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Integrated Practical Solutions

EN-RPT-0002 Remediation Action Plan

Royal Far West Redevelopment14-22 Wentworth Street & 19-21 South Steyne, Manly

Prepared for
Royal Far West

Project 72252.09
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The undersigned, on behalf of Douglas Partners Pty Ltd, confirm that this document and all attached drawings, logs and test results have been checked and reviewed for errors, omissions and inaccuracies.

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Redevelopment of Royal Far West
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1. Introduction

This Remediation Action Plan (RAP) has been prepared in relation to the proposed Royal Far West, redevelopment at 14-22 Wentworth Street and 19-21 South Steyne, Manly, as shown on Drawing 1, Appendix B. The report was prepared for Royal Far West and was undertaken in accordance with Douglas Partners Pty Ltd (DP) proposal 72252.08.P.003.Rev4.P.003 dated 27 January 2022. The report was prepared to reference the updated design drawings and development plans and to incorporate the findings of subsequent investigations.

DP has previously undertaken a preliminary site investigation of contamination for the current site, reported in (DP, 2022a) *Updated Report Addendum to Phase 1 Contamination Assessment, Redevelopment of Royal Far West, 14-22 Wentworth Street & 19-21 South Steyne, Manly*, Report 72252.09.R.001.Rev0, dated February 2022 and a limited intrusive investigation reported in (DP, 2022c), Report on Site Investigation (Contamination) with Limited Sampling, 14-22 Wentworth Street and 19-21 South Steyne, Manly..

Potential sources of contamination for the site were identified to comprise fill of unknown origin, former diesel storage and use (including inground underground storage tanks, UST), former workshop(s), hazardous building materials (from former and current buildings), electrical transformer, grease trap, and off-site groundwater. Based on the site information and the details of the proposed development, it was considered that the site can be rendered suitable for the proposed development subject to remediation of the UST and contaminants which are potentially present at the site.

The objective of this RAP is to facilitate the remediation and management of the UST removal, and other identified contaminants in an acceptable manner, with minimal environmental and health impacts and to a condition suitable for the proposed development. The strategy therefore aims to:

- Minimise impacts from the site works on the environment and on public health and safety during site redevelopment works;
- Maximise the protection of workers who may be present at the site during these works;
- Render the site suitable for the proposed land use; and
- Minimise asbestos and other contaminated soil related impacts on human health and the local environment.

This RAP is not a specification and should not be used to determine quantities during remediation.

2. Site Information

2.1 Site Identification

Site Address	14-22 Wentworth Street & 19-21 South Steyne, Manly
Legal Description (Drawing 2, Appendix B shows location of Lots at the site)	Lot 100 in D.P. 1276056 Lot 101 in D.P. 1247422 Note; The above lots were consolidated from former Lots as referenced in the site history assessment in (DP, 2011) Part Lot 101 in Deposited Plan (D.P.) 1247422 Lots 1 and 2 in D.P. 223468 Lot 1 in D.P. 435023 Lot 2587 in D.P. 752038 Lots 1 and 2 in D.P. 1093126 Lot 12 in D.P. 1096038
Area	5,500 m^2
Zoning	Zone B2 Local Centre
Local Council Area	Northern Beaches Council
Current Use	Royal Far West (RFW), including Drummond House (heritage), school and commercial (shared office space).
Surrounding Uses	North: Retail at street level, residential in higher levels, car parking at basement level. East: South Steyne and then the pedestrian promenade and beach. South: The former RFW Terraces (currently a medical centre) and high density residential (including a residential unit block), then Victoria Parade. West: The RFW Centre for Country Kids (CCK) and residential.

A survey of the site is included in Drawing 3, Appendix B.

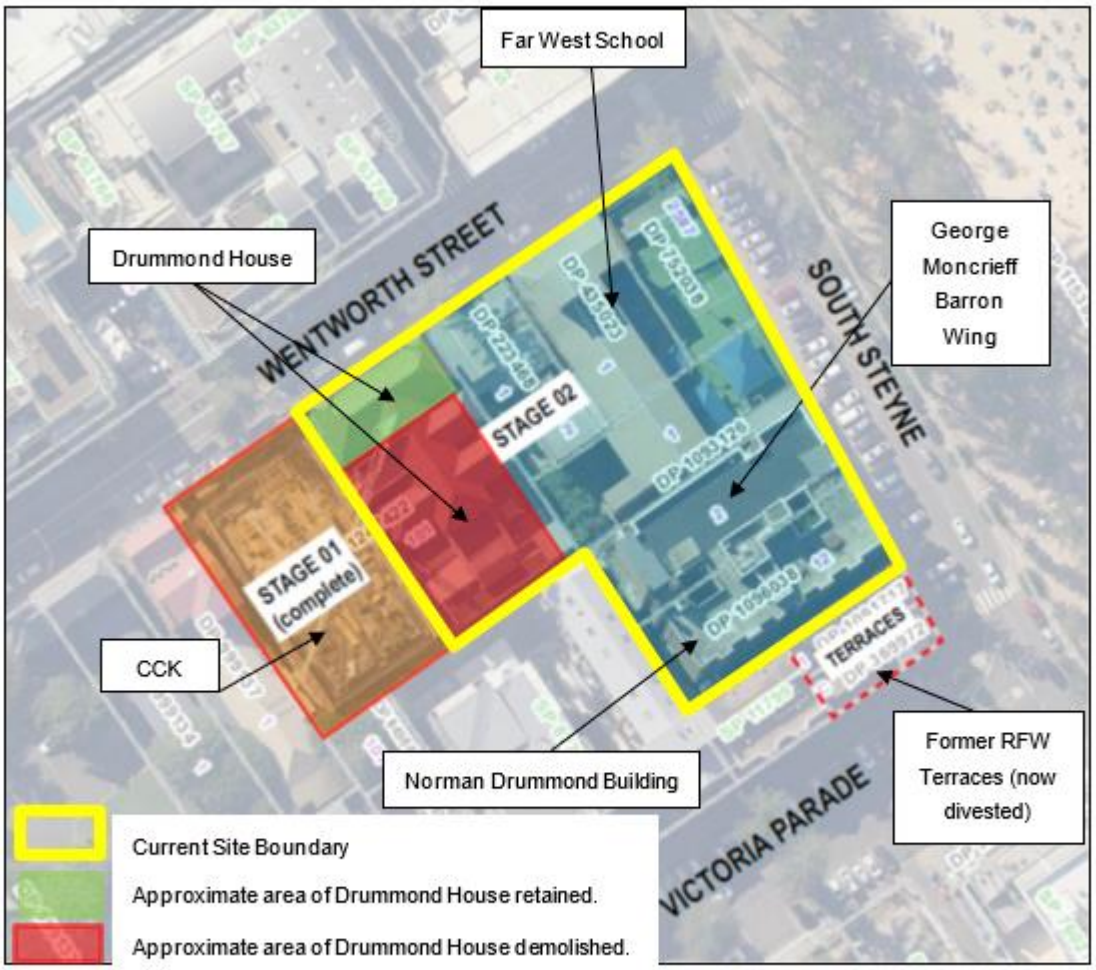


Figure 1: Site Location and Sub-Areas

2.2 Proposed Development

The project sees the implementation of Stages 3 and 4 of the Concept Approval as modified (Application # MP10_0159 MOD 1) and involves the retention and alterations to the previously constructed Stages 1 and 2 (hospital facility 'Centre for Excellence' now known as the `CCK' building) as well as alterations and additions to Drummond House and the construction of mixed use buildings which incorporate tourist and visitor accommodation, residential apartments and retail/ commercial uses with basement parking and landscaping.

The larger RFW site was assessed in DP (2011) and comprised the current site, Stages 1 and 2 and the former RFW Terraces (which have since been sold and no longer form part of the RFW site), as shown on Figure 1, Section 2.1.

This site investigation (contamination) with limited sampling is being prepared to support a Development Application being lodged with the Northern Beaches Council for the proposed Stages 3 and 4 Development of the current subject site in accordance with the Concept Approval.

The current development proposal will comprise the following:

- Demolition of the former school building, the Royal Far West administration building, clinical building and part of Drummond House (refer to Drawings DA-103 to DA-106);
- Construction of a two-level basement carpark and storage area which will be integrated into the existing basement of the CCK Building and shall occupy the majority of the site footprint with the exception of the heritage listed portion of Drummond House (refer to Drawings DA-110 and DA-111);
- Refurbishments, alterations and additions to Drummond House (Building B) including a new dining hall on the ground level and new guest rooms on the ground level and Level 1 and 2, plant rooms on Level 3 and an activity room of Level 3 (refer to Drawings DA - 113 to DA - 115);
- Construction of a new mixed-use building (Building C) including ground floor commercial (including restaurants), commercial space on Levels 1 and 2, residential apartments (42) on Levels 3 to 7 and plant rooms and communal open space on Level 8 (refer to Drawings DA - 112 to DA - 119); and
- Construction of a new mixed-use building (Building D) along the South Steyne frontage which includes ground floor commercial (including restaurants), residential apartments on Levels 1 to 4 and plant rooms on Level 5 (refer to Drawings DA - 112 to DA - 117).

The current design drawings are provided in Appendix A and include:

Drawing DA - 103 Demolition Plan - Level Ground;

Drawing DA - 104 Demolition Plan - Level 1;

Drawing DA - 105 Demolition Plan - Level 2;

Drawing DA - 106 Demolition Plan - Level 3;

Drawing DA - 10 Basement 2 Floor Plan;

Drawing DA - 111 Basement 1 Floor Plan;

Drawing DA - 112 Ground Floor Plan;

Drawing DA - 113 Level 1 Floor Plan;

Drawing DA - 114 Level 2 Floor Plan;

Drawing DA - 115 Level 3 Floor Plan;

Drawing DA - 116 Level 4 Floor Plan;

Drawing DA - 117 Level 5 Floor Plan;

Drawing DA - 118 Level 6 Floor Plan;

Drawing DA - 119 Level 7 Floor Plan; and

Drawing DA - 120 Level 8 Floor Plan.

The ground floor plan is also presented in Figure 2.

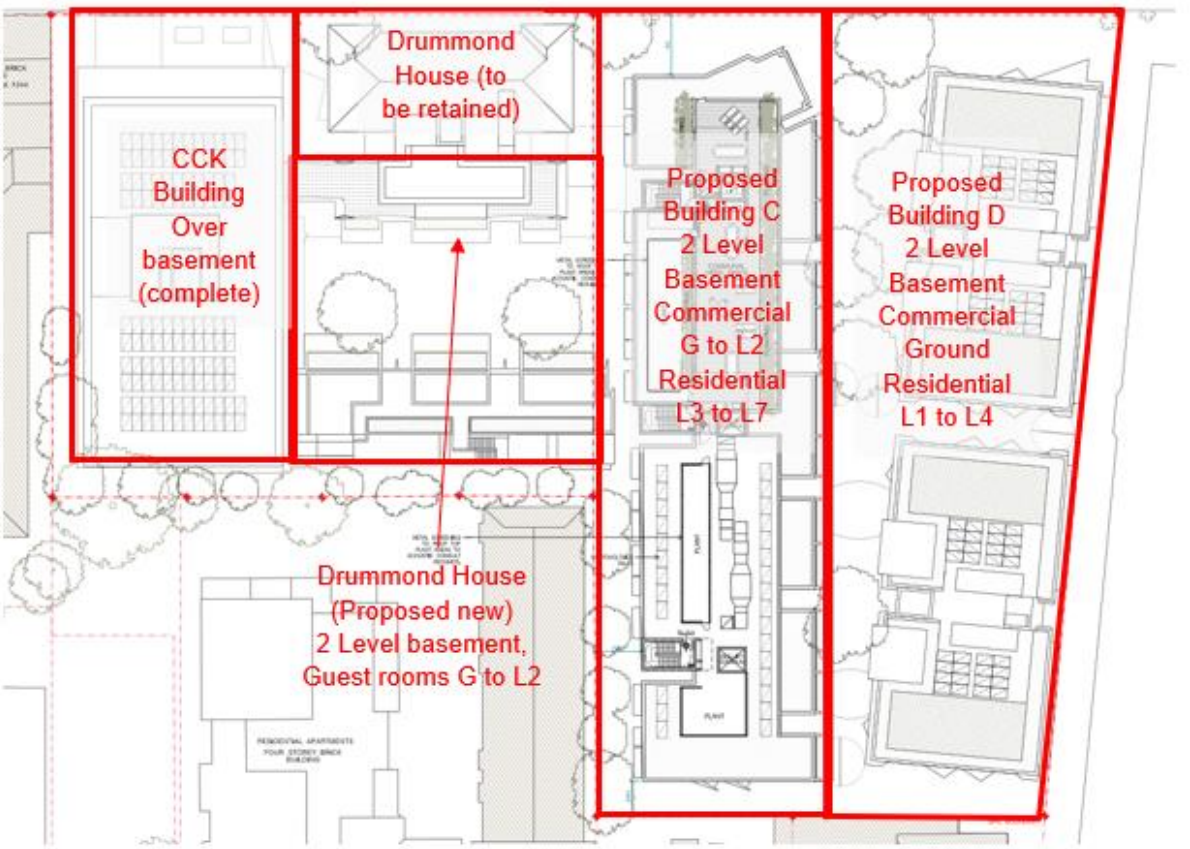


Figure 2: Proposed Ground Floor Development

2.3 Environmental Setting

Review of the *Sydney 1:100,000 Geology Sheet* indicates that the site is underlain by Quaternary sands comprising coarse quartz sand with varying amounts of shell fragments. The Quaternary sands are underlain at depth by Hawkesbury Sandstone. The DP (2014) Detailed Site Investigation (DSI) identified fill soils on the site to a depth of between 0.5 m to 1.0 m below ground level (bgl) underlain by sand.

Groundwater at the site was measured at a depth of 4.8 m bgl during the in 2014. The site is directly opposite Manly Beach. Hence, groundwater at the site is expected to be subject to salt-water intrusion. The depth to the water-table is also likely to change regularly depending on the tide.

Site Topography	The site is generally level, located on a sand filled plain between the Tasman Sea to the north-east and Manly Cove to the south-west. The ground surface rises further to the north-west and south-east of the site to sandstone outcrops.

Geology	Review of the Sydney 1:100,000 Geology Sheet indicates that the site is underlain by Quaternary sands comprising coarse quartz sand with varying amounts of shell fragments. The Quaternary sands are expected to be underlain at depth by Hawkesbury Sandstone.
Acid Sulfate Soils	A review of the Acid Sulphate Soil (ASS) risk for the site was undertaken using data from the 1:25,000 Acid Sulfate Soil Risk Map (NSW Department of Environment and Climate Change, 1994-1998). The review indicated that the site is in an area where the probability of ASS is low. Generally, not expected to contain ASS materials, although highly localised occurrences may occur especially near boundaries with environments with a high probability of ASS occurrence. DP (2022c) included a preliminary acid sulfate soil investigation. The investigation did not identify potential acid sulfate soils to investigation limit of 8 m bgl.
Groundwater and Surface Water	Groundwater at the site is potentially affected by the tidal influences of the Tasman Sea, located across the road from the site to the north-east, and Manly Cove, located approximately 300 m to the south-west of the site.
Site Infrastructure	The below key site infrastructure has been identified at the site. UST No 1: A former diesel UST which was present in the CCK Site (Stage 1 Area, not within the current site boundary) UST No 2: A disused diesel UST located the rear (southern corner) of 19-21 South Steyne. The fill point is in a box at the front (eastern) corner of this Lot.
	A grease trap is located in the rear courtyard of the Norman Drummond Building (western portion of 19-21 South Steyne.
	An electrical substation is present in the northern corner of 22 Wentworth St. The client stated that the substation was moved to this location (in approximately 2007) from its former location in the south-east of the school playground.
	<u>Former Boilers Rooms and Basement at Drummond House</u> The client stated that there had previously been two below ground rooms in the southern area of Drummond House. The northern-most room had contained a boiler, which was supplied by UST No 1 previously located in the Stage 1 area (UST No 1, which has now been removed as noted above). Pipework from this UST which split towards Drummond House was observed to have been cut and capped during the UST removal works associated with the Stages 1 and 2 redevelopment. A second boiler room is present at 19-21 South Steyne which was supplied by UST No. 2 but is now on the main gas supply.

