Appendix G

Contamination Assessment Stage 1

Sydney Park Junction

Stage 1 Contamination Assessment

Final

Transport for NSW

Sydney Park Junction

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Document history and status

Revision	Date	Description	Author	Checked	Reviewed	Approved
Rev A	13/03/2020	Stage 1 contamination assessment	MS	AR	DW	
Rev B	01/09/2020	Incorporating TfNSW comments	MS	AR	DW	
Rev C	16/04/2021	Inclusion of design refinements along Princess Highway and ancillary compounds	MS	KK	DW	
Final	19/04/2021	Final Issue - Addressed TfNSW comments	MS	KK	DW	F Napolitano

Contents

List of tables

List of figures

Executive Summary

Jacobs has undertaken a Stage 1 contamination assessment of the Sydney Park Junction proposal as part of key deliverables and scope to inform a Review of Environmental Factors (REF).

The Stage 1 contamination assessment has included a review of desktop information, a site inspection, an assessment of potential areas and sources of on-site and off-site contamination, an assessment of the potential impacts to human health and the environment from exposure to contamination during construction / operation of the site, potential mitigation / management measures, and recommendations for further investigations where necessary.

The findings of this contamination assessment have identified a moderate to high potential for on-site contamination as a result of extensive historic landfilling/filling activities, brick making and associated structures (degradation of hazardous building materials) and current (service station) land use.

On-site soil and ground gas contamination, if exposed during construction activities and long-term operation of the site, could impact upon human health and environmental receptors if appropriate management / remediation measures are not adopted in response to contamination risks.

To quantify the potential contamination impacts identified, the following is recommended:

- For areas that have been identified as having moderate or high contamination impact potential, a further review of data would be performed (where relevant data is available)
- If available and where data from the additional data review is insufficient to understand the impact of contamination, a Detailed Site Investigation would be carried out in accordance with the National Environment Protection (Assessment of Site Contamination) Measure 1999, as revised in 2013 (NEPM, 2013) and other guidelines made or endorsed by the New South Wales Environment Protection Authority.

If construction activities extend beyond one meter below natural ground surface or lower the water table beyond one meter below natural ground surface within the eastern portion of the proposal or lower the water table below one metre AHD in areas adjoining the proposal, an ASS management plan would need to be prepared in accordance with the requirements of the ASSMAC (1998) guidelines and implemented.

Important note about your report

The sole purpose of this report and the associated services performed by Jacobs was to provide a preliminary assessment of site contamination conditions in accordance with the scope of services set out in the contract between Jacobs and Transport for New South Wales (the Client). That scope of services, as described in this report, was developed with the Client.

In preparing this report, Jacobs has relied upon, and presumed accurate, any information (or confirmation of the absence thereof) provided by the Client and/or from other sources. Except as otherwise stated in the report, Jacobs has not attempted to verify the accuracy or completeness of any such information. If the information is subsequently determined to be false, inaccurate or incomplete then it is possible that our observations and conclusions as expressed in this report may change.

Jacobs derived the data in this report from information sourced from the public domain, the Client (if any) and from observations made during the site inspection. The passage of time, manifestation of latent conditions or impacts of future events may require further examination of the proposal and subsequent data analysis, and re-evaluation of the data, findings, observations and conclusions expressed in this report. Jacobs has prepared this report in accordance with the usual care and thoroughness of the consulting profession, for the sole purpose described above and by reference to applicable standards, guidelines, procedures and practices at the date of issue of this report. For the reasons outlined above, however, no other warranty or guarantee, whether expressed or implied, is made as to the data, observations and findings expressed in this report, to the extent permitted by law.

This report should be read in full and no excerpts are to be taken as representative of the findings. No responsibility is accepted by Jacobs for use of any part of this report in any other context.

This report has been prepared on behalf of, and for the exclusive use of, Jacobs' Client, and is subject to, and issued in accordance with, the provisions of the contract between Jacobs and the Client. Jacobs accepts no liability or responsibility whatsoever for, or in respect of, any use of, or reliance upon, this report by any third party.

1. Introduction

1.1 Overview of the proposal

Transport for NSW proposes to improve the southern 'gateway' to King Street, Newtown by reducing the capacity of King Street, Princes Highway and Sydney Park Road and enhancing pedestrian and cyclist access along the Princes Highway, Sydney Park Road and King Street road corridors (the proposal).

The proposal objectives align with the strategic objectives articulated in the *Greater Sydney Region Plan* (Greater Sydney Commission, 2018), the *Road Safety Plan 2021* (Transport for NSW, 2018) and the *Future Transport Strategy 2056* (Transport for NSW, 2018).

The proposal is located about four kilometres south west of the Sydney Central Business District (CBD), in the suburbs of St Peters, Newtown, Erskineville and Alexandria along the boundary between the Inner West and Sydney Local Government Areas (LGAs) (refer to Figure 1-1).

The key features of the proposal include:

- Reducing the Princes Highway/King Street carriageway from six lanes (generally) to four lanes(two lanes off-peak) from Campbell Street to Sydney Park Road, to accommodate a two way on-road segregated cycleway (on the western side of King Street between May Street and St Peters square), additional landscaping and community spaces to increase urban amenities
- Reducing the Sydney Park Road carriageway from four lanes to two lanes to accommodate a permanent solution for the existing temporary two-way on-road segregated cycleway (northern side), parking and additional landscaping to increase urban amenities,
- New mid-block pedestrian shared crossings to improve access across the Princes Highway/King Street and into Sydney Park, including:
  - A new mid-block pedestrian crossing on Princes Highway north of Short Street.
  - A new mid-block pedestrian and cyclist crossing on Princes Highway between May Street and Goodsell Street.
- Traffic signal and intersection reconfiguration works to improve safety, including:
  - Princes Highway/King Street and Sydney Park Road intersection:
    - King Street southbound approach: Reduce existing three though lanes and one left turn slip lane to a one through lane and one through/left turn lane
    - King Street northbound approach: Maintain existing two through lanes and reduce existing two dedicated right turn lanes to one lane
    - Sydney Park Road approach: Reduce existing two left turn lanes and two right turn lanes to one left turn lane and one right turn lane
    - Replacing existing signalised pedestrian crossing facilities with signalised shared crossing facilities on all approaches
  - Princes Highway/King Street and Goodsell Street intersection:
    - New raised zebra crossing to prioritise pedestrians at the entrance of Goodsell Street
  - Princes Highway/King Street and May Street intersection:
    - Removing traffic signals and re-configuring May Street to left in and left out only movements with a new raised zebra crossing to prioritise pedestrians at the entrance of May Street
  - Princes Highway/King Street and Barwon Park Road intersection:
    - Installing new traffic signals with new pedestrian crossings

- Sydney Park Road and Mitchell Road intersection:
  - Eastbound approach: Reduce existing two though lanes and one left turn lane to one through lane and a through/left turn lane
  - Westbound approach: Reduce existing one right turn lane, one through lane and one through/left turn lane to one through/right turn lane and one through/left turn lane
  - Mitchell Road approach: Change existing one right turn lane and one right/through/left turn lane to one bus dedicated right turn lane and one through/left turn lane

- Reducing the posted speed limit on Princes Highway from 50 kilometres per hour to 40 kilometres from Campbell Street to Goodsell Street
- Sydney Park carpark access on Kings St will be modified so that Barwon Park Road access will be entry only into the carpark, and King Street will be exit only from the carpark
- Adjustments and relocation of parking spaces along the road corridor
- Road re-surfacing at signalised intersections and along road corridor where required
- Providing dynamic community spaces on both sides of Princes Highway
- Providing landscaped buildouts on Sydney Park Road and Princes Highway
- Relocating the bus stops on Princes Highway near the Short Street intersection, and on Sydney Park Road near the Mitchell Road intersection
- Relocating utilities and adjustments to streetlights where required
- Removing the Princes Highway and Sydney Park Road corridors from the approved B-double freight access network
- Adjusting stormwater to accommodate designed works
- Relocating existing VMS and CCTV camera
- Relocating road signs and line marking works
- Temporary construction facilities, including site compounds and an ancillary facility at Burrows Road and Venice Street, Mascot.

Construction is expected to commence in early 2022 and would take around 20 months to complete.

1.2 Purpose of this report

This technical paper is one of several technical papers that form part of the REF. The purpose of this technical paper is to provide a Stage 1 contamination assessment to assess the potential contamination impacts to construction and operation of the proposal associated with historical and current contaminating activities and/or operations undertaken on and/or adjacent to the study area. This report presents factual information derived through desktop review of available information relevant to potential contamination issues, and the observations from a site walkover inspection.

Figure 1-1 Overview of the proposal

2. Methodology

This section provides an overview of the study area and methodology for this Stage 1 contamination assessment.

2.1 Study area

To account for potential soil, groundwater and vapour contamination that may be present as a result of historical and/or current activities carried out on and/or adjacent to the site, the study area for this assessment is defined as the construction footprint (referred to herein after as the site), and surrounding land within approximately one kilometre of the site.

2.2 Study methodology

The scope of works undertaken for the Stage 1 contamination assessment was as follows:

- A review of available information relating to the physical environment within and around the site, including topography, geology, hydrogeology, soils and surface waters
- A review of historical aerial photography and maps
- A review of publicly available information including (but not limited to) NSW Environment Protection Authority (NSW EPA) databases and the Department of Primary Industries, Office of Water licensed groundwater bore database
- A review of recent and historic reports relevant to contamination and/or intrusive ground investigations undertaken within and around the site
- Site walkover inspection
- Identification and description of Areas of Environmental Interest (AEI's)
- Conclusions and recommendations.

2.3 Desktop assessment

The desktop assessment involved a review of available information relevant to the site and surrounding areas as detailed in the Lotsearch report LS011880 EP, dated 7 April 2020, and other publicly available information sources to understand the existing environment and the potential for contamination sources to be present within and/or adjacent to the site. The review of information included:

- Review of existing land uses along and in vicinity to the site and information on topography, drainage, geology, soils, hydrogeology and receiving environments
- Review of historical aerial photographs and maps as contained within the Lotsearch (April 2020) report
- Review of publicly available information as contained within the Lotsearch (April 2020) report
- Publicly available information available via general internet searches for the key words (contamination, remediation and site investigation) for suburbs and major projects within and adjoining the site
- Review of information provided by the project team, including relevant design plans.

2.4 Site inspection

A site walkover inspection was conducted on 1 May 2020 for the proposal area, and 11 May 2021 for the construction compound sites, by an experienced contamination specialist. The site walkover was undertaken from publicly accessible areas only.

2.5 High-level prioritisation exercise

A high-level prioritisation exercise was carried out to assist in assessing the potential impact from construction and operation to expose contamination to human and/or ecological receptors. The exercise considered source-pathway-receptor relationships consistent with a conceptual site model as defined by the *National Environment Protection (Assessment of Site Contamination) Measure 1999*, as revised in 2013 (NEPM, 2013). The prioritisation exercise considered the following:

Contamination severity and extent

- Known or potential sources of contamination and likely potential contaminants of concern
- The type of potentially affected media (soil, sediment, groundwater, surface water, indoor and ambient air)
- Approximate spatial distribution of potential contamination, and proximity to the site (e.g. within the study area).
- The nature of construction and operational activities of the proposal (e.g. surface disturbance, cut-and-fill areas) and whether such activities would expose known or potential areas of contamination.

Pathways and receptors

- Assessment of potential pathways from a contamination source to a receptor without mitigation measures. Pathways were considered to include dust generation, vapour/gas emissions, excavation and disposal or reuse of soils, extraction and disposal or reuse of groundwater from dewatering or drainage, migration of groundwater via preferential pathways and surface water erosion. It was assumed that where construction or operational activities would expose known or potential areas of contamination, the exposure pathways to construction workers could be complete. Where construction or operational activities are located within and/or adjacent to sensitive environmental receptors, pathways could exist as a result of uncontrolled site discharges during construction
- Potential human and ecological receptors (including location, and potential for primary or secondary contact with contamination). Potential receptors were considered to comprise project construction workers and visitors, operational site users, the general public and nearby residents and commercial workers in the surrounding land use, intrusive maintenance workers, receiving water bodies and ecological receptors. Exposure pathways to these receptors were considered to include direct dermal contact (der), ingestion (ing) or inhalation (inh) by human receptors and uptake by aquatic flora and intake by aquatic fauna.

Based on this prioritisation exercise, AEI's were categorised into five categories of contamination potential (very low, low, moderate, high and very high) representing potential impacts during construction and operation without mitigation measures. The matrix used for categorising potential impacts from construction and operation is provided in Table 2-1.

The categories of potential contamination impact to construction or operational activities represent a qualitative assessment. Although not definitive, examples of the contamination status represented by the categories is provided below:

- *Very low to low impact* could represent smaller volumes of contaminated materials, likely to be limited to surface soils, with pathways readily managed with typical soil and water controls and personnel protective equipment (PPE), and readily remediated by standard construction methods and management measures
- *Moderate impact* could represent larger volumes of contaminated materials, with pathways readily managed with typical soil and water controls and personnel protective equipment (PPE) and readily remediated by standard construction methods or smaller volumes of more complex contamination which may require specialised remediation methods and specialised management measures for pathways and/or administrative controls during operation
- *High to very high impact* could represent more significant exposure risks, contaminated groundwater and gas/vapours, increased quantum of contaminated materials and wider contamination extent requiring remediation and specialised remediation methods. Pathways may require specialised management measures for example, positive pressure tents, odour control and/or engineering controls during operation.

Table 2-1 Contamination impact potential matrix

		Contamination severity and extent				
		SE1 Low potential for contamination to be present in the media of concern at concentrations above the relevant assessment criteria and limited in extent	**SE2** Contamination possibly present in the media of concern at concentrations above the relevant assessment criteria and limited in extent	**SE3** Contamination possibly present in the media of concern at concentrations above the relevant assessment criteria and potentially widespread	**SE4** Known contamination present in the media of concern at concentrations above the relevant assessment criteria and limited in extent	**SE5** Known contamination present in the media of concern at concentrations above the relevant assessment criteria and widespread
Pathways and receptors	**PR1** Media of concern is unlikely to coincide with or otherwise impact on the proposal *AND/OR* No or unlikely exposure pathway for human or ecological receptor's during construction and/or operation	Very low	Low	Low	Moderate	Moderate
	PR2 Media of concern may intersect the proposal *AND* Exposure pathway for human or ecological receptors could be present and complete during construction and/or operation	Low	Moderate	Moderate	High	High
	PR3 Media of concern would intersect the proposal *AND* Exposure pathway for human or ecological receptors could be present and complete during construction and/or operation	Moderate	Moderate	High	High	Very high

3. Legislative and policy context

This section outlines the state and local strategies relevant to contamination assessment of the site.

3.1 Relevant contamination guidelines

In preparing this technical paper, the following guidelines were considered (where relevant):

- *Managing Land Contamination: Planning Guidelines SEPP 55 – Remediation of Land* (Department of Urban Affairs and Planning and Environment Protection Authority (EPA), 1998)
- Guidelines for Consultants Reporting on Contaminated Sites (Office of Environment and Heritage, 2011)
- National Environment Protection (Assessment of Site Contamination) Measure 1999 (as revised 2013)
- PFAS National Environmental Management Plan Revision 2.0 (HEPA, January 2020)

Should further investigations, remediation work and validation be carried out, these activities would be carried out in accordance with the following guidelines or other appropriate/endorsed guidelines available at that time:

- Guidelines made or approved under section 105 of the *Contaminated Land Management Act 1997*, including
  - *Contaminated Sites: Sampling Design Guidelines* (EPA, 1995)
  - *Contaminated Sites: Guidelines for the NSW Site Auditor Scheme (3rd Edition)* (EPA, 2017)
  - *Contaminated Sites: Guidelines for the Assessment and Management of Groundwater Contamination* (DEC, 2007)
  - *Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997* (EPA, 2015).
- Australian Standard (AS 4482.1-2005) Guide to the sampling and investigation of potentially contaminated soil. Part 1: Non-volatile and semi-volatile compounds
- Australian Standard (AS 4482.2-1999) Guide to the sampling and investigation of potentially contaminated soils – Volatile substances
- *Managing asbestos in or on soil* (WorkCover NSW, 2014). [Online] Available at: http://www.safework.nsw.gov.au/__data/assets/pdf_file/0005/329171/Managing-asbestos-in-soil-guide.pdf
- Technical Note: Light Non-Aqueous Phase Liquid Assessment and Remediation (EPA, 2015)
- Information for the assessment of former gasworks sites (DEC, 2005)
- Vapour Intrusion: Technical Practice Note (DECW, 2010)
- Guidelines for the Assessment and Management of Sites Impacted by Hazardous Ground Gases (EPA, 2012)
- Best Practice Note: Landfarming (EPA, 2014)
- *Acid Sulfate Soil Assessment Guidelines (*Acid Sulfate Soil Management Advisory Committee (ASSMAC), 1998)
- Guidelines for the Management of Acid Sulfate Materials (RTA, 2005)
- Waste Classification Guidelines (EPA, 2014)
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (Management Council of Australia and New Zealand (ANZECC & ARMCANZ), 2000)
- Guidelines for Implementing the Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation 2008 (DECCW, 2009)
- Contaminated Land Management Act 1997
- Protection of the Environment Operations Act 1997.

