:
44	11 Nov 2014

Direction Photo Taken:

East

Description:

Photograph showing vacant lots on the corner of Campbell Street and Church Street, St Peters (Lot A and B DP349446)

PHOTOGRAPHIC LOG

Site Name:	Site Location:	Project No:
WCX New M5, Worst Case Surface Disturbance Footprint	Project Area 5, Campbell Road, St Peters	60327128

Plate No.	Date:
45	11 Nov 2014

Direction Photo Taken:

South

Description:

Photograph showing an industrial property with a faded sign 'Winden Cleaning Products' (Lot 19 DP73532)

Plate No.	Date:
46	11 Nov 2014

Direction Photo Taken:

South

Description:

Photograph of Lot 1 DP906751 and Lot 1 DP921970 on Campbell Street between Barwon Park Road and Crown Street. The property appeared to be used for storage (mainly sandstone masonry blocks).

PHOTOGRAPHIC LOG

Site Name:	**Site Location:**	**Project No:**
WCX New M5, Worst Case Surface Disturbance Footprint	Project Area 5, Campbell Road, St Peters	60327128

Plate No.	**Date:**
47	11 Nov 2014

Direction Photo Taken:

South

Description:

Photograph showing the Lot 1 DP921124 on Campbell Road (between Barwon Park Road and Crown Street). The property appeared to be used as a storage yard/workshop.

Plate No.	**Date:**
48	11 Nov 14

Direction Photo Taken:

North

Description:

Photograph showing Sydney Park car park (Lot 1 DP1105933) located at the intersection of Euston Road and Sydney Park Road. The building in the background houses a Transgrid tunnel access portal (Lot 81 DP1033767).

Appendix D

Acid Sulfate Soils Maps

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Figure D1 Project areas 1 and 2 acid sulfate soil risk