3. Previous Reports

The following previous reports have been reviewed in preparing this RAP:

- (DP, 2011) *Report on Phase 1 Contamination Assessment, Royal Far West, 12-22 Wentworth Street & 19-21 South Steyne, Manly*, Report 72252.00.R.001.Rev 1, dated July 2011;
- (DP, 2014a) *Report on Detailed Site (Contamination) Investigation Royal Far West Centre for Child Health and Learning 22 Wentworth Street, Manly*, Report 72252.02.R.001, dated December 2014;
- (DP, 2014b) *Remediation Action Plan Royal Far West Centre for Child Health and Learning 14-22 Wentworth Street. Manly* Report 72252.03.R.001, dated November 2014;
- RMA Contracting Pty Ltd RE: *Certificate of Underground Storage Tank Commissioning, 18 Wentworth Street Manly NSW 2095*, dated 31 May 2016 (RMA, 2016);
- (DP, 2022a) DP *Updated Report on Addendum to Phase 1 Contamination Assessment, Redevelopment of Royal Far West 14-22 Wentworth Street & 19-21 South Steyne, Manly*, prepared for Royal Far West, Report 72252.09.R.001.Rev0 dated February 2022 (the PSI); and
- (DP, 2022b) Draft Updated Remediation Action Plan, Redevelopment of Royal Far West, 14-22 Wentworth Street & 19-21 South Steyne, Manly, Prepared for Richard Crookes Constructions Pty Ltd, Project 72252.09, February 2022 (the draft RAP).

3.1 Site History

A site history investigation was included in DP (2011) and DP (2022) and is summarised in Table 1.

Table 1: Summary Site History

Property	Likely Land Use Post Subdivision of Estate	Current (2020) Land Use
Part Lot 101, D.P. 1247422 (formerly Lot 1, D.P. 72969)	Former Lot 1, D.P. 72969: residential until at least 1920. Former Lot 1, D.P. 979703: possible residential or commercial land use prior to 1930. Both former Lots: Drummond House constructed c1934. Likely hospital / school use from at least 1960.	Accommodation (Drummond House)
Part Lot 101, D.P. 1247422 (formerly Lot 1, D.P. 979703)		
Lot 100 in D.P. 1276056 (formerly Lot 1, D.P. 223468)	Possible residential or commercial land use until purchase by Royal Far West in 1960. Likely hospital/school use from 1960, more recently as a playground / garden.	Playground / Garden
Lot 100 in D.P. 1276056 (formerly Lot 2, D.P. 223468)	Possible residential or commercial land use until purchase by Royal Far West in 1960. Likely school use from 1960.	School
Lot 100 in D.P. 1276056 (formerly Lot 1, D.P. 435023)	Possibly vacant prior to use as Manly Luna Park *circa* 1929-1950. Likely school use since this time.	School
Lot 100 in D.P. 1276056 (formerly Lot 2587, D.P. 752038)		Playground
Lot 100 in D.P. 1276056 (formerly Lot 1, D.P. 1093126)	Possible residential / commercial use prior to 1960, likely school use since this time.	Playground
Lot 100 in D.P. 1276056 (formerly Lot 2, D.P. 1093126)	Possible residential / commercial use prior to 1960, likely medical services use since this time.	Commercial (offices) (Moncrieff Barron Wing)
Lot 100 in D.P. 1276056 (formerly Lot 12, D.P. 1096038)		Commercial (offices) (Norman Drummond Bdg)

DP (2011) included information from a site inspection and discussion with Mr Daryl Hawthorne undertaken in 2011. Mr Hawthorne had then worked at the site for over two decades. Mr Hawthorne noted the following:

- Previous minor excavation works in the school playground (approximately 20 years before 2011) encountered filling containing fibre-cement fragments;
- Only small volumes of standard household / commercial chemicals (cleaning products, turpentine, paint and petrol for the lawn mower) were kept on site; and
- All waste is disposed off-site. This includes standard Council removed wastes, wastes from the grease trap, clinical wastes and waste paint.

Stage 1: CCK Building (not part of current investigation area)

With respect to the now off-site CCK site, the following is noted:

- An incinerator and splint workshop had historically been present at the rear (south-east);
- A workshop was present in 2011 and was used for minor repair works for the site;
- A diesel UST (UST No: 1) was present in 2011, and had previously been used to fuel a boiler in the workshop via underground pipework;
- DP (2014a) recorded petroleum contamination in soil in the vicinity of the UST No. 1. No other contaminants were recorded in soil above the site assessment criteria (SAC);
- DP (2014a) included sampling of groundwater from one well, constructed near UST No 1. Petroleum was recorded in the groundwater sample at a concentration below the SAC. Arsenic was recorded in the groundwater sample from this location at a concentration above the SAC. No other contaminants were recorded above the SAC in groundwater;
- The diesel UST (UST No 1) was decommissioned in situ in 2016 by removal of 3,300 L of diesel liquid products, 'inerting' and washing the UST; and
- DP (2014b) provided a strategy for the remediation of the CCK site for its (now current) use.

The location of site features noted in DP (2011) and DP (2022a) are provided in Drawing 4, Appendix A.

DP (2011) included recollections from an RFW employee who provided the following information in regard to the CCK development. Whilst this area is not part of the current site, the following potentially relevant information is noted:

- UST No. 1, the associated pipework and associated diesel impacted soil at the CCK site was removed as part of the redevelopment, which included construction of two levels of basement;
- The RFW employee recollected that diesel odours were observed in the sand immediately surrounding the UST No 1, and that sampling was undertaken in assessing the extent of the diesel impacts. The RFW employee's recollection was that contamination was not identified along the pipework, or in groundwater (based on testing of water from dewatering for disposal); and

- Sporadic fragments of fibre cement were encountered in fill, mainly in the southern area of the CCK site.

Stage 2: Current Investigation Site

The following specific areas are noted:

Underground Storage Tank (UST) (UST No. 2)

- The UST is located at the rear (southern corner) of 19-21 South Steyne. The fill point is in a box at the front (eastern) corner of this Lot;
- The client stated that the UST had been previously used to store diesel for the boiler room at the rear (south-west) of the Norman Drummond Building at 19-21 South Steyne. The boiler room is still operational but now operates using gas which is on mains supply;
- The client understood that the UST was abandoned approximately 25 years ago, and concrete cover was constructed at this time;
- The client stated that the concrete was recently cut open to allow inspection of the UST by RFW personnel. Based on this inspection the client advised that:
  - The UST dip stick was marked with 'Total Capacity 7,200 Litres';
  - At the time of the inspection the UST contained approximately 1,200 L of liquid which appeared to be diesel; and
  - The tank appeared to have a volume of roughly 10 cubic metres.
- The client stated that RFW personnel observed fibre cement fragments (potential asbestos) in building debris at the top of the exposed tank pit; and
- DP observed the fill point and the top of the UST through the broken concrete lid.

Drawing 4, Appendix A shows the approximate location of the UST, fill point and boiler room location.

Grease Trap

- A grease trap is located in the rear courtyard of the Norman Drummond Building (western portion of 19-21 South Steyne;
- The client stated that the grease trap is no longer used, and the trap was previously used more intensively (when food was cooked on-site); and
- The location of the grease trap is shown on Drawing 4, Appendix A.

Electrical Substation / Transformer

- An electrical substation is present in the northern corner of 22 Wentworth St (Lot 2587, D.P. 752038);
- The client stated that the substation was moved to this location (in approximately 2007 based on DP (2011)) from its former location in the south-east of the school playground; and
- The former and current substations locations are shown on Drawing 4, Appendix A.

Former Boiler and Basement at Drummond House

- The client stated that there had previously been two below ground rooms in the southern area of Drummond House. Each room was approximately 3 m by 3 m in area;
- The client stated that these were sealed off during the renovation of Drummond House, more than 20 years ago;
- The northern-most room had contained a boiler, which was supplied by the UST No 1 previously located in the Stages 1 area (which has now been removed as noted above). Pipework from this UST which split towards Drummond House was observed to have been cut and capped during the UST removal works associated with the Stages 1 redevelopment; and
- The approximate location of these rooms, as indicated by the client, is shown on Drawing 4, Appendix A.

Former Workshops

- The client stated that there were no longer any workshops at the site; and
- Workshops were previously located in the off-site Stages 1 and 2 area, and possibly in the area of the former kitchen at 22 Wentworth Street.

Chemical Storage

- The client stated that there were no bulk chemicals currently stored at the site (other than the in the abandoned diesel UST as noted above). Only small volumes of standard household / commercial were kept, in small containers which readily fit in a cupboard.

Hazardous Building Materials

- The client noted the known presence of asbestos containing materials (potentially including friable asbestos) and synthetic mineral fibre (SMF) in the site buildings.

Waste

- Various bins were observed in tidy waste areas.

3.2 Expected Subsurface Conditions

The subsurface conditions reported in DP (2014a) in the CCK site, are as follows:

FILLING Variable fill typically between 1 to 2 m below ground level (bgl) increasing in depth, particularly in the vicinity of the underground diesel tank.

SAND Loose to very dense sand, increasing in density with depth. Sand was encountered into depths in excess of 34 m bgl. Clay bands were encountered in places.

Similar sub-surface conditions are anticipated for the subject site.

3.3 DP (2014a)

DP (2014a) involved the drilling of seven test bores (BH1 to BH7) at the CCK site. Two groundwater wells were installed; however, only one groundwater sample could be recovered from one of the wells.

Soil samples collected during the investigation were analysed for:

- The priority heavy metals: arsenic (As), cadmium (Cd), chromium (Cr), copper (Cu), lead (Pb), mercury (Hg), nickel (Ni) and zinc (Zn);
- Polycyclic aromatic hydrocarbons (PAH);
- Total (recoverable) petroleum hydrocarbons (TPH);
- Benzene, toluene, ethylbenzene and xylene (BTEX);
- Organochlorine pesticides (OCP) and organophosphorus pesticides (OPP);
- Polychlorinated biphenyls (PCB);
- Volatile organic compounds (VOC);
- Phenols; and
- Asbestos.

The analytical results for the soil samples indicated that the concentrations of TPH C6-C10, BTEX, PCB, OCP, OPP, phenols, and VOCs in all soil samples analysed were below the laboratory's limit of reporting and hence, below their screening criteria. The only exceedance in soil was 770 mg/kg of TPH >C10-C16 less Naphthalene (F2) recorded in BH3 at 4.95 - 5.0 m bgl that exceeded the adopted HSL-A for vapour intrusion for F2 of 110 mg/kg. The TPH was likely to be associated with the UST.

A groundwater sample collected from BH3 was analysed for TPH, BTEX, PAH, OCP, OPP, PCB, VOC and heavy metals. A hydrocarbon odour was noted in the well at BH3 during groundwater sampling, however, no separate phase product was observed.

The analytical results for the groundwater sample indicated that the concentrations of TPH C6-C10, BTEX, PCB, OCP, OPP and VOC in the groundwater sample analysed were below the laboratory limit of reporting and below their screening criteria.

Detectable concentrations of TPH >C10-C16 less Naphthalene (F2) and TRH >C16-C34 (F3) were recorded in the well at BH3 but were below the screening criteria. Detectable levels of PAH were recorded in the groundwater sample, but all were below their screening criteria.

Arsenic was recorded at 28 µg/L in the well at BH3 and this concentration exceeded the Drinking Water Guideline value of 10 µg/L. Low concentrations of the other heavy metals were recorded in the groundwater from BH3 which were all below the screening criteria.

3.4 DP (2014b)

DP (2014b) was a remediation action plan (RAP) for the CCK development. Broadly the requirements of this RAP included:

- Further soil and groundwater investigations;
- The removal and validation of the diesel UST on the CCK site;
- Excavation of the fill soils followed by validation of the underlying natural soils and then progression of bulk excavation to the basement design levels; and
- Preparation of a validation report.

It is noted that the redevelopment works for the CCK building were undertaken in 2017 and 2018. It is understood that the diesel UST (UST No 1) was removed at this time and that bulk excavation for the basement extended into natural sand (refer to Figure 2). However, there is no documentation available for review relating to the removal and validation of UST No 2 and / or the other remediation works specified in DP (2014b). Therefore, this is considered a data gap that should be addressed as part of the remediation works outlined in this RAP, given the potential for soil and groundwater impacts from the neighbouring site.

Figure 2: Aerial Photograph of CCK Building During Construction, 19 October 2017

3.5 DP (2022c)

(DP, 2022c) included the drilling of four boreholes and installation of four groundwater wells. The test locations were within the footprints of proposed Buildings C and D. No boreholes were drilled in the footprint of Drummond House due to access constraints. The locations of the boreholes is presented in Drawing 5, Appendix A.

Concrete:	In all boreholes to a depth of 0.1 to 0.15 m (bgl).
Fill:	Generally comprising grey, orange and red brown sand with red brown sub-rounded igneous gravels to depths of between 0.75 to 2.2 m bgl. Brick and concrete fragments were observed in BH203A and BH203B. BH204 refused on concrete at 1.0 m. Borehole BH204B encountered fill to depth of 2.2 m bgl.
Sand:	Fine to medium, yellow brown sand was encountered below the fill to borehole completion at a depth of 8.0 m bgl.

It is also noted that the concurrent geotechnical investigation (DP Project 72252.08) included 2 cone penetration tests (CPT)s. The inferred soil profile in the CPTs was sand to a depth of approximately 20 m.

As the boreholes were within the footprint of proposed Building C and D the appropriate investigation levels were HILB/HSLD. All concentrations of contaminants were within the HILB/HSLD/EILD/ESLD screening levels with the exception of samples:

- Benzo(a)pyrene exceeded the ESL (1.4 mg/kg) in sample the replicate sample of sample 201/0.5-0.6 (1.6 mg/kg) and in samples 203B/0.15-0.25 and its replicate (5 mg/kg and 3 mg/kg); and
- Benzo(a)pyrene TeQ exceeded the HILB (4 mg/kg) in samples 203B/0.15-0.25 and its replicate (7.4 mg/kg and 4.1 mg/kg).

It was noted that the B(a)P ESL is a low reliability value. Higher reliability screening levels have been published in CRC CARE *Risk-based Management and Remediation Guidance for Benzo(a)pyrene* (CRC CARE, 2017). The high reliability value of 33 mg/kg (or ranging from 21 mg/kg to 135 mg/kg) for fresh B(a)P suggests that the concentrations of B(a)P detected at the site are unlikely to pose an unacceptable risk to terrestrial ecosystems and therefore the EILS exceedances are not considered to be of concern.

It was also noted that the proposed basement for Buildings C and D will extent laterally to a position close to the boundary of the site such that BaP TeQ impacted fill at BH203 would be excavated to the practical limits of excavation during site redevelopment works. If the PAH impacted soils are not fully removed by the basement excavation (to be determined during validation sampling per the RAP, then (a) shallow excavations could be continued to the site boundary to remove impacted fill or (b) the impacted fill can be capped under a pavement. Therefore, the benzo(a)pyrene detections do not impact the proposed remediation strategy to remove fill soils to the extent practical during basement excavation with a provision for capping of soils around the site perimeter. It is noted that if soils are capped under a pavement that an environmental management plan (EMP) would be required and as such removal of all BaP_TQ impacted soils may be the preferred option.

Asbestos was not detected in soils however a suspected asbestos fragment was previously noted in the in the fill at the top of the UST (DP, 2022a). It is also noted that there is a risk that asbestos may be present in the fill and therefore post demolition investigation is recommended as per the RAP ((DP, 2020b) and Section 12.

It is also noted that localised hydrocarbon impacts would be expected to be encountered in the vicinity of the UST and pipework that cannot be detected during the current investigation. The UST and pipework will need to be removed and validated in accordance with the RAP (DP, 2022b).

Soil samples were collected from each borehole to a depth of up to 8 m and subjected to acid sulfate soil screening tests. The results indicated a very low probability of acid sulfate soils to a depth of 8 m bgl. Therefore, no further analysis for acid sulfate soil was considered to be warranted.

If clay or peat materials are encountered below 8 m, then further acid sulfate soil assessment may be warranted. It is noted that the CPTs completed for the concurrent geotechnical investigation (Project 72252.08) did not identify any suspected clay or peat layers to a depth of approximately 20 m.

The results of the fill samples were the thresholds for general solid waste and therefore it was considered likely that the fill would be classified as general solid waste. As previously noted, there is a moderate to high potential for asbestos to be present. If asbestos is encountered the minimum classification would be special waste (asbestos).

The concentration of contaminants in the natural sand were within typical background ranges and therefore it was considered likely that the sand is classified as virgin excavated natural material. It was noted that localised impacts in the vicinity of the UST and pipework and other AECs may impact the classification in some areas. As per Section 8.7 the VENM classification must be completed after the removal of the fill and AECs.

Groundwater samples were analysed for heavy metals, TRH, BTEX, PAH, OCP, OPP, PCB, phenols, oil and grease and VOC.

All results were below the SAC, with the exception of some low-level heavy metals. It was considered that the concentrations of metals in groundwater are considered likely to be attributed to the background concentrations. However, during dewatering treatment of heavy will be required if groundwater is disposed to stormwater. Typically, settlement tanks with a flocculant can be adopted to reduce heavy metal and suspended solids. All other analytes were below detection limited with the exception of trace levels TRH and PAH were detected in MW203.

The concentration of PAH and TRH were within the adopted guidelines however could be indicative of localised impacts near the UST and pipework. Additional groundwater investigation is required as recommended Section 4.5. Groundwater extracted from the vicinity of the UST and pipework may require some treatment to remove trace hydrocarbons prior to disposal if disposed to stormwater.

The analytical results suggest that groundwater beneath the site has not been significantly impacted by organic contaminants TRH, PAH, OCP, OPP, PCB, phenol or VOC (including BTEX). Based on the current results groundwater remediation is not considered to be warranted, however this must be confirmed following the additional groundwater investigation recommended in Section 4.5 and following the removal of the UST No 2 and pipework and any remnant pipework from UST No 1.

3.6 Conceptual Site Model

The potential on-site sources of contamination are summarised in Table 2. The locations of the identified areas of environmental concern (AECs) are noted on Drawing 4, Appendix A.

Table 2: Potential Sources of Contamination (Refer to Drawing 4, Appendix A for Locations)

Potential Source	Description of Potential Contaminating Activity	Contaminants of Concern
Fill (S1)	Potential for fill of unknown origin. Anecdotal information suggesting the potential sporadic presence of asbestos cement in fill at the neighbouring CCK site, including in the UST tank pit.	Typical and commonly screened contaminants for fill of an unknown source include metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, zinc), total petroleum hydrocarbons (TPH), BTEX (benzene, toluene, ethyl benzene, xylene), polycyclic aromatic hydrocarbons (PAH), OCP, Polychlorinated Biphenyls (PCB), Phenols and Asbestos.
Diesel storage and use (S2)	The abandoned UST at Lot 100 in D.P. 1276056 and associated pipework (UST No 2). Potential remnant pipework / contamination associated with former boiler at Drummond House which was connected to former UST No 1.	TRH, PAH and phenols.
Hazardous building materials (HBM) from former and existing building and underground services (S3)	Anecdotal information suggests the presence of asbestos (potentially including friable asbestos) and SMF in site buildings. Given the age of the buildings there is also considered to be a potential for PCB and lead-based paint.	Asbestos, SMF, PCB and lead.
Electrical transformer (S4)	Spill/ leaks at current or former location of electrical substation / transformer.	PCB, TPH, VOC.
Grease trap (S5)	Former grease trap from former kitchen. Workshop possibly later present in area.	Grease, TPH, VOC, phenols and metals.
Off-site groundwater and soil (S6)	Petroleum recorded in samples from CCK Site which may impact groundwater and could migrate onto the subject site Asbestos in fill soils in CCK site which may also be present in filling on the subject site.	TPH and arsenic.

A ‘source - pathway - receptor’ approach has been used to assess the potential risks of harm being caused to human, water or environmental receptors from sources of contamination on or in the vicinity of the site, via exposure pathways. The possible pathways between the above sources and receptors are provided in Table 3 below. The preliminary CSM is used to inform the scope of intrusive investigations reported in subsequent sections.

Table 3: Summary of Potentially Complete Exposure Pathways

Source and COPC	Transport Pathway	Receptor	Risk Management Action
S1: Fill: metals, TPH, BTEX, PAH, OCP, PCB and asbestos S2: Diesel storage and use: TPH, PAH, and phenols S3: HBM: asbestos, SMF, lead and PCB S4: Electrical transformer: PCB, TPH, VOC S5: Grease trap: grease, TPH, VOC, phenols, metals S6: Off-site groundwater: TPH, arsenic	P1: Direct Contact (Ingestion and dermal contact) P2: Dust generation (inhalation of dust) P3: Volatilisation (inhalation of vapours)	R1: Construction and maintenance workers	Implementation of appropriate WHS controls
	P1: Direct Contact (Ingestion and dermal contact) P2: Dust generation (inhalation of dust) P3: Volatilisation (inhalation of vapours)	R2: Future site users R3: Adjacent site users	Remediation of identified contaminants following intrusive investigation to inform the extent of remediation or management required.
	P4: Surface water run-off P5: Leaching of contaminants and vertical migration into groundwater P6: Lateral migration of groundwater	R4: Groundwater R5: Surface Water and Marine Ecosystem (South Pacific Ocean)	
	P1: Direct Contact P2: Dust generation	R6: Terrestrial organisms	
	P1: Direct Contact P3: Volatilisation	R7: In-ground engineered structures	

4. Remediation Options and Preferred Remediation Strategy

4.1 Typical Remedial Options Available

The required extent of remediation (or management) of contamination at the site is not currently known, given the limitations in access for appropriate intrusive investigations.

The extent of remediation (or management) will be determined through a data gap investigation as outlined in Section 4.5). The following discussion on remediation options is based on the anticipation of similar conditions to that encountered for the CCK development. A revised RAP will be developed on completion of the data gap investigation.

A number of remedial options were reviewed. The suitability of the remedial options was examined in accordance with a number of relevant documents, including, *inter alia*, the following:

- NSW Environment Protection Authority, Contaminated Land Management, Guidelines for the NSW Site Auditor Scheme (3rd edition);
- (NSW EPA , 2022) Preparing Environmental Management Plans for Contaminated Land Practice Note: NSW Environment Protection Authority;
- ANZECC (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality;
- ANZG (2018) Australian and New Zealand Guidelines for Fresh and Marine Water Quality;
- NEPC (2013) National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013);
- NHMRC (2018) Australian Drinking Water Guidelines 6 2011 (v3.5 updated August 2018);
- NHMRC (2008) Guidelines for Managing Risk in Recreational Water;
- NEPC (2013) National Environment Protection (Assessment of Site Contamination) Measure (as amended 2013); and
- NSW Department of Environment and Climate Change (DECC) Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation 2008 (UPSS Regulation).

Soil (and groundwater if required) remediation would commence following a demolition of the existing structures and the data gap assessment. Prior to demolition of building hazardous building materials must be removed and validated. Following the completion of the demolition works a site clearance must be undertaken by an Occupational Hygienist. A hazardous building materials assessment (Hazmat) and demolition management plan must be prepared to facilitate this process.

Possible remedial options to achieve the remedial objectives (refer Section 1) are identified as follows:

- No action;
- On-site treatment of contaminated material;
- Removal of contaminated material to landfill;
- Groundwater remediation (if required); and
- Capping / on-site containment of contaminated materials.

The following is a summary of the review of remediation options.

4.1.1 No Action

The “No Action” option involves no remedial response to the contamination identified on the subject site. This option was not considered appropriate for the following reasons:

- It does not provide any means to improve the current condition of the site, whereas the limited nature of the soil contamination issues render localised remediation feasible and practicable;
- The proposed development will include basement excavations; and
- Appropriate management arrangements and procedures would be required to manage / alleviate the impacts due to asbestos contamination.

4.1.2 On-site Treatment of Contaminated Material

On-site treatment of the contaminated material would typically involve the excavation, stockpiling, treatment and replacement of the treated contaminated material. On-site treatment is considered unlikely to be suitable due to the nearby sensitive receptors, and the proposed basement excavation which is not likely to accommodate the replacement of treated soils.

4.1.3 Removal of Contaminated Material to Landfill

Off-site disposal of contaminated material is considered a suitable option for managing human health and environmental impacts from the contaminated materials, particularly in view of the extent of bulk excavation required for the construction of basement levels, resulting in net surplus soils.

This option would adequately address the remediation objectives via the (likely) complete removal of the contaminants and area of environmental concern from the subject site.

The removal of the contaminated material would involve the stockpiling, waste classification and transport of contaminated material to an EPA licensed landfill.

4.1.4 Capping

Based on the proposed development that will include bulk excavation across the majority of the site, capping is not anticipated to form a substantial part of the remediation works. However, it is possible that some form of capping may be required around the perimeter of the site and / or where existing buildings are being retained. If a EMP is required it must be prepared in accordance with (NSW EPA , 2022).

The necessity for capping, location and nature of such capping systems will be determined based on the outcome of the data gap assessment. If capping systems are required, this must be detailed in an updated RAP or addendum to the RAP and will require to be addressed under an Environmental Management Plan (EMP).

4.1.5 Groundwater Remediation

Based on the findings of the data gap assessment it may be necessary to undertake some form of groundwater remediation. If groundwater remediation is required (beyond source removal during the bulk excavation works), this RAP must be revised and / or an addendum to this RAP be prepared to detail the nature and extent of groundwater remediation works required.

4.2 Selected Remediation Options

Based on the anticipated potential contamination at the site (i.e., based on the CSM) and the nature of the proposed development which includes basement excavations and landscape elements, it is considered that the proposed remediation options with respect to soil contamination will comprise:

- Hazardous building materials assessment, demolition and clearance inspections;
- Data gap investigations as outlined in Section 4.4;

- Decommission, removal and validation of the identified potential sources of contamination (UST No 2 and pipework, remnant pipework from UST No 1 which leads to former Boiler Room in Drummond House and grease trap);
- Excavation, waste classification and removal of soils from the basement excavation, and any additional contamination outside the basement footprint, if deemed unsuitable to be retained within the site (i.e., fill material at borehole 203 which is impacted by PAH;
- Potential capping in landscape areas and beneath building being retained. If contaminated soils are capped on site a EMP will be required that meets the requirements of (NSW EPA , 2022); and
- Validation of the remedial excavations to confirm the completeness of the remediation.

The necessity and / or nature of potential groundwater remediation will be determined based on the results of the data gap assessment. A variety of options may be considered, including but not limited to:

- Multi-phase vapour extraction (MPVE);
- Monitoring natural attenuation (MNA);
- Pump and treat systems;
- Ventilation systems; and
- Vapour barriers and / or systems to prevent groundwater intrusion into the basements.

4.3 Remediation Implementation

Remediation and associated works will be required prior to commencement of bulk earthworks in and described in the following sections:

- Hazmat, demolition and clearance (refer to Section 4.4);
- Data gap assessment (refer to Section 4.5);
- Removal and validation of UPSS (refer to Section 8.1);
- Removal and validation of grease trap (refer to Section 8.2);
- Removal and validation of contaminated soils at borehole 203 and any additional soils if identified in data gap assessment, or in accordance with the unexpected finds protocol (refer to Section 8.10) if not identified in the data gap assessment; and
- Bulk excavation and validation of natural soils (refer to Section 8.5).

4.4 Hazmat, Demolition and Clearance

Prior to the commencement of demolition works a hazardous building materials (hazmat) assessment must be undertaken to identify the type, condition, and location of hazardous building materials in the structures to be demolished (such as asbestos).

Following the completion of the hazmat a demolition plan must be prepared by the contractor to detail the process to safety remove hazardous materials in a manner to prevent risk to human and environmental health. Following the removal of the hazardous materials a clearance inspection and report must be completed by an Occupational Hygienist before general demolition works commence.

Following the completion of the demolition works a surface clearance inspection and certificate must be prepared by an Occupational Hygienist to confirm that no hazardous building materials from the demolition works remain at the surface before the data gap assessment can commence.

4.5 Data Gap Assessment

It is proposed that the data gap assessment will be undertaken by the Environmental consultant post demolition and clearance at which point the potential risk associated with asbestos in building demolition waste can most effectively be assessed.

4.5.1 UST No 2: Diesel UST and Related Infrastructure

The proposed data gap assessment in relation to the diesel UST and related pipework shall include:

- Drilling and installation of one additional groundwater well (including soil sampling) to a depth of between 6 to 8 m bgl depending on the observed depth of groundwater. on the well shall be positioned to the northeast of the UST as indicated on Drawing 6, Appendix B; and
- Drilling of three additional soil bores to a depth of 4 m bgl along the extent of the pipework as indicated in Drawing 6, Appendix B.

The proposed sampling methodology is described in Section 4.5.4 and the proposed analytical suite is provided in Section 4.5.5.

4.5.2 CCK Site Data Gap

Due to the absence of the validation report for the CCK building including a validation for the removal of UST No. 1 it is proposed that the following data gap testing be undertaken to the east of the CCK building:

- Drilling and installation of two groundwater wells (including soil sampling) to a depth of between 6 to 8 m bgl depending on the observed depth of groundwater as indicated on Drawing 6, Appendix B.

The proposed sampling methodology is described in Section 4.5.4 and the proposed analytical suite is provided in Section 4.5.5.

4.5.3 General Site

The NSW EPA (1995) Sampling Design Guidelines recommends for a site of 5000 m^2 a minimum of 13 sampling points with additional sampling points where there are potential point sources of contamination. In this regard, the general site data gap assessment should assess the following potential point sources (in addition to those addressed in Section 4.5.1 and 4.5.2):

- The boiler room;
- The grease trap;
- The current and former substation locations (completed in DP (2021c); and
- The building footprints of the buildings proposed to be demolished.

Based on the above considerations, the following post demolition data gap assessment is recommended:

- Drilling and installation of one additional groundwater well adjacent to the boiler room (including soil sampling) to a depth of between 6 to 8 m bgl depending on the observed depth of groundwater as indicated on Drawing 5, Appendix B;
- Drilling of one additional soil bore to a depth of 4 m bgl adjacent to the grease trap as indicated in Drawing 5, Appendix B; and
- Excavation of 14 test pits on general grid across the site, targeting the footprints of the existing buildings. The test pits will be excavated to a depth of 2.0 m or 0.5 m below the fill / natural soil interface, whichever is greater.

4.5.4 Proposed Sampling Methodology

The sampling methodology is provided in Appendix D.

4.5.5 Proposed Analytical Suite

A minimum of two soil samples must be analysed from each soil test location. Soil samples must be (at a minimum) analysed for the following contaminants of concern per Table 4.

Table 4: Minimum Soil Analysis Requirements

Area	Analytical Suite
UST No. 2: Diesel UST and Pipework 2 bores 203 and 204 completed in DP (2021c). 4 additional bores to be completed post demolition	Heavy metals, PAH, TRH, BTEX, phenols*
Boiler Room (1 bore)	Heavy metals, PAH, TRH, BTEX, phenols*
Bores to east of the CCK Building (2 bores) Assess potential impacts related to UST No.	Heavy metals, PAH, TRH, BTEX, phenols*

Area	Analytical Suite
1	
Grease Trap (1 bore)	Oil and Grease, Heavy metals, PAH, TRH, BTEX, phenols, VOC*
Substations (2 bores) Completed in DP (2021c)	completed in DP (2022a)
Test Pits for site coverage (14 test pits)	Heavy metals, PAH, TRH, BTEX, phenols, OCP, OPP, PCB, asbestos (500 ml FA/AF), TCLP as required for waste classification

Note: * Additional analysis may be required if fill is encountered. Fill samples may require analysis for Heavy metals, PAH, TRH, BTEX, phenols, OCP, OPP, PCB, asbestos (500 ml FA/AF), TCLP as required for waste classification.

The data gap investigations should include the preparation of preliminary *in situ* waste classification assessment reports.

Groundwater samples should be collected from both the proposed wells and the four existing wells (201 to 204) installed for DP (2021c) and analysed for the following potential contaminants of concern as per Table 5.

Table 5: Proposed Groundwater Analysis

Area	Analytical Suite
Diesel UST (UST No 2) and Pipework (3 wells)	Heavy metals, PAH, TRH, BTEX, phenols, VOC
Bores to east of the CCK Building (2 wells)	Heavy metals, PAH, TRH, BTEX, phenols, VOC
Boiler Room / Grease Trap (1 well)	Heavy metals, PAH, TRH, BTEX, phenols, VOC, Oil and Grease
Substations (2 wells)	PCB, TRH, VOC, OCP

4.5.5.1 QA / QC Requirements

QA / QC testing in conjunction with the data gap assessment must also be undertaken including:

- Inter-laboratory duplicate samples for the full analytical suite of the primary sample at a rate of 5% of the primary sampling or a minimum of one sample per sampling day / source material;
- Intra-laboratory duplicate samples for the full analytical suite of the primary sample at a rate of 5% of the primary sampling or a minimum of one sample per sampling day / source material;
- One trip spike (BTEX) and trip blank (BTEX) per sampling day; and
- One rinsate sample per sampling day (PAH and heavy metals), if non-disposable sampling equipment is used.

4.5.6 Acid Sulfate Soils

Based on the findings of (DP, 2022c) further acid sulfate soil assessment is no longer considered necessary. However, if materials suspected of potentially containing ASS are identified, samples shall be collected in accordance with the methods outlined in Appendix D and the results compared to the action criteria in Appendix C.

4.5.7 Data Gap Assessment Report

A data gap assessment report should be prepared in stages which includes the results of the following:

- Results of testing in relation to UST No. 2, grease trap, data gap related to the CCK site and general site condition;
- Preliminary in situ waste classification; and
- Advice on requirements for any addenda to this RAP (i.e., groundwater remediation) as required.

If considered necessary based on the findings of the data gap assessment a revised RAP or RAP addenda will be prepared. This may include requirements to remediate specific sources of contamination identified, groundwater remediation requirements and / or capping strategies (as required).

5. Remediation Acceptance Criteria

The proposed development will include mixed uses including, retail, commercial, residential apartments and accommodation at the at Drummond House related to the services provided at the CCK Building. As Drummond House and the completed CCK building may accommodate staff and children with medical conditions, the proposed land-use classification will need to account for the risk of exposure of the most susceptible human receptors to any contamination, i.e., children.

The health investigation and screening levels developed for low-density residential land-use (HIL/HSL A) are the most sensitive thresholds documented in NEPM (Schedule B1, NEPC, 2013). Apart from their use for the preliminary assessment of land for residential use, *HIL/HSL A values are also applicable to the preliminary assessment of potential risks at sites where children are likely to be the most sensitive human receptors, including childcare centres, kindergartens, preschools and primary schools and their integral playgrounds* (NEPM Schedule B7, NEPC, 2013).

In this regard, Table 6 summarises the adopted investigation levels for this RAP which ware detailed in Appendix C.

Table 6: Summary of Adopted Investigation and Screening Levels

Area	Health Investigation Level (HIL)	(Health Screening Level)
CCK Building and Boundary adjoining CCK Building	HILA	HSLA
Drummond House	HILA	HSLA
Proposed New Buildings C and D	HILB	HSLD

5.1 Data Quality Objectives

The RAP has been devised broadly in accordance with the seven-step Data Quality Objective (DQO) process which is provided in Appendix B, Schedule B2 of NEPC, (2013). The DQO process is outlined as follows:

- Stating the Problem;
- Identifying the Decision;
- Identifying Inputs to the Decision;
- Defining the Boundary of the Assessment;
- Developing a Decision Rule;
- Specifying Acceptable Limits on Decision Errors; and
- Optimising the Design for Obtaining Data.

Conformance with this process must be included in the data gap assessment report, the revised RAP and the final validation report.

6. Roles and Responsibilities

6.1 Principal

The Principal will retain the overall responsibility for ensuring that this RAP is appropriately implemented. The Principal is to nominate a representative (the Principal's Representative - PR), who is responsible for overseeing the implementation of this RAP.

6.2 Principal Contractor

The Principal Contractor will be the party responsible for the day-to-day implementation of this RAP and shall fulfil the responsibilities of the Principal Contractor as defined by SafeWork. It is noted that the Contractor may appoint appropriately qualified sub-contractors or sub-consultants to assist in fulfilling the requirements of the procedures.

In addition to the implementation of the RAP it will be the Contractor's responsibility:

- To obtain specific related approvals as necessary to implement the earthworks, including for example, permits for removal of asbestos-containing materials, SafeWork notification (if required), etc.;
- To develop or request and review plans to manage site works as detailed in this RAP;
- That all site works, and other related activities are undertaken in accordance with this RAP;
- To maintain all site records related to the implementation of the RAP;
- To have sufficient information to engage, or direct the Contractor to engage all required parties, including sub-contractors, to implement the requirements of the RAP other than those that are the direct responsibility of the Contractor;
- To manage the implementation of any recommendation made by those parties in relation to work undertaken in accordance with the RAP;
- To inform, the relevant regulatory authorities, of any non-conformances with the procedures and requirements of the RAP in accordance with the procedures outlined in this document;
- To retain records of any contingency actions;
- To review the RAP and related records for completeness and update as necessary upon completion of the project; and
- To recommend any modification to general documentation which would further improve the environmental outcomes of this RAP.

6.3 Asbestos Contractor

The Asbestos Contractor will be responsible for undertaking all asbestos works, if asbestos is encountered at any time during the works and will hold a minimum of a Class B licence (or a Class A licence if friable asbestos is discovered) for the removal of asbestos (issued by SafeWork NSW). The asbestos contractor can be the same entity as the principal contractor.

6.4 Sub-Contractors

All sub-contractors' staff should be fully informed and will be inducted onto the site, informed of their responsibilities in relation to this RAP and sign their agreement to abide by the RAP requirements. Where necessary, sub-contractors will also be trained in accordance with the requirements of this document. All sub-contractors must conduct their operations in accordance with this RAP as well as all applicable regulatory requirements.

6.5 Environmental Consultant

The Environmental Consultant will provide advice on implementing this RAP.

The Environmental Consultant will be responsible for:

- Undertake data gap assessment in accordance with the RAP;
- Undertaking validation sampling in accordance with this RAP;
- Validating imported materials to the site (if any);
- Undertaking any required assessments where applicable (e.g., waste classification, validation, etc.);
- Providing advice and recommendations arising from monitoring and / or inspections; and
- Notifying their client with the results of any assessments and any observed non-conformances in a timely manner.

The Environmental Consultant and Occupational Hygienist (refer Section 6.6) can be the same entity.

6.6 Occupational Hygienist

The Occupational Hygienist will provide advice on Work Health and Safety (WHS) issues related to the asbestos works.

The Occupational Hygienist will hold an Asbestos Assessor Licence, where appropriate, in accordance with the WHS Regulations.

The Occupational Hygienist will be responsible for:

- Undertaking Hazmat assessments and preparing demolition plans;
- Preparing any WHS plans and advice if requested by the Contractor;
- Undertaking airborne asbestos monitoring, if required;
- Undertaking clearance inspections;
- Providing advice and recommendations arising from monitoring and/or inspections; and
- Notifying their client with the results of any assessments and any observed non-conformances in a timely manner.

The Occupational Hygienist and Environmental Consultant can be the same entity.

6.7 Site Workers

All workers on site are responsible for observing the requirements of this and other management plan. These responsibilities include the following:

- Being inducted on site and advised of the general nature of the soil contamination at the site;
- Being aware of the requirements of this plan;
- Wearing appropriate PPE as required by this plan;
- Only entering restricted areas when permitted; and
- Requesting clarification when unclear of requirements of this or any other plans (e.g., SWMS).

7. Regulatory Requirements and Relevant Standards

All works must be conducted in accordance with the development consent conditions. All works must be also undertaken in accordance with the relevant regulatory criteria and guidelines, including *inter alia*:

- NSW *Work Health and Safety Act* 2011 (WHS Act);
- NSW *Work Health and Safety Regulation* 2011 (WHS Regulation);
- NSW *Contaminated Land Management Act* 1997;
- *National Environment Protection Measures 2013 (NEPM);* and
- *Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia* (WA DoH 2009).

Reference to relevant Codes of Practice, Australian Standards and industry standards should also be made in determining appropriate safe work practices. These include, *inter alia:*

- *National Code of Practice How to Manage and Control Asbestos in the Workplace* (Safe Work Australia 2011);
- *National Code of Practice How to Safely Remove Asbestos* (Safe Work Australia 2011);
- NSW EPA Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation 2019;
- NOHSC *Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres 2nd Edition* [NOHSC:3003 (2005)];
- NOHSC *Guidance Note on the Interpretation of Exposure Standards for Atmospheric Contaminants in the Occupational Environment* [NOHSC:3008 (1995)] 3rd edition;
- AS/NZS 1715:2009 *Selection, Use and Maintenance of Respiratory Protective Devices;*
- AS/NZS 1716:2012 *Respiratory Protective Devices;*
- AS/NZS 1716:2003/Amdt 1:2005: *Respiratory protective devices;* and
- WorkCover NSW: *Working with Asbestos: Guide 2008.*

8. Proposed Remediation Methodology and Validation Plan

Based on the proposed development (including the two-level basement excavation), the proposed remediation strategy will be to remove the identified potential sources of contamination via excavation and disposal to the extent practical (limited by the basement extent / site boundaries and the heritage listed Drummond House which is to be retained). The identified potential contaminant sources to be removed, disposed and validated include:

- Hazardous building materials;
- UST No 2 and pipework which lead to the Boiler Room at the rear of 19-21 South Steyne and to the fill point on South Steyne and remnant pipework from UST No 1 which leads to the former Boiler Room at the rear of Drummond House;
- The grease trap;
- Fill soils within the proposed basement footprint; and
- Contaminated soils identified during DP (2021c) and potentially during further data gap assessment (if any).

In addition to these there is a potential for groundwater contamination. The presence of and requirement to remediate groundwater will be determined during the data gap assessment.

8.1 Diesel UST (UST No 2) and Pipework for UST No 1

The following is the proposed sequence for the removal and validation of the UST No 2 and its pipework and remnant pipework from former UST No 1 to the former boiler room in the basement of Drummond House:

1. Prior to the removal of UST No 2 and associated appurtenances (pipework/fuel lines etc), any residual product (liquid / vapour) will be removed from the tank and disposed of appropriately in accordance with Australian Standard (AS 4976 - 2008 *The Removal and Disposal of Petroleum Underground Storage Tanks*). Records of disposal should be provided for the validation report;
2. The UST will be exposed and examined for potential leaks and general condition. A suitably qualified environmental consultant should be engaged to inspect the UST prior to its removal;
3. The UST will be removed, and the structures disposed of by a qualified contractor in accordance with AS 4976 - 2008. Disposal records should be provided to the environmental consultant for inclusion in the validation report;
4. All associated infrastructure for UST No 2 (i.e., the remnants including fuel lines etc) will be removed and disposed in a similar manner if present;
5. All remnant fuel lines leading from former UST No 1 into the basement of Drummond House will be removed and disposed if present;

6. Excavate and stockpile impacted materials (based on field observations to the practical extent possible based on structural engineers' recommendations and materials backfilled around the tank for classification. Materials which meet the remediation criteria in the RAP can be retained on site, although it is likely that the material will be surplus to the development due to the proposed basement excavation. Materials that are surplus to the development and / or fail the remediation criteria in the RAP will require off-site disposal to a licensed landfill unless otherwise advised by the environmental consultant. Land farming of impacted soils may be considered upon further advice from the environmental consultant based on the nature and extent of impacted soils and consideration of the potential impacts on neighbours;
7. Collect validation samples from the tank pit at a minimum rate of one location per side wall or one sample per soil type and at the depth of observed groundwater, whichever is the greater and at least one sample in the excavation base. Note that the actual number of samples may vary depending on the size of the tank pit excavation and the degree of contamination, the soil profile encountered and the presence of groundwater;
8. Collect validation samples below the fuel lines for UST No 1 and UST No 2 (following removal). Validation samples should be collected at a rate of one sample per 5 m linear metres of the fuel lines;
9. The validation samples will be analysed at a NATA accredited laboratory for the following analytical scope; TRH, PAH, BTEX, and VOC. Additional analysis may be required as advised by the environmental consultant based on the contents of the tank;
10. Excavated material from the tank pits / fuel line will be placed into a stockpile for assessment for potential reuse and/or waste classification as appropriate. If excavated soils exhibit signs of contamination during excavation (such as hydrocarbon odours or staining) then the soil should be segregated from soils that are not impacted into a separate stockpile and placed on impermeable surface (concrete or plastic) and bunded to prevent leachate generation All stockpile samples will be analysed for heavy metals, PAH, TPH, BTEX, phenols, polychlorinated biphenyls (PCB), organochlorine pesticides (OCP) and asbestos (to determine if the materials are suitable to be retained on site and/or disposed to landfill; and
11. If water is encountered in the pit, a grab sample will be collected. The grab sample will be analysed for heavy metals, TPH, BTEX, PAH, VOC and hardness.

8.2 Grease Trap

The following is the proposed sequence for the removal and validation grease trap:

1. Prior to the removal of a grease trap, any residual product will be removed from the tank and disposed of appropriately. Records of disposal should be provided for the validation report;
2. The trap will be exposed and examined for potential leaks and general condition. A suitably qualified environmental consultant should be engaged to inspect prior to its removal;
3. The structures be removed disposed of by a qualified contractor. Disposal records should be provided to the environmental consultant for inclusion in the validation report;
4. All associated infrastructure (i.e., the remnants including pipes) will be removed and disposed in a similar manner if present;

5. Excavate and stockpile impacted materials (based on field observations to the practical extent possible based on structural engineers' recommendations and materials backfilled around the tank for classification. Materials which meet the remediation criteria in the RAP can be retained on site, although it is likely that the material will be surplus to the development due to the proposed basement excavation. Materials that are surplus to the development and / or fail the remediation criteria in the RAP will require off-site disposal to a licensed landfill unless otherwise advised by the environmental consultant;
6. Collect validation samples from the resultant pit at a minimum rate of one location per side wall or one sample per soil type and at the depth of observed groundwater, whichever is the greater and at least one sample in the excavation base. Note that the actual number of samples may vary depending on the size of the tank pit excavation and the degree of contamination, the soil profile encountered and the presence of groundwater;
7. Collect validation samples below the pipes (following removal). Validation samples should be collected at a rate of one sample per 5 m linear metres of the fuel lines;
8. The validation samples will be analysed at a NATA accredited laboratory for the following analytical scope; TRH, PAH, phenols, heavy metals, oil and grease and VOC. Additional analysis may be required as advised by the environmental consultant based on the contents of the tank;
9. Excavated material from trap and pipes will be placed into a stockpile for assessment for potential reuse and / or waste classification as appropriate. If excavated soils exhibit signs of contamination during excavation (such as hydrocarbon odours or staining) then the soil should be segregated from soils that are not impacted into a separate stockpile and placed on impermeable surface (concrete or plastic) and bunded to prevent leachate generation All stockpile samples will be analysed for heavy metals, PAH, TPH, BTEX, phenols, polychlorinated biphenyls (PCB), organochlorine pesticides (OCP) and asbestos (to determine if the materials are suitable to be retained on site and / or disposed to landfill; and
10. If water is encountered in the pit, a grab sample will be collected. The grab sample will be analysed for TRH, PAH, phenols, heavy metals, oil and grease and VOC.

8.3 Contaminated Soils Identified in DP (2022c) and Data Gap Assessment

(DP, 2022c) identified one location which records a result that exceeded the adopted RAC. The concentration of Benzo(a)pyrene TeQ exceeded the HILB (4 mg/kg) in sample 203B/0.15-0.25 and its replicate (7.4 mg/kg and 4.1 mg/kg). Therefore, the following remedial excavation works is recommended:

- Initially excavate PAH impacted 25 m^2 area centred on borehole 203 to a depth of approximately 2 m bgl (observed depth of fill);
- Excavate and stockpile impacted materials (based on field observations to the practical extent possible based on structural engineers' recommendations;
- Excavated material will be placed into a stockpile for assessment for potential reuse and/or waste classification as appropriate. If excavated soils exhibit signs of contamination during excavation (such as hydrocarbon odours or staining) then the soil should be segregated from soils that are not impacted into a separate stockpile and placed on impermeable surface (concrete or plastic) and bunded to prevent leachate generation All stockpile samples will be analysed for heavy

metals, PAH, TPH, BTEX, phenols and asbestos (to determine if the materials are suitable to be retained on site and / or disposed to landfill;

- Materials which meet the remediation criteria in the RAP can be retained on site, although it is likely that the material will be surplus to the development due to the proposed basement excavation. Materials that are surplus to the development and / or fail the remediation criteria in the RAP will require off-site disposal to a licensed landfill unless otherwise advised by the environmental consultant;
- Collect validation samples from the resultant excavation at a minimum rate of one location per side wall or one sample per soil type and at the depth of observed groundwater, whichever is the greater and at least one sample in the excavation base;
- If validation samples results exceed the RAC chase out excavation under the direction of the environmental consultant; and
- The validation samples will be analysed at a NATA accredited laboratory for the PAH, phenols, heavy metals, oil and grease and VOC. Additional analysis may be required as advised by the environmental consultant based on the contents of the tank.

If no other significant contamination is identified during the data gap assessment it may be appropriate to adopt the unexpected finds protocols for minor contamination finds such as isolated asbestos finds (refer to Appendix E).

However, if significant contamination is identified during the data gap assessment, then the RAP must be either revised or an addendum prepared for the identified contaminant / source(s).

8.4 Groundwater Contamination Identified in Data Gap Assessment

If contaminated groundwater is identified during the data gap assessment, then the RAP should be revised or an addendum to this RAP should be prepared specific to the identified groundwater contamination.

It is noted that the proposed basement excavation, will, in all probability remove the greater portion of any likely groundwater contaminant sources at the site and therefore it is considered highly unlikely that groundwater remediation, beyond source removal (the proposed bulk excavation) would be required.

8.5 Bulk Excavation

Following the removal of the identified AECs (UPSS and grease trap), the PAH impacted soils at borehole 203 and any unexpected contamination finds, bulk excavation should proceed to remove the fill soil within the basement footprint. Upon the completion of the excavation of fill the underlying natural soil (sand) should be validated to (a) confirm that contaminated fill (if present) has been removed and to facilitate a VENM assessment of the natural soils. The following validation sampling must be undertaken:

- Validation samples must be collected from the top of the natural soil profile in accordance with the NSW EPA Sampling Design Guidelines (1995) for the area being assessed. Nominally 13 sampling points;
- Validation samples must be analysed heavy metals, TRH, PAH, VOC, BTEX, OCP, OPP, PCB, phenols and asbestos. Note the analytical suite may be adjusted based on the results of the data gap assessment; and
- QA / QC analysis per Section 8.9.

If appropriate a VENM assessment can be prepared following the removal of the overlying fill and / or contaminated soils (if present). It is noted that if acid sulfate soils are encountered that these materials cannot be classified as VENM

8.6 Waste Classification Requirements

All off-site disposal of wastes, where required, will be undertaken in accordance with the POEO Act. The proposed data gap assessment shall include preliminary in situ waste classification assessment/s. Following the *in situ* classification, *ex situ* classifications and / or further assessment during excavation may be required. The further assessment may include visual assessment and / or further testing as required.

Any soils removed from the site will be classified in accordance with either:

- The NSW EPA *Waste Classification Guidelines 2014*; or
- A General or Specific Exemption under the *Protection of the Environment Operations (Waste) Regulation* 2005.

Soil samples must be analysed for the primary contaminants of concern identified in the conceptual site model (CSM) including heavy metals, TRH, PAH, VOC, BTEX, OCP, OPP, PCB, phenols and asbestos. QA / QC requirements in accordance with Section 8.9.

For stockpiled fill material, one sample will be taken per 25 m^3 - 250 m^3 depending on the homogeneity of the material with a minimum of three samples per stockpile. For the purpose of the waste classification process the following sampling rate is to be adopted:

- ≤ 50 m^3: Minimum of three samples;
- 50 m^3 - 250 m^3: One sample per 50 m^3, minimum of three samples; and
- 250 m^3: One sample per 250 m^3, minimum of three samples.

Following the removal of stockpiles containing asbestos-based materials, it is recommended that the footprint of the stockpile, if located on unsealed ground, be validated by an occupational hygienist.

No soils will leave the site without a formal waste classification.

All transport of waste and disposal of materials must be conducted in accordance with the requirements of the POEO Act. All licences and approvals required for disposal of the material will be obtained prior to removal of the materials from the site.

Removal of waste materials from the site shall only be carried out by a licensed contractor holding appropriate licence, consent and / or approvals to dispose of the waste materials according to the assigned waste classification and the corresponding requirements outlined in the NSW EPA Waste Classification Guidelines 2014, and with the appropriate approvals obtained from the EPA, if required.

Details of all soils removed from the site (including VENM) shall be documented by the Contractor with copies of the receiving site environmental protection licence (EPL), weighbridge slips, trip tickets and consignment disposal confirmation (where appropriate) provided to the Environmental Consultant and the PR. A site log shall be maintained by the Contractor to track disposed loads against on-site origin.

Transport of spoil shall be via a clearly delineated, pre-defined haul route. The proposed waste transport route will be notified to the local Council and truck dispatch shall be logged and recorded by the Contractor for each load leaving the site. A record of the truck dispatch will be provided to the PR.

8.7 Natural Soils

Based on the expected depth of fill soils and the proposed basement excavation it is anticipated that natural sands will be encountered during bulk excavation. The natural soils must be validated following the removal of the overlying fill as per the requirements in Section 8.5 and a VENM Certificate prepared.

Alternatively, natural materials can be assessed in stockpiles. Stockpiles should be assessed at a minimum of one sample per 25 m^3 for stockpiles less than 250 m^3 (or a minimum of 3 samples per stockpile) to 1 sample per 100 m^3 for stockpiles greater than 1000 m^3. Soil samples must be analysed for TPH, BTEX, PAH, OCP, OPP, PCB, phenols, ASS, asbestos and heavy metals.

QA / QC testing must also be undertaken in accordance with Section 8.9.

It is noted that potential or actual acid sulfate soils cannot be classified as VENM. If acid sulfate soils are detected in the data gap assessment this will need to be taken into account in regards to classification of materials.

8.8 Imported Materials

Materials imported to the site must be VENM, ENM or other certified landscaping materials such as topsoil (not recycled or blended product), mulch (not recycled or blended product) or quarry won products (such as gravel, blue metal) from a reputable supplier. If not VENM or a quarried product, all imported materials must comply with a general or specific resource recovery order as approved by the NSW EPA.

The source site must provide reports confirming the above which must be provided to the environmental consultant for review and approval prior to importation of the material. If the reports do not meet the satisfaction of the Environmental Consultant, then the source site may be rejected, or additional analysis requested.

In addition, upon receipt of the material a minimum of three check samples (per source site) of the imported material must be collected and analysed for heavy metals, TRH, PAH, OCP, PCB, BTEX, phenols and asbestos. In addition, pH and cation exchange capacity must be tested for the imported materials to determine appropriate ecological screening levels.

In addition to complying with an applicable resource recovery order, the analytical results must also meet the RAC as outlined in Section 5.

Other imported products such as gravel, topsoil and mulch must be either clean, virgin products (i.e., quarried natural stone, VENM classified topsoil, or documented mulching of specific trees) or documented by the supplier as being compliant with a relevant Resource Recovery Order (RRO).

It is highly recommended that no recycled or blended product is used given the high risk of containing contaminants such as asbestos, lead and PCB. Should such products be proposed for use, apart from being required to comply with an RRO, the Environmental Consultant will conduct a more rigorous validation process including:

- A visit to the source site;
- Thorough review of the reports provided confirming compliance with an RRO;
- Inspection of the imported product; and
- Verification sampling of the imported product at a rate of at least 1 sample per 25 m^3.

Analysis of the verification samples for the contaminants of concern (determined by the source and the information provided in the RRO compliance documentation). Asbestos will be analysed as a minimum for all incoming products.

8.9 QA / QC Requirements

- QA / QC testing in conjunction with validation sampling must also be undertaken including:
- Inter-laboratory duplicate samples for the full analytical suite of the primary sample at a rate of 5% of the primary sampling or a minimum of one sample per sampling day / source material;
- Intra-laboratory duplicate samples for the full analytical suite of the primary sample at a rate of 5% of the primary sampling or a minimum of one sample per sampling day / source material;

- One trip spike (BTEX) and trip blank (BTEX) per sampling day; and
- One rinsate sample per sampling day (PAH and heavy metals), if non-disposable sampling equipment is used.

8.10 Unexpected Finds

Should unexpected occurrences be identified during works (such as unidentified buried tanks or unexpected contaminants e.g., friable asbestos material), the following general approach will be adopted:

- Foreman will barricade the impacted area and stop all works which are potentially impacted by or which will potentially impact the issue / area of concern;
- The Contractor will notify the PR and Environmental Consultant of the occurrence;
- The Environmental Consultant will assess the identified issue / area of concern, and provide advice to the PR regarding potential remedial / management options;
- The PR will instruct the Environmental Consultant of the preferred remedial / management strategy;
- The Environmental Consultant will prepare a plan detailing the works required for the preferred remedial / management option;
- The PR / Contractor will obtain any necessary approvals for undertaking the remedial / management works; and
- The Contractor will undertake the remedial / management works in accordance with the provided plan upon instruction by the PR.

Further unexpected finds protocols are provided in Appendix E.

8.11 Incident Response

If during works any incident of non-conformance ('incident') with this or other plans (as outlined below) is observed, then this is to be immediately reported to the PC. The PC is to record the incident and the rectification works which were subsequently undertaken to address the non-conformance. Depending on the nature of the non-conformance, input from the asbestos contractor, environmental consultant and / or occupational hygienist may be required.

8.12 Reporting Requirements

8.12.1 Data Gap Assessment

Refer to Section 4.5.7 for data gap assessment reporting requirements.

8.12.2 Revised RAP

Following the completion of the data gap assessment this RAP must be revised or appropriate addenda prepared unless no contamination is identified (outside of the known sources) or where the proposed remediation strategies are insufficient (i.e., if groundwater remediation is required).

8.12.3 Interim Validation Advice

As required interim validation advice may be required during stages of remediation including:

- Following the removal of the diesel UPSS;
- Following the removal of the grease trap;
- Following the removal of unexpected finds; and
- Following the removal fill.

8.12.4 Waste Classification

As required additional waste classification reports may be required for materials proposed for removal from the site.

8.12.5 Validation Report

At the completion of the works a validation report must be prepared by the Environmental Consultant that details the following:

- All previous investigation results;
- Summaries of the validation testing results;
- Summaries of previous waste classifications, clearances and validation letters;
- A summary of this RAP and the remedial strategy adopted;
- Records (including photographic records) of site inspections completed during the works;
- Records of off-site disposal of surplus soils, including landfill disposal dockets if applicable;
- Documented validation process adopted for all imported materials used in the cap; and
- Validates the site is suitable for the proposed land use.

8.13 Long-Term Environmental Management Plan

Based on the proposed development and bulk excavation plan significant capping of contaminated materials is not anticipated. However, if capping is required around the perimeter of the proposed basement excavation and / or in areas where existing buildings are being retained a Long-Term Environmental Management Plan (EMP) may be required.

In the event that some amount of capping of contaminated materials is deemed necessary this may be considered by the Environmental Consultant subject to the type and extent of contamination identified. If capping is adopted in any part of the site and / or long-term management of residual contamination is required (such as residual groundwater contamination) then a long-term EMP may be required. If required, the EMP must include:

- Details the extent of contaminated soils that remain present at the site;
- A description of the expected conditions at the site;
- Details the remediation works completed at the site;
- The management and maintenance protocols for the capping system or other management system;
- The protocols for future works at the site within contaminated areas;
- The hazards associated with the contaminated materials at the site and the corresponding management controls; and
- The responsibilities of the appropriate parties to the EMP.

The EMP must be reasonably legally enforceable (by the consent authority). It is recommended that the preparation of an EMP be made a condition of the development consent for the works if required. The EMP would be prepared following the completion of the (development) works and the preparation of the validation report. It is noted that EMPs requiring passive management are to be avoided on residential sites however are acceptable where a strata body exists to manage and oversee the EMP. The EMP must be prepared in accordance with (NSW EPA , 2022).

9. Outline Asbestos Work Health and Safety Plan

The asbestos work health and safety plan is provided in Appendix F.

10. Outline Spoil and Remediation Environmental Management Plan

The Spoil and Environmental Management Plan is provided in Appendix G.

11. Documentation Requirements

11.1 Documentation Requirements

The following documents will be prepared / obtained by the relevant party, and provided to other parties (the PR, Contractor, Environmental Consultant and / or Occupational Hygienist) as required. The purpose of the documentation is to ensure the works are conducted in accordance with all applicable regulations and that appropriate records of the works are kept for future reference. Documentation should be provided by the relevant parties in a timely manner to allow the works to be conducted efficiently.

11.1.1 PR

The PR will prepare / obtain the following documents:

- Any licences and approvals required for the Works which are not the responsibility of the Contractor to provide.

11.1.2 Contractor

The Contractor will prepare / obtain the following documents:

- Any licences and approvals required for the Works which are the responsibility of the Contractor to provide;
- Excavation and stockpiling records: These will record the source of any stockpiled material, the date of excavation and any issues of concern;
- Transportation record: this will comprise a record of any truckloads of soil entering or leaving the site, including truck identification (e.g., registration number), date, time, load characteristics (i.e., classification, on-site source, destination);
- Tip dockets: these comprise dockets of receipt provided by the receiving waste facility and from the suppliers of materials imported to the site;
- Survey levels of remedial and excavation works; and
- Incident Reports: Any WHS or environmental incidents which occur during the works will be documented and the PR and appropriate regulatory authority will be informed in accordance with regulatory requirements.

11.1.3 Environmental Consultant

The Environmental Consultant will prepare / obtain the following documents:

- Data gap assessment report/s. Depending of the scheduling of works this may be a single data gap assessment report or several;
- Interim validation advice as required during the remediation works;
- Validation test results for remediation excavation testing;
- Waste classification reports, including records of sampling and analysis (if required);

- Validation reports associated with imported materials;
- Validation report, including records of inspections, sampling and analysis; and
- Long-Term Environmental Management Plan (EMP) (if required).

11.1.4 Occupational Hygienist

If asbestos is encountered during the works, the Occupational Hygienist will prepare / obtain the following documents:

- Airborne asbestos monitoring records as required;
- Interim visual clearances of asbestos removal (if any undertaken);
- A written final clearance certificate stating that:
  - The assessor or competent person found no visible asbestos residue from asbestos removal work on the surface of the works area, or on the surface in the vicinity of the area where the work was carried out, and
  - If air monitoring was carried out by the assessor or competent person as part of the clearance inspection - the airborne asbestos fibre level was less than 0.01 asbestos fibres / mL.

12. Conclusions

It is considered that following proper implementation of this RAP (to be revised following the implementation and reporting of the data gap assessment), the project site can be made suitable for the intended land use.

In the event that contaminated materials are capped on-site then a EMP will be required. If required the EMP must comply with (NSW EPA , 2022).

13. References

CRC CARE. (2017). *Risk-based Management and Remediation Guidance for Benzo(a)pyrene.* Technical Report no. 39: Cooperative Research Centre for Contamination Assessment and Remediation of the Environment.

DP. (2011). *Report on Phase 1 Contamination Assessment, Royal Far West, 12-22 Wentworth Street & 19-21 South Steyne, Manly.* Report 72252.00.R.001 Rev1, dated July 2011: Douglas Partners Pty Ltd.

DP. (2014a). *Report on Detailed Site (Contamination) Investigation Royal Far West Centre for Child Health and Learning 22 Wentworth Street, Manly.* Report 72252.02.R.001, dated December 2014: Douglas Partners Pty Ltd.

DP. (2014b). *Remediation Action Plan Royal Far West Centre for Child Health and Learning 14-22 Wentworth Street. Manly.* Report 72252.03.R.001, dated November 2014: Douglas Partners Pty Ltd.

DP. (2022a). *Updated Report on Addendum to Phase 1 Contamination Assessment, Redevelopment of Royal Far West, 14-22 Wentworth Street & 19-21 South Styene, Manly.* Report 72252.09.R.001.Rev0 dated February 2022: Douglas Partners Pty Ltd.

DP. (2022b). *Draft Updated Remediation Action Plan, Redevelopment of Royal Far West, 14-22 Wentworth Street and 19-21 South Steyne, Manly.* Report 72252.09.R.002.dftA dated February 2022: Douglas Partners Pty Ltd.

DP. (2022c). *Report on Site Investigation (Contamination) with Limited Sampling, 14-22 Wentworth Street and 19-21 South Steyne, Manly.* Project 72252.09.R.003.Rev0: Douglas Partners Pty Ltd.

NEPC. (2013). *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM].* Australian Government Publishing Services Canberra: National Environment Protection Council.

NSW EPA . (2022). *Preparing Environmental Management Plans for Contaminated Land .* Practice Note: NSW Environment Protection Authority.

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

NSW EPA. (2014). *Waste Classification Guidelines, Part 1: Classifying Waste.* NSW Environment Protection Authority.

NSW EPA. (2020). *Guidelines for Consultants Reporting on Contaminated Land.* Contaminated Land Guidelines: NSW Environment Protection Authority.

Stone, Y., Ahern, C. R., & Blunden, B. (1998). *Acid Sulfate Soil Manual.* Acid Sulfate Soil Management Committee (ASSMAC).

Sullivan, L., Ward, N., Toppler, N., & Lancaster, G. (2018). *National Acid Sulfate Soils Guidance: National Acid Sulfate Soils Sampling and Identification Methods Manual.* Canberra ACT CC BY 4.0: Department of Agriculture and Water Resources.

14. Limitations

Douglas Partners (DP) has prepared this report (or services) for this project in accordance with DP's proposal dated 27 January 2022 and. The work was carried out under DP's Conditions of Engagement. This report is provided for the exclusive use of Royal Far West 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.

DP's advice is based upon the conditions encountered during previous investigations. 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 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 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 environmental 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

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

LOCALITY MAP

Notes:
1. Basemap from metromap.com (dated 30/07/2021)

LEGEND

- Site Boundary
- Approximate Area of Drummond House Retained
- Approximate Area of Drummond House Demolished

0 10 20 30 40 50 m

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT:	Royal Far West		
OFFICE:	Sydney	DRAWN BY:	AS/MG
SCALE:	1:750 @ A3	DATE:	29.03.2022

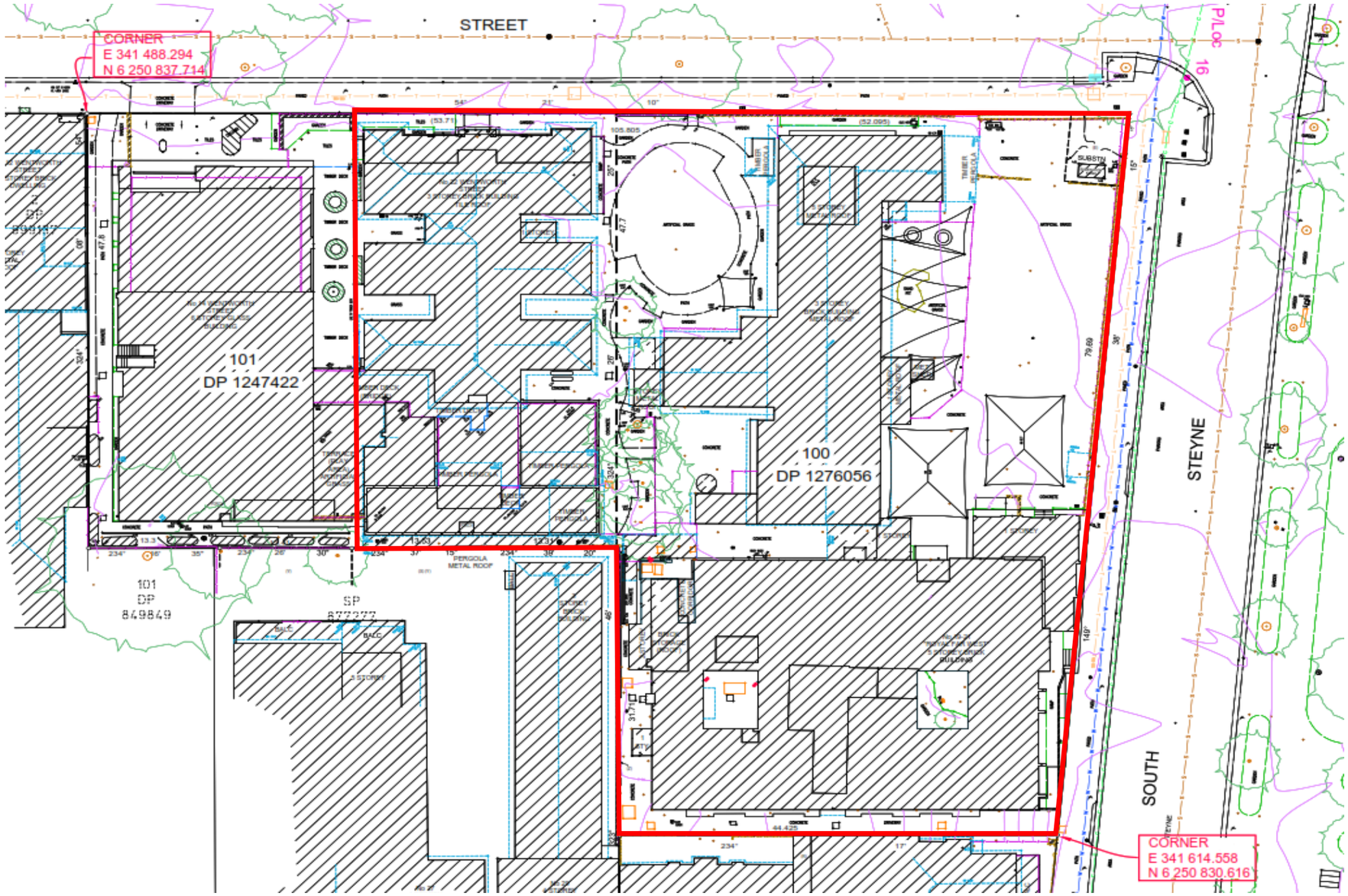
TITLE: **Site Location**
Royal Far West
12-22 Wentworth Street & 19-21 South Steyne, Manly

N

PROJECT No:	72252.09
DRAWING No:	1
REVISION:	0

LOCALITY MAP

Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: Royal Far West		TITLE: **Lot and Deposited Plan (DP) Identification**	PROJECT No:	72252.09
	OFFICE: Sydney	DRAWN BY: KDP	**Royal Far West**	DRAWING No:	2
	SCALE: As Shown	DATE: 6 Jun 2022	**14-22 Wentworth Street 19-21 South Steyne, Manly**	REVISION:	0



LOCALITY MAP

Notes:
Base survey plan from Veris Drawing DA-000 Survey Site Plan dated 17.02.2022

LEGEND
Site Boundary

0 2 4 6 8 10 12 14 16 18 20
LENGTHS ARE IN METRES

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT:	Royal Far West		
OFFICE:	Sydney	DRAWN BY:	KDP
SCALE:	As Shown	DATE:	6 Jun 2022

TITLE: **Site Survey**
Royal Far West
14-22 Wentworth Street 19-21 South Steyne, Manly

PROJECT No:	72252.09
DRAWING No:	3
REVISION:	0

LOCALITY MAP

Notes:
1. Basemap from metromap.com (dated 30/07/2021)

LEGEND

Site Boundary

0 10 20 30 40 50 m

Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: Royal Far West	TITLE: **Areas of Environmental Concern**	PROJECT No: 72252.09
	OFFICE: Sydney / DRAWN BY: AS/MG	**Royal Far West**	DRAWING No: 4
	SCALE: 1:750 @ A3 / DATE: 30.03.2022	**12-22 Wentworth Street & 19-21 South Steyne, Manly**	REVISION: 0

LOCALITY MAP

Notes:
1. Basemap from metromap.com (dated 30/07/2021)
2. Test locations shown are approximate only

LEGEND
- Site Boundary
- Well Locations

0 5 10 15 20 25 30 35 m

Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: Royal Far West	TITLE: **Monitoring Well Plan** **Royal Far West** **12-22 Wentworth Street & 19-21 South Steyne, Manly**	PROJECT No: 72252.09
	OFFICE: Sydney / DRAWN BY: JY/MG		DRAWING No: 5
	SCALE: 1:500 @ A3 / DATE: 29.03.2022		REVISION: 0

LOCALITY MAP

Notes:
1. Basemap from metromap.com (dated 30/07/2021)
2. Test locations shown are approximate only

LEGEND
- Site Boundary
- Well Locations (Completed)
- Proposed Soil Bore Locations
- Proposed Test Pit Locations
- Proposed Well Locations

0 5 10 15 20 25 30 35 m

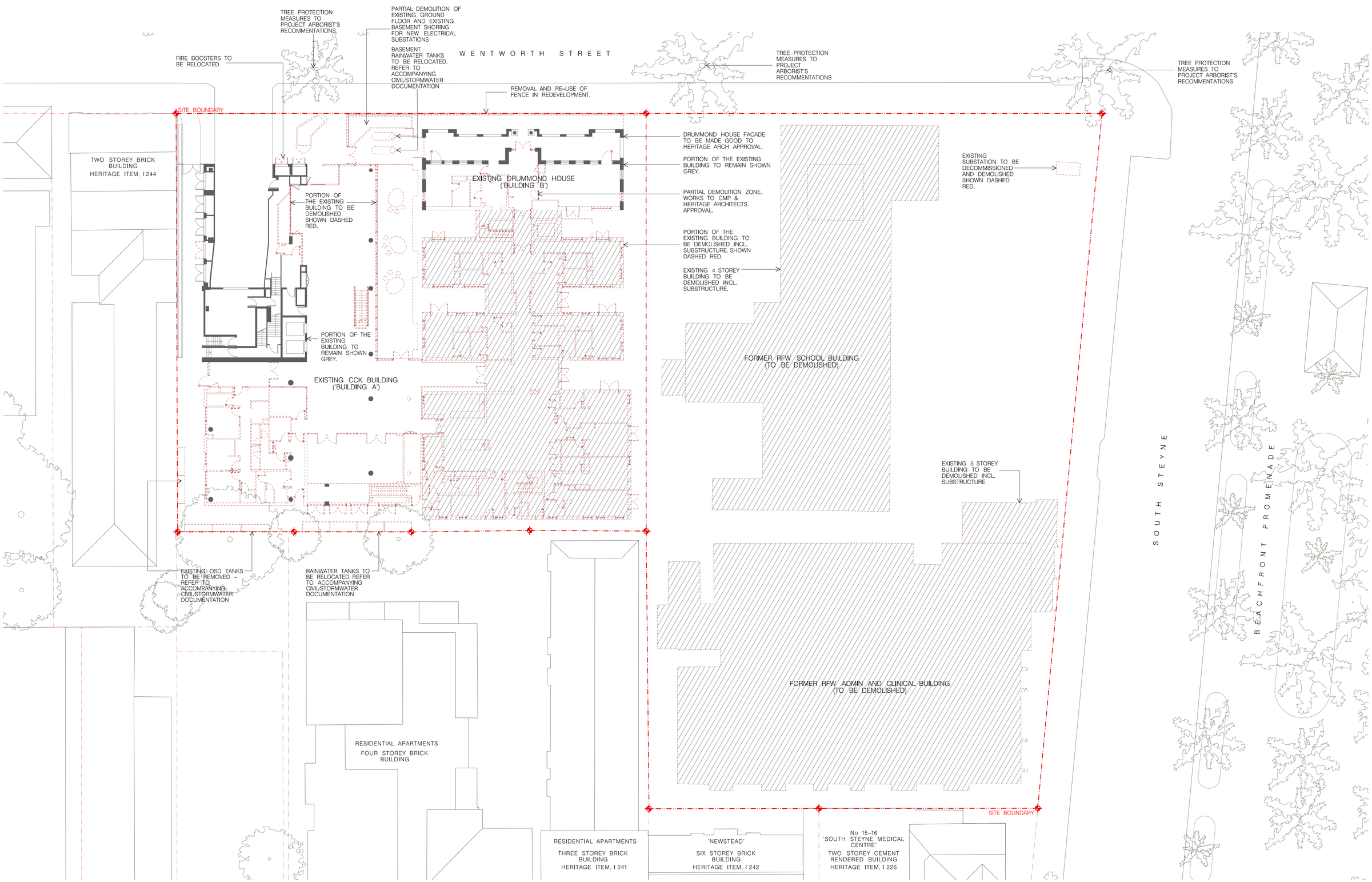
Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT:	Royal Far West		
OFFICE:	Sydney	DRAWN BY:	JY/MG
SCALE:	1:500 @ A3	DATE:	30.03.2022

TITLE: **Location of Curent Boreholes and Revised Data Gap Test Plan**
Royal Far West
12-22 Wentworth Street & 19-21 South Steyne, Manly

N

PROJECT No:	72252.09
DRAWING No:	6
REVISION:	0



01 — DEMOLITION PLAN – GROUND
1:200

W B M Y C

300mm 250mm 200mm 150mm 50mm

Note.
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This document shall only be used for the purpose for which it was commissioned.

DRAWING ORIGINAL SIZE: A1

Town Planning:
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Structural Engineer:
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mail@jamestaylorassociates.com.au
T: 02 9969 1999

Issue	Date	Description
01.	10.06.2022	DA ISSUE

NORTH

Project:
Royal Far West Neighbourhood
Site:
14-22 Wentworth Street & 19-21 South Steyne, Manly
Applicant:
Royal Far West

Scale:	Drawn By:	Checked 1:	Checked 2:	Approved:
As shown @ A1	GG, BD, EP	BD	EP	EP

Architect:
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info@candalepas.com.au
T: 02 9283 7755
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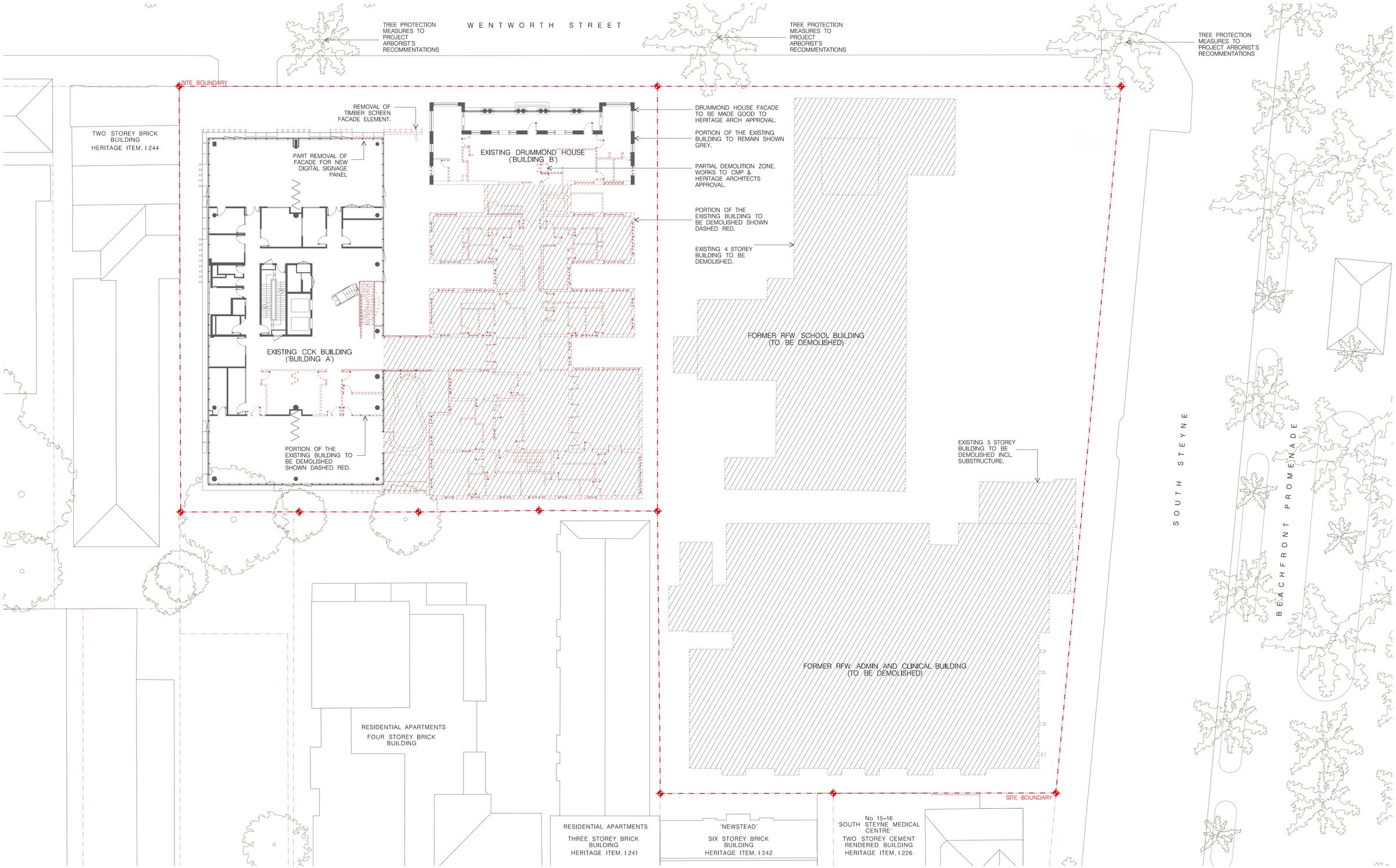
Registration No. NSW 5773

Drawing:
DEMOLITION PLAN - LEVEL GROUND
Drawing Number:
DA - 103

FOR A DEVELOPMENT APPLICATION ONLY

Job Number: 5899
Issue: 01.



01 — DEMOLITION PLAN – LEVEL 1
1:200

W B M Y C

300mm 250mm 200mm 150mm 50mm

Note.
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DRAWING ORIGINAL SIZE: A1

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Issue	Date	Description
01.	10.06.2022	DA ISSUE

NORTH

Project:
Royal Far West Neighbourhood
Site:
14-22 Wentworth Street & 19-21 South Steyne, Manly
Applicant:
Royal Far West

Scale:	Drawn By:	Checked 1:	Checked 2:	Approved:
As shown @ A1	GG, BD, EP	BD	EP	EP

Architect:
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info@candalepas.com.au
T: 02 9283 7755
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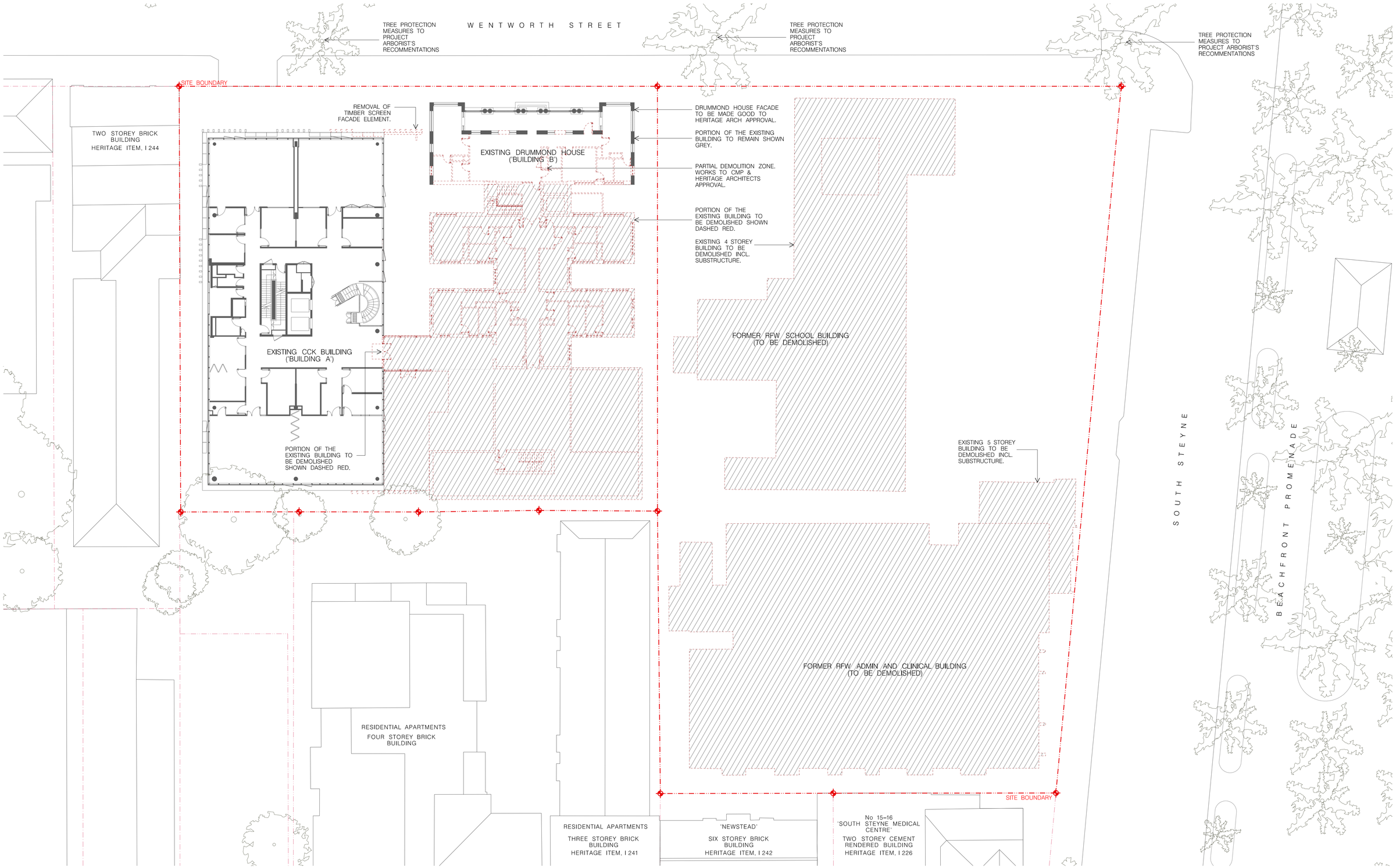
Registration No. NSW 5773

Drawing:
DEMOLITION PLAN - LEVEL 1
Drawing Number:
DA - 104

FOR A DEVELOPMENT APPLICATION ONLY

Job Number:
5899
Issue:
01.



01 — DEMOLITION PLAN – LEVEL 2
1:200

W B M Y C

300mm 250mm 200mm 150mm 50mm

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Issue	Date	Description
01.	10.06.2022	DA ISSUE

NORTH

Project:
Royal Far West Neighbourhood
Site:
14-22 Wentworth Street & 19-21 South Steyne, Manly
Applicant:
Royal Far West

Scale:	Drawn By:	Checked 1:	Checked 2:	Approved:
As shown @ A1	GG, BD, EP	BD	EP	EP

Architect:
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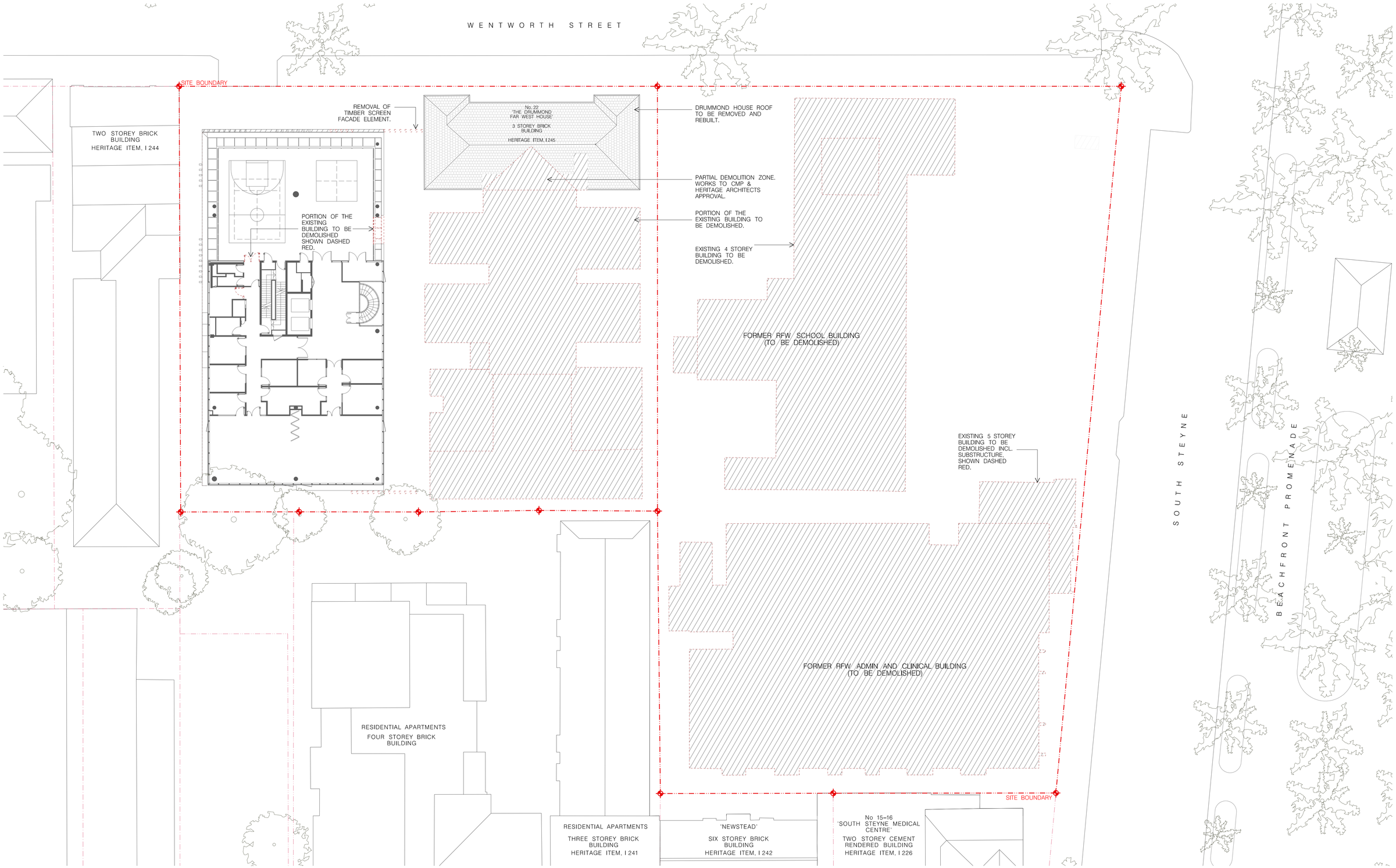
Registration No. NSW 5773

Drawing:
DEMOLITION PLAN - LEVEL 2
Drawing Number:
DA - 105

FOR A DEVELOPMENT APPLICATION ONLY

Job Number:
5899
Issue:
01.



01 — DEMOLITION PLAN – LEVEL 3
1:200

W B M Y C

300mm 250mm 200mm 150mm 50mm

DRAWING ORIGINAL SIZE: A1

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Neutral Bay NSW 2089
mail@jamestaylorassociates.com.au
T: 02 9969 1999

Issue	Date	Description
01.	10.06.2022	DA ISSUE

NORTH

Project:
Royal Far West Neighbourhood

Site:
14-22 Wentworth Street & 19-21 South Steyne, Manly

Applicant:
Royal Far West

Scale:	Drawn By:	Checked 1:	Checked 2:	Approved:
As shown @ A1	GG, BD, EP	BD	EP	EP

Architect:
Murcutt Candalepas
309 Sussex Street
Sydney NSW 2000
info@candalepas.com.au
T: 02 9283 7755
F: 02 9283 7477
Registration No. NSW 5773

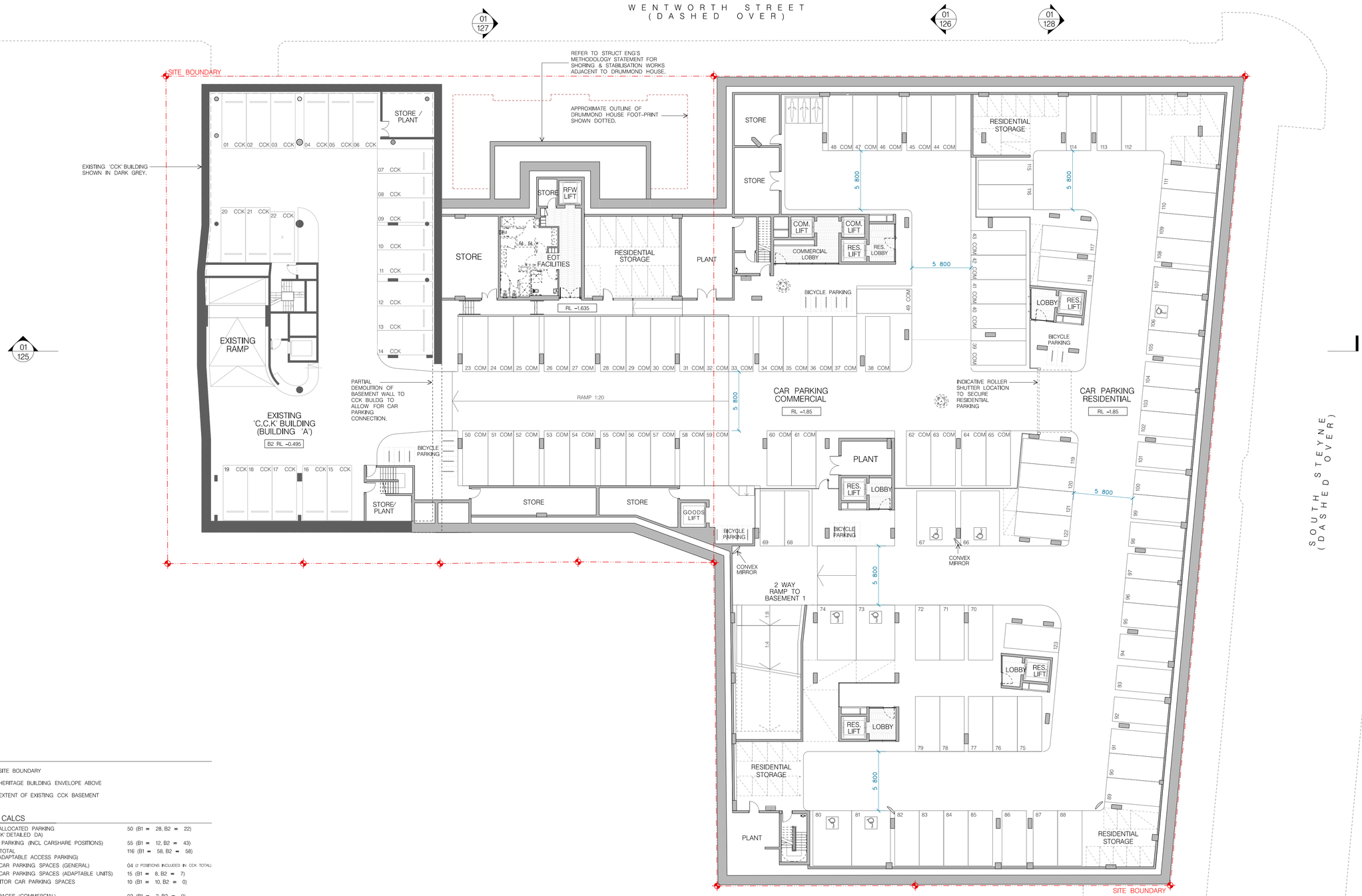
Drawing:
DEMOLITION PLAN - LEVEL 3

Drawing Number:
DA - 106

FOR A DEVELOPMENT APPLICATION ONLY

Job Number:
5899

Issue:
01.



LEGEND

- SITE BOUNDARY
- HERITAGE BUILDING ENVELOPE ABOVE
- EXTENT OF EXISTING CCK BASEMENT

PARKING CALCS

PREVIOUSLY ALLOCATED PARKING (STAGE 2 'CCK' DETAILED DA)	50 (B1 = 28, B2 = 22)
COMMERCIAL PARKING (INCL CARSHARE POSITIONS)	55 (B1 = 12, B2 = 43)
RESIDENTIAL TOTAL (INCLUDING ADAPTABLE ACCESS PARKING)	116 (B1 = 58, B2 = 58)
ACCESSIBLE CAR PARKING SPACES (GENERAL)	04 (2 POSITIONS INCLUDED IN CCK TOTAL)
ACCESSIBLE CAR PARKING SPACES (ADAPTABLE UNITS)	15 (B1 = 8, B2 = 7)
RESIDENT VISITOR CAR PARKING SPACES	10 (B1 = 10, B2 = 0)
CARSHARE SPACES (COMMERCIAL)	02 (B1 = 2, B2 = 0)
BICYCLE PARKING SPACES (INCL 20 STAGE 2 'CCK' DETAILED DA)	85 (B1 = 44, B2 = 41)
MOTORBIKE PARKING SPACES	3 (B1 = 0, B2 = 3)
TOTAL PROPOSED CAR PARKING	231 (B1 = 108, B2 = 123)

01 / _ FLOOR PLAN – BASEMENT LEVEL 02

1:200

Town Planning: Boston Blyth Fleming — Suite 1, 9 Narabang Way, Belrose NSW 2085, greg@bbfplanners.com.au, T: 02 9986 2535

Project Manager: Lighthouse Project Group — Level 2, 56 Berry St, North Sydney NSW 2000, info@lighthouseprn.com.au

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Landscape Architect: Jane Irwin Landscape Architecture — Suite 203, L2, 61 Marlborough St, Surry Hills NSW 2010, info@jia.net.au, T: 02 9212 6957

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Structural Engineer: James Taylor & Associates — Suite 1, 115 Military Rd, Neutral Bay NSW 2089, mail@jamestaylorassociates.com.au, T: 02 9969 1999

Issue	Date	Description
01.	10.06.2022	DA ISSUE

NORTH

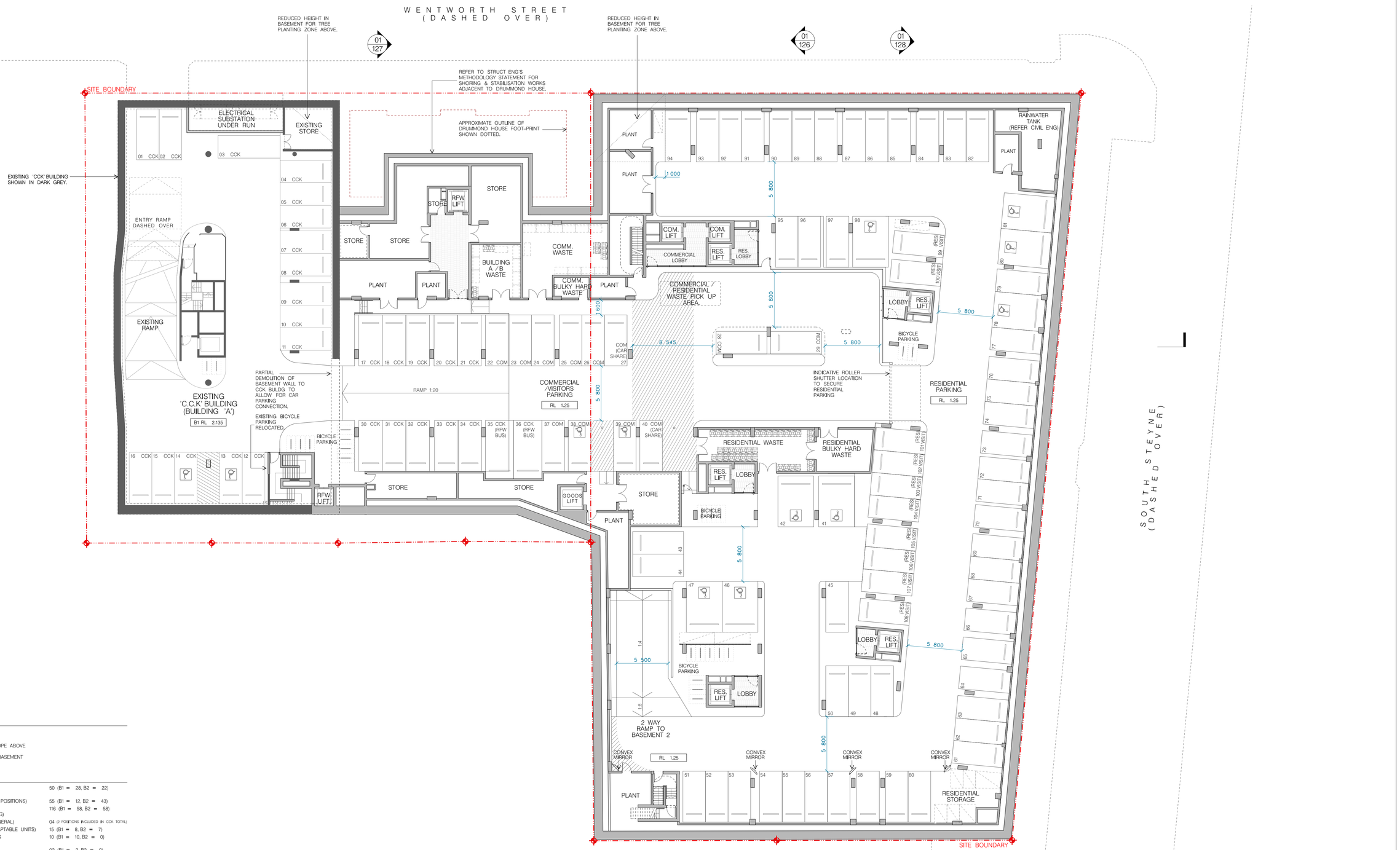
Project: Royal Far West Neighbourhood
Site: 14-22 Wentworth Street & 19-21 South Steyne, Manly
Applicant: Royal Far West

Scale:	Drawn By:	Checked 1:	Checked 2:	Approved:
As shown @ A1	GG, BD, EP	BD	EP	EP

Architect: Murcutt Candalepas — 309 Sussex Street, Sydney NSW 2000, info@candalepas.com.au, T: 02 9283 7755, F: 02 9283 7477, Registration No. NSW 5773

Drawing: BASEMENT 2 FLOOR PLAN
Drawing Number: DA - 110
Job Number: 5899
Issue: 01.

FOR A DEVELOPMENT APPLICATION ONLY



LEGEND

- SITE BOUNDARY
- HERITAGE BUILDING ENVELOPE ABOVE
- EXTENT OF EXISTING CCK BASEMENT

PARKING CALCS

PREVIOUSLY ALLOCATED PARKING (STAGE 2 'CCK' DETAILED DA)	50 (B1 = 28, B2 = 22)
COMMERCIAL PARKING (INCL CARSHARE POSITIONS)	55 (B1 = 12, B2 = 43)
RESIDENTIAL TOTAL (INCLUDING ADAPTABLE ACCESS PARKING)	116 (B1 = 58, B2 = 58)
ACCESSIBLE CAR PARKING SPACES (GENERAL)	04 (2 POSITIONS INCLUDED IN CCK TOTAL)
ACCESSIBLE CAR PARKING SPACES (ADAPTABLE UNITS)	15 (B1 = 8, B2 = 7)
RESIDENT VISITOR CAR PARKING SPACES	10 (B1 = 10, B2 = 0)
CARSHARE SPACES (COMMERCIAL)	02 (B1 = 2, B2 = 0)
BICYCLE PARKING SPACES (INCL 20 STAGE 2 'CCK' DETAILED DA)	85 (B1 = 44, B2 = 41)
MOTORBIKE PARKING SPACES	3 (B1 = 0, B2 = 3)
TOTAL PROPOSED CAR PARKING	231 (B1 = 108, B2 = 123)

01 — FLOOR PLAN – BASEMENT LEVEL 01

1:200

Town Planning: Boston Blyth Fleming
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Issue	Date	Description
01.	10.06.2022	DA RSUE

NORTH

Project: Royal Far West Neighbourhood
Site: 14-22 Wentworth Street & 19-21 South Steyne, Manly
Applicant: Royal Far West

Scale:	Drawn By:	Checked 1:	Checked 2:	Approved:
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Architect: Murcutt Candalepas
309 Sussex Street
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info@candalepas.com.au
T: 02 9283 7755
F: 02 9283 7477
Registration No. NSW 5773

Drawing: BASEMENT 1 FLOOR PLAN
Drawing Number: DA - 111
FOR A DEVELOPMENT APPLICATION ONLY
Job Number: 5899
Issue: 01.

EXISTING
BUILDING A
'C.C.K' BUILDING

EXISTING + EXTENSION
BUILDING B
DRUMMOND HOUSE

PROPOSED
BUILDING C
RESIDENTIAL / COMMERCIAL

PROPOSED
NEW OPEN SPACE

PROPOSED
BUILDING D
RESIDENTIAL/RETAIL

EXISTING BASEMENT CARPARK ENTRY

RE-USE PORTIONS OF STREET ART FENCE AS BACKDROP TO FRONT SIDE BOUNDARY WALL.

REDUCED HEIGHT IN BASEMENT FOR TREE PLANTING

WENTWORTH STREET

01 127

REFURBISHMENT WORKS TO DRUMMOND HOUSE TO HERITAGE ARCH APPROVAL.

REDUCED HEIGHT IN BASEMENT FOR TREE PLANTING

FIRE BOOSTER ASSEMBLY

01 126

01 128

EX. RL. 5.03
EX. RL. 4.93
EX. RL. 4.96
EX. RL. 4.79
EX. RL. 4.66
EX. RL. 4.60
EX. RL. 4.49
EX. RL. 4.35
EX. RL. 4.39
EX. RL. 4.36
EX. RL. 4.31
EX. RL. 4.20
EX. RL. 4.25
EX. RL. 4.39

SITE BOUNDARY

KIOSK SUB-STATIONS

MAIN ENTRY

ENTRY VESTIBULE

LOBBY
RL. 5.15

Acc. WC

VISITOR LOUNGE

LUGGAGE STORE

STORE

RL. 5.19

LIFT

DH RECEPTION

WC

Acc. WC

KITCHEN & SERVERY

RL. 5.15

EXISTING DRIVEWAY

Acc. WC

M WC

F WC

CCK RECEPTION

RL. 5.15

EXISTING SHADED DARK GREY

DINING/FLEX SPACE

DINING/FLEX SPACE

DINING

WALKWAY ROOF OVER

EXISTING 'C.C.K' BUILDING

STORE

CONFERENCE RM

RL. 5.15

CONFERENCE AREA/ OPEN TERRACE

CONFERENCE RM

EXTERNAL LANDSCAPED TERRACE

CARETAKER 56.7 Sq. m

GUEST ROOM G.1

GUEST ROOM G.2

GUEST ROOM G.3

GUEST ROOM G.4

RL. 5.15

PLANT

STORE

LIFT

STORE

Acc. WC

LIFT

RETAIL
RL. 4.75

REFER TO PROJECT FLOOD REPORT FOR ADDITIONAL DETAILS ON PROPOSED FLOOR LEVELS IN THIS AREA

COMM. LIFT

COMM. LIFT

RES. LOBBY
RL. 4.92

RES. LIFT

COMM. LOBBY
RL. 5.00

COMMERCIAL
RL. 5.15

SLIDING DOORS

FORECOURT
RL. 5.0

AFTERHOURS GATES

RL. 5.0

STORE 1

STORE 2

RES. LOBBY
RL. 4.85

RES. LIFT

RL. 4.7

AFTERHOURS GATE

COMMERCIAL
RL. 4.70

RETAIL
RL. 4.70

RES. LIFT

RES. LOBBY
RL. 4.75

POSSIBLE ZONE FOR AMENITIES. REFER FUTURE FITOUT DEVELOPMENT APPLICATION

RES. LIFT

RES. LOBBY
RL. 4.70

RETAIL
RL. 4.70

COMMERCIAL
RL. 4.70

AFTERHOURS GATE

RES. LIFT

RES. LOBBY
RL. 4.70

RETAIL
RL. 4.70

SOUTH STEYNE

BEACHFRONT PROMENADE

TWO STOREY BRICK BUILDING
HERITAGE ITEM, I 244

MANLY VILLAGE PUBLIC SCHOOL
SCHOOL HALL

RESIDENTIAL APARTMENTS
FOUR STOREY BRICK BUILDING

RESIDENTIAL APARTMENTS
THREE STOREY BRICK BUILDING
HERITAGE ITEM, I 241

'NEWSTEAD'
SIX STOREY BRICK BUILDING
HERITAGE ITEM, I 242

'SOUTH STEYNE MEDICAL CENTRE'
TWO STOREY CEMENT RENDERED BUILDING
HERITAGE ITEM, I 226

01 125

RE-USE PORTIONS OF STREET ART FENCE AS BACKDROP TO LANDSCAPE TERRACE.

W B M Y C

300MM
250MM
200MM
150MM
50MM

01 GROUND FLOOR PLAN

1:200

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Structural Engineer:
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mail@jamestaylorassociates.com.au
T: 02 9969 1999

Issue	Date	Description
01.	10.06.2022	DA ISSUE

NORTH

Project:
Royal Far West Neighbourhood

Site:
14-22 Wentworth Street & 19-21 South Steyne, Manly

Applicant:
Royal Far West

Scale:	Drawn By:	Checked 1:	Checked 2:	Approved:
As shown @ A1	GG, BD, EP	BD	EP	EP

Architect:
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309 Sussex Street
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info@candalepas.com.au
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F: 02 9283 7477
Registration No: NSW 5773

Drawing:
GROUND FLOOR PLAN

Drawing Number:
DA - 112

FOR A DEVELOPMENT APPLICATION ONLY

Job Number:
5899

Issue:
01.

EXISTING
BUILDING A
'C.C.K' BUILDING

EXISTING + EXTENSION
BUILDING B
DRUMMOND HOUSE

PROPOSED
BUILDING C
RESIDENTIAL / COMMERCIAL

PROPOSED
NEW OPEN SPACE

PROPOSED
BUILDING D
RESIDENTIAL

WENTWORTH STREET

01 / 127

01 / 126

01 / 128

01 / 125

SITE BOUNDARY

TWO STOREY BRICK BUILDING
HERITAGE ITEM, I 244

EXISTING SHADED DARK GREY

NEW ELECTRONIC ILLUMINATED SIGNAGE PANEL FLUSH WITH FACADE GLAZING.

NON-TRAFFICABLE GREEN ROOF

NEW BRICKWALLS FROM RECYCLED BRICKS FROM SITE.

EXISTING 'C.C.K' BUILDING

NEW SCHOOL OFFICE

NEW SCHOOL OFFICE

NEW EXTERNAL PLAY

GUEST ROOM 1.11
GUEST ROOM 1.12
GUEST ROOM 1.13
GUEST ROOM 1.14
RL 9.14
LIFT
LOUNGE
RL 9.14

GUEST ROOM 1.7 (ACCESSIBLE)
GUEST ROOM 1.8
GUEST ROOM 1.9
GUEST ROOM 1.10

ACCESSIBLE GUEST ROOM TO MEET BCA REQS.

OBSCURED GLAZING TO PREVENT VIEWS INTO CCK BLDG.

10.2m

GUEST ROOM 1.1
GUEST ROOM 1.2
GUEST ROOM 1.3
GUEST ROOM 1.4
GUEST ROOM 1.5
GUEST ROOM 1.6
RL 9.14
LIFT
KITCHENETTE
BATHING ROOM
LAUNDRY
RPA LOUNGE

3.6m

FIXED EXTERNAL METAL LOUVRES ON BUILDING C & B TO PREVENT VIEWS OF NO 29 VICTORIA PDE.

4.6m

PERGOLA

6m

3.8m

LANDSCAPE PLANTERS FOR VINE TRELLIS.

POSSIBLE ZONE FOR AMENITIES, REFER FUTURE 'FITOUT' DEVELOPMENT APPLICATION

COMMERCIAL
792.3 Sq. m
RL 8.75

COMM. LIFT
COMM. LIFT
RES. LIFT
RES. LIFT
RES. LIFT

2.5m

5.1m

4.4m

14.4m

WINDOW HOOD TO PREVENT VIEWS ACROSS COURTYARD

D1.1
3B
203.1 Sq. m
ADAPTABLE

24.2 Sq. m

RES. LIFT
RL 9.15

WINDOW HOOD TO PREVENT VIEWS ACROSS COURTYARD

D1.2
3B
190.2 Sq. m
ADAPTABLE

24.1 Sq. m

12.2m

4.8m

AWNING BELOW

WINDOW HOOD TO PREVENT VIEWS ACROSS COURTYARD

D1.3
3B
190.2 Sq. m
ADAPTABLE

24.1 Sq. m

RES. LIFT
RL 9.15

WINDOW HOOD TO PREVENT VIEWS ACROSS COURTYARD

D1.4
3B
190.2 Sq. m
ADAPTABLE

24.1 Sq. m

AWNING BELOW

9m

3.5m

4.9m

3.4m

SITE BOUNDARY

RESIDENTIAL APARTMENTS
FOUR STOREY BRICK BUILDING

'MANLY VILLAGE PUBLIC SCHOOL'
SCHOOL HALL

RESIDENTIAL APARTMENTS
THREE STOREY BRICK BUILDING
HERITAGE ITEM, I 241

'NEWSTEAD'
SIX STOREY BRICK BUILDING
HERITAGE ITEM, I 242

'SOUTH STEYNE MEDICAL CENTRE'
TWO STOREY CEMENT RENDERED BUILDING
HERITAGE ITEM, I 226

SOUTH STEYNE

BEACHFRONT PROMENADE

01 / — LEVEL 1 FLOOR PLAN
1:200

W B M Y C

300MM 250MM 200MM 150MM 50MM

DRAWING ORIGINAL SIZE: A1

Note.
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01. Issued — 10.06.2022 — DA RFI/JE Description

NORTH

Project:
Royal Far West Neighbourhood
Site:
14-22 Wentworth Street & 19-21 South Steyne, Manly
Applicant:
Royal Far West
Scale: As shown @ A1 | Drawn By: GG, BD, EP | Checked 1: BD | Checked 2: EP | Approved: EP

Architect:
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309 Sussex Street
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Registration No. NSW 5773

Drawing:
LEVEL 1 FLOOR PLAN
Drawing Number:
DA - 113

FOR A DEVELOPMENT APPLICATION ONLY

Job Number: 5899
Issue: 01.

EXISTING
BUILDING A
'C.C.K' BUILDING

EXISTING + EXTENSION
BUILDING B
DRUMMOND HOUSE

PROPOSED
BUILDING C
RESIDENTIAL / COMMERCIAL

PROPOSED
NEW OPEN SPACE

PROPOSED
BUILDING D
RESIDENTIAL

WENTWORTH STREET

SITE BOUNDARY

TWO STOREY BRICK BUILDING
HERITAGE ITEM, I 244

EXISTING SHADED DARK GREY

EXISTING C.C.K BUILDING

NEW BRICKWALLS FROM RECYCLED BRICKS FROM SITE.

GUEST ROOM 2.5
GUEST ROOM 2.6
GUEST ROOM 2.7
GUEST ROOM 2.8
RL. 13.28
LIFT
LOUNGE
RL. 13.28
GUEST ROOM 2.1 (ACCESSIBLE)
GUEST ROOM 2.2
GUEST ