



Douglas Partners

Geotechnics | Environment | Groundwater

Report on
Detailed Site Investigation

Parramatta Leagues Club Hotel
1 Eels Place, Parramatta

Prepared for
APP Corporation Pty Ltd

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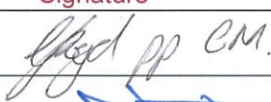

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Executive Summary

This report presents the results of a detailed site investigation (DSI) undertaken by Douglas Partners Pty Ltd (DP) for the Parramatta Leagues Club Hotel at 1 Eels Place, Parramatta (the site). The investigation was commissioned in an email dated 19 October 2018 by Mr Thomas Gould of APP Corporation Pty Ltd on behalf of Parramatta Leagues Club (PLC) and was undertaken in accordance with DPs proposal NWS180079.P.001.Rev2 dated 11 October 2018.

It is understood that the DSI is required to support a development application for the site. Plans provided by the client indicated that the proposed development will include the construction of a new 17 storey hotel with a single level basement. Bulk excavation is expected to be required to a maximum depth of approximately 3.5 m within the basement footprint.

Previous investigations by EIS had indicated asbestos, potentially friable, was present in fill material on-site.

The investigation included a review of previous investigations carried out on the site, a desktop review of the site history, the drilling of five boreholes, the installation of three groundwater monitoring wells, laboratory testing and reporting.

The site history review identified that the site has a history of open space recreation since prior to 1943 to prior to 1965 when the site's commenced land use as a car park. The surrounds have a history of commercial, recreational and residential land use activities since prior to 1943 up to present day.

Based on the site history and previous information a preliminary conceptual site model was prepared which identified potential contamination sources such as hazardous building materials, car park related activities, imported fill, off-site petrol station and dry cleaners.

The intrusive investigation indicated that the site is underlain by filling and natural soils to depths between 3.0 m and 4.8 m and then bedrock which progressively increases in strength with depth. Groundwater was not recorded in the monitoring wells (i.e. below RL 8.5 m AHD).

The chemical and asbestos analysis indicated the following:

- Samples analysed for BTEX, OCP, OPP, phenols, PCB and PAH were below the site assessment criteria (SAC). All samples recorded metals concentrations below the SAC except for some exceedances of the Ecological Investigation Limits for copper and nickel.
- Trace asbestos was reported at one location in the fill.
- Soils were tested for Acid Sulfate Soils (ASS). The soils were not ASS but were acidic.

The investigation has identified asbestos and elevated nickel in the fill. These potential areas of environmental concern will need to be managed during the development of the site.

The fill at the site classifies as Special (Asbestos) Waste – General Solid Waste (non-putrescible) and the natural soils, which are acidic, have been preliminarily classified as General Solid Waste.

Further investigation of groundwater at the site is not required unless plans for development change to extend beyond the proposed 3.5 m depth.

It is recommended that a remediation action plan (RAP) is prepared with reference to NSW OEH, *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites* (OEH, 2011). The RAP should include:

- Assessment and management of the extent of asbestos impacted filling;
- Assessment and management of filling to remain on site;
- Assessment and management of acidic soils; and
- An unexpected finds protocol to manage contamination encountered during the works.

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Report on Detailed Site Investigation

Parramatta Leagues Club Hotel

1 Eels Place, Parramatta

1. Introduction

This report presents the results of a detailed site investigation (DSI) undertaken by Douglas Partners Pty Ltd (DP) for the Parramatta Leagues Club Hotel at 1 Eels Place, Parramatta (the site). The investigation was commissioned in an email dated 19 October 2018 by Mr Thomas Gould of APP Corporation Pty Ltd on behalf of Parramatta Leagues Club (PLC) and was undertaken in accordance with DPs proposal NWS180079.P.001.Rev2 dated 11 October 2018.

It is understood that the DSI is required to support a development application for the site. Plans provided by the client indicated that the proposed development will include the construction of a new 17 storey hotel with a single level basement. Bulk excavation is expected to be required to a maximum depth of approximately 3.5 m within the basement footprint.

Investigation was required to supplement previous contamination investigations undertaken by Environmental Investigation Services (EIS), and included a review of previous reports, intrusive investigations and the installation of groundwater monitoring wells. The details of the review and field work are presented in this report, together with comments and recommendations related to potential contamination at the site.

The Secretary's Environmental Assessment of Requirements (SEARs) for the preparation of an Environmental Impact Statement (Application Number SSD8800 dated 6 November 2017) includes the following items (no. 1 and 17) that are required to be referenced:

1. Environmental Planning Instruments, Policies and Guidelines

- The relevant statutory provisions contained within the applicable EPIs including:
 - State Environmental Planning Policy (State & Regional Development) 2011
 - State Environmental Planning Policy (Infrastructure) 2007
 - State Environmental Planning Policy No. 19 – Bushland in Urban Areas
 - State Environmental Planning Policy No.55 – Remediation of Land (SEPP55)

17. Contamination

- Provide a detailed assessment of site contamination including information about groundwater and a detailed assessment of the footprint and surrounds of existing buildings and roads following demolition.

This DSI assessment has considered the applicable statutory provisions outlined above and was prepared in reference to the applicable Section 17 requirements.

DP carried out a geotechnical investigation in conjunction with this contamination investigation, the results of which are presented in a separate report (*Report on Geotechnical Investigation, Parramatta*

Leagues Club Hotel, 1 Eels Place, Parramatta, Reference 94523.00.R.001.Rev0 dated November 2018 – DP, 2018).

2. Scope of Work

The scope of work comprised the following:

- Review of the previous EIS reports provided;
- Review of historical information comprising:
 - o Previous reports;
 - o Lotsearch Enviro Professional Report Ref LS004615 EP dated 14 November 2018;
 - o Current and historic titles to identify previous owners that may indicate a potentially contaminating activity; and
 - o Readily available Council records.
- Review of site information, including:
 - o Geological and topographical maps/drawings;
 - o Published maps of acid sulfate soil (ASS) potential; and
 - o Relevant information provided by the client (e.g. survey plans, design plans, etc.);
- A site walkover to observe situations that indicate a potential for contamination and identify environmental receptors;
- Preparation of a preliminary conceptual site model (CSM);
- Drilling of three boreholes;
- The collection of samples for chemical and asbestos analysis from each borehole from the near surface, at 0.5 m depth in fill at one location, and samples from the underlying clays at regular 0.5 m depths to a maximum depth of 2.0 m;
- Screening of all samples collected with a photo-ionisation detector (PID) to assess the likely presence or absence of volatile organic compounds;
- Field screening of selected samples for Acid Sulfate Soils (ASS);
- Analysis of selected soil samples for one or more of the following common contaminants at a NATA accredited laboratory:
 - o metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, zinc);
 - o total recoverable hydrocarbons (TRH);
 - o monocyclic aromatic hydrocarbons (benzene, toluene, ethylbenzene and xylenes–BTEX)
 - o polycyclic aromatic hydrocarbons (PAH);
 - o total phenols;
 - o organochlorine pesticides (OCP);
 - o organophosphorus pesticides (OPP);

- o polychlorinated biphenyls (PCB);
- o asbestos in fill (500 ml soil samples); and
- o SPOCAS testing of two samples for Acid Sulfate Soils
- Field sampling and laboratory analysis in compliance with standard environmental protocols, including a Quality Assurance / Quality Control (QA / QC) plan consisting of 10 % replicate sampling, trip spikes, trip blanks, appropriate Chain of Custody procedures and in-house laboratory QA / QC testing; and
- The installation and monitoring of groundwater wells in each of the boreholes following drilling.

3. Site Information

The site information is presented in Table 1, below.

Table 1: Site Identification

Item	Description
Site Address	1 Eels Place, Parramatta
Legal Description	Part Land Crown Plan 80-3000
Area	Approximately 0.3 ha
Zoning	RE2 Private Recreation
Permitted with Consent	Boat launching ramps; Boat sheds; Building identification signs; Business identification signs; Charter and tourism boating facilities; Centre-based child care facilities; Community facilities; Emergency services facilities; Entertainment facilities; Environmental facilities; Environmental protection works; Flood mitigation works; Function centres; Information and education facilities; Jetties; Kiosks; Markets; Recreation areas; Recreation facilities (indoor); Recreation facilities (major); Recreation facilities (outdoor); Registered clubs; Respite day care centres; Restaurants or cafes; Roads; Take away food and drink premises; Tourist and visitor accommodation; Water recreation structures; Water recycling facilities
Local Council Area	Parramatta City Council

The site comprises an on-grade asphalt car park with marked parking bays. The site is relatively flat and is bounded by the following:

North East – Parramatta Leagues Club

North West - Parramatta Leagues Club multi-storey parking;

South East – The Ross Street Gatehouse and a grassed access way to the adjacent O’Connell Street;

South – Parramatta Stadium; and

West – Open space associated with Parramatta Stadium beyond which is the Parramatta River

4. Proposed Development

Following a review of client supplied return brief for the proposed development¹, plans provided indicate that the proposed development will involve the construction of a 17 storey hotel building with a single level basement. The building footprint extends beyond the basement footprint on its western side. Additional fill material will be required on the western side to build up existing ground surface levels to the underside of the floor slab.