Figure D2 Project areas 1 and 2 acid sulfate soil classes

Figure D3 Project area 3 acid sulfate soil risk

Figure D4 Project area 3 acid sulfate soil classes

Figure D5 Project area 4 acid sulfate soil risk

Figure D6 Project area 4 acid sulfate soil classes

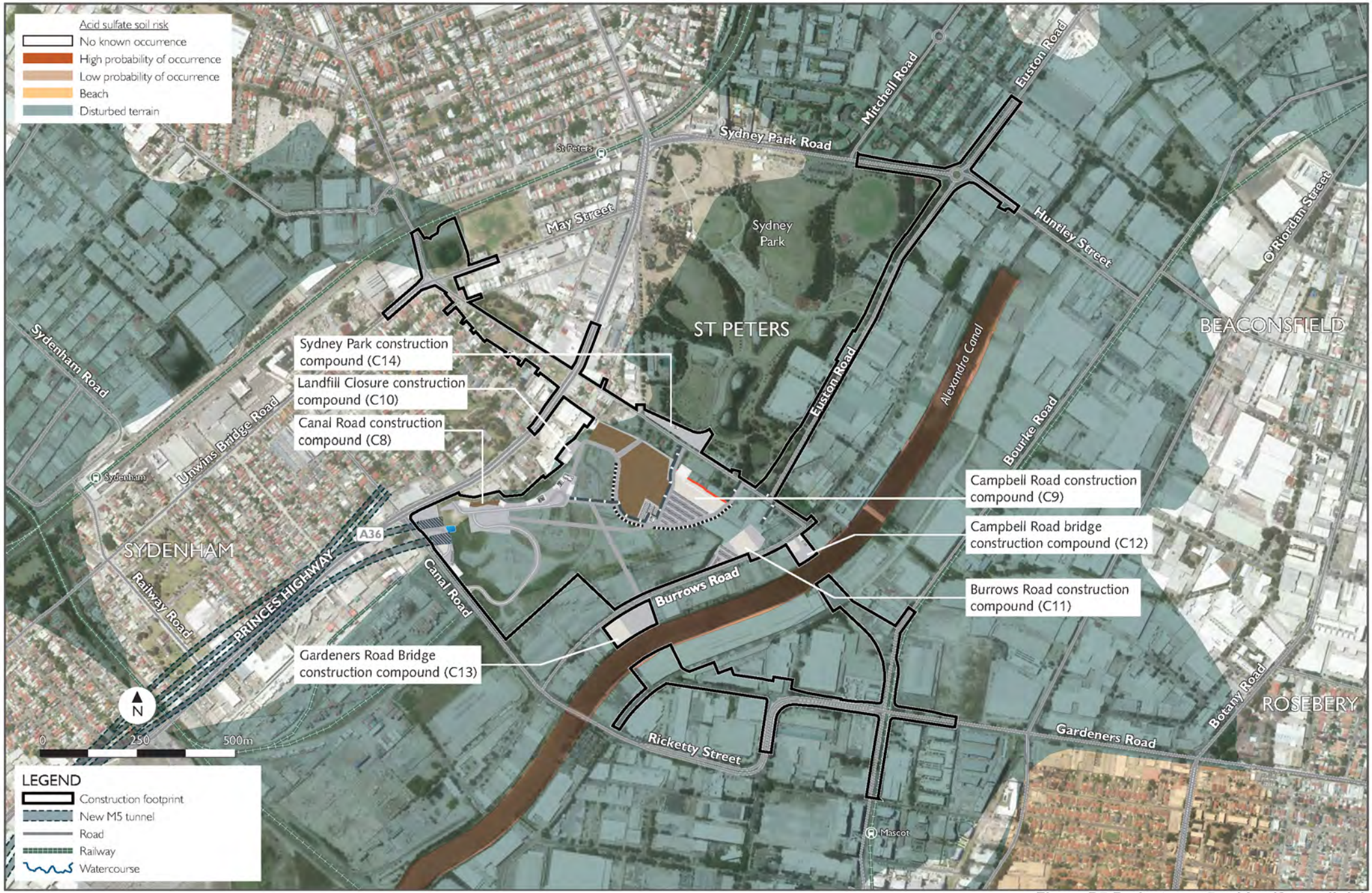

Figure D7 Project area 5 acid sulfate soil risk

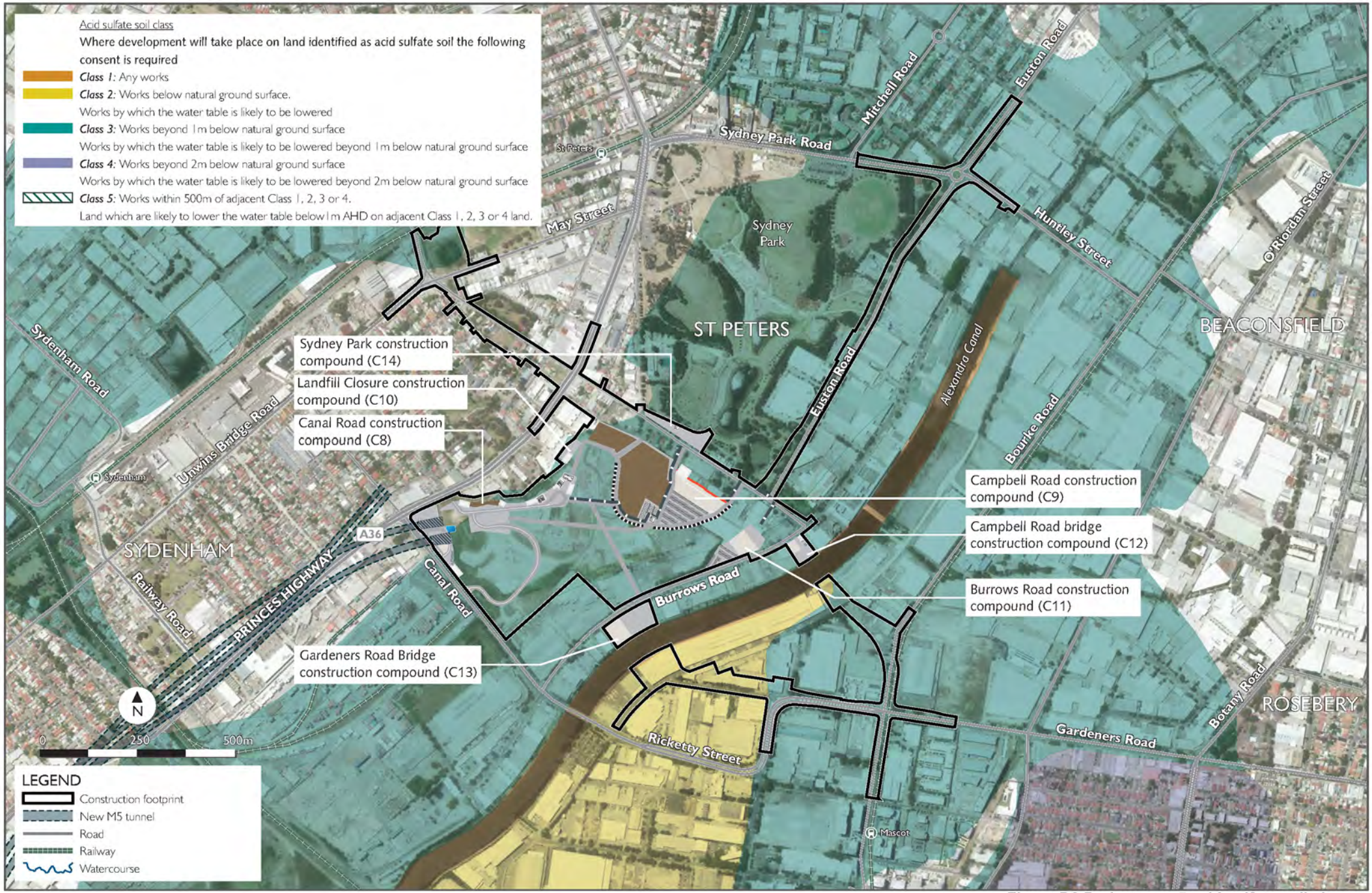

Figure D8 Project area 5 acid sulfate soil classes