4. Existing environment

This section includes a description of the existing environment, zoning, and land use characteristics and features across the site for the purpose of informing conditions relevant to contamination assessment.

4.1 Site identification

The site currently comprises roadways and adjoining areas surrounding Sydney Park, St Peters NSW. The particulars of the study area are identified in Table 4-1.

Table 4-1 Site details

Particulars	Description
Address	Sydney Park Road, Mitchell Road, King Street, Lord Street, Concord Street, Goodsell Street, May Street, Princes Highway, Barwon Park Road, Burrows Road in St Peters and Venice Street in Mascot.
Legal description	NA
Local government area	City of Sydney
Site dimensions	Area: 50,101 square metres Perimeter: 4,067 metres

4.2 Zoning and land use

At the time of preparing this Stage 1 contamination assessment, the site was adjacent to a combination of land uses including:

- North: High density residential premises, substation (St Peters zone substation) and railway line (T2 inner west)
- East: Sydney Park and commercial/industrial premises
- South: Sydney Park and commercial/residential premises
- West: Commercial/residential premises and railway line (T2 inner west).

A review of the Lotsearch (April 2020) report indicated that a number of environmental planning instruments (EPI) apply to the site including:

- Sydney Local Environment Plan 2012
- Marrickville Local Environment Plan 2011.

Based on the following EPI, the following use zoning exist within the site:

- SP2 – Infrastructure
- R1 – General Residential
- B5 – Business Development
- B4 – Mixed Use
- B2 – Local Centre.

4.3 Geology

Reference to the Sydney 1:100,000 surface geology mapping sheet indicates the western portion of the site is underlain by Ashfield Shale of the Wianamatta Group and the eastern portion of the site is underlain by Quaternary alluvium.

Descriptions of the surface geological units are summarised in Table 4-2.

Table 4-2 Summary of surface geology across the site area

Unit	Descriptions
Quaternary Alluvium	The surface geology comprises Quaternary alluvium consisting of medium to fine-grained sand with podsols. Alluvial and marine sediments. Undifferentiated, Holocene- and Pleistocene-age alluvial, estuarine and marine sediments have been deposited in gullies, valleys, and former drainage channels. These sediments comprise interbedded sands and clays with discontinuous "inter-fingered" lenses of the same material. Pleistocene-age, marine sediments comprise typically clayey sediments with intermittent sand lenses.
Ashfield Shale	Black to dark grey shale and laminate. Triassic claystone, mudstone, siltstone, laminites, and fine-grained lithic sandstone of four variably thick sub-units. The Middle-Triassic Ashfield Shale comprises black to dark grey shale and laminate of four variably thick sub-units. The thickness of the unit ranges between less than one metre and 50 metres. At some locations, the shale may become carbonaceous, with variable silt and clay particles present. The unit is laminated, although it retains bedding planes at some locations.

4.4 Soils

A review of the Sydney 1:100,000 soil landscape mapping sheet indicates that the eastern portion of the site is underlain by the Tuggerah Soil Landscape and the western portion of the site is underlain by the Blacktown Soil Landscape and disturbed terrain.

Descriptions of the soil landscape units encountered across the study area are summarised in Table 4-3.

Table 4-3 Summary of soil landscapes across site area

Unit	Description
Tuggerah	Landscape: Gently undulating to rolling coastal dune fields. Local relief to 20 metres, slope gradients generally 1-10 per cent, but occasionally up to 35 per cent. North— south oriented dunes with convex narrow crests, moderately inclined slopes and broad gently inclined concave swales. Extensively cleared open-forest and eucalypt/apple woodland. Soils: Deep (>200 centimetres) Podzols on dunes and Podzols/Humus Podzol intergrades on swales. Limitations: Extreme wind erosion hazard, non-cohesive, highly permeable soil, very low soil fertility, localised flooding and permanently high water tables.
Blacktown	Landscape: Typically located on the flat to gently undulating terrain between creek channels and are described as shallow to moderately deep (<100 centimetres) clays and silty clays derived from Bingelly Shale. Soils: Typically comprises hard setting mottled texture contrast soils, red and brown podzolic soils on crests grading to yellow podzolic soils on lower slopes and in drainage lines. Limitations: High erodibility, shrink-swell potential, salinity, low fertility and localised areas of permanently high water tables or seasonal waterlogging.
Disturbed Terrain	Landscape: Found on a variety of landscapes ranging from level plain to hummocky terrain that has been extensively disturbed by human activity. Slopes are typically less than five per cent and local reliefs of less than 10 metres. Soils: The original soil has been completely disturbed, removed or buried. Landfill may include soil, rock, building and waste material with a cap of sandy loam. Soil may by strongly acidic to strongly alkaline. Limitations: Low fertility, low wet strength, low availability water capability, high permeability, localised toxicity/acidity and/or alkalinity, potential mass movement hazard.

4.5 Acid sulfate soils

Acid sulfate soils (ASS) are the common name given to naturally occurring sediments and soils containing iron sulfides (principally iron sulfide or iron disulfide or their precursors). The exposure of the sulfide in these soils to oxygen by drainage or excavation leads to the generation of sulfuric acid. Areas of ASS can typically be found in low lying and flat locations which are often swampy or prone to flooding.

A review of the ASS risk maps from the Sydney Local Environmental Plan (2012) indicates that the eastern portion of Sydney Park Road is Class 3 ASS. The remainder of the site is Class 5 ASS. Class 1 and Class 2 ASS are located within 500 metres of the proposal.

Works which could represent a risk under the various ASS classes within the site are detailed below:

- Class 3: Works beyond one metre below natural ground surface, works by which the water table is likely to be lowered beyond one metre below natural ground surface
- Class 5: Works within 500 metres of adjacent Class 1, 2, 3, or 4 land which are likely to lower the water table below one metre Australian Height Datum (AHD) on adjacent Class 1, 2, 3 or 4 land.

Potential ASS risks could be encountered during construction as detailed below:

- Eastern portion of Sydney Park Road: Any construction activities which extend beyond one metre below natural ground surface or that could lower the water table beyond one metre below natural ground surface
- Remaining areas of site: Works which could lower the water table below one metre AHD on adjacent Class 3 land (areas to the north and east of the site).

4.6 Topography and drainage

Topography data presented by Lotsearch (April 2020) indicated that the site generally slopes from north to south towards Alexandra Canal. Steeper / higher topography is present to the north and west of the site with flatter / lower topography to the east and south. The elevation of the site varies between 20 metres AHD within the northern portion of the site to 10 metres AHD within the eastern portion of the site. Areas within Sydney Park (to the south of the site) have variable localised topography which is likely to be indicative of former landfilling and reinstatement works.

The majority of the site is formed by sealed roadways. Rainfall falling onto the site is likely to be directed by formal kerb and guttering into the local stormwater system with discharge to Alexandra Canal.

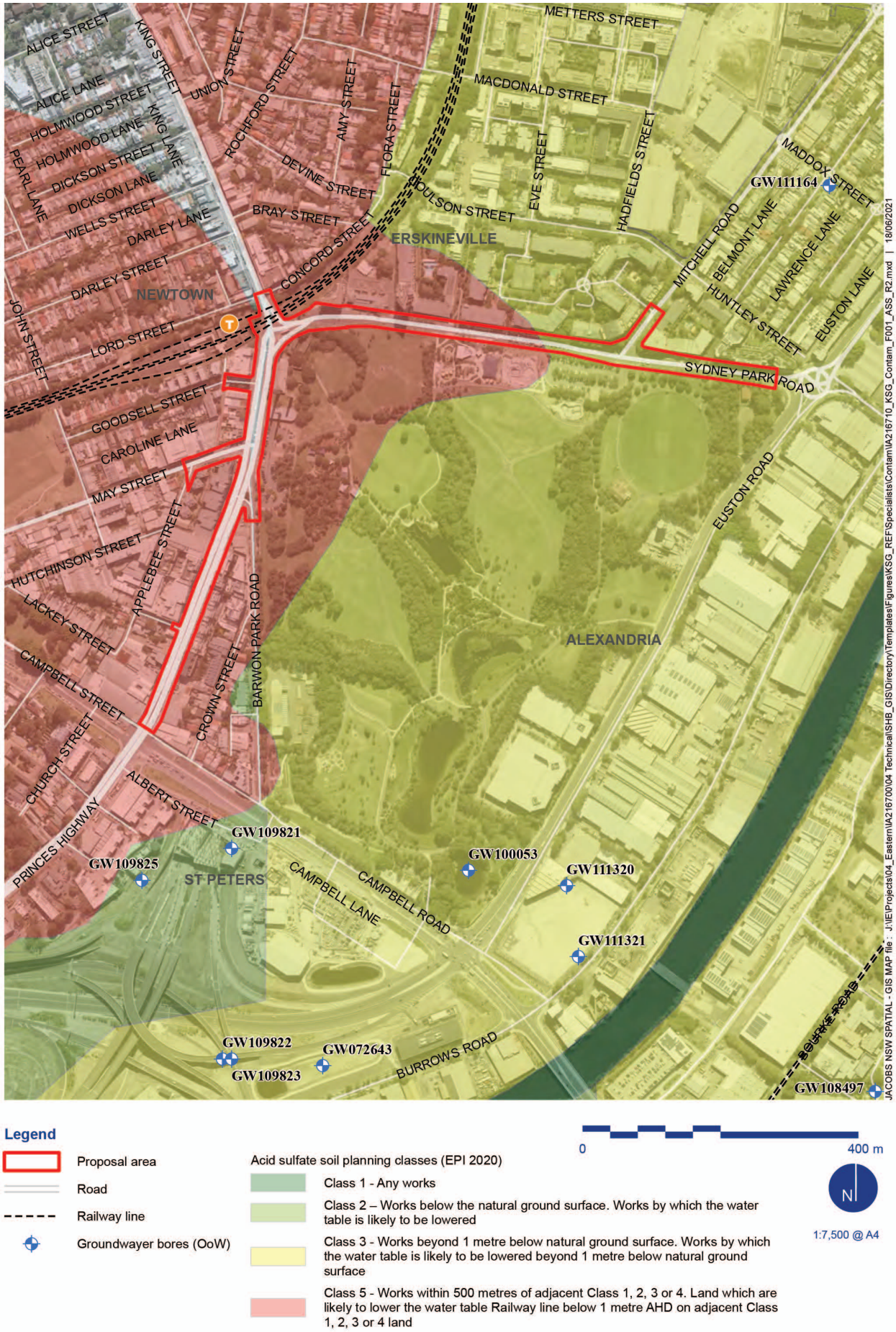


Figure 4-1 Acid sulfate soil risk

4.7 Groundwater bore database

The Lotsearch (April 2020) report search of the NSW Department of Primary Industries (DPI) – Office of Water registered groundwater bore database and the Bureau of Meteorology National Groundwater Information System indicated that there were 41 registered groundwater bores within 500 metres of the site, as shown in Figure 4-1. No registered groundwater bores were identified to be located within the site.

A summary of key information for the groundwater bores within 500 metres of the site is presented in Table 4-4, while a full list of all registered bores identified within a two kilometre buffer of the site is provided in the Lotsearch (April 2020) report.

Table 4-4 Registered groundwater monitoring bores within 500 metres (m) of the site

Well ID	Location relative to site	Date of installation	Registered use	Total depth (m)	Standing water level (m)
GW114985	70m (north east)	21/06/2011	Monitoring Bore	6.00	
GW114984	81m (north east)	09/09/2011	Monitoring Bore	6.00	2.70
GW114986	82m (north east)	21/06/2011	Monitoring Bore	6.00	
GW114561	174m (east)	06/12/2013	Monitoring Bore	4.00	2.92
GW114562	184m (east)	06/12/2013	Monitoring Bore	4.00	2.51
GW114563	185m (east)	06/12/2013	Monitoring Bore	4.00	
GW109821	196m (south)	03/04/1997	Monitoring Bore	35.00	14.5
GW109825	196m (south west)	10/02/2005	Monitoring Bore	22.00	14.9
GW113816	211m (east)	22/01/2010	Monitoring Bore	5.75	
GW111164	248m (north east)	22/10/2010	Domestic	8.00	
GW113819	306m (east)	22/01/2010	Monitoring Bore	3.25	
GW113817	335m (east)	22/01/2010	Monitoring Bore	3.70	
GW113820	340m (east)	22/01/2010	Monitoring Bore	5.00	
GW113810	342m (east)	22/01/2010	Monitoring Bore	4.60	
GW113806	343m (east)	22/01/2010	Monitoring Bore	4.10	
GW113818	353m (east)	22/01/2010	Monitoring Bore	4.40	
GW113814	360m (east)	22/01/2010	Monitoring Bore	3.80	
GW113805	361m (east)	22/01/2010	Monitoring Bore	4.60	
GW113812	371m (east)	22/01/2010	Monitoring Bore	6.10	
GW113811	380m (east)	22/01/2010	Monitoring Bore	5.40	
GW113822	381m (east)	22/01/2010	Monitoring Bore	1.86	
GW113821	385m (east)	22/01/2010	Monitoring Bore	4.60	
GW113813	388m (east)	22/01/2010	Monitoring Bore	6.10	
GW113815	417m (east)	22/01/2010	Monitoring Bore	6.10	
GW113801	432m (east)	22/01/2010	Monitoring Bore	4.50	
GW114925	443m (west)	24/03/2012	Monitoring Bore	6.10	2.80
GW113823	443m (east)	22/01/2010	Monitoring Bore	3.20	
GW113800	454m (east)	22/01/2010	Monitoring Bore	4.60	
GW113809	457m (east)	22/01/2010	Monitoring Bore	4.50	
GW113804	459m (east)	22/01/2010	Monitoring Bore	6.00	

Well ID	Location relative to site	Date of installation	Registered use	Total depth (m)	Standing water level (m)
GW113824	460m (east)	22/01/2010	Monitoring Bore	3.05	
GW113808	461m (east)	22/01/2010	Monitoring Bore	4.20	
GW114924	466m (west)	24/03/2012	Monitoring Bore	9.00	7.60
GW113799	466m (east)	22/01/2010	Monitoring Bore	4.10	
GW109822	469m (south)	04/04/1997	Monitoring Bore	10.45	3.00
GW109823	472m (south)	23/10/2000	Monitoring Bore	29.00	12.5
GW114919	474m (north)	06/07/2015	Monitoring Bore	3.00	
GW113802	480m (north east)	22/01/2010	Monitoring Bore	6.10	
GW113803	482m (north east)	22/01/2010	Monitoring Bore	5.80	
GW100053	496m (south)	20/04/1994	Recreation (groundwater)	7.00	1.00
GW113807	497m (east)	22/01/2010	Monitoring Bore	4.20	

With the exception of bores GW111164 (domestic) and GW100053 (recreation), the bores identified within the 500 metre buffer are registered as monitoring bores and as such are unlikely to represent beneficial groundwater use (e.g. potable water supply or irrigation supply). The actual and specific use of bores GW111164 and GW100053 is not understood. Based on the local topography and the location of the nearest surface water body (i.e. Alexandra Canal located to the south and south west of the site), bore GW111164 is likely to be located hydraulically up gradient of the site. Bore GW100053 is likely to be located hydraulically down gradient of the site and could be impacted by contamination (if present) mobilised during construction of the proposal.

4.8 Botany groundwater management zones

The Lotsearch (April 2020) report indicated that the majority of the site is located within the Botany groundwater management zone 2.

In Zone 2, all domestic groundwater use is banned and all industrial users must test their bore water annually and provide results to the NSW Office of Water.

4.9 Sensitive receptors

A number of sensitive receiving environments have been identified on and/or adjacent to the proposal through the desktop assessment, including:

- Recreational users of Sydney Park – located adjacent to eastern and southern boundaries of the site
- Marine ecosystems of Alexandra Canal – located 310 metres south east of the site.

These sensitive receiving environments have the potential to be impacted by contamination as a result of construction and/or operation of the proposal.

5. Site History

5.1 Historical Aerial Imagery

Aerial imagery was reviewed for the years 1930, 1943, 1951, 1955, 1961, 1965, 1970, 1982, 1991, 2000, 2007, 2014 and 2019 to assess land use and changes in general conditions within and adjacent to the site. The findings of the aerial imagery review are summarised in Table 5-1. Historical aerial imagery is presented in the Lotsearch (April 2020) report provided in **Error! Reference source not found.**.

Table 5-1 Summary of historical aerial imagery

Years	Site	Surrounding Area
1930	The majority of the site appears to be formalised roadways (Mitchell Road, western portion of Sydney Park Road, King Street, Lord Street, Concord Street, Goodsell Street, May Street, Princes Highway and Barwon Park Road). The eastern portion of Sydney Park Road (east of Mitchell Road) is occupied by quarrying activities and buildings (possible warehouses, commercial / industrial). A formalised stormwater drain extends from the eastern portion of Sydney Park Road and discharges to the Alexandra Canal. The north western portion of the site (intersection of Sydney Park Road and King Street) is partially occupied by quarrying activities).	North: Quarry, commercial/industrial premises, a number of large round structures (possible above ground storage tanks). The inner west railway line, commercial and residential premises are present to the north west of the site. East: Quarrying (five to seven pits) and brick making activities (buildings and kilns). Two gasometers are present within the south eastern portion of Sydney Park. Commercial and residential premises are present between Princes Highway and Barwon Park Road. South: Quarrying (five to seven pits) and brick making activities (buildings and kilns). Two gasometers are present within the south eastern portion of Sydney Park. Quarry pit, residential and commercial premises also evident to the south of Campbell Road. West: The inner west railway line, commercial and residential premises.
1943	Site generally unchanged from the 1930 imagery.	Areas surrounding the site are generally unchanged from the 1930 imagery with the exception of the following: Warehouse type building constructed to the north east of the site Large warehouse type building constructed to the north of the gasometers present on Sydney Park.
1951	Site generally unchanged from the 1943 imagery.	Areas surrounding the site are generally unchanged from the 1943 imagery with the exception of the following: Portions of some of the quarry pits (especially northern pits) located on Sydney Park appear subject to filling Possible construction yard present with southern portion of Sydney Park Warehouse type building constructed to the south east of the site (south of Campbell Street).
1955	Site generally unchanged from the 1951 imagery.	Areas surrounding the site are generally unchanged from the 1951 imagery with the exception of the following: Quarry pit to the north of the site has been filled Quarry pits (northern pits) located on Sydney Park continue to be filled Two of the quarry pits (central pits) located on Sydney Park contain water Possible construction yard present with southern portion of Sydney Park is no longer present Warehouse type building extended to the south east of the site (south of Campbell Street).

Years	Site	Surrounding Area
1961	Site generally unchanged from the 1955 imagery with the exception of the following: Possible service station constructed at the intersection of Barwon Park Road and Princes Highway / King Street.	Areas surrounding the site are generally unchanged from the 1955 imagery with the exception of the following: Structures on the property to the north of Sydney Park Road formerly containing large round structures (possible above ground storage tanks) have been demolished with the property undergoing redevelopment The majority of the quarry pits on Sydney Park have been filled or are in the process of being filled Additional buildings have been constructed to the north of the gasometers present on Sydney Park A large warehouse type building has been constructed on Sydney Park, to the west of the gasometers Possible construction yard present with southern portion of Sydney Park Warehouse type building extended to the south east of the site (south of Campbell Street) Quarry pits to the south of the site (south of Campbell Street) are in the process of being filled.
1965	Site generally unchanged from the 1961 imagery.	Areas surrounding the site are generally unchanged from the 1961 imagery with the exception of the following: Remaining quarry pits on Sydney Park continue to be filled Possible substation constructed to the north of the site Quarry pits to the south of the site (south of Campbell Street) are in the process of being filled.
1970	Site generally unchanged from the 1965 imagery.	Areas surrounding the site are generally unchanged from the 1965 imagery with the exception of the following: Remaining quarry pits on Sydney Park continue to be filled Quarry pits to the south of the site (south of Campbell Street) are in the process of being filled.
1982	Site generally unchanged from the 1970 imagery.	Areas surrounding the site are generally unchanged from the 1970 imagery with the exception of the following: Remaining quarry pits on Sydney Park continue to be filled Shipping container storage facilities are present within the north eastern and south western corners of Sydney Park Large industrial premises (use unknown) is present adjacent to Sydney Park Road on Sydney Park Quarry pits to the south of the site (south of Campbell Street) are in the process of being filled.

Years	Site	Surrounding Area
1991	Site generally unchanged from the 1982 imagery with the exception of the following: Eastern portion of Sydney Park Road has been extended to Euston Road.	Areas surrounding the site are generally unchanged from the 1982 imagery with the exception of the following: The majority of the quarry pits on Sydney Park have been filled with some minor filling continuing within the central portion of the site The majority of the buildings associated with brick making have been demolished Gasometers previously present on Sydney Park have been demolished Possible construction yard present with southern portion of Sydney Park is no longer present Additional warehouse type buildings have been constructed on Sydney Park adjacent to Barwon Park Road (possible council depot) Quarry pits to the south of the site (south of Campbell Street) are in the process of being filled.
2000	Site generally unchanged from the 1991 imagery.	Areas surrounding the site are generally unchanged from the 1991 imagery with the exception of the following: Some of the commercial/industrial premises located to the north of Sydney Park Road have been demolished and high density residential have been constructed All quarry pits within Sydney Park have been filled and general layout of the Sydney Park is consistent with present day Some large warehouse and commercial type and buildings have been constructed in the southern portion of Sydney Park Quarry pits to the south of the site (south of Campbell Street) are in the process of being filled.
2007	Site generally unchanged from the 2000 imagery.	Areas surrounding the site are generally unchanged from the 2000 imagery with the exception of the following: Some of the commercial/industrial premises located to the north of Sydney Park Road have been demolished and high density residential have been constructed Additional facilities constructed within Sydney Park Quarry pits to the south of the site (south of Campbell Street) have been filled.
2014	Site generally unchanged from the 2007 imagery.	Areas surrounding the site are generally unchanged from the 2007 imagery with the exception of the following: Additional facilities constructed within Sydney Park.
2019	Site generally unchanged from the 2014 imagery.	Areas surrounding the site are generally unchanged from the 2014 imagery with the exception of the following: St Peters interchange is being constructed in areas to the south of the site (south of Campbell Street).

5.2 Historical maps

Historical maps were reviewed for the years 1917, 1936, 1938-1950, 1956, 1975 and 2015 to assess land use and changes in general conditions within and adjacent to the site. The findings of the historical map review are summarised in Table 5-2. Historical maps are presented in the Lotsearch (April 2020) report.

Table 5-2 Summary of historical maps

Years	Site	Surrounding Area
1917	Little detail on the site.	Brickworks are present to the north and south of the site and on the Sydney Park. Sheas Creek Canal (Alexandra Canal) is surrounded by vegetated open space and swamps.
1936	Site appears to comprise road ways.	Areas surrounding the site are generally unchanged from the 1917 map. Clay pits are noted in areas to the north and south of the site and on Sydney Park.
1938-1950	The site comprises road ways (Mitchell Road, King Street, Lord Street, Concord Street, Goodsell Street, May Street, Princes Highway, Barwon Park Road).	Areas surrounding the site are occupied by a number of activities as detailed below. North: Pottery and kilns (Bakewell Bros), clay pit, tractor distributors (Waugh and Josephson), P.M.C training garage and department school, kilns (NSW Brick Co). East: Clay pits and kilns (Austral Brick Co, Carrington Brickworks, Brickworks Ltd, Central Brick and Tile Co), industrial chemist (C.P. Curlewis), Modern Motors, bolt and rivet works (McPhersons), The Australian Gas Light Company, stores depot (Department of Works and Housing). South: Clay pits and kilns (Austral Brick Co, Carrington Brickworks and Brickworks Ltd), industrial chemist (C.P. Curlewis), Modern Motors, bolt and rivet works (McPhersons), The Australian Gas Light Company, stores depot (Department of Works and Housing). West: Engineering (A.C.Willard). Alexandra Canal appears to be formalised.
1956	The site comprises road ways (Mitchell Road, King Street, Lord Street, Concord Street, Goodsell Street, May Street, Princes Highway, Barwon Park Road).	The map details business names only.
1975	Site appears to comprise road ways.	Quarry pits are noted on Sydney Park and areas to the south of Campbell Street.
2015	Site appears to comprise road ways.	A rubbish tip is noted in areas to the south of Campbell Street.

Review of the historic aerial imagery and topographic maps has identified a number of potential sources of contamination, including:

- Fill material used during the construction of road ways
- The degradation and inappropriate demolition of on-site structures containing hazardous building materials
- Substation operations including transformer oils and the use / storage of Aqueous Film Forming Foam (AFFF)
- Landfilling beneath areas of the site (eastern portion of Sydney Park Road and north western portion of site – intersection of Sydney Park Road and King Street)
- Landfilling in areas to the north and south of the site and within Sydney Park
- Fuel sources and wastes generated during the operation of kilns in areas to the north and south of the site and within Sydney Park
- Possible service station operation at the intersection of Barwon Park Road and Princes Highway / King Street
- Former commercial / industrial operations adjacent to the site (operations undertaken on Sydney Park adjacent to Sydney Park Road).

These above historic potential contamination sources have the potential to impact on construction and operation of the site. The potential sources of contamination have been inspected (where currently present) as part of a site walkover (Section 8).

6. Information review

6.1 NSW EPA contaminated sites register

A search of the NSW EPA Contaminated Sites Record of Notices (under section 58 of the *Contaminated Land Management Act 1997* (CLM Act)) and the list of contaminated sites notified to the NSW EPA (under section 60 of the CLM Act) as detailed in the Lotsearch (April 2020) report indicated that there were 11 registered with the NSW EPA within 500 metres of the site that was either regulated, formerly regulated or had been notified. The site is summarised in Table 6-1.

A full list of all registered contaminated sites within a one kilometre buffer of the site is provided in the Lotsearch (April 2020) report.

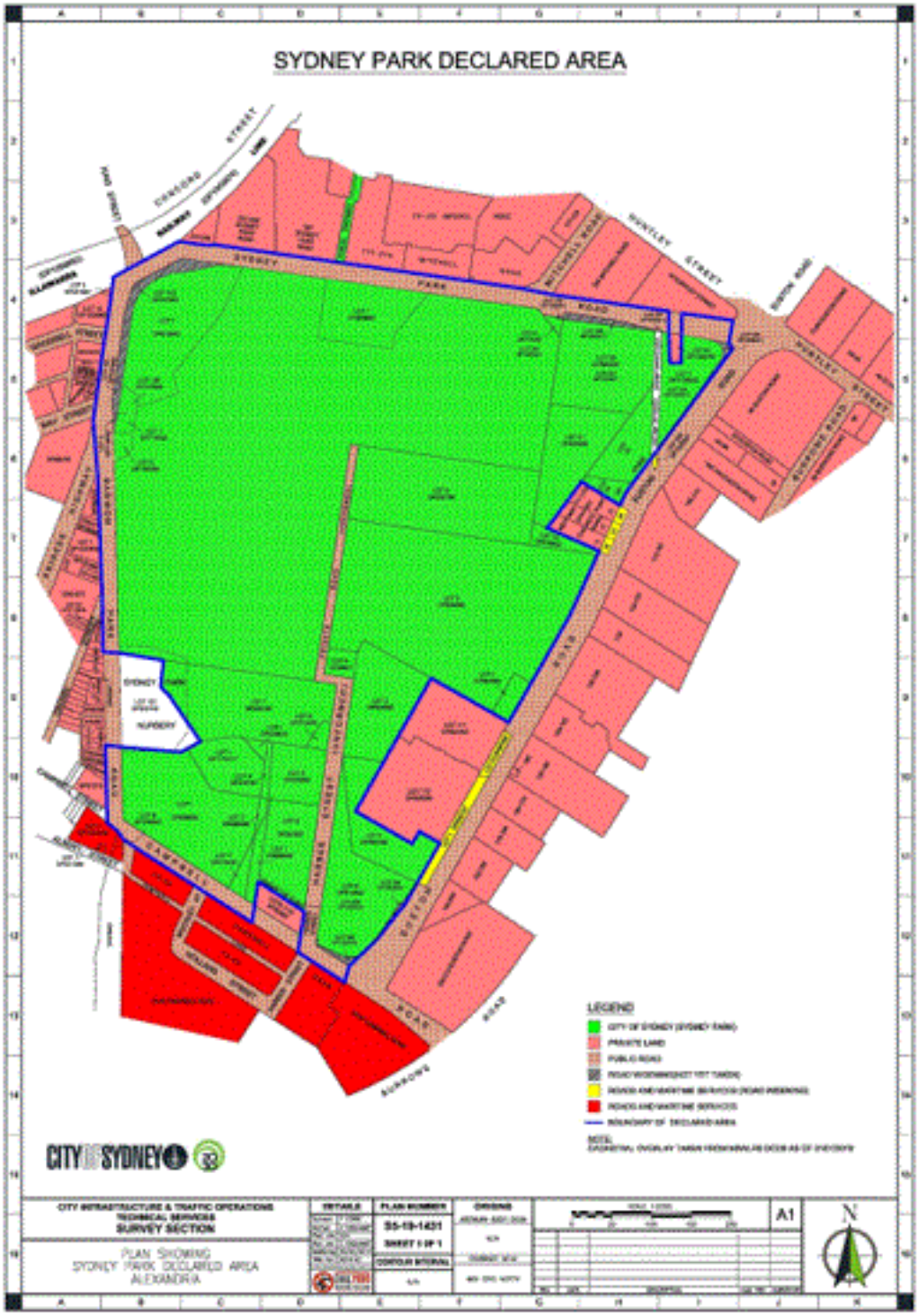
Table 6-1 NSW EPA regulated / formerly regulated / notified sites within 500 metres of the site

Site	Site address	Regulated / formerly regulated / notified	Site activity	Location relative to site	Contamination status
Sydney Park	Sydney Park Road	Regulated	Landfill	Onsite	Contamination currently regulated under CLM Act
BP Express Service Station	2 Princes Highway	Notified	Service Station	Onsite	Regulation under CLM Act not required
Area B – Public Domain / The Roadway	1A Coulson Street	Notified	Other Petroleum	95m (north east)	Regulation under CLM Act not required
Former Tidyburn Facility	53 Barwon Park Road	Formerly regulated	Chemical Industry	121m (south)	Contamination formerly regulated under the CLM Act
Camdenville Park	May Street	Notified	Other Industry	166m (west)	Regulation under CLM Act not required
RailCorp land	Coulson Street	Notified	Other Industry	207m (north)	Regulation under CLM Act not required
Alexandra Canal Sediments	Off Huntley Street	Regulated	Other Industry	310m (south east)	Contamination currently regulated under CLM Act
Lot 4/1A Coulson Street	Coulson Street	Notified	Other Industry	328m (north east)	Regulation under CLM Act not required
Redevelopment Site (Former Industrial Park) Erskineville	36/1A Coulson Street	Notified	Other Industry	342m (north)	Regulation under CLM Act not required
Former Industrial Manufacturing Facility (Taubman's Paints)	75 Mary Street	Notified	Other industry	489m (south west)	Regulation under CLM Act not required
Perry Park	1B Maddox Street	Notified	Landfill	493m (east)	Regulation under CLM Act not required

Based on the review of the NSW EPA contaminated sites register, two sites within 500 metres of the site are currently regulated by the NSW EPA (i.e. contamination is considered significant enough to warrant regulation). These sites and respective contamination are detailed below:

- Sydney Park – Landfill gas (methane and carbon dioxide)
- Alexandra Canal – Sediments (chlorinated hydrocarbons and metals).

The declared area for Sydney Park (as of 26 June 2021) is detailed in the figure below. The declared area extends across most areas of Sydney Park and also includes Sydney Park Road, Barwon Park Road and portions of King Street and Campbell Street.



Information from the City of Sydney website (https://www.cityofsydney.nsw.gov.au/public-health-safety-programs/sydney-park-voluntary-management-proposal) indicated that Sydney Park was formerly the site of major landfill and brickmaking activities and that past testing has shown elevated concentrations of methane and carbon dioxide inside the park and along its perimeter. The landfill gas issues at the Sydney Park are being managed in accordance with the voluntary management proposal for the site.

Landfill gas has the potential to migrate from Sydney Park or maybe present beneath the proposal area which could impact upon construction and /or operation of the proposal. Sediments within Alexandra Canal are unlikely to impact upon construction and/or operation of the proposal.

6.2 Environmental protection licences

A search of the NSW EPA Protection of the Environment Operations Act public register (under section 308 of the *Protection of the Environment Operations Act 1997* (POEO Act)) as detailed in the Lotsearch (April 2020) report indicated there were seven sites within 500 metres of the site that have current environmental protection licences (EPL). The sites are summarised in Table 6-2 .

A full list of all environmental protection licences within a one kilometre buffer of the site is provided in the Lotsearch (April 2020) report.

Table 6-2: Sites with current EPL within 500 metres of the site

Organisation	Name	Site address	Activity	Location relative to site
Lendlease Engineering Pty Ltd	Not detailed	WestConnex between M4 East at Haberfield and the New M5 at St.Peters, MARRICKVILLE, NSW 2204	Road construction	On-site
Sydney Trains	Not detailed	Not detailed	Railway systems activities	On-site
John Holland Pty Ltd	Sydney Metro City & Southwest Tunnels and Excavation Works	Locations between Chatswood railway station and Sydenham railway station, SYDNEY, NSW 2000	Concrete works, railway systems activities	On-site
CPB Contractors Pty Ltd	Alexandria Landfill	10-16 Albert Street, St Peters	Waste disposal by application to land	115m (south west)
CPB Contractors Pty Ltd	Westconnex New M5	Between Beverly Hills and St Peters, BEVERLY HILLS, NSW 2209	Road construction	160m (south west)
Dial-A-Dump Industries Pty Ltd	Not detailed	76-82 Burrows Road, Alexandria	Non-thermal treatment of general waste	298m (south east)
Dial-A-Dump Industries Pty Ltd	Not detailed	76-82 Burrows Road, Alexandria	Waste storage – other types of waste	298m (south east)

A search of the NSW EPA Protection of the Environment Operations (POEO) Act public register (under section 308 of the *POEO Act 1997*) as detailed in the Lotsearch (April 2020) report indicated there were 15 sites within 500 metres of the site that had EPLs no longer in force, that had been surrendered or were delicensed activities which were still regulated by the NSW EPA. The sites are summarised in Table 6-3.

A full list of all former EPLs or delicensed activities within a one kilometre buffer of the site is provided in the Lotsearch (April 2020) report.

Table 6-3 Sites with former EPL or delicensed activities within 500 metres of the site

Organisation	Status	Site address	Activity	Location relative to site
Metromix Pty Ltd	Delicensed activity	169 Euston Road, Alexandria	Concrete works	208m (south east)
Holcim (Australia) Pty Ltd	Delicensed activity	122-132 Euston Road, Alexandria	Concrete works	353m (south east)
Sealed Air Australia Pty Ltd	Delicensed activity	3 Burrows Road, St Peters	Hazardous, Industrial or Group A Waste Generation or Storage	493m (south)
Luhrmann Environment Management Pty Ltd	Former EPL	Waterways throughout NSW	Other Activities / Non Scheduled Activity - Application of Herbicides	On-site
Robert Orchard	Former EPL	Various waterways throughout NSW	Other Activities / Non Scheduled Activity - Application of Herbicides	On-site
Sydney Weed and Pest Management Pty Ltd	Former EPL	Waterways throughout NSW	Other Activities / Non Scheduled Activity - Application of Herbicides	On-site
McConnell Dowell Constructors (Aust) Pty Ltd	Former EPL	Various streets from Kurnell to Erskineville, including the pipeline route across Botany Bay	Water-based extractive activity, Miscellaneous licensed discharge to waters (at any time)	On-site
Anglo Metals Pty Ltd	Former EPL	373-377 Belmont Street, Alexandria	Hazardous, Industrial or Group A Waste Generation or Storage	40m (east)
Roads and Maritime Services	Former EPL	10-16 Albert Street, St Peters	Recovery of general waste	115m (south west)
Roads and Maritime Services	Former EPL	10-16 Albert Street, St Peters	Waste storage – other types of waste	115m (south west)
Tidyburn Pty Ltd	Former EPL	15 CAMPBELL STREET, ST PETERS, NSW 2044	Hazardous, Industrial or Group A Waste Generation or Storage	130m (south)
J A Bradshaw Pty Ltd	Former EPL	2 Albert Street, St Peters	Crushing, grinding or separating	215m (south)
CSR Viridian Ltd	Former EPL	8-40 Euston Road, Alexandria	Glass production (float), Ceramic waste generation	346m (east)
Good River Properties Pty Ltd	Former EPL	33 Burrows Road (also known as 53-57 Campbell Road), St Peters	Non-thermal treatment of general waste	476m (south)
Good River Properties Pty Ltd	Former EPL	33 Burrows Road (also known as 53-57 Campbell Road), St Peters	Waste storage - hazardous, restricted solid, liquid, clinical and related waste and asbestos waste	476m (south)
Good River Properties Pty Ltd	Former EPL	33 Burrows Road (also known as 53-57 Campbell Road), St Peters	Waste storage – other types of waste	476m (south)
TF Group Pty Ltd c/- Hall Chadwick Chartered Accountant	Former EPL	5A Canal Road, St Peters	Waste storage - other types of waste; Non-thermal treatment of general waste	478m (south west)

Organisation	Status	Site address	Activity	Location relative to site
The Council of the City of Sydney	Former EPL	25 Burrows Road, St Peters	Recovery of general waste	493m (south)
The Council of the City of Sydney	Former EPL	25 Burrows Road, St Peters	Waste storage – other types of waste	493m (south)

The EPLs issued (historic and current) and delicensed activities within 500 metres of the site are associated with waste management, herbicide application to waterways, quarrying, cement related operations, road construction and railway systems. EPLs generally detail requirements for the management of pollution risks associated with the licenced activities. As such, if activities are operating in accordance with their respective EPL, the risk of those activities causing contamination would be reduced. Potential contamination impacts to construction and/or operation would likely be associated with those licenced activities relating to waste management and which store/use chemicals which could cause groundwater contamination (bulk chemical storage/use and liquid waste management) adjacent to the site.

6.3 Other NSW EPA information

6.3.1 EPA sites with other contamination issues

A search of EPA sites with other contamination issues (i.e. James Hardie asbestos manufacturing and waste disposal sites, radiological investigation sites in Hunters Hill and Pasminco lead abatement strategy area) as detailed in the Lotsearch (April 2020) report indicated no records within the site, or within one kilometre of the site.

6.3.2 Former gasworks

A search of former gasworks sites as detailed in the Lotsearch (April 2020) report indicated one former gasworks within one kilometre of the site. The site is summarised in Table 6-4.

Table 6-4 Former gasworks within one kilometre of the site

Site	Site address	Location relative to site
Macdonaldtown Triangle	Erskineville	902m (north)

There is likely to be a low impact from contamination from the former Macdonaldtown Triangle gasworks on the construction and/or operation of the proposal considering the spatial separation between the respective sites.

6.3.3 EPA PFAS investigation program

A search of EPA Per- and polyfluoroalkyl substances (PFAS) investigation program as detailed in the Lotsearch (April 2020) report indicated two sites which are part of the EPA PFAS investigation program within one kilometre of the site. The sites are summarised in Table 6-5.

Table 6-5 PFAS investigation sites within one kilometre of the site

Site	Site address	Location relative to site
Botany Bay area and Georges River	Not detailed	652m (south)
Alexandria Fire and Rescue NSW	189 Wyndham Street, Alexandria	992m (east)

Potential contamination issues associated with the PFAS investigation sites include potential impacts to groundwater as a result of offsite migration of chemicals (via infiltration into underlying groundwater). The location of the PFAS investigation sites within one kilometre of the site are likely to be hydraulically cross and down gradient of the site. In consideration of the above information, the potential for PFAS to impact upon groundwater beneath the site is likely to be low.

6.4 Waste management and liquid fuel facilities

A search of waste management sites as detailed in the Lotsearch (April 2020) report indicated six records listed on the National Waste Management Site Database within one kilometre of the site. The sites are summarised in Table 6-6.

Table 6-6 Waste management sites within one kilometre of the site

Site	Site address	Facility type	Location relative to site
Alexandria Landfill	Albert Street, St Peters	Landfill and reprocessing	115m (south west)
Veolia Environmental Services (Australia) Pty Ltd	76-82 Burrows Road, Alexandria	Reprocessing and transfer station	298m (south east)
The Council of the City of Sydney – Materials recycling depot	25 Burrows Road, St Peters	Reprocessing and transfer station	493m (south)
Boral Recycling Pty Ltd	25 Burrows Road, St Peters	Reprocessing	493m (south)
Dial-a-dump	33 Burrows Road, St Peters	Reprocessing and transfer station	538m (south)
Australian Refined Alloys Lead Acid Recycling Plant	202-212 Euston Road, Alexandria	Reprocessing	586m (south)

Potential contamination issues associated with the recorded waste management facilities include potential impacts to groundwater and/or surface water as a result of offsite migration of chemicals (via infiltration into underlying groundwater or surface water discharge). Contaminants of potential concern include volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), organic contaminants, hydrocarbons, heavy metals and PFAS compounds.

A search of liquid fuel facilities sites as detailed in the Lotsearch (April 2020) report indicated four records listed on the National Liquid Fuel Facilities Database within one kilometre of the site. The sites are summarised in Table 6-7.

Table 6-7 Liquid fuel facilities within one kilometre of the site

Site	Site address	Facility type	Location relative to site
BP Express	2 Princes Highway, St Peters	Petrol station	On-site
BP Connect	14 Grove Street, St Peters	Petrol station	703m (south west)
BP	27-33 Erskineville Road, Newtown	Petrol station	802m (north)
Caltex	36 Enmore Road, Newtown	Petrol station	940m (north west)

Potential contamination issues associated with the recorded liquid fuel facilities include potential impacts to soil, groundwater and vapours as a result of leakage and/or failure of underground storage systems and associated infrastructure. Contaminants of potential concern include VOCs, SVOCs, hydrocarbons and heavy metals.

6.5 Department of Defence

A search of Defence sites subject to the PFAS investigation program, PFAS management program and/or three-year regional contamination investigation program as detailed in the Lotsearch (April 2020) report indicated no records within the site, or within one kilometre of the site.

6.6 Airservices Australia

A search of Airservices Australia sites subject to the national PFAS management program as detailed in the Lotsearch (April 2020) report indicated no records within the site, or within one kilometre of the site.

6.7 Business directory search

A search of business directory listing between the years 1950 to 1991 as detailed in the Lotsearch (April 2020) was undertaken.

Businesses with potential contaminating activities are based on those industries detailed in the Australian Standard *Guide to the sampling and investigation of potentially contaminated soil. Part 1: Non-volatile and semi-volatile compounds* (AS 4482.1-2005).

- Agricultural / horticultural activities
- Airports
- Asbestos production and disposal
- Battery manufacture and recycling
- Breweries / distilleries
- Chemicals manufacture and use
- Defence works
- Drum reconditioning
- Dry cleaning
- Electrical
- Engine works
- Foundries
- Gas works
- Iron and steel works
- Landfill sites
- Marinas
- Metal treatments
- Mining and extractive industries
- Power stations
- Printing shops
- Railway yards
- Scrap yards
- Service stations and fuel storage facilities
- Sheep and cattle dips
- Smelting and refining
- Tanning and associated trades
- Water and sewerage treatment plant
- Wood preservation.

The business directory search indicated a number of records (including motor garages) associated with potential contaminating activities within, adjacent to or within 50 metres of the site.

Table 6-8 Businesses with potential contaminating activities within 50m of the site

Activity	Business description	Premises	Site address	Years	Location relative to site
Service stations and fuel storage facilities	Motor garages and service stations	BP	2 Princes Highway, St Peters	1964 to 1993	On-site
Engine Works	Motor garages and engineers	BP, Mackenzie and Adams	2 Princes Highway, St Peters	1964 to 1993	On-site

Activity	Business description	Premises	Site address	Years	Location relative to site
Engine Works	Motor Engineers	Wolfsburg Motors	38 Princes Highway, St Peters	1991	Adjacent (south west)
Electrical	Transformer and/or transformer equipment manufactures	Martin de Launay Pty Ltd	40 Princes Highway, St Peters	1986	Adjacent (south west)
Chemicals manufacture and use	Chemical manufacturers and/or distributors	Hoechst Australia Ltd	42 Princes Highway, St Peters	1975, 1978	Adjacent (south west)
Service stations and fuel storage facilities	Fuel merchants – coal/coke/wood	A.S. Newton	120 Princes Highway, St Peters	1961, 1965	Adjacent (south west)
Printing shops	Printing supplies	Monotype Corporation of Australia Pty Ltd	15 May Street, St Peters	1970, 1975	Adjacent (west)
Chemicals manufacture and use	Chemical manufacturers and/or distributors	Corium Chemicals Division	21 May Street, St Peters	1970	Adjacent (west)
Dry cleaning	Dry cleaners	Esquire Dry Cleaners	99 Princes Highway, St Peters	1956 to 1962	Adjacent (south west)
Chemicals manufacture and use	Chemical manufacturers	Industrial Chemical Products Pty Ltd	78 Princes Highway, St Peters	1950, 1961, 1965, 1970	Adjacent (south west)
Printing shops	Die cutters - printers	Mounting & Diecutting Pty Ltd	42 Applebee Street, St Peters	1986	Adjacent (south west)
Metal treatments	Electroplaters	Betta Metal Polishing & Electroplating Co. Pty Ltd	60 Applebee Street, St Peters	1961, 1965, 1970, 1975, 1978	Adjacent (south west)
Engine Works	Motor garages and engineers	Lober. W. H. & Co. Pty Ltd	84 Princes Highway, St Peters	1964 to 1976	Adjacent (south west)
Engine Works	Motor garages and engineers	Bowcher, A. Holden Sales & Service / Chant Bros. Pty Ltd	84-88 Princes Highway, St Peters	1953 to 1961	Adjacent (south west)
Service stations and fuel storage facilities	Motor service stations - petrol	Victory Motor Engineering Coy. Pty Ltd	84-86 King Street, St Peters	1950 to1961	Adjacent (south west)
Dry cleaning	Dry cleaners, pressers and dyers	Trilon Dry Cleaners	31 Princes Highway, St Peters	1958	Adjacent (south west)
Printing shops	Printing supplies	A. C. P. Polychrome Ltd / Champion Press Pty Ltd / Langlea Printery Pty Ltd	31 Princes Highway, St Peters	1961, 1965, 1970, 1975, 1978	Adjacent (south west)
Service stations and fuel storage facilities	Motor garages and/or engineers and/or service stations	Motorways (St. Peters) Pty Ltd	110 Princes Highway, St Peters	1962 to 1981	Adjacent (south west)
Iron and steel works	Founders – ferrous Founders – Non-ferrous	Foster, G. & Sons Pty Ltd	1 Princes Highway, St Peters	1950, 1961, 1965, 1970, 1975	Adjacent (south west)

Activity	Business description	Premises	Site address	Years	Location relative to site
Chemicals manufacture and use	Chemical manufacturers and/or distributors	Swintons Industries Pty. Ltd	21 Princes Highway, St Peters	1961	Adjacent (south west)
Iron and steel works	Founders – ferrous	Marrickville Engineering Works Pty Ltd	1 King Street, St Peters	1950	Adjacent (south west)
Service stations and fuel storage facilities	Motor garages and service stations	Esso St. Peters	2A Princes Highway, St Peters	1966 to 1989	Adjacent (south west)
Service stations and fuel storage facilities	Motor garages and service stations	Esso Service Centre	694 King Street, St Peters	1966 to 1971	Adjacent (south west)
Engine Works	Motor garages and engineers	Gosson Industries Pty Ltd	661-663 Princes Highway, St Peters	1962	Adjacent (west)
Printing shops	Printing supplies	Australian Cutting Formes Pty Ltd	661 Princes Highway, St Peters	1975, 1978	Adjacent (west)
Chemicals manufacture and use	Chemical manufacturers and/or distributors	Australian Pharmaceutical Industries Ltd	221 Mitchell Road, Alexandria	1975, 1978, 1982	Adjacent (north)
Chemicals manufacture and use	Chemical manufacturers and/or distributors	Wholesale Drug Co Ltd	221 Mitchell Road, Alexandria	1965, 1970	Adjacent (north)
Dry cleaning	Dry cleaners	Back Like New Dry Cleaners	611 King Street, St Peters	1971 to 1976	18m (north west)
Service stations and fuel storage facilities	Fuel merchants – coal/coke/wood	Henderson, A. M	143 Princes Highway, St Peters	1950	23m (south west)
Iron and steel works	Engineers – foundry Founders – ferrous Founders – non-ferrous	Hadfields Steelworks Limited	165 Mitchell Road, Alexandria	1950, 1961, 1965, 1970	25m (north east)
Service stations and fuel storage facilities	Motor garages and service stations	Ampol Alexandria	340 Mitchell Road, Alexandria	1989 to1991	31m (north east)
Chemicals manufacture and use	Chemical manufacturers and/or distributors	Amyl Chemical Industries Pty Ltd / Olims Chemicals Pty Ltd	61 Crown Street, St Peters	1961, 1965	28m (south west)
Service stations and fuel storage facilities	Motor garages and/or engineers and/or service stations	Karger Automotive / City Star Motors Pty Ltd	85 Crown Street, St Peters	1978 to1991	30m (south west)
Service stations and fuel storage facilities	Motor garages and service stations	Ampol Alexandria	1 Huntley Street, Alexandria	1983 to 1991	31m (north east)
Dry cleaning	Dry cleaners, pressers and dyers	Eldridge, W. C. Pty Ltd	7 Lord Street, Newtown	1950	34m (north west)
Printing shops	Printing supplies	Packaging Processors Pty Ltd	27 May Street, St Peters	1986	36m (west)

Activity	Business description	Premises	Site address	Years	Location relative to site
Service stations and fuel storage facilities	Motor garages and/or engineers and/or service stations	Wilson, D	74 Applebee Street, St Peters	1982	37m (south west)
Printing shops	Printing supplies	Edwards Dunlop & B.J. Ball	70 Euston Road, Alexandria	1970, 1975, 1978, 1982	37m (east)
Printing shops	Printing supplies	A.C.P. Manufacturers Pty Ltd	3 Applebee Street, St Peters	1965	42m (west)
Dry cleaning	Dry cleaners, pressers and dyers	Mills Dye Works Pty Ltd	1A Lord Street, Newtown	1950	42m (north west)
Tanning and associated trades	Tanners	Morella, H	9 Lord Street, Newtown	1950	44m (north west)

Based on the review, potential contaminating activities could be associated with a number of businesses located within, adjacent to or within 50 metres of the site. These potential contaminating activities have been undertaken at the following locations:

- Princes Highway, St Peters (service station/fuel storage facilities, engine works, electrical, chemical manufacture/use, dry cleaning, iron/steel works, printing shops)
- King Street, St Peters (service station/fuel storage facilities, iron/steel works, dry cleaning)
- May Street, St Peters (chemical manufacture and use, printing shops)
- Crown Street, St Peters (service station/fuel storage facilities, chemical manufacture / use)
- Applebee Street, St Peters (service station/fuel storage facilities, printing shops, metal treatments)
- Lord Street, Newtown (tanning, dry cleaning)
- Mitchell Road, Alexandria (service station/fuel storage facilities, chemical manufacture/use, iron/steel works)
- Euston Road, Alexandria (printing shops)
- Huntley Street, Alexandria (service station/fuel storage facilities).

Potential contamination issues associated with the activities detailed above include potential impacts to soil, groundwater and vapours as a result of inappropriate waste disposal, leaks and spills associated with chemical storage and use. Contaminants of potential concern include hydrocarbons (Total Recoverable Hydrocarbons (TRH), benzene, toluene, ethylbenzene and xylenes (BTEX), Polycyclic Aromatic Hydrocarbons (PAH)), VOCs, SVOCs, PFAS compounds, other organic contaminants and heavy metals.

6.8 Previous contamination site investigations

A search of internet resources was carried out for previous contamination investigations and/or general contamination information for sites which were located within and/or adjacent (within one kilometre) to the site. The internet search used the key words "contamination", "remediation" and "site investigation" in the suburbs of St Peters, Erskineville and Alexandria and Sydney Park.

The following publicly available investigations and contamination information were reviewed:

- Environmental Impact Statement / Preliminary Draft Major Development Plan. Sydney Gateway Road Project. Technical Working Paper 5 – Contamination and Soils (Roads and Maritime Services / Sydney Airport Corporation Limited, November 2019)
- St Peters Interchange – Landfill Closure Management Plan (LCMP) (Golder Associates, 4 August 2017)
- Remedial Action Plan. Australian Refined Alloys. 202-212 Euston Road, Alexandria NSW (ERM, June 2017)
- Preliminary Geotechnical Investigation Report. 75 Mary Street, St Peters NSW (Environmental Investigations Australia, 18 September 2018).

The following provides direct excerpts from the information sources detailed above.

Environmental Impact Statement / Preliminary Draft Major Development Plan. Sydney Gateway Road Project. Technical Working Paper 5 – Contamination and Soils (Roads and Maritime Services / Sydney Airport Corporation Limited, November 2019)

The location of the proposal (construct new road linkages) subject of this report is located approximately 500 metres south west of the site. The closest proposal works are located within the St Peters Interchange.

The purpose of this technical working paper is to undertake an assessment of site contamination to consider whether the site is suitable for the proposed development and to identify the need for remediation.

The objectives of the technical working paper are to:

- Identify and define areas of historical contamination within the project site which include:
- The former Tempe Tip site
- Alexandra Canal
- Airport Land
- Identify impacts associated with these areas and determine whether remediation is required
- Outline mitigation and management measures for potential impacts during construction and operation associated with contamination.

The report does not provide specific contamination information for the project works in the near vicinity of the site (i.e. St Peters Interchange).

St Peters Interchange – Landfill Closure Management Plan (LCMP) (Golder Associates, August 2017)

The location of the site subject of this report is located adjacent to the southern extent of the site. It is possible that the contamination detailed within the plan has been remediated/managed as part of the construction of the St Peters interchange.

This LCMP outlines key strategies for landfill closure and management of the Alexandria Landfill.

The Site comprises Lot 2 in Deposited Plan (DP) 1168612, 10 Albert Street, St Peters, NSW. The Site was acquired by RMS on 20December 2014 to facilitate the development of the proposed St Peter Interchange (SPI) for the WestConnex New M5 (WCX M5).

This LCMP provides a landfill closure and environmental management and monitoring framework to be implemented both during and post landfill closure. This 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.

A summary of the key information is outlined below:

- *The Alexandria Landfill (ALF) site was previously occupied by the Austral Brick Company bricks works and quarry which operated from 1908 to 1962. The brickworks infrastructure (buildings, kilns, offices, etc.) was located within the north-eastern and southern areas of the site. The shale was mined from a large quarry which covered much of the western half of the site*
- *The former brickworks remained vacant and unused following closure of Austral bricks works and its demolition during the 1970s until City of Sydney Council used the quarry as a landfill from 1988 to 2002*
- *In 2002 Alexandria Landfill Pty Ltd acquired operation of part of the ALF which was licensed as a general solid waste landfill. The rest of the ALF was acquired by Boiling Point Pty Ltd which was operated by Dial-A-Dump Industries Pty Ltd (DADI) as a waste recycling and transfer facility*
- *In December 2014 the site was acquired by WestConnex Delivery Authority (WDA, now Sydney Motorway Corporation (SMC)) and in October 2015 the ownership of ALF was transferred to RMS.*

In regards to the extent and nature of the waste landfilling activities the following is noted (AECOM 2014a):

- *During the 1990s, acceptance of waste at ALF appeared to have been less regulated and therefore uncontrolled contaminated materials may have been disposed during this period*
- *From 1988 to1996 the landfill was reported to be filled with non-putrescible solid waste, incinerator ash, demolition waste (including asbestos), industrial and commercial waste and incinerated green waste. The green waste was incinerated on the site in a pit burner. Reports stated that after 1996 the landfill ceased accepting asbestos waste and no longer incinerated green waste. The green waste materials were buried and composed about 9% of the total accepted landfill materials*
- *In 1999 landfill operators were accepting non-approved contaminated wastes. The nature and volume of illegal waste accepted, and the areas filled are unknown*
- *Between 2002 and the present, ALF was licensed to accept general solid waste (non-putrescible, no garden or wood waste), shredded tyres and asbestos*
- *Approximately 900,000 m^3 of fill has been disposed within the landfill, representing approximately 47% of the total landfill capacity. The filling history of the landfill indicates that the eastern portion of the landfill was filled in preference to the western portion*
- *The base of the landfill is not lined and therefore fractures and joints within the underlying Ashfield shale may be providing migration pathways for contaminated leachate and gas to enter the Botany Sands Aquifer or Ashfield Shale Aquifer*
- *Bradshaw Mountain (BM) was previously occupied by the brick works operation. It included large buildings constructed of brick and fibre cement materials (which may potentially have contained asbestos). It does not appear that historical land fill occurred at this location as part of the ALF (AECOM 2014a). However, potential soil contamination at the base of the current stockpile of crushed sandstone, and elsewhere on the BM site, may exist as a result of the historical brick works and associated historical building demolition activities. A photograph from approximately 1994, presented in the AECOM (2014a) Phase 1 report, provides a view of the buildings fronting Campbell Lane.*

Land contamination issues at the Site are associated with its historical use as a landfill and waste transfer and recycling facility. They principally relate to the fill material and the associated leachate and landfill gas generation.

It is understood that approximately 900,000 m^3 of fill material has been disposed within the landfill, which comprises approximately 47% of the total landfill capacity. The base of the ALF is not lined and, as such, fractures and joints within the underlying Ashfield shale may be providing migration pathways for contaminated leachate and gas to enter the Botany Sands and Ashfield Shale Aquifers.

Based on the most recent investigations completed at the site on behalf of WDA, the key Contaminant of Potential Concern (CoPC) are identified as including: heavy metals; polycyclic aromatic hydrocarbons; petroleum hydrocarbons (measured as total recoverable hydrocarbons (TRH)), dioxins, asbestos, methane, carbon dioxide, carbon monoxide, hydrogen sulphide and ammonia.

Soil contamination

During the approximate period 1988 to 1996, the ALF was reported to have been filled with non-putrescible solid waste, incinerator ash, demolition waste (including asbestos), industrial and commercial waste and incinerated green waste.

Previous environmental assessment reports stated that after 1996 the ALF did not accept asbestos waste and no longer incinerated green waste. The green waste material was directly buried and comprised approximately 9% of the total fill material.

In 1999 the landfill operators were accepting non-approved contaminated waste. The type and extent of illegal waste that was accepted, and the areas that were filled, are unknown. These non-approved waste disposal practices are understood to have continued for over a period of four years. Between 2002 and present, ALF has been licensed to accept general solid waste (non-putrescible, no garden or wood waste), shredded tyres and asbestos. However, landfill and resource recycling activities ceased in December 2014 when RMS acquired the Site.

Contamination within the landfill waste is highly variable both laterally and vertically. CoPCs in the waste material at the Site were detected at concentrations exceeding human-health and ecological based assessment criteria for both the open space and commercial/industrial land use scenarios.

The CoPCs include: lead; carcinogenic PAHs, TRH, dioxins and asbestos (AECOM, 2015m).

The depth of contamination encountered ranged from 3.2 to 23 m bgl, with no consistency in the nature of contamination due to the varied landfilling history at the Site.

Groundwater contamination

Groundwater monitoring at ALF has been undertaken from 1997 to 2015 and has included sampling of monitoring wells screened within the fill materials, Botany Sands and the underlying shale or sandstone bedrock.

The CoPCs were identified in samples collected from the groundwater monitoring wells that are screened in the fill material (i.e. landfill leachate) and/or the surrounding groundwater.

The CoPCs with concentrations in excess of the adopted site assessment criteria, include: ammonia, TRH, heavy metals and benzene.

Light Non-Aqueous Phase Liquid (LNAPL), in the form of diesel/oil, was previously identified in one monitoring well (MW306, AECOM 2015m) that is located in the centre of the ALF site. This well is screened within the landfill waste material.

The inferred groundwater flow direction for the groundwater in the Botany Sands and landfill was towards the main leachate sump (LP1) located in the southwest portion of the site, with flow from all directions.

- *It appears that groundwater from the bedrock on the north, north east, west and south west sides of the site is also flowing towards LP1 and is connected to groundwater within the landfill*

- *Deeper groundwater was present in the eastern and down-gradient side of the Site however it is unclear, due to the limited number of groundwater monitoring wells screened in the bedrock, whether groundwater is flowing towards or away from the site in the eastern portion of the site.*

Landfill gas

Recent investigations found elevated concentrations of landfill gases at the site including: methane, carbon dioxide, carbon monoxide and hydrogen sulphide.

Results of methane monitoring that were undertaken as part of the Phase 2 ESA (AECOM, 2015m) indicate the Site is classified as Characteristic Gas Situation 4 (moderate to high risk) based on the Modified Wilson and Card Classification (MWCC) (NSW EPA, Guidelines for the Assessment and Management of Sites Impacted by Hazardous Ground Gases, 2012).

The investigation also detected concentrations of landfill gases at the locations adjacent to the site boundary greater than the NSW EPA Environment Guidelines, Solid Waste Landfills (1996) value.

Groundwater monitoring

Based on information presented in the Phase 2 ESA (AECOM, 2015m), it is understood that groundwater monitoring has been undertaken around the perimeter of the landfill since 1997.

The latest round of groundwater gauging and sampling completed in February 2015 as part of the Phase 2 ESA (AECOM, 2015m) indicates the following:

- *Groundwater in the leachate, Botany Sands and up-gradient bedrock was found to be flowing on an inward gradient towards the main leachate sump in the southwest of the site.*
- *It is unclear if groundwater is flowing towards or away from the sump in the bedrock aquifer in the southeast of the Site (at MW2D). Concentrations of cobalt, copper, nickel and zinc exceeded ANZECC (2000) 95% trigger values for marine ecosystems criteria in the bedrock aquifer and were at similar or higher concentrations as detected in the leachate. Lead slightly exceeded the ANZECC (2000) 95% trigger values for marine ecosystems in the Botany Sands in southern corner of the Site.*
- *Concentrations of ammonia slightly exceeded the ANZECC (2000) 95% trigger values for marine ecosystems criteria in the wells screened in the Botany Sands and bedrock aquifers.*
- *Concentrations of TRH, BTEX, volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs) were not detected in the Botany Sands or bedrock aquifer.*

Landfill gas monitoring

The latest round of subsurface landfill gas monitoring completed as part of the Phase 2 ESA (AECOM, 2015m) in February 2015, included the monitoring of thirteen landfill gas wells (LG300 to LG312) and two groundwater monitoring wells (MW311 and MW313) with a landfill gas analyser and sampling with Summa canisters for bulk and trace landfill gases.

With the exception of the northeast boundary of the site where subsurface methane concentrations were analysed at 74.2% at the boundary (LG308), concentrations of subsurface methane were highest across the central portion of the landfill and lower around the edges of the site.

The concentrations of trace ground gases including BTEX, naphthalene, vinyl chloride, DCFM and 1,2,4-TMB were detected in landfill gas above the adopted criteria during from the round of landfill gas sampling completed as part of the Phase 2 ESA (AECOM, 2015m) in February 2015.

Remedial Action Plan. Australian Refined Alloys. 202-212 Euston Road, Alexandria NSW (ERM, June 2017)

The location of the site subject of this report is located adjacent to the south east (greater than 500 metres) of the site. It is possible that the contamination detailed within the plan has been remediated/managed.

Environmental Resources Management Australia Pty Ltd (ERM) was commissioned by Enirgi Metals Group Pty Ltd (Enirgi) to prepare a Remedial Action Plan (RAP) for the Australian Refined Alloys Alexandria site located at 202-212 Euston road, Alexandria, New South Wales (NSW) ('the Site').

ERM understand that Enirgi have sold the site and are currently leasing it back for a period of three years and that as part of the conditions of sale, Enirgi will hand the site to the purchaser at the end of the three year lease with the following endpoints achieved:

- *the site remediated to a condition such that an independent auditor can issue a site audit statement certifying that the site is suitable for ongoing industrial use;*
- *the site is in a condition that does not require an Environmental Management Plan (EMP) to manage potential risks; and*
- *not subject to regulation by the New South Wales Environment Protection Authority (NSW EPA) under the Contaminated Land Act 1997.*

A review of the NSW EPA Record of Notices and the Record of Sites Notified to the EPA indicates that the site is already notified but that regulation under the Act is not currently required.

ERM notes that the site currently operates an Environmental Management Plan under the conditions of the Environmental Protection Licence. For handing back the site ERM understands that the aim for the site remediation should be that an Environmental Management Plan should not be required in order to make the site suitable for commercial/industrial use.

At the time of writing, battery breaking and acid neutralisation processes were being undertaken on site and the furnace was temporarily out of operation. Demolition works had not commenced at the site.

Hydrogeological conditions based on observations made during previous site investigations can be summarised as follows:

- *Groundwater was observed during well installation within fine to medium grained sand and sandy clay between 2.3 – 2.8 mbgl. Groundwater levels, gauged between 2006 and 2016, have ranged between 1.5 and 2.8 mbgl and suggest groundwater on site is unconfined.*
- *Based on groundwater elevations measured in the wells on-site the inferred groundwater flow direction is south-south-east.*

Between 1887 and 1936, Sydney Park was the site of the Bedford Brick Works, which was later purchased and operated by Austral Brick Company until 1970. Clay was quarried and processed into bricks through on-site kilns. From 1948 the former brick pits were used as a municipal waste depot where it accepted domestic waste. Landfill operations ceased in 1976 and capped with soil and building rubble to create the Sydney Park. Some areas of Sydney Park were not part of the brickwork operations and operated as gas storage, manufacturing and warehouse facilities (City of Sydney, 2016).

The first environmental investigations were undertaken at the site in 2006. At this time, three groundwater monitoring wells were installed on site to assess potential groundwater contamination underlying, and potentially migrating on or off-site. Two additional monitoring wells were installed in 2007 to supplement data collected during the 2006 investigation.

In May 2010, ERM completed a baseline Environmental Site Assessment (ESA) comprising of; a Phase I ESA to establish current (as of 2010) environmental conditions and surrounding land use and to gain an understanding of historical land use; and a Phase II ESA to target known or suspected sources or areas of impact identified in the Phase I ESA.

The Phase II ESA identified impacts to soil related to the presence of lead at several locations, with additional limited areas of Total Petroleum Hydrocarbon (TPH) and asbestos impact. Elevated concentrations of lead were primarily in shallow soils in the grassed/landscaped southern portion of the site as well as limited areas beneath the intact concrete slab in the production area and in the landscaped area near the eastern site boundary. Elevated concentrations of TPH were present in shallow soils near the previous location of an unbunded fuel aboveground storage tank (AST). Investigation beneath the main building was not undertaken at this time.

Groundwater analytical results indicated that lead was reported at the time in excess of the NSW EPA Notification Triggers for Groundwater at two locations - BH3 and MW01. Relatively low concentrations of other metals were also detected, however these were considered to be indicative of background conditions in the area.

Under Section 60 of the Contaminated Land Management (CLM) Act 1997, and based on the results of the Baseline ESA, Australian Refined Alloys (ARA) notified the NSW Environmental Protection Authority of lead impacts identified in soil and groundwater.

ARA received correspondence from the NSW EPA in December 2010 stating the lead contamination identified in soil and groundwater at the site would not be regulated under the CLM Act 1997. However the EPA presented the following requirements to manage potential health risks and monitor groundwater conditions:

- *the grass in the Southern Landscaped Area is required to be maintained in order to reduce dust generation and mobilisation of lead particulates; and*
- *a program of regular groundwater monitoring should be undertaken which could be included under the site's Environmental Protection Licence (EPL).*

ERM subsequently developed an Environmental Management Plan (EMP) for the site to address these requirements. The EMP only applies to the existing use of the site in its current layout and is referenced as part of the ARA's EPL. The EMP will not apply for future site occupation by new owners, and soil and groundwater impacts will be managed by implementing a Remedial Action Plan.

In accordance with the EMP, the condition of the grassed landscaped area was documented by ERM in 2011, and ERM also conducted groundwater monitoring in 2011 and 2012. Stephenson Environmental Management Australia conducted groundwater monitoring in 2013 and 2014 and documented the condition of the grassed area in 2014.

In February 2013, three soil samples were collected from the grassed areas of the site during excavation for electrical installations. Off-site disposal of some soil is understood to have been undertaken; however quantities removed were not provided. The soil quantities landfilled are likely to have been small, based on the purpose of the works.

Demolition works including the removal of concrete slabs and sampling of underlying soils were undertaken at the site within the factory building in 2013. The extent of the demolition works and the number, location and depth of soil samples collected during this event is unclear based on available information. The demolition area is understood to have been excavated to a generally to a depth of 0.3 m. Beneath the former battery breaker area, slag bay and furnace, excavation occurred to a depth of 1 - 1.5 m (pers. comm. L. Marcon 30 September 2015). Approximately 550m3 of excavated soil is understood to have been removed from site during this time. Precise excavation and disposal quantities, depth and extent of excavations, and the soil quality remaining could not be determined from the available documentation. It is understood that the remaining soils were validated prior to backfilling, however the data for this were not available. The approximate area over which the excavation and soil removal occurred is shown on Figure 5, with Area C1 indicating excavation generally to 1-1.5m and Area C2 indicating excavation to 0.3m.

Additional soil and groundwater data was collected by ERM as part of a Data Gaps Investigation to provide current data and a comprehensive coverage of potential contamination across the site, with the objective of informing the HERA and this RAP.

Twenty-one soil bore locations were investigated, confirming lead impacts within fill material across the site. Asbestos fibres were detected in four of the five samples analysed, but no visual identification of asbestos was made in the field. Evidence of petroleum hydrocarbons was also identified within the central portion of the factory building in soils within the water bearing zone. The source of hydrocarbon impact was not identified during this phase of works, but may be uncovered during site demolition. Due to access restrictions, soils within

the southern portion of the factory building could not be sampled and assessment of this area will also be required during site demolition. Groundwater results indicated the presence of dissolved phase metals on both the up-gradient and down-gradient site boundary, and were consistent with historical results.

Preliminary Geotechnical Investigation Report. 75 Mary Street, St Peters NSW (Environmental Investigations Australia, 18 September 2018).

The location of the site subject of this report is located approximately 700 metres west of the site.

The report was prepared to provide preliminary geotechnical advice and recommendations in support of a development application and the preparation of initial concept designs for the proposed residential development

The report detailed the following with respect to potential contamination.

Fill was present to a maximum depth of 0.7m. Fill material comprised sandy clay, clayey silt, clay, silty gravel, gravelly clay and gravelly sand with some brick and glass fragments.

Depth to groundwater (as measured in groundwater monitoring wells) ranged from 0.89 to 3.85 m below ground level.

Waste Classification. Sydney Park Gateway (Sydney Program Alliance, June 2021).

The waste classification was undertaken on portions of Princes Highway and Sydney Park Road within the Sydney Gateway project footprint.

The waste classification (Jacobs, 2021) was undertaken on materials sampled by Macquarie Geotech during a geotechnical investigation undertaken at the site in 2020 (MG, 2020). Six samples were collected during the MG (2020) investigation from natural (five samples) and fill materials (one sample) from select locations. Samples for waste classification were collected from depths between 0.5 and 0.8m below ground level and submitted to a National Accredited Testing Authority (NATA) laboratory for the following analysis:

- Heavy Metals (As, Be, Cd, Hg, Mo, Ni, Pb, Se, Ag)
- Hydrocarbon compounds (TRH, BTEX and PAH)
- Pesticides (OCP, OPP)
- Herbicides
- Polychlorinated biphenyls (PCB)
- Speciated phenols
- Phthalates
- Volatile and semi-volatile organic compounds
- Cyanide compounds
- Hexavalent chromium
- Fluoride
- Asbestos (presence/absence).

Jacobs have undertaken a review of the analytical results against the National Environment Protection (Assessment of Site Contamination) Measure 1999 (as revised 2013) guidelines for the protection of human health under a commercial/industrial land use (considered to be the most appropriate contamination exposure scenario to construction workers associated with the project). The results of the review indicated that contamination was not identified above human health investigation levels for a commercial / industrial land use in any of the samples analysed.

With respect to the potential contamination risk with respect to the sampling and analysis undertaken as part of the Jacobs (2021) waste classification, the following is noted:

- The sampling undertaken was limited
- The sampling locations did not target all of the areas of interest (AEIs) identified in this Stage 1 Contamination Assessment (refer to Section 8)
- Sampling was not undertaken to the full proposed depth of construction activities (i.e. 1 m below ground level)
- Majority of samples were collected from natural soils. Largest potential contamination risk is likely to be associated with fill
- Boreholes are not necessarily the best excavation technique to assess the presence / absence of asbestos containing materials.

7. Site inspection

A site inspection was undertaken by a Jacobs Environmental Scientist on 1 May 2020. The site inspection was undertaken from publicly accessible areas. Photographs taken during the inspection are provided in Appendix A.

At the time of undertaking the site inspection, the majority of the site comprised existing roadways surrounded by residential, open space and commercial / retail land use.

A number of potential AEI's (with respect to contamination) were identified during the site inspection as detailed in Table 7-1.

Table 7-1 Summary of site inspection AEI observations

AEI	Location	Potential contamination source	Potential contamination distribution	Reference Photo Plate
Brick kilns and stacks	Within Sydney Park (corner of Sydney Park Road and King Street)	Coal waste - Used as potential fuel stock for kilns Ash – Waste product from kilns Asbestos – Used in the construction of the structures.	Shallows soils within the footprint and immediately surrounding the structures	1
Landfill wastes	Foundation excavations for timber bollards within Sydney Park (adjacent to Sydney Park Road)	Excavated material contained observable wastes including plastic, glass, metal.	In soil/fill profile (shallow and depth) in areas adjacent to Sydney Park	2
Substation	Western portion of Sydney Park Road	Transformer oils and fire fighting activities	Localised shallow soil and deeper groundwater contamination	3
TransGrid yard	Eastern portion of Sydney Park Road	General maintenance activities and storage of electrical equipment	Localised shallow soil contamination	4
Carpark areas and associated structures	Carpark areas within Sydney Park	Landfill gas - Passive venting systems observed in carparks areas and structures located within the northern and western portions of Sydney Park.	Shallow and deep gas distribution	5
Industrial workshop (Cheapest Load of Rubbish)	Corner of Goodsell Street and King Street	General maintenance activities and storage of equipment, storage and use of chemicals	Localised shallow soil and deeper groundwater contamination	6
Service station	Corner of Princes Highway and Barwon Park Road	Storage and dispensing of fuels	Localised shallow soil and deeper groundwater contamination. Shallow and deeper vapour contamination.	7

AEI	Location	Potential contamination source	Potential contamination distribution	Reference Photo Plate
Chamber substation (Sydney County Council Electric Substation No. 549)	Princes Highway	Transformer oils	Localised shallow soil contamination	8
Mechanical workshops (Motociclo and Graeme Cooper Automotive)	Princes Highway	General maintenance activities, storage and use of chemicals	Localised shallow soil and deeper groundwater contamination	9

At the time of undertaking the site inspection, the following land uses were observed surrounding the site:

- North: Generally medium to high density residential areas
- East: Sydney Park
- South: Sydney Park, low to medium density residential and commercial/retail areas
- West: medium to high density residential and commercial/retail areas.

7.1 Ancillary sites

Site 1 – Venice Street, Mascot

An inspection of the site was undertaken on 11 May 2021 by a Jacobs contaminated land specialist from publicly accessible areas only (the actual site was not accessed). At the time of the inspection, the site comprised a fenced, predominantly concrete and asphalt sealed vacant parcel of land.

Land use surrounding the site comprised vacant land (vegetated open space) and Gardeners Road to the north, commercial/industrial premises to the east and south and Alexandria Canal to the west.

No evidence of potential contamination sources (e.g. wastes, material stockpiles, chemical storage, above or underground petroleum storage systems, above ground structures containing hazardous building materials) were observed to be present at the site.

Potential contamination may be present at the site associated with the following:

- Potential for the site to have historically been used for commercial/industrial purposes. The activities undertaken at the site during these commercial/industrial operations could have contaminated underlying soils and groundwater.
- Portions of the site (especially the western portion) may have been subject to land reclamation during the construction of Alexandria Canal. The source of the materials used for land reclamation are not known but could have included dredged sediment and/or contaminated fill.

Site 2 – 12-18 Burrows Road, St Peters

An inspection of the site was undertaken on 11 May 2021 by a Jacobs contaminated land specialist from publicly accessible areas only (the actual site was not accessed). At the time of the inspection, the site comprised a fenced, predominantly concrete and asphalt sealed vacant parcel of land.

Land use surrounding the site comprised vacant land (vegetated open space) and Ricketty Street / Canal Road to the north, Alexandria Canal to the east, commercial/industrial premises to the south, commercial/industrial premises and vacant land (vegetated open space) to the west.

A number of potential dip and fill points for underground petroleum storage systems (UPSS) were observed within the south western portion of the site. It is not known whether these UPSS have been decommissioned or whether investigations have been undertaken to assess the potential for contamination associated with the UPSS.

No other evidence of potential contamination sources (e.g. wastes, material stockpiles, chemical storage, aboveground petroleum storage systems, above ground structures containing hazardous building materials) were observed to be present at the site.

Potential contamination may be present at the site associated with the following:

- Potential for the site to have historically been used for commercial/industrial purposes. The activities undertaken at the site during these commercial/industrial operations could have contaminated underlying soils and groundwater.
- Portions of the site (especially the eastern portion) may have been subject to land reclamation during the construction of Alexandria Canal. The source of the materials used for land reclamation are not known but could have included dredged sediment and/or contaminated fill.
- The potential presence of UPSS within the south western portion of the site. Any spills and/or leaks associated with the operation of the UPSS and associated refuelling infrastructure could have contaminated underlying soils and groundwater.

8. Areas of environmental interest

Based on the findings of the desktop review and observation from the site inspection, a number of a potential contamination sources have been identified within and/or adjacent to the site.

To understand the potential interaction of construction activities and operation of the site with potential contamination, areas have been categorised into five categories of potential contamination impact (very low, low, moderate, high and very high) based on the impact prioritisation methodology in Section 2.5. The results of this exercise are presented in Table 8-1. The location of AEI with a moderate to high impact potential are presented on Figure 1.

Based on the results of the information review and site inspection, a number of sites within and or next to the proposal are considered to represent a low impact potential. No further consideration of contamination impacts has been provided for these sites.

A number of areas have been identified as having moderate to high potential for contamination to impact upon construction and operation of the site. Additional information would need to be obtained and reviewed (such as site-specific data), if available or further investigations need to be undertaken in order to determine the most appropriate site-specific responses or controls, which may include remediation.

Although not associated with contamination, there is the potential for ASS to be present within the eastern portion of the site and in areas adjacent to the site.

Table 8-1 High-level contamination prioritisation

Number	Areas of interest	Contamination severity and extent assessment			Pathways and receptors Assessment of relationship to construction and operational footprint and scope				Potential contamination impact
		Media and COPCs	Contamination status	Reference to Table 2-1 criteria	Location relative to site	Potential for contamination to be intersected	Exposure pathways (der – direct contact, ing – ingestion or inh – inhalation)	Reference to Table 2-1 criteria	
AEI1	Historical quarrying and brick making activities	Soils (surface and depth) Heavy metals, hydrocarbons (TRH, PAH), asbestos	Contamination possibly present at concentrations above the relevant assessment criteria and widespread	SE3	Within the site (Eastern portion of Sydney Park Road and intersection of Sydney Park Road and King Street) and adjacent to the site (north and south)	Contamination (if present) would be exposed during excavation of soil materials	**Construction workers could be exposed to contamination via contact (der, ing, inh) with contaminated soils** Adjacent site users could be exposed to contamination via dust emissions (inh), namely asbestos	PR3	High
AEI2	Historical filling (soil and rock materials of unknown quality)	Soils (surface and depth) Heavy metals, hydrocarbons (TRH, PAH), pesticides, polychlorinated biphenyls (PCB), phenols, asbestos	Contamination possibly present at concentrations above the relevant assessment criteria and widespread	SE3	Within the site (Eastern portion of Sydney Park Road)	Contamination (if present) would be exposed during excavation of soil materials	**Construction workers could be exposed to contamination via contact (der, ing, inh) with contaminated soils** Adjacent site users could be exposed to contamination via dust emissions (inh), namely asbestos	PR3	High
AEI3	Historical landfilling (Sydney Park and St Peters interchange - Known areas of waste and gas contamination)	Waste Heavy metals, hydrocarbons (TRH, BTEX, PAH), pesticides, PCB, PFAS, asbestos	Contamination possibly present at concentrations above the relevant assessment criteria and widespread	SE3	Within the site (eastern portion of Sydney Park Road) and adjacent to site	Contamination (if present) would be exposed during excavation of sub-surface (fill/waste/soil) materials	**Construction workers could be exposed to contamination via contact (der, ing, inh) with contaminated soils and wastes** **Adjacent site users could be exposed to contamination via dust emissions (inh), namely asbestos**	PR3	High
		Groundwater Nutrients, heavy metals, hydrocarbons (TRH, BTEX, PAH), volatile organic compounds (VOC), PFAS	Contamination possibly present at concentrations above the relevant assessment criteria and widespread	SE3	Within the site (eastern portion of Sydney Park Road) and adjacent to site	Groundwater (and contamination if present) unlikely to be exposed during construction	**Contamination unlikely to be exposed during construction and therefore unlikely to impact upon human and environmental receptors**	PR1	Low
		Vapour and landfill gas Methane, hydrogen sulphide, carbon dioxide, VOC	Known contamination present at concentrations above the relevant assessment criteria and widespread	SE5	Within the site (eastern portion of Sydney Park Road) and adjacent to site.	Potential for landfill gas and vapour from on and off-site source to be present within construction footprint (i.e. accumulation within below ground excavations, structures and services)	Construction workers could be exposed to contamination via landfill gas and vapour emissions (inh) Adjacent site users could be exposed to contamination via landfill gas and vapour emissions (inh)	PR2	High
AEI4	Service Station (2 Princes Highway, St Peters) – Leaks from underground petroleum storage tanks and associated refuelling infrastructure	Soils (surface and depth) Heavy metals, hydrocarbons (TRH, BTEX, PAH)	Contamination possibly present at concentrations above the relevant assessment criteria and limited in extent	SE2	Adjacent to site (corner of Princes Highway and Barwon Park Road)	Soil contamination from source site unlikely to migrate and be exposed during construction	**Construction workers could be exposed to contamination via contact (der, ing, inh) with contaminated soils**	PR1	Low
		Groundwater Heavy metals, hydrocarbons (TRH, BTEX, PAH), VOC, semi-volatile organic compounds (SVOC), PFAS	Contamination possibly present at concentrations above the relevant assessment criteria and widespread	SE3	Adjacent to site (corner of Princes Highway and Barwon Park Road)	Groundwater (and contamination if present) unlikely to be exposed during construction	Contamination unlikely to be exposed during construction and therefore unlikely to impact upon human and environmental receptors	PR1	Low
		Vapour VOCs	Contamination possibly present at concentrations above the relevant assessment criteria and widespread	SE3	Adjacent to site (corner of Princes Highway and Barwon Park Road)	Potential for vapour from on-site source to be present within construction footprint	Construction workers could be exposed to contamination via vapour emissions (inh) Adjacent site users could be exposed to contamination via vapour emissions (inh)	PR2	Moderate

Number	Areas of interest	Contamination severity and extent assessment			Pathways and receptors Assessment of relationship to construction and operational footprint and scope				Potential contamination impact
		Media and COPCs	Contamination status	Reference to Table 2-1 criteria	Location relative to site	Potential for contamination to be intersected	Exposure pathways (der – direct contact, ing – ingestion or inh – inhalation)	Reference to Table 2-1 criteria	
AEI5	Former and existing structures – Hazardous building materials within or from on-site buildings / structures, demolition wastes	Surface soil Heavy metals, hydrocarbons (TRH, PAH), pesticides, asbestos	Contamination possibly present at concentrations above the relevant assessment criteria and limited in extent	SE2	Within the site (Eastern portion of Sydney Park Road and intersection of Sydney Park Road and King Street) and adjacent to site	Surficial contamination (if present) would be exposed during excavation of surface materials	**Construction workers could be exposed to contamination via contact (der, ing, inh) with contaminated soils and dust.** Adjacent site users could be exposed to contamination via dust emissions (inh), namely asbestos	PR3	Moderate
AEI6	Historical commercial / industrial use within locality – Inappropriate chemical storage and use, industrial operations, waste disposal and management etc	Surface soil Heavy metals, hydrocarbons (TRH, PAH), pesticides, PCB, SVOCs, phenols, PFAS and other organic contaminants.	Contamination possibly present at concentrations above the relevant assessment criteria and limited in extent	SE2	Adjacent to site	Surficial contamination from source site unlikely to migrate and be exposed during construction	Contamination unlikely to be exposed during construction and therefore unlikely to impact upon human and environmental receptors	PR1	Low
		Groundwater Heavy metals, hydrocarbons (TRH, BTEX, PAH), VOC, SVOC, PFAS	Contamination possibly present at concentrations above the relevant assessment criteria and widespread	SE3	Adjacent to site	Groundwater (and contamination if present) unlikely to be exposed during construction	Contamination unlikely to be exposed during construction and therefore unlikely to impact upon human and environmental receptors	PR1	Low
AEI7	St Peters Substation – Leakage of transformer oils and potential firefighting activities and AFFF storage	Soils – Hydrocarbons and PCBs	Contamination possibly present at concentrations above the relevant assessment criteria and limited in extent	SE2	Adjacent to site	Surficial contamination from source site unlikely to migrate and be exposed during construction	Contamination unlikely to be exposed during construction and therefore unlikely to impact upon human and environmental receptors	PR1	Low
		Groundwater - PFAS	Contamination possibly present at concentrations above the relevant assessment criteria and widespread	SE3	Adjacent to site	Groundwater unlikely to be exposed during construction	Contamination unlikely to be exposed during construction and therefore unlikely to impact upon human and environmental receptors	PR1	Low
AEI8	Chamber Substation (Sydney County Council Electric Substation No. 549) – Leakage of transformer oils	Soils – Hydrocarbons and PCBs	Contamination possibly present at concentrations above the relevant assessment criteria and limited in extent	SE2	Adjacent to site	Surficial contamination from source site unlikely to migrate and be exposed during construction	Contamination unlikely to be exposed during construction and therefore unlikely to impact upon human and environmental receptors	PR1	Low
AEI9	Mechanical workshops (Motociclo and Graeme Cooper Automotive)	Surface soil Heavy metals, hydrocarbons (TRH, BTEX, PAH), SVOCs, VOC	Contamination possibly present at concentrations above the relevant assessment criteria and limited in extent	SE2	Adjacent to site	Surficial contamination from source site unlikely to migrate and be exposed during construction	Contamination unlikely to be exposed during construction and therefore unlikely to impact upon human and environmental receptors	PR1	Low
		Groundwater Heavy metals, hydrocarbons (TRH, BTEX, PAH), SVOCs, VOC	Contamination possibly present at concentrations above the relevant assessment criteria and widespread	SE3	Adjacent to site	Groundwater (and contamination if present) unlikely to be exposed during construction	Contamination unlikely to be exposed during construction and therefore unlikely to impact upon human and environmental receptors	PR1	Low
AEI10	Industrial workshop (Cheapest Load of Rubbish) - General maintenance activities and storage of equipment, storage and use of chemicals	Surface soil Heavy metals, hydrocarbons (TRH, PAH), VOCs and SVOCs	Contamination possibly present at concentrations above the relevant assessment criteria and limited in extent	SE2	Adjacent to site	Surficial contamination from source site unlikely to migrate and be exposed during construction	Contamination unlikely to be exposed during construction and therefore unlikely to impact upon human and environmental receptors	PR1	Low
		Groundwater Heavy metals, hydrocarbons (TRH, BTEX, PAH), VOC, SVOC	Contamination possibly present at concentrations above the relevant assessment criteria and widespread	SE3	Adjacent to site	Groundwater (and contamination if present) unlikely to be exposed during construction	Contamination unlikely to be exposed during construction and therefore unlikely to impact upon human and environmental receptors	PR1	Low
AEI11	Ancillary Site 1 - Historical commercial / industrial use. Inappropriate chemical storage and use, industrial	Surface soil Heavy metals, hydrocarbons (TRH, PAH), pesticides, PCB, SVOCs, phenols, PFAS and other organic contaminants.	Contamination possibly present at concentrations above the relevant assessment criteria and limited in extent	SE2	Within Ancillary Site 1	Surface soils unlikely to be disturbed as part of construction	Contamination unlikely to be exposed during construction and therefore unlikely to impact upon human and environmental receptors	PR1	Low

Number	Areas of interest	Contamination severity and extent assessment			Pathways and receptors Assessment of relationship to construction and operational footprint and scope				Potential contamination impact
		Media and COPCs	Contamination status	Reference to Table 2-1 criteria	Location relative to site	Potential for contamination to be intersected	Exposure pathways (der – direct contact, ing – ingestion or inh – inhalation)	Reference to Table 2-1 criteria	
	operations, waste disposal and management etc	Groundwater Heavy metals, hydrocarbons (TRH, BTEX, PAH), VOC, SVOC, PFAS	Contamination possibly present at concentrations above the relevant assessment criteria and widespread	SE3	Within Ancillary Site 1	Groundwater (and contamination if present) unlikely to be exposed during construction	Contamination unlikely to be exposed during construction and therefore unlikely to impact upon human and environmental receptors	PR1	Low
	Ancillary Site 1 - Historical filling (soil and rock materials of unknown quality)	Soils (surface and depth) Heavy metals, hydrocarbons (TRH, PAH), pesticides, polychlorinated biphenyls (PCB), phenols, asbestos	Contamination possibly present at concentrations above the relevant assessment criteria and widespread	SE2	Within Ancillary Site 1	Surface soils unlikely to be disturbed as part of construction	Contamination unlikely to be exposed during construction and therefore unlikely to impact upon human and environmental receptors	PR1	Low
AEI12	Ancillary Site 2 - Historical commercial / industrial use. Inappropriate chemical storage and use, industrial operations, waste disposal and management etc	Surface soil Heavy metals, hydrocarbons (TRH, PAH), pesticides, PCB, SVOCs, phenols, PFAS and other organic contaminants.	Contamination possibly present at concentrations above the relevant assessment criteria and limited in extent	SE2	Within Ancillary Site 2	Surface soils unlikely to be disturbed as part of construction	Contamination unlikely to be exposed during construction and therefore unlikely to impact upon human and environmental receptors	PR1	Low
		Groundwater Heavy metals, hydrocarbons (TRH, BTEX, PAH), VOC, SVOC, PFAS	Contamination possibly present at concentrations above the relevant assessment criteria and widespread	SE3	Within Ancillary Site 2	Groundwater (and contamination if present) unlikely to be exposed during construction	Contamination unlikely to be exposed during construction and therefore unlikely to impact upon human and environmental receptors	PR1	Low
	Ancillary Site 2 - Historical filling (soil and rock materials of unknown quality)	Soils (surface and depth) Heavy metals, hydrocarbons (TRH, PAH), pesticides, polychlorinated biphenyls (PCB), phenols, asbestos	Contamination possibly present at concentrations above the relevant assessment criteria and widespread	SE2	Within Ancillary Site 2	Surface soils unlikely to be disturbed as part of construction	Contamination unlikely to be exposed during construction and therefore unlikely to impact upon human and environmental receptors	PR1	Low
	Ancillary Site 2 – Leaks from underground petroleum storage tanks and associated refuelling infrastructure	Soils (surface and depth) Heavy metals, hydrocarbons (TRH, BTEX, PAH)	Contamination possibly present at concentrations above the relevant assessment criteria and limited in extent	SE2	Within Ancillary Site 2	Soils (and contamination if present) unlikely to be disturbed as part of construction	Contamination unlikely to be exposed during construction and therefore unlikely to impact upon human and environmental receptors	PR1	Low
		Groundwater Heavy metals, hydrocarbons (TRH, BTEX, PAH), VOC, semi-volatile organic compounds (SVOC), PFAS	Contamination possibly present at concentrations above the relevant assessment criteria and widespread	SE3	Within Ancillary Site 2	Groundwater (and contamination if present) unlikely to be exposed during construction	Contamination unlikely to be exposed during construction and therefore unlikely to impact upon human and environmental receptors	PR1	Low
		Vapour VOCs	Contamination possibly present at concentrations above the relevant assessment criteria and widespread	SE3	Within Ancillary Site 2	No excavation to be undertaken during construction	Contamination unlikely to be exposed during construction and therefore unlikely to impact upon human and environmental receptors	PR1	Low

A summary of the potential AEI with a moderate to high impact potential and their associated contaminants of concern is provided below:

Quarrying and brick making activities undertaken within the eastern portion of Sydney Park Road, the intersection of Sydney Park Road and King Street and areas to the north of Sydney Park Road represent a potential source of heavy metals, hydrocarbons (TRH, PAH) and asbestos associated with these historical activities. These areas of historical quarrying and brick making activities pose a high impact potential given contamination (if present) would be exposed during excavation of soil materials in these areas. Limited sampling and analysis of fill and natural material in the vicinity of this AEI (intersection of Sydney Park Road and King Street) undertaken as part of the Jacobs (2021) waste classification did not report contamination above levels which would pose a risk to human health under a commercial / industrial land use.

Historical filling using material of unknown quality undertaken within the eastern portion of Sydney Park Road represent a potential source of heavy metals, hydrocarbons (TRH, PAH), pesticides, polychlorinated biphenyls PCB, phenols and asbestos which may be present within the fill materials. These areas of filling activities within the eastern portion of Sydney Park Road pose a high impact potential given contamination (if present) would be exposed during excavation of soil materials in this area.

Historical landfilling within Sydney Park and St Peters interchange represent known / potential areas of waste (heavy metals, hydrocarbons (TRH, BTEX, PAH), pesticides, PCB, PFAS and asbestos) and gas (methane, hydrogen sulphide, carbon dioxide, VOC) contamination. The historical landfilling (namely within Sydney Park and the eastern portion of Sydney Park Road) pose a high impact potential given waste (if present) would be exposed during excavation of sub-surface materials and there is the potential for landfill gas and vapour from on and off-site source to be present within construction footprint. Limited sampling and analysis of fill and natural material in the vicinity of this AEI (western portion of Sydney Park Road) undertaken as part of the Jacobs (2021) waste classification did not report contamination above levels which would pose a risk to human health under a commercial / industrial land use.

The service station located at 2 Princes Highway represents a potential source of vapour (moderate impact potential) contamination associated with leaks and spills from fuel storage infrastructure (i.e. hydrocarbons). Vapour contamination impacts (if present) from the service station to adjoining areas could be present at depth in groundwater and possible vapour portioning from groundwater. Volatile compounds in vapour (if present) may need to be managed during construction activities and operation.

Former and existing structures could represent a potential source of contamination associated with the degradation and demolition of hazardous building materials namely heavy metals, hydrocarbons (TRH, PAH), pesticides and asbestos. These former and existing structures were / are present across and adjacent to the proposal. These areas surrounding current and former structures pose a moderate impact potential given contamination (if present) would be exposed during excavation of soil materials as part of construction.

Figure 8-1 Areas of Environmental Interest

9. Potential impacts

The following information details potential impacts to the site from contamination identified as part of this Stage 1 contamination assessment.

9.1 Construction

9.1.1 Contamination – soil

The results of this assessment have identified areas across the site which have a moderate to high potential for contamination impact as a result of the following:

- On-site: Historic landfilling/filling activities, (brick making) and associated structures (degradation of hazardous building materials) and current (service station) land use
- Off-site: Historic structures (degradation of hazardous building materials)

If contamination risks are not quantified in these areas and appropriately managed, construction activities may expose workers, the public, and the environmental receptors to contaminated fill materials and soils.

Potential impacts as a result of disturbance of contaminated fill and soil without appropriate management and/or remediation may include:

- Contaminant exposure risk to construction personnel and the general public
- Contaminant exposure to environmental receptors
- Cross contamination associated with the incorrect handling or disposal of spoil/unexpected finds
- Contamination of previously clean areas.

Should contaminated fill materials and soil be identified, these materials can be managed subject to the implementation of appropriate management measures and/or remediation.

Higher risks and increased management and/or remediation effort during construction could be associated where materials have the potential to:

- Contain dispersible fibres (e.g. asbestos)
- Generate vapours (e.g. hydrocarbons and volatile organic compounds)
- Contain concentrations of contaminants or constituents that categorise the material at a higher waste classification (e.g. restricted waste, special waste, hazardous waste).

The appropriate management measures and/or remediation can only be determined based on the results of additional information reviews (where information is available) and investigations, which would be completed prior to the commencement of construction.

Any fill materials and/or soils disturbed as part of site construction activities have the potential to become mobilised into stormwater drainage networks during rainfall events if not appropriately managed. As such there is potential for on-site fill materials and/or soils disturbed as part of construction to migrate and impact off-site receiving environments.

9.1.2 Contamination – groundwater

Contaminated groundwater may be present beneath the site and adjacent areas. Groundwater could potentially be encountered at depths greater than 2 to 3 mbgl. In consideration of the depth of the proposed excavation works (nominal 1.5 to 1.8 mbgl), groundwater is unlikely to be encountered during construction.

9.1.3 Contamination – vapour and gas

Vapours are generally partitioned from volatile compounds present within soil and groundwater. The generation of vapours can be influenced by sub-surface conditions and the presence of below ground and surface structures. Vapours have the potential to accumulate within excavations and enclosed structures associated with the site at concentrations which could represent an explosion or acute/chronic health risk.

Sources of ground gas can include putrescible waste and inert waste landfill sites, general uncontrolled fill, reclaimed wetlands and mangroves, organic waste disposal, coal workings, and other natural/anthropogenic sources.

The migration and behaviour of hazardous ground gases are subject to physical processes including advection, diffusion, and dissolved phase transport.

Potential vapour and landfill gas sources identified as part of this assessment include:

- Sydney Park
- Service Station (2 Princes Highway, St Peters).

If present within and/or adjacent to the construction footprint, landfill gas / hazardous ground gas could accumulate within below ground excavations and enclosed structures associated with the site at concentrations which could represent an asphyxiation or explosion risk.

Landfill / ground gas may also cause odour issues that can affect stakeholders in areas surrounding the site. This may be particularly prevalent during construction stage, during the excavation of waste materials.

9.1.4 ASS

ASS risks (acidification and contaminant mobilisation) could be encountered in the eastern section of Sydney Park Road (mapped as having the potential to contain Class 3 ASS) during the following construction works:

- any works which extend beyond one metre below natural ground surface or that could lower the water table beyond one metre below natural ground surface
- any works which could lower the water table below one metre AHD on adjacent Class 3 areas.

Construction activities as detailed above could results in the oxidation of potential ASS (where present) which could cause acidification and increased mobilisation of contamination (namely heavy metals). Should ASS be identified, these materials can be managed subject to the implementation of appropriate management measures.

9.2 Operation

9.2.1 Contamination – soil

The results of this assessment have identified areas across the site which have a moderate to high potential for contamination impact as a result of historic landfilling/filling activities, commercial/industrial use and degradation of hazardous building materials from structures on and/or adjacent to the site. These materials have the potential to impact site users, site staff, the general public, and local ecology through direct exposure if they remain on-site or have migrated from the site as part of operation if appropriate management and mitigation measures are not adopted as part of the design, construction and ongoing operation.

The site is proposed to be operated as roadways and pedestrian access. The proposed use of the site is unlikely to cause soil contamination.

9.2.2 Contamination – groundwater

The site is proposed to be operated as roadways and pedestrian access. The proposed use of the site is unlikely to generate groundwater or cause groundwater contamination.

9.2.3 Contamination – vapour and gas

Impacts from ground gas / vapour to the operation of the site may include the following:

- Accumulation of hazardous / explosive gases within below ground structures (e.g. service trenches and pit) which could create potential explosion / asphyxiation risks.

Although not associated with the operation of the project, potential vapour and landfill gas sources are present adjacent to the site which could accumulate in sub-surface features constructed as part of the proposal. Potential vapour and landfill gas sources identified as part of this assessment include:

- Sydney Park
- Service Station (2 Princes Highway, St Peters).

9.2.4 ASS

The site is proposed to be operated as roadways and pedestrian access. The proposed use of the site is unlikely to expose ASS.

9.3 Cumulative impacts

Potential cumulative impacts from contamination have been assessed in consideration of the interaction with other projects within the local area that would increase, decrease and/or alter potential contamination impacts to common human and/or environmental receptors.

Cumulative impacts would be dependent on a variety of factors including the presence of contamination and the type of potentially affected media (e.g. soil, groundwater), the nature and timing of construction disturbance (associated with the site and other projects), as well as complete exposure pathways for contamination to human and/or environmental receptors.

Contamination impacts from individual projects, prior to appropriate typical mitigation measures being implemented could include (but are not limited) to the following:

- Excavation activities and liberation of contamination (as dust or fibres) which could deposit on adjacent land and be transported by surface water flows to surrounding areas
- Odours/vapours detectable at site boundaries
- Accumulation of gas within below ground structures and low-lying land form features on adjacent land.

It should be noted that contamination is reported as a concentration (e.g. mg/kg, µg/L, g/m^3) and not as mass. As such, the measurement of contamination from multiple sources at a receptor is not compounded, rather it would be reported as an average concentration. If contamination is not migrating from source sites at concentrations above criteria protective of receptors, then the cumulative contamination from the source sites is unlikely to impact upon that receptor.

Management of contamination associated with the construction and operation of the proposal and construction and operation of other projects would need to be undertaken in accordance with the following legislation (where triggered):

- CLM Act – Sites containing existing contamination and sites that have been contaminated by future operations where the contamination is deemed significant enough to warrant regulation by the regulator (NSW EPA)

- POEO Act – Establishes the NSW environmental regulatory framework and includes a licensing requirement for certain activities to control the localised, cumulative and acute impacts of pollution in NSW.

In consideration of the construction of the site, with the exception of the use and storage of chemicals associated with construction activities (e.g. fuels and oils associated with the operation of plant and equipment), the construction activities associated with the site are unlikely to represent a significant source of contamination. Management measures associated with the use and storage of chemicals during construction activities would be detailed in the respective construction environmental management plans and implemented by the contractor.

There are unlikely to be cumulative contamination impacts associated with the operation of the site.

It is envisaged that contamination sources associated with the construction and operation of other projects would also be managed in accordance with appropriate construction environmental management plans (including appropriate licensing requirements to meet legislative obligations under the POEO Act, where applicable).

Any new projects to be undertaken within the vicinity of the site would need to undertake contamination investigations to assess the suitability of the site/s for the proposed land use. Where contamination is identified, it would need to be remediated to remove or suitably reduce the exposure to human and/or environmental receptors in accordance with the legislative requirements of the CLM Act. Both the management of contamination sources during construction and operation of these projects and remediation works to render the proposal suitable for use is unlikely to increase potential cumulative impacts from contamination exposure to common receptors (i.e. unlikely that cumulative impacts would arise).

10. Mitigation and management measures

Based on the information reviewed, the potential AEIs with respect to contamination and ASS identified could pose (without appropriate mitigation, management and safeguard measures) a risk to human and/or environmental receptors. This is due to the diverse nature of the potential contamination (including asbestos), the possible migration pathways, potential presence of ASS in construction extents, proposed construction activities and the proximity and location of these AEIs in relation to the proposal and environmental receivers.

The risk (time and financial) of contamination and ASS impacting upon construction activities could increase if excavation works take place within these areas. The risk (human health and environmental) of exposure to site users, site workers and surrounding environments, and the migration of contamination (if present), could also be increased.

10.1 Construction

Based on the assessed level of potential contamination impact to construction, a range of mitigation and management measures have been developed in order to manage potential contamination during construction. These have been termed mitigation measures C1 to C5 and are listed in Table 10-1.

Construction at the site would be managed in accordance with a soil and water management plan (SWMP). The management of landfill gas and vapours (where present) during construction will also need to be detailed in the SWMP. The SWMP includes the implementation of an unexpected finds procedure.

For sites that have been assessed to have a moderate to high contamination impact potential, mitigation measures will need to be implemented. The type of mitigation measures and appropriate management actions (where required) would be dependent on the outcomes from further investigations.

Table 10-1 Summary of mitigation and management measures for potential construction impacts

Ref	Mitigation measure	Application location(s)[1]
C1	For areas that have been identified as having moderate or high contamination impact potential, a further review of data would be performed (where relevant information is available). Should the additional data review confirm that contamination is likely to have a very low or low impact potential, the areas would then be managed in accordance with the Soil and Water Management Plan. This would typically occur where there is minor, isolated contamination that can be readily remediated through standard construction practices such as excavation and off-site disposal.	Areas within and adjacent to Sydney Park Service Station (2 Princes Highway)
C2	If available and where data from the additional data review (C1) is insufficient to understand the impact of contamination, a Detailed Site Investigation (Stage 2 assessment) would be carried out in accordance with the NEPM (2013) and other guidelines made or endorsed by the NSW EPA. The areas requiring Detailed Site Investigation would be confirmed following the additional data review (C1), however on the basis of the Stage 1 assessment, it is anticipated that DSIs could be required in some selected areas.	Areas within and adjacent to Sydney Park Service Station (2 Princes Highway)
C3	Where data from additional data review (C1) or the Detailed Site Investigation (C2) confirms that contamination would have a moderate to very high risk, a Contamination Management Plan (CMP) would be developed for the area of the construction footprint. The CMP would detail the management works required to mitigate impacts from contamination throughout and following completion of construction. The CMP would be prepared in accordance with relevant NSW EPA guidelines and where applicable, detail management methodologies in accordance with Australian Standards and other relevant government guidelines and codes of practice. Management would be performed as an integrated component of construction and to a standard commensurate with the proposed end use of the land. The requirements for a CMP and management would be confirmed following the additional data review (C1) and Detailed Site Investigation (C2).	Dependent on outcomes of the C1 and C2 assessments

Ref	Mitigation measure	Application location(s)[1]
C4	Where contamination is highly complex, such as where there is significant groundwater contamination; contamination that requires specialised remediation techniques; or contamination that requires ongoing active management during and beyond construction, an accredited Site Auditor may need to be engaged to review and approve the RAP and remediation activities and to develop a Site Audit Statement (SAS) and Site Audit Report (SAR) upon completion of management acitivities. The requirement for auditor involvement would be confirmed following the completion of the Detailed Site Investigation (C2) and prior to the preparation of the CMP (C3).	Dependent on outcomes of the C1, C2 and C3 assessments
C5	Information about any areas where contamination remains after construction would be documented in an appropriate form and implemented for any areas where minor, residual contamination remains following construction.	Dependent on outcomes of the C1-C4 assessments

It should be noted that the appropriate management measures and/or remediation for soil, groundwater and ground vapour and gas as part of construction of the site can only be determined based on the results of additional information reviews and investigations, which should be completed to inform the design and the commencement of construction.

Stormwater relocation works are likely to involve excavation of more than one meter below natural ground surface, therefore an ASS management plan would need to be prepared and implemented in accordance with the requirements of the ASSMAC (1998) guidelines (as per Figure 4-1). All other construction activities on the eastern portion of the proposal are unlikely to lower the water table beyond one meter below natural ground surface, or below one metre AHD for areas adjoining the proposal, however, if this does occur then an ASS management plan would be needed for these areas and activities.

10.2 Operation

Information about any areas where contamination remains after construction would be documented in an appropriate form and provided to the relevant council for potential inclusion into the OEMP. This would include areas where the potential for vapour and ground gas emissions remains.

11. Conclusions and recommendations

Jacobs has undertaken a Stage 1 contamination assessment of the proposed Sydney Park Junction proposal as part of key deliverables and scope to inform a REF.

The Stage 1 contamination assessment has included a review of desktop information, a site inspection, an assessment of potential areas and sources of on-site and off-site contamination, an assessment of the potential impacts to human health and the environment from exposure to contamination during construction / operation of the site, potential mitigation / management measures, and recommendations for further investigations where necessary.

The findings of this contamination assessment have identified a moderate to high potential for on-site contamination as a result of extensive historic landfilling/filling activities, brick making and associated structures (degradation of hazardous building materials) and current (service station) land use.

On-site soil and ground gas contamination if exposed during construction activities and long-term operation of the site could impact upon human health and environmental receptors if appropriate management / remediation measures are not adopted in response to contamination risks.

To quantify the potential contamination impacts identified, the following is recommended:

- For areas that have been identified as having moderate or high contamination impact potential, a further review of data would be performed (where relevant data is available)
- If available and where data from the additional data review is insufficient to understand the impact of contamination, a Detailed Site Investigation would be carried out in accordance with the NEPM (2013) and other guidelines made or endorsed by the NSW EPA.

If construction activities extend beyond one meter below natural ground surface or lower the water table beyond one meter below natural ground surface within the eastern portion of the proposal or lower the water table below one metre AHD in areas adjoining the proposal, an ASS management plan will need to be prepared in accordance with the requirements of the ASSMAC (1998) guidelines and implemented.

12. References

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Appendix A. Site photographs

Location	Reference Photo Plate
Within Sydney Park (corner of Sydney Park Road and King Street)	Photograph 1 - Brick kilns and stacks 
Foundation excavations for timber bollards within Sydney Park (adjacent to Sydney Park Road)	Photograph 2 – Landfill wastes 

Location	Reference Photo Plate
Western portion of Sydney Park Road	Photograph 3 – Substation 
Eastern portion of Sydney Park Road	Photograph 4 – TransGrid Yard 

Location	Reference Photo Plate
Carpark areas within Sydney Park	Photograph 5 - Carpark areas and associated structures 
Corner of Goodsell Street and King Street	Photograph 6 - Industrial workshop (Cheapest Load of Rubbish) 

Location	Reference Photo Plate
Corner of Princes Highway and Barwon Park Road (2 Princes Highway)	Photograph 7 – Service station 
Princes Highway (South of 2 Princes Highway)	Photograph 8 - Chamber substation (Sydney County Council Electric Substation No. 549) 

Location	Reference Photo Plate
Motociclo and Graeme Cooper Automotive (Princes Highway)	Photograph 9 - Mechanical workshops