From information provided, the basement floor level is at RL 10.0 m AHD, lower ground floor is at RL 12.35 m AHD and upper ground floor at RL 13.8 m AHD. Based on these levels bulk excavation to depths in the order of 3.5 m is proposed. The basement footprint is not expected to extend to the site boundaries. The basement will include car parking, storage, locker rooms and laundry facilities.

The layout of the development is shown on Drawing 1.

The development is further understood to include the upgrade of existing areas surrounding the proposed hotel building to integrate with existing infrastructure.

5. Previous Reports

Several previous reports have been undertaken on a larger area which encompasses the current site. DP's review of these reports has focussed on the results relevant to the current site.

Three previous reports undertaken on the larger area of the site were provided for review by the client as below:

- i) EIS - *Report to Parramatta Leagues Club, Preliminary Environmental Site Assessment for a Proposed Multistorey Car Park at Parramatta Leagues Club, O'Connell Street, Parramatta NSW*, REF: E28152KHrpt, 18 March 2015 (EIS, 2015a);
- ii) EIS - *Report to Parramatta Leagues Club, Stage 2 Environmental Site Assessment for a Proposed Multistorey Car Park at Parramatta Leagues Club, O'Connell Street, Parramatta NSW*, REF: E28152KHrpt2, 9 July 2015 (EIS, 2015b);
- iii) EIS - *Report to Parramatta Leagues Club, Asbestos Management Plan for a Proposed Multistorey Car Park at Parramatta Leagues Club, O'Connell Street, Parramatta NSW*, REF: E28152KHrpt4 AMP, 2 September 2015 (EIS, 2015c);

¹ Hassell, Parramatta Leagues Club, Hotel Development, Return Brief, Rev2, dated June 2018

- iv) EIS - *Report to Parramatta Leagues Club, Remediation Action Plan for a Proposed Multistorey Car Park at Parramatta Leagues Club, O'Connell Street, Parramatta NSW*, REF: E28152KHrpt3-RAP-rev1, 14 October 2015 (EIS, 2016);

A summary of the findings of these investigations is included below. Relevant results have been included within the assessment of this site.

5.1 EIS (2015a)

EIS previously conducted a preliminary environmental site assessment (PESA) for an area to the northwest of the site which included the recently constructed multi-story car park. The EIS (2015a) investigation boundary encroached onto the northwest of the site.

EIS (2015a) included a review of 1943 and 2011 historical aerial photographs, a site inspection and sampling and analysis from five boreholes, two of which (BH4 and BH5) were located in the current site boundary.

The key findings of EIS (2015a) were as follows:

- The historical investigation indicated that the site land use comprised a park prior to 1947, with the land use changing to a car park prior to 2015. No other historical information was provided;
- Fill extended to a depth of approximately 0.5 m in the current site;
- Results of chemical analysis reported no exceedances of the following contaminants of potential concern (COPC): TRH, PAH, BTEX, OPP, OCP and PCB;
- Two nickel exceedances of the ecological criteria was reported at BH4/0.1-0.2 and BH5/0.1-0.2;
- Fill in BH1 (outside the current site boundary) contained traces of ash in fill and asbestos was detected at between 2.5 m and 2.8 m below ground level (bgl) in the form of fibre cement fragments. The fill was considered likely to be backfill associated with the nearby sewer;
- Data gaps were identified and it was indicated that further assessment of fill, including the extent of asbestos would need to be assessed.

5.2 EIS (2015b)

A stage two environmental site assessment was carried out on a larger area covering the EIS (2015a) site to the northwest and the current site, and included the drilling of boreholes, sampling and analysis.

For a 12,500m² site a minimum of 23 sampling points are recommended (NSW EPA Contaminated Sites Sampling Design Guidelines, 1995). This investigation included the drilling of 18 boreholes, seven of which (BH101, BH111, BH114 to BH118) were located in the current site boundary. The investigation also included the results of the five boreholes drilled previously as part of EIS (2015a). The total density (23 locations) met the minimum sampling density recommended.

The following discusses the findings of EIS (2015b) relevant to the site.

Intrusive Investigations

- Pavement /asphaltic concrete was reported up to 0.1m bgl;
- Fill was reported beneath pavement in all boreholes and generally extended to depths of between 0.2 m and 0.5 m bgl;
- Natural soils were encountered to depths of approximately 5.0 m to 5.8 m bgl; and
- Bedrock (sandstone bedrock) was encountered to a maximum depth of 9.58 m bgl.

Groundwater

- Groundwater monitoring wells were installed in BH1 and BH4 (with BH4 located within the current site area). The standing water levels (SWLs) were measured at 3.63 m and 4.98 m bgl in the monitoring wells, respectively.

Laboratory Testing

- Soil and groundwater samples were tested for a suite of common contaminants;
- Heavy metals, BTEX, PAH, OCP, OPP and PCB results were below adopted health site assessment criteria;
- Several nickel and copper results were above the adopted ecological site assessment;
- Asbestos was detected in a fill sample from BH101. The fragment at BH101 (weighing 3.22 g) was reported in fill 0.3-0.5 m bgl adjacent to a sewer and was reported as potentially friable. A fragment of ACM was present on the ground surface, near BH104 (outside the site boundary); and
- There were exceedances of nickel and zinc in the groundwater samples.

CSM

The CSM identified fill (in particular deep fill in the western section of the EIS (2015b) site and hazardous building materials (from previously demolished buildings) to be potential sources of contamination.

Recommendations

EIS (2015b) highlighted the following data gaps:

- The horizontal extent of asbestos contamination has not been adequately addressed, however, it was considered that contamination likely extends over the whole of the larger site;
- The nature of the asbestos encountered has not been confirmed, however, indicated the potential for friable material due to presence of 'loose fibre bundles'.

EIS considered the larger site could be made suitable for the car park development provided that the below recommendations were carried out and data gaps were closed out to mitigate further risks:

- Prepare a remediation action plan (RAP);
- Prepare an asbestos management plan (AMP);
- Prepare a validation assessment; and
- Prepare an environmental management plan (EMP).

5.3 EIS (2015c)

The AMP was prepared to outline procedures to be undertaken to remediate and/or manage the asbestos contamination identified previously in EIS (2015b).

Key findings are listed as below:

- Asbestos was detected in fill samples from BH1, BH101 and BH104 and in a fragment obtained from the ground surface in the vicinity of BH104;
- It was concluded that the asbestos contamination is confined to the fill on the larger site and that due to the heterogeneous nature of asbestos contamination in the fill material, no distinct hotspots could be identified at the larger site. Thus, all fill material in the proposed development area was considered to be contaminated and should be treated accordingly.

DP notes that there was no recommendation to attempt to delineate the asbestos contamination.

5.4 EIS (2016)

The RAP was prepared to identify potential remediation options, outline the remediation procedures, and validation sampling and analysis plan for the remediation work based on the results of EIS (2015a) and EIS (2015b).

As per EIS (2015c), all fill at the site was considered to be impacted with asbestos, with remediation options comprising either (i) off-site disposal, or (ii) on-site capping.

Considering no excavations for the proposed development were planned at that stage, it was considered that capping of the site (with hardstand and soil materials) was the most appropriate remediation method.

6. Environmental Setting

6.1 Topography

Based on the elevation contours provided in the Lotsearch Enviro Professional Report Ref: LS004615 EP, dated 14 November 2018, 1 Eels Place, Parramatta, (the Lotsearch report) p. 63, Appendix C the

regional topography comprises undulating, low-lying rounded hills with elevations to 40 m and 30 m Australian Height Datum (AHD) northeast and west of the site (respectively) sloping south and towards the Parramatta River. Areas to the north, east and south of the site are relatively level.

Based on the Lotsearch Report the site topography is relatively level at approximately 12 m AHD.

Table 2 below provides additional relevant information pertaining to the site.

Table 2: Summary of available information from Lotsearch Report

Topographic Feature	Comments
Point of Interest	Lotsearch (p. 56, Appendix C) identified 117 points of interest within 1 km of the site including schools, parks, historic sites and monuments. No identified points of interest are considered to warrant further consideration.
Tank Areas	No tank areas were identified within 1 km of the site.
Tank Points	No tank points were identified within 1 km of the site.
Major Easements	Four major easements are reported within 1 km of the site, but none within 500 m of the site. These easements are not considered to warrant further consideration
State Forests/ National Parks and Wildlife Service Reserves	No State Forests or National Parks and Wildlife Service Reserves are located within 1 km of the site.

6.2 Site Geology

Reference to the Lotsearch Report (pp. 70 to 76, Appendix C) indicates that the site is underlain by residual soil of the Lucas Heights residual Landscape Group. The Lucas Heights Group is characterised by stony soils of low fertility and low water capacity.

Reference to the Lotsearch Report indicates that the site is underlain by Ashfield Shale of the Wianamatta Group. Ashfield Shale typically comprises dark grey to black shale, siltstone and laminate which weathers to a residual clay profile of medium to high plasticity.

6.3 Acid Sulfate Soils

Reference to the Lotsearch Report (pp. 77, Appendix C) indicates that the site is classified as Soil Class 5.

The Parramatta River, located approximately 160 m west of the site classifies as Class 1, with Class 1, 3 and 4 located on a meander bend to the south. As per the Parramatta Local Environment Plan

2011, any works done on a site that is below 5 metres AHD and by which the water table is likely to be lowered below 1 metre AHD on adjacent Class 1, 2, 3 or 4 land, present an environmental risk.

6.4 Other Records

In addition to the above information the following Table 3 summarises the results of searches and data, relating to the environmental setting, acquired from the Lotsearch Report included in Appendix C.

Table 3: Summary of available information from Lotsearch Report

Record / Source of Information	Comments
Naturally occurring asbestos potential	No naturally occurring asbestos potential recorded within in the search buffer (p.72)
Dryland salinity	There are no known dryland salinity issues within the search buffer (p.81)
Dryland salinity potential of western Sydney	Lotsearch (p. 81) indicates site and surrounds is located in an area of moderate salinity potential.
Mining subsidence districts	There are no mining subsidence districts within the search buffer (p.83).
Natural Hazards	The site is not located in an area of Bush Fire Prone Land (p.104).
Ecological Constraints	No ecological constraints are reported for the site or within 100m of the site (p. 106). Cumberland Riverflat Forest is located 140 m west of the site.

6.5 Groundwater and Surface Water

Reference to the Lotsearch Report (p. 65 Appendix C) indicates that there are five registered groundwater bores within 1 km of the site and twenty one within 2 km of the site. The five groundwater bores from within 1 km of the site are summarised in Table 4. Work summaries for the available bores and the locations are included in the Lotsearch Report.

Table 4: Summary of available information from nearby registered groundwater bores

GW Well ID	Purpose	Bore Depth (m)	Standing Water Level	Salinity	Distance from Site (m)	Direction from Site
GW108611	Domestic	60.5	6.2	Saline	237	Southeast
GW062300	Industrial	100	NA	Fresh	937	North
GW110914	Monitoring bore	6	5	NA	957	East
GW110913	Monitoring bore	10	7	NA	974	East
GW110912	Monitoring bore	10	7	nA	977	East

The closest watercourse is the Parramatta River, located approximately 185 m west of the site. The Parramatta River flows in an easterly direction before discharging into Sydney Harbour approximately 25 km away.

Based on local topography observed from the elevation contours in the Lotsearch Report (p. 63, Appendix C), groundwater is anticipated to flow west and south into the Parramatta River.

The site is located on porous, extensive aquifers of low to moderate productivity (Lotsearch Report p.64, Appendix C).

The site does not fall within the Botany Groundwater Management Zones (Lotsearch Report p. 64, Appendix C).

7. Site History

A site history of the site was conducted to identify potential areas of environmental concern (PAEC) at the site. All PAEC identified during the historical review will be summarised at the conclusion of Section 7.

7.1 Title Deeds

A historical title deeds search was used to obtain ownership and occupancy information including company names and the occupations of individuals. The title information can assist in the identification of previous land uses by the company names or the site owners and can, therefore, assist in establishing whether there were potentially contaminating activities occurring at the site. A summary of the title deeds and possible land uses (with reference to the aerial photographs and other historical searches) is presented in Table 5. A full copy of the search is included in Appendix C.

Table 5: Historical Title Deeds

Date of Acquisition and term held	Registered Proprietor(s) & Occupations where available	Potential Land Use
Prior to 1997	Crown Land - Reserve D500239 known as Parramatta Park also, part Parramatta Domain Act 1857	Recreational – open space
1997 to date	State of New South Wales (Crown Land) - Reservation of Parramatta Regional Park, for the purpose of recreation and enjoyment vide National Parkes and Wildlife Act 1974	Car park

7.2 Historical Aerial Photography

The history of the site's land use and development has been reviewed by reference to historical aerial photographs included in the Lotsearch Report (pp. 41 to 51 - Appendix C). A review of recent Nearmap aerial photographs was also undertaken for January and October 2018 (not provided in this report). The findings of historical and recent aerial photographs are summarised in Table 6 below.

Table 6: Aerial Photograph Review

Year	Site	Surrounding Land Use
1943	The site has been cleared of trees and appears to be grass covered. A track is present leading north to south towards trees beyond the southern boundary	<p>Land to the northwest comprises land mostly cleared of trees and grass covered. Residential properties have are present to the northeast and the Norma Parker Correctional Facility is present to the northwest.</p> <p>A residential property is present immediately east of the site, beyond which is O'Connell street and residential properties.</p> <p>A dirt road lined with trees is present in the south running west from O'Connell Street. Further south an oval has been constructed in the place of the current Parramatta Stadium. The remainder of the south appears grass covered with sparse trees.</p> <p>The land to the west is mostly cleared with patches of trees. A track leading to a crossing at the Parramatta River. A number of tracks are cut across the landscape.</p>
1951	No significant land use changes or site features were observed.	No significant land use changes or site features were observed.
1956	No significant land use changes or site features were observed.	No significant changes were observed with the exception of the construction of addition residential and commercial properties to the north and west, and a rectangular ground disturbance to the northwest.
1961	No significant land use changes or site features were observed with	The PLC has been constructed north of the site. The remainder of the surrounds appear relatively

Year	Site	Surrounding Land Use
	the exception of the construction of rectangular structures in the southwest.	unchanged albeit for the construction of a public pool in the south, and construction of fences surrounding properties to the north.
1965	Although quality of the photograph is poor, erosion, or the application of fill, is observed at the site. It appears that the site may be utilised as a makeshift car park.	No significant changes were observed with the exception of additional development to the PLC.
1970	The eastern portion of the site appears to be now covered with hardstand (potentially asphalt). Marked car spaces are evident in this area. The car park is likely associated with the PLC. The rectangular sheds/temporary structures observed in the previous photographs appear to have been removed.	No significant land use changes were observed with the exception of the demolition of three residential properties southeast of the site and the use of the area immediately north as a car park (likely associated with the PLC). Development of the PLC appears complete.
1982	The entire site now appears to be covered with asphalt and is being utilised as a car park.	No significant land use changes were observed with the exception of the construction of an additional building adjoining the PLC.
1991	No significant land use changes or site features were observed.	The PLC car park has been expanded further west and the land immediately south of the site has been largely cleared of vegetation and is now covered with hardstand (likely asphalt). A new stadium has been constructed in place of the former stadium to the south.
2003	No significant land use changes or site features were observed. The car park appears to have been re-surfaced	No significant land use changes were observed with the exception of the demolition of a building north of the site and an addition constructed on the west of the PLC.
2009	No significant land use changes or site features were observed.	No significant land use changes were observed
2017	Use of the site as a car park has stopped, most likely due to the construction of the adjacent multi-story car park to the west. Soil on the surface in the southwest and north indicates that the site has been utilised for the storage of soil materials.	An additional building has been demolished and replaced with a car park to the north, and the multi-story car park is under construction to the northwest. The previous stadium to the south has been demolished and the construction of a new stadium is underway. Temporary site sheds associated with the construction of the stadium have been erected adjacent to the southern boundary. Stockpiled fill materials (covered with material) are stockpiled west and south of the site.

Year	Site	Surrounding Land Use
January 2018	The site appears to have been either scraped to underlying clays over most of the site, or the site has been covered with soils for the adjacent multi-story car park construction. Stockpiles of material are present.	The surrounds appear similar to the previous photograph with the exception of additional works south of the site (Parramatta Stadium).
October 2018	The soils observed in the previous photograph site appears to have been cleared and the site appears to have been re-surfaced.	The surrounds appear similar to the previous photograph with the exception of additional works south of the site (Parramatta Stadium).

7.3 Historical Maps

A review of historical maps from 1917-1929, 1936-1945, 1975 and 2015 presented in the Lotsearch report (P. 53-55 - Appendix C) indicate that the site and its immediate surrounds land use have not changed significantly during the years provided with street alignments and lots remaining relatively unchanged.

7.4 Historical Business Activities

A review of the UBD Business to Business directory, reported in the Lotsearch report (pp. 19 to 40 - Appendix C) was conducted. A summary of the local businesses reported in the Lotsearch Report, which are considered to be moderate to high risks of contamination (i.e. on site or off site with mobile contaminants e.g. dry cleaners service stations etc.), is presented in Table 7.

Table 7: Summary of Historical Business Activities

Directory (year)	Business Activity	Location Relative to Site
1961 and 1965	Motor garage/engineers and/or service station	256 m east
	Dry cleaners	317 m east
1965	Motor garage/engineers and/or service station	344 m east
1961 and 1965	Motor garage/engineers and/or service station	376 m southeast
1950	Motor garage/engineers and/or service station	377 m east
1978	Motor garage/engineers and/or service station	391 m east
1961, 1965, 1970 and 1975	Motor garage/engineers and/or service station	394 m east
1975	Motor garage/engineers and/or service station	395 m east
1965 and 1975	Motor garage/engineers and/or service station	397 m east
	Dry cleaners	
1970	Motor garage/engineers and/or service station	401 m east

Directory (year)	Business Activity	Location Relative to Site
1950	Dry cleaners	404 m east
1950, 1961, 1965	Motor garage/engineers and/or service station	418 m southeast
1961, 1965, 1970, 1975 and 1978	Motor garage/engineers and/or service station	421 m northeast
1950	Dry cleaners	438 m southeast
1970, 1975 and 1978	Motor garage/engineers and/or service station	461 m northeast
1950, 1961, 1965, 1970, 1975, 1978, 1982 and 1986	Motor garage/engineers and/or service station	484 m southeast
1961	Motor garage/engineers and/or service station	495 m southeast
1965	Motor garage/engineers and/or service station	498 m southeast
1965, 1970, 1975 and 1978	Motor garage/engineers and/or service station	109 m*
1961	Motor garage/engineers and/or service station	345 m*
1965	Motor garage/engineers and/or service station	444 m*
2978 and 1986	Motor garage/engineers and/or service station	456 m*

*Mapped to an area within the 500 m buffer zone. Records are mapped to the road when a building number is not supplied, cannot be found, or the road has been renumbered since the directory was published

7.5 Current Local Business Activities

A summary of the local businesses discovered during an internet search, which are considered to be moderate to high risks of contamination (i.e. on site or off site with mobile contaminants e.g. dry cleaners service stations etc), is as follows:

- BP Service Station located approximately 400 m northeast of the site;
- Refresh Dry Cleaners located approximately 500 m southeast of the site;
- Lawrence Dry Cleaners located approximately 800 m northeast of the site; and
- The Dry Cleaners on George located approximately 900 m southeast of the site.

7.6 NSW EPA Information

The following sections summarise the results of searches and data acquired from the Lotsearch Report included in Appendix C.

7.6.1 Contaminated Sites Notified to EPA

A search of the public database undertaken in the Lotsearch Report indicated that the site was not listed as a contaminated site under the Contaminated Land Management Act 1997 (CLM Act). It is

noted that there were three sites currently listed as contaminated sites located within 1 km of the site. The sites are outlined in Table 8 below and are shown in the Lotsearch Report (pp. 8, Appendix C).

Table 8: Contaminated Sites as Currently Listed by the EPA within 1 km of the Site

Site	Address	Activity	Management Class	Distance and Direction from Site
BP Service Station	435 Church Street, Parramatta	Service Station	Regulation under CLM Act not required	397 m northeast
Coleman Oval Embankment	CNR Pitt Street and Macquarie Streets, Parramatta	Unclassified	Regulation under CLM Act not required	500 m northwest
Parramatta Park Toilet Block Demolition	The Crescent Toilet Block, Parramatta Park	Unclassified	Regulation under CLM Act not required	560 m southwest

7.6.2 Other Sites with Contamination Issues Notified to EPA

Additionally, the EPA maintains a list of other sites with contamination issues. These are provided in Table 9 below.

Table 9. Other Sites with Contamination issues within 1 km of the Site

Site	Address	Data Set	Current Land Use	Approximate Distance and Direction from Site
Cumberland Oval	O'Connell Street, Parramatta	James Hardie Asbestos Waste Sites	Parramatta Stadium Parramatta Pool	140 m southwest
Catt & Goldsmith Pty Ltd site	Victoria Rd, Parramatta	James Hardie Asbestos Waste Sites	Commercial site Possibly a timber yard.	231 m east
Parramatta showground	Old Windsor Rd, Westmead	James Hardie Asbestos Waste Sites	Parramatta hospital being constructed on site	970 m west

7.6.3 Contaminated Land: Record of Notices

The search found that no sites had a Record of Notice within the 1 km of the site. It should be noted that the EPA record of Notices for contaminated land does not provide a record of all contaminated land in NSW.

7.6.4 Other EPA Records

There were no former gasworks or sites on the National Waste Management Site Database located within the 1 km dataset buffer of the site (p. 9, Appendix C).

7.6.5 EPA Activities

The NSW EPA also issues environmental protection licenses under section 308 of the *Protection of the Environment Operations Act 1997* (POEO Act). The register contains:

- Environmental protection licenses;
- Applications for new licenses and to transfer or vary existing licenses;
- Environment protection and noise control licenses;
- Convictions in prosecutions under the POEO Act;
- The result of civil proceedings;
- License review information;
- Exemptions from provisions of the POEO Act or Regulations;
- Approvals granted under Clause 9 of the POEO (Control of Burning) Regulation; and
- Approvals granted under Clause 7a of the POEO (Clean Air) Regulation.

A search of the public register undertaken in the Lotsearch Report indicated that there was one current Environment Protection Licence issued to a site within the 1 km search buffer. This was to Sydney Trains for railway systems activities approximately 816 m southwest of the site (p. 19, Appendix C).

Three delicensed activities were identified within the 1 km search buffer of the site. These were Parramatta Blood Service, Westmead Children's Hospital and Westmead Hospital located 602 m south, 776 m northwest and 955 m west respectively. The activity for each of these sites was Hazardous, Industrial or Group A Waste Generation or Storage.

There were six surrendered licensed activities identified within the 1 km search buffer zone as listed in Table 10.

Table 10: Former (Surrendered) Licensed Activities under the POEO Act 1997 within 1 km of the Site.

Organisation	Location	Activity	Distance and Direction from Site
Parramatta Stadium Trust	O'Connell Street, Parramatta	Miscellaneous licensed discharge to waters (wet weather only)	Immediately adjacent
Luhrmann Environment Management Pty Ltd	Waterways throughout NSW	Non Scheduled Activity - Application of Herbicides	151 m

Organisation	Location	Activity	Distance and Direction from Site
Robert Orchard	Various Waterways throughout Sydney, NSW	Non Scheduled Activity - Application of Herbicides	151 m
Sydney Weed and Pest management Pty Ltd	Waterways throughout NSW	Non Scheduled Activity - Application of Herbicides	151 m
Sydney West Area Health Service	Marsden Park Road, Parramatta	Hazardous, Industrial or Group A Waste Generation or Storage	488 m south
Laing O'Rourke Australia Construction Pty Ltd	Within the rail corridor between Hawksbury Rd, Westmead and Marion St, Harris Park, Parramatta	Railway systems activities	808 m southwest

The EPA activities search results are presented on pages 7 to 17 of the Lotsearch Report, Appendix C. Considering the proposed development comprises a hotel, the activities discussed above are not considered to be a matter for concern and as such, are not discussed further.

7.6.6 EPA PFAS investigation programme

A search of the EPA PFAS Investigation Program undertaken in the Lotsearch Report found no sites under investigation within the 1 km search buffer of the site (p. 10, Appendix C).

7.6.7 UPSS Sensitive Zones

Due to the proximity to the Parramatta River the site is located within a UPSS Environmentally Sensitive Zone (p.18, Appendix C).

7.7 SafeWork Search

The paperwork required to conduct a NSW SafeWork Dangerous goods search was not provided in time for reporting.

7.8 Planning Records

7.8.1 Section 10.7 Planning Certificate

A Planning Certificate was not available for the site as it is identified as Crown Land.

7.8.2 Other Records

In addition to the above information the following Table 11 summarises the results of searches and data acquired from the Lotsearch Report included in Appendix C (p.84 to 114).

Table 11: Summary of available information from Lotsearch Report

Record / Source of Information	Comments
State Environmental Planning	The site is not in a coastal protections zone, has no coastal wetlands or no littoral rainforests reported in the 1 km data buffer
Local Environmental Planning	Land zoning in the 1 km data buffer comprises low, medium and high-density residential, mixed use, public recreation, infrastructure, special activities, general industrial and natural waterways.
Heritage	No heritage areas are listed for the site. 23 State Heritage curtilages are within the 1 km data set buffer. There are >150 heritage items located within the 1 km data set buffer.

7.9 Council Records

A request for council records under the informal Government Information (Public Access) Act 2007 was made to Council for records pertaining to the site. At the time of reporting no information had been provided.

7.10 Site Walkover

A site walkover was undertaken on 2 November 2018. The site comprised a car park and the general site topography appeared relatively flat with a slight slope to the south and southwest towards the multi-story car park (refer Photographs 1 and 2 – Appendix D).

The site layout appears to have remained relatively unchanged from the 2018 aerial photograph provided in the Lotsearch report (p.6, Appendix C). No evidence of contamination, such as staining, odours, or presence of fill on the site or immediately adjacent was reported.

7.11 Summary of Identified PAEC

Following a review of the historical information, the following PAEC have been identified:

- PAEC 1 – Temporary structures erected in the southwest of the site; identified in the 1961 aerial photograph;
- PAEC 2 – Car park identified in the 1970 historical photograph;

- PAEC 3 – Potential for construction and demolition waste in the northeast (from construction of the adjacent PLC identified in the 1961, 1965 and 1982 photographs;
- PAEC 4 – Potential imported fill identified in the 1965 aerial photograph;
- PAEC 5 – Current and former dry cleaners within 1 km of the site;
- PAEC 6 – Current and former service stations and mechanics within 1 km of the site;
- PAEC 7 – Contaminated sites within 1 km of the site identified in Section 7.6.1.1;
- PAEC 8 – Other sites with contamination issues identified in Section 7.6.1.2;

8. Preliminary Conceptual Site Model

A preliminary conceptual site model (CSM) is a representation of site-related information regarding contamination sources, receptors and exposure pathways between those sources and receptors. The CSM provides the framework for identifying how the site became contaminated and how potential receptors may be exposed to contamination either in the present or the future i.e. it enables an assessment of the potential source – pathway – receptor linkages (complete pathways).

8.1 Potential Sources

Based on the current investigation and the identified PAEC, the following potential sources of contamination and associated contaminants of potential concern (COPC) have been identified.

Hazardous Building Materials (Potential Source S1)

Structures erected on the site prior to 1961 and construction of the PLC were undertaken during a time when the use of asbestos containing materials were common in construction. Other hazardous building materials (such as lead paint) that may have also been used in construction. Therefore remnant building materials at the site may be a source of contamination. Asbestos was also reported in a test location on site in EIS (2015b).

There is potential for contamination of surface soils in the vicinity of the former structures and land adjacent to the PLC to be impacted by hazardous building material related COPC including:

- Asbestos;
- Lead and zinc.

Car Park (Potential Source S2)

Construction and regrading of the car park occurred on site prior to 1970, 1982 and 1991. Coal tar was often used as a binder instead of bitumen in the 1970s and early 1980s in asphalt mixes. Although the site appears to have been re-surfaced in early 2018, it is unclear if all previous asphalt was removed.

PAH and TRH have also been a source of hydrocarbon contamination to soils underlying asphalt. However, considering EIS (2015a and 2015b) reported TRH and PAH below the criteria, it is

considered unlikely that TRH and PAH contamination is present as a result of the car park, however, there is still the potential for localised contamination

There is potential for contamination of surface soils from related COPC asphalt including:

- TRH and BTEX;
- PAH; and
- Coal tar

Imported Fill (Source S3)

Ground disturbance was observed in the 1965 aerial photograph. It is unclear if the ground disturbance resulted from erosion or was instead fill applied to the site. Considering fill was reported in EIS investigations, it is likely that fill was applied to the site at some stage prior to construction, or during regrading of, the car park. It is not known whether fill materials were sourced from within the site or imported from an off-site source.

There is potential for areas of the site to be impacted from fill and demolition waste related COPC including:

- Heavy metals;
- TRH;
- BTEX;
- PAH;
- PCB;
- OCP and OPP; and
- Asbestos.

DP notes that EIS (2015a and 2015b) reported copper and nickel ecological exceedances and asbestos at the site. Considering no exceedances of the remaining COPC were reported, contamination is considered unlikely, however, there is still the potential for localised contamination.

Off-Site Petrol Station (Potential Source S4)

One current and a number of former petrol stations were reported within 1 km of the site. The current service station is currently listed on contaminated sites notified to the EPA, and the contamination status of previous petrol stations is unknown. Fuel and oil spills from petrol bowsters, USTs and associated infrastructure may result in contamination to the surrounding soils and groundwater in site resultant from the migration of up-gradient contaminated groundwater.

There is potential for contamination of soils and at the site to be impacted by from former and current petrol station related COPC including:

- TRH;
- BTEX;
- Naphthalene;

- Fuel additives including ethanol, methyl tert-butyl ether (MTBE) and lead; and
- Volatile organic compounds (VOCs).

DP notes that EIS (2015b) did not report exceedances of the criteria for TRH, BTEX, or naphthalene in groundwater. Fuel additives and VOC were not analysed.

Off-Site Dry Cleaners (Potential Source S5)

Three current and a number of former dry cleaners are located within 1 km of the site. Sometimes due to improper management and disposal of dry cleaning fluids, contamination to surrounding soils and groundwater may result.

There is potential for contamination of soils and groundwater at the site to be impacted by dry cleaner related COPC including:

- Chlorinated hydrocarbons (eg. Perchloroethylene [PCE] and Trichloroethylene [TCE]);
- Carbon tetrachloride;
- Freon 133;
- Kerosene and mineral spirits; and
- Petroleum based solvents.

These COPC were not analysed by EIS investigations.

8.2 Potential Receptors

Human Health Receptors:

- R1 – Current users and workers (recreation);
- R2 - Construction and maintenance workers;
- R3 – End users and workers (recreational); and
- R4 - Adjacent site users (recreational, commercial and residential).

Environmental Receptors:

- R5 – Surface water (Parramatta River located 160 m west);
- R6 – Groundwater; and
- R7 – Terrestrial ecology.

8.3 Potential Pathways

- P1 – Ingestion and dermal contact;
- P2 – Inhalation of dust and/or vapours;
- P3 - Surface water run-off;

- P4 – Lateral migration of groundwater providing base flow to water bodies;
 P5 – Leaching of contaminants and vertical migration into groundwater; and
 P6 – Contact with terrestrial ecology.

8.4 Summary of Potential Complete Pathways

A 'source–pathway–receptor' approach has been used to assess the potential risks of harm being caused to human or environmental receptors from contamination sources on or in the vicinity of the site, via exposure pathways (potential complete pathways). The possible pathways between the above sources (S1 to S5) and receptors (R1 to R7) are provided in Table 12 below.

Table 12: Summary of Potential Complete Pathways

Source and COPC	Transport Pathway	Receptor	Risk Management Action Recommended
S1: Hazardous Building materials S2: Carpark S3: Imported Fill	P1: Ingestion and dermal contact	R1: Current users and workers	An intrusive investigation is recommended to supplement EIS investigations and assess possible contamination including chemical testing of the soils and groundwater.
	P2: Inhalation of dust and/or vapours	R2: Construction and maintenance workers	
		R3: End users and workers	
	P2: Inhalation of dust and/or vapours	R4: Adjacent site users	
	P3 – Surface water run-off	R5: Surface water	
	P4: Lateral migration of groundwater providing base flow to water bodies		The intrusive investigation and soil testing is included in this report, however, the wells were dry so groundwater testing could not be undertaken,
	P5 – Leaching of contaminants and vertical migration into groundwater	R6: Groundwater	
	P6 –Contact with terrestrial ecology	R7 – Terrestrial ecology	
S4: Off-site Petrol Stations	P1: Ingestion and dermal contact	R1: Current users and workers	
S5: Off-site Dry cleaners	P2: Inhalation of dust and/or vapours	R2: Construction and maintenance workers	
		R3: End users and workers	

9. Assessment Criteria

The Site Assessment Criteria (SAC) applied in the current investigation are informed by the CSM which identified human and environmental receptors to potential contamination on the site (refer to Section 8). Analytical results are assessed (as a Tier 1 assessment) against the SAC comprising primarily the investigation and screening levels of Schedule B1, *National Environment Protection (Assessment of Site Contamination) Measure* 1999, as amended 2013 (NEPC, 2013).

The investigation and screening levels applied in the current investigation comprise levels adopted for a generic commercial / industrial land use scenario. The derivation of the SAC is included in Appendix G and the adopted SAC are listed on the analytical results tables in Appendix H.

10. Fieldwork Methods

The fieldwork included the drilling of three boreholes (BH201 to BH203) using a track-mounted drilling rig using solid flight augers to practical refusal at depths of 3.15 m, 5.4 m and 6.0 m, respectively. The locations of the boreholes were decided by DP and were positioned in locations considered best to determine potential impacts to the development (ie. two in the footprint of the proposed PLC Hotel development [BH201 and BH202] and one at the location of proposed service installation [BH203]).

The boreholes were converted to groundwater monitoring wells at the completion of drilling. The wells involved inserting Class 18 uPVC screen and casing to the required depths, backfilling the screened length with clean sand, plugging the top of the sand with bentonite pellets and backfilling the casing with drilling spoil. The top of the well was finished with a road box mounted flush with the surface.

The AHD ground surface levels at the borehole locations were determined by using a High Precision Differential GPS which is accurate to approximately 0.1 m. The locations of the boreholes are shown on Drawing 1 in Appendix B.

10.1 Soil Sampling Methodology and Rationale

The general sampling procedure adopted for the collection of soil samples is summarised below:

- Collection of the following using disposable sampling equipment (new nitrile gloves for each sample) from the base of the auger:
 - o One soil sample from surface soils (0.1-0.3 m depth) underlying the pavement for chemical and asbestos analysis. Asbestos analysis of soil samples comprised 500 ml samples for asbestos fines/friable asbestos (AF/FA);
 - o One soil sample from fill at 0.5 m for chemical analysis;
 - o Five samples for subsequent ASS analysis; and
 - o Soil samples were also collected at regular depths (i.e. every 0.5 m) to 2.0 m bgl from the underlying clays for chemical analysis. Based on the potential sources of contamination identified in Section 8 this depth of sampling and testing was considered appropriate for this site assessment.

- Transferring chemical samples into laboratory-prepared glass jars, completely filled to minimise the headspace within the sample jar, and capping immediately to minimise loss of volatiles;
- Transferring asbestos samples into new resealable plastic zip-locked bags;
- Transferring ASS samples into new resealable plastic zip-locked bags completely filled to minimise the headspace within the bag;
- Labelling of sample containers with individual and unique identification, including project number, sample location and sample depth;
- Placement of the glass jars and 500 ml asbestos samples into a cooled, insulated and sealed container for transport to the laboratory; and
- Collection of two additional blind duplicates (BD1 and BD2) for QA/QC requirements.

Samples were recorded on a chain of custody form and dispatched to NATA accredited laboratory Envirolab Services Pty Ltd (Envirolab) for analysis of primary samples and intra-laboratory blind duplicate BD1. Duplicate sample BD2 was dispatched to ALS Environmental for QAQC purposes.

11. Fieldwork Observations

The borehole logs from the current investigation are provided in Appendix C. Notes defining classification methods and terms used to describe the soils and rocks are included in Appendix A. Selected photographs are provided in Appendix D). The geotechnical investigation DP (2018) included two cored boreholes (BH201A and BH202A) which were located adjacent to BH201 and BH202 respectively. Soil samples weren't taken from BH201A or BH202A, however, the lithology from these two boreholes has been included in the description of subsurface conditions below,

The subsurface conditions encountered in the current boreholes can be described as:

- | | |
|-----------------|---|
| Pavement: | - Asphaltic concrete (70 mm to 150 mm thick) overlying roadbase gravels to depths ranging between 0.25 m and 0.4 m; |
| Filling: | - Brown and grey silty clay or gravelly sand filling with traces of gravel and sand in BH202, BH201A and BH202A to depths of between 0.4 m and 0.6 m; |
| Natural Soil: | - Typically very stiff or hard, red brown silty clay with traces of gravel. In BH203, clayey silt was encountered below the filling to a depth of 0.8 m and sandy clay was encountered below a depth of 5.5 m; |
| Weathered Rock: | - Extremely and very low strength, orange brown sandstone was encountered in all bores except BH203 at depths of 3.1 m and 4.8 m, respectively. This layer included some high strength iron cemented bands. The thickness of the extremely or very low strength sandstone ranged from 0.6 m to 1.0 m. |

- Medium and High Strength Sandstone (Mittagong Formation): - Medium, medium to high strength and high strength, highly weathered to slightly weathered, slightly fractured to unbroken, fine to medium grained, grey and brown sandstone was encountered below depths of 4.2 m and 5.35 m in BH201A and BH202A.
- High Strength Sandstone (Hawkesbury Sandstone) - High strength, moderately weathered to fresh, slightly fractured to unbroken, brown and grey, medium to coarse grained sandstone at depths of 7.0 m to 7.4 m in BH201A and BH202A.

The results of the PID field screening of samples were below 1 ppm.

No signs of potential contamination, such as staining, odours or anthropogenic material were observed in the boreholes.

Free groundwater was not observed during augering and the use of drilling fluid prevented groundwater observations during rotary drilling and coring. The groundwater wells were measured for groundwater on completion of installation on 2 November 2018 and subsequently on 8 November 2018. The wells were dry on both occasions inferring groundwater levels, at the time of measurement, were below the base of the wells at elevations less than RL 10.5 m, 8.5 m and 7.5 m AHD for BH201, BH202 and BH203 respectively.

Following a review of the available information, conditions encountered during field work were similar to those reported in EIS (2015a and 2015b).

12. Analytical Results

12.1 Chemical and Asbestos Analytical Results

Analytical results for soil samples collected are provided in Tables H1 and H2 (Appendix H) together with the adopted SAC and relevant results obtained in EIS (2015a) and EIS (2015b). Laboratory certificates are provided in Appendix I.

Soil analytical results obtained are summarised below:

- All samples analysed reported BTEX, OCP, OPP phenols and PCB concentrations below the LOR and the SAC;
- All samples analysed reported TRH and PAH concentrations below the adopted SAC;
- All samples analysed recorded metals concentrations below the adopted SAC with the exception of the following:
 - o Copper at BH116/0.07-0.2 (160 mg/kg) exceeded the EIL of 130 mg/kg; and
 - o Nickel at BH111/0.05-0.2 (48 mg/kg), BH115/0.07-0.2 (82 mg/kg), BH116/0.07-0.2 (59 mg/kg), BH117/0.1-0.3 (110 mg/kg) and BH18/0.05-0.2 (120 mg/kg) exceeded the EIL of 45 mg/kg.

- Asbestos was reported at the following:
 - o Trace chrysotile and amosite asbestos was reported in the 50 g sample collected at BH101/0.03-0.15. No concentration was provided; and
 - o AF/FA (0.0068 g) was reported in sample BH202/0.12-0.25. Envirolab calculated the concentration of asbestos in soil as <0.001% w/w i.e. less than the LOR.
- Asbestos was not reported in any other samples analysed for the site.

DP notes that samples collected from the underlying clays for this investigation were not analysed given that no contamination to the overlying fill was reported. However, the underlying materials were sampled in EIS (2015b) in two locations where exceedances were reported in the overlying fill. No exceedances of the underlying clays and silts were reported.

As discussed in Section 11 above. No groundwater was observed in the wells on the two occasions DP visited the site. Therefore no groundwater samples were able to be collected Acid Sulfate Soils

Five samples of the soils recovered from the site were screen tested for ASS potential in a laboratory by carrying out field pH (pH_F) testing and field peroxide pH (pH_{FOX}) testing. This form of testing is indicative only and was used to assist in selecting samples for additional quantitative laboratory testing.

The results are given in Appendix E and are summarised in Table 13.

Table 13: Field ASS pH screening testing

Bore	Material	Sample Depth (m)	pH_F	pH_{FOX}	Reaction Rate
BH201	Silty Clay	0.5 – 0.6	4.8	3.5	Slight
BH201	Silty Clay	2.0 – 2.1	4.9	3.8	Slight
BH202	Silty Clay	1.5 – 1.6	4.6	3.5	Slight
BH202	Silty Clay	3.0 – 3.1	4.8	3.6	Slight
BH203	Silty Clay	2.0 – 2.1	4.4	3.6	Slight

The action criteria for ASS was sourced from the Acid Sulfate Soils Management Advisory Committee Acid Sulfate Soils Assessment Guidelines, 1998 (ASSMAC 1998) and the Queensland Acid Sulfate Soil Technical Manual (QASSIT) for disturbance of more than 1000 tonnes of material. Given the ground conditions encountered on the site the Action Criteria for disturbance of the site clay is as follows in Table 14.

Table 14: ASSMAC Action Criteria

Screening Criteria	Threshold ³	
Laboratory Results pH^A	pH_F	<4 ¹
	pH_{FOX}	<3.5 ²
	Change	>1

- Notes:
- 1 Indicative value only for Actual Acid Sulfate Soil.
 - 2 Indicative value only for Potential Acid Sulfate Soil.
 - 3 ASSMAC and QASSIT Action Criteria for disturbance of more than 1000 tonnes of coarse texture material.

On the basis of the pH results, all sample results were outside the Action Criteria. Two of the samples (BH201 0.5 – 0.6 m and BH202 1.5 – 1.6 m) were on the threshold for pH_{FOX} with values of 3.5

obtained. Based on the results, these samples were further tested for the SPOCAS (Suspension, Peroxide, Oxidation Combined Acidity and Sulfur) suite of tests. The results of SPOCAS testing are included in Table 15 and compared to ASSMAC and QASSIT guideline values.

Table 15: Results of SPOCAS Testing

Bore	Sample Depth (m)	pH _{KCL}	Titratable Actual Acidity (TAA)	Retained Acidity (s-S _{NAS})	Acid Neutralising Capacity (s-ANC)	s- Net Acidity	Oxidisable sulfur (SPOS)	Soluble Sulfur (S _{KCL})
		%w/w S	%w/w S	%w/w S	%w/w S	%w/w S		%w/w S
201	0.5-0.6	4.1	0.09	<0.01	<0.05	0.10	0.006	0.02
202	1.5-1.6	3.9	0.12	<0.01	<0.05	0.12	<0.005	0.02
ASSMAC Guidelines			0.03					
QASSIT Guidelines			0.03					

Based on the results of the laboratory testing the following discussion is provided:

- Both samples had pH_{KCL} values less than 5.5 (3.9 and 4.1);
- Both samples reported titratable actual acidity (TAA) that exceeded the acid sulfate soil action criterion (TAA result >0.03%S);
- Both samples tested had retained acidity (S_{NAS}) and acid neutralising capacity (AND) values below the laboratory LOR;
- The oxidisable and low sulfur are less than 0.03%;
- Two samples reported TAA values that exceeded the ASSMAC/QASSIT action criterion for disturbance of greater than 1000 tonnes of material. These samples are further discussed below:

While the Potential and Existing Acidity values are above the ASSMAC/QASSIT action criteria for disturbance of more than 1000 tonnes of ASS the combination of oxidisable and soluble sulphur levels less than 0.03% suggests that these soils are acidic soils rather than acid sulfate soils with reference to the QASSIT guidelines. The pH_{KCL} values less than 5.5 indicate that a management plan is required. The management plan will require stabilisation of the soil materials.

12.2 QA/QC

A review of the adopted QA/QC procedures and results (Appendix J) indicates that the data quality indicators (DQIs) have generally been met. On this basis, the sampling and laboratory methods used during the investigation were found to meet the DQO for this project (as discussed in Appendix E).

13. Waste Classification

Chemical and asbestos sample analysis results were compared against the NSW EPA Waste Classification Guidelines, Part 1: Classifying Waste 2014. Results from in EIS (2015b) reported exceedances of the CT1 criterion for nickel in five surface fill samples at BH111 and BH115 to BH118.

Subsequent toxicity characteristic leachate procedure (TCLP) conducted on each of the exceedances reported that the material had a low leachability potential.

Considering the presence of asbestos in fill, and the results of the chemical analysis, the fill at the site classifies as Special Waste (Asbestos) – General Solid Waste (non-putrescible).

Although EIS (2015a and 2015b) classified the clays underlying fill as virgin excavated natural material (VENM), EIS did not test any natural soils to confirm this classification. Given that the results of the ASS assessment indicate that the natural soils are acidic, they will require neutralisation with lime (or similar) prior to disposal. Once neutralised, the soils will require reclassification but are considered likely to be General Solid Waste (non-putrescible).

Further investigation and validation of the underlying materials is required to confirm the classifications.

14. Discussion

The results of the investigations identified that the site has a history of open space recreation since prior to 1943 to prior to 1965 when the site's commenced land use as a car park. The surrounds have a history of commercial, recreational and residential land use activities since prior to 1943 up to present day.

Asbestos in the form of AF/FA was identified as a part of this investigation, and asbestos reported in EIS (2015b) was reported as potentially friable. It is unclear whether the material is associated with former structures in the general locality or impacted imported fill. Given that the two locations where asbestos was reported are in close proximity, it is possible that these areas represent a hot spot asbestos, however, further investigation would be required to determine this. Given that asbestos was reported in fill with no other potential indicators for asbestos present, such as demolition waste, delineation of potential hotspots of asbestos may be difficult, therefore DP considers that all fill has the potential to be impacted by asbestos.

Ecological exceedances for copper and nickel were identified in surface soils in EIS (2015a) and EIS (2015b). Considering the site is currently an asphalt car park and the proposed development is a hotel with predominantly hard cover the reported EIL exceedances are not considered to be of concern. However, if fill is to remain on site areas that are not proposed to be covered in hardstand the fill should be analysed to confirm suitability to remain in these areas.

Based on the results of the investigation and observations made on site, the PAEC (Section 7.11) requiring further investigation have been assigned as areas of environmental concern (AEC) with the remaining PAEC not considered to be of concern. Reasoning behind further investigation/AEC allocation is shown in Table 16 below. Given that it is unknown if the source of asbestos at the site was demolished structures on site (PAEC1), construction waste from the adjacent PLC hotel construction (PAEC3), or imported fill (PAEC4), these PAEC have been grouped together in Table 16.

Table 16: PAECs and Assigned AECs

PAEC/ID	Further Investigation Required	Reasoning	Assigned AEC	Description
1, 3, 4	Yes	Asbestos reported in two fill samples	1	Demolished structures / Construction Waste / Imported Fill
2	No	There was the potential for coal tar to have been previously used in construction. It is also possible that asphalt may be impacted with asbestos from underlying soils. Further investigation is required if asphalt is considered for re-use or disposal.	NA	Car park
5	No	No groundwater was reported at the site and the two dry cleaners in operation are located south of the site, and so potentially impacted groundwater is considered unlikely to impact the site.	NA	Adjacent current and former dry cleaners
6	No	No hydrocarbons were reported in groundwater samples in EIS (2015b)	NA	Current and former service stations
7	No	Contamination at identified locations was not considered to be significant enough to warrant regulation by the EPA, and so is considered unlikely to impact the site.	NA	Contaminated sites within 1 km of site
8	No	Other sites with contamination issues identified are not considered to be a matter of concern given that the contaminant (asbestos) is contained within the specific sites and does not have the potential to migrate once contained	NA	Other sites with contamination issues

PAEC/ID	Further Investigation Required	Reasoning	Assigned AEC	Description
BH111 BH115 BH116 BH117 and BH118	Yes	Considering the site is to be developed, resulting in either the removal or capping with hardstand, of the fill, the EIL exceedances are not considered to be a matter of concern. However, analysis is required if fill is to remain in areas not covered by hardstand.	2	Nickel and copper in soil
BH4	No	The presence of nickel and zinc reported in groundwater in EIS (2015b) could not be further investigated due to the lack of groundwater at the site. Considering the concentrations of these metals in water was low, and considering that groundwater will not be extracted for use in the proposed development, DP does not consider that further investigation for metals in groundwater is necessary.	NA	Nickel and zinc in groundwater

15. Recommendations

The investigation has identified asbestos and elevated nickel in the fill. These will need to be managed during the development of the site.

The fill at the site classifies as Special (Asbestos) Waste – General Solid Waste (non-putrescible) and the natural soils, which are acidic, have been preliminarily classified as General Solid Waste.

Further investigation of groundwater at the site is not required unless plans for development change to extend beyond the proposed 3.5 m depth.

It is recommended that a remediation action plan (RAP) is prepared with reference to NSW OEH, *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites* (OEH, 2011). The RAP should include:

- Assessment and management of the extent of asbestos impacted filling;
- Assessment and management of filling to remain on site;
- Assessment and management of acidic soils; and
- An unexpected finds protocol to manage contamination encountered during the works.

16. Limitations

Douglas Partners (DP) has prepared this report for this project at 1 Eels Place, Parramatta in accordance with DP's proposal NWS180079 dated 11 October 2018 and acceptance received from Mr Thomas Gould dated 19 October 2018. The work was carried out under DP's Conditions of Engagement. This report is provided for the exclusive use of Parramatta Leagues Club Pty Ltd for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of DP, does so entirely at its own risk and without recourse to DP for any loss or damage. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

The results provided in the report are indicative of the sub-surface conditions on the site only at the specific sampling and/or testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences. Such changes may occur after DP's field testing has been completed.

DP's advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by DP in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and/or testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

This report must be read in conjunction with all of the attached notes and should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by DP. This is because this report has been written as advice and opinion rather than instructions for construction.

The scope for work for this investigation/report did not include the assessment of surface or sub-surface materials or groundwater for contaminants, within or adjacent to the site. Should evidence of filling of unknown origin be noted in the report, and in particular the presence of building demolition materials, it should be recognised that there may be some risk that such filling may contain contaminants and hazardous building materials.

The contents of this report do not constitute formal design components such as are required, by the Health and Safety Legislation and Regulations, to be included in a Safety Report specifying the hazards likely to be encountered during construction and the controls required to mitigate risk. This design process requires risk assessment to be undertaken, with such assessment being dependent upon factors relating to likelihood of occurrence and consequences of damage to property and to life. This, in turn, requires project data and analysis presently beyond the knowledge and project role respectively of DP. DP may be able, however, to assist the client in carrying out a risk assessment of potential hazards contained in the Comments section of this report, as an extension to the current scope of works, if so requested, and provided that suitable additional information is made available to DP. Any such risk assessment would, however, be necessarily restricted to the geotechnical

components set out in this report and to their application by the project designers to project design, construction, maintenance and demolition.

Douglas Partners Pty Ltd

Appendix A

About This Report

About this Report

Douglas Partners



Introduction

These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

DP's reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

Copyright

This report is the property of Douglas Partners Pty Ltd. The report may only be used for the purpose for which it was commissioned and in accordance with the Conditions of Engagement for the commission supplied at the time of proposal. Unauthorised use of this report in any form whatsoever is prohibited.

Borehole and Test Pit Logs

The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable or possible to justify on economic grounds. In any case the boreholes and test pits represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

Groundwater

Where groundwater levels are measured in boreholes there are several potential problems, namely:

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;

- A localised, perched water table may lead to an erroneous indication of the true water table;
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at the time of construction as are indicated in the report; and
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, DP will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical and environmental aspects, and recommendations or suggestions for design and construction. However, DP cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, DP will be pleased to assist with investigations or advice to resolve the matter.

About this Report

Site Anomalies

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

Information for Contractual Purposes

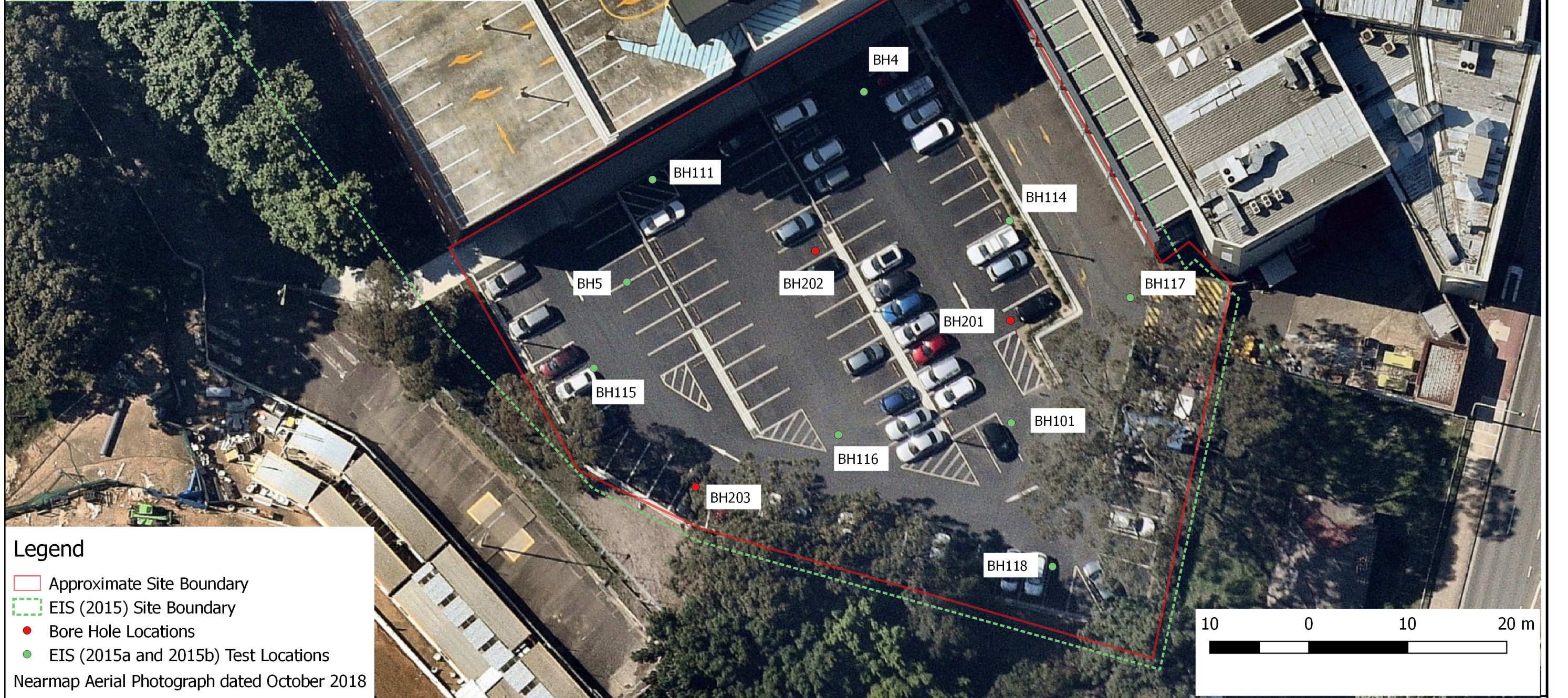
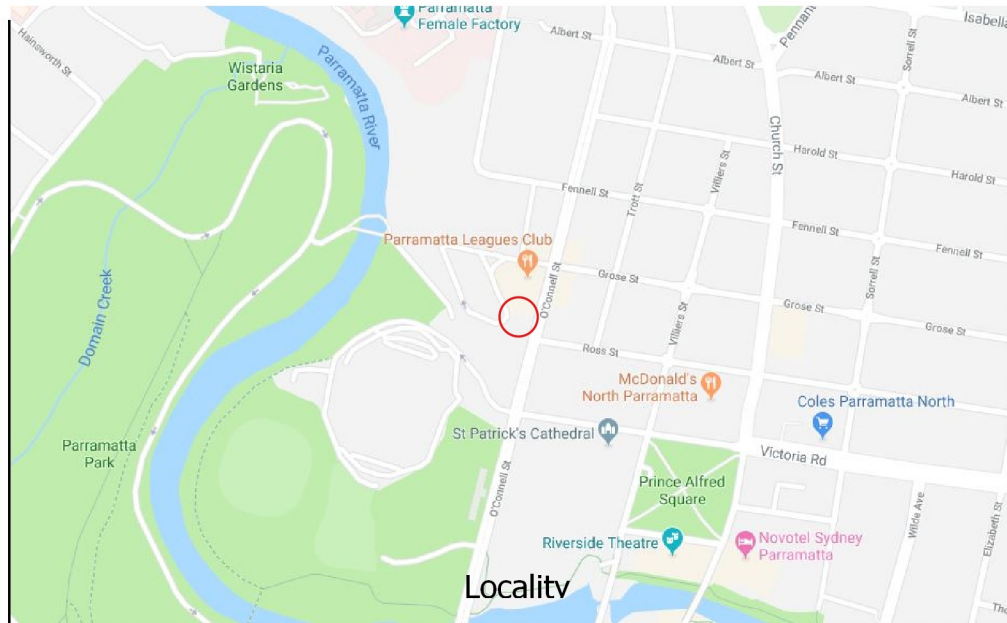
Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. DP would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection

The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.

Appendix B

Drawings



Legend

- Approximate Site Boundary
- EIS (2015) Site Boundary
- Bore Hole Locations
- EIS (2015a and 2015b) Test Locations

Nearmap Aerial Photograph dated October 2018



CLIENT: APP Corporation Pty Ltd

OFFICE: Macarthur

SCALE: 1:25,000

DRAWN BY: CKM

DATE: 23.11.18

TITLE: **Site Locality, Boundary and Test Locations**
Detailed Site Investigation
1 Eels Place, Parramatta



PROJ No: 94523.00.R.002

DRAWING No: 1

REVISION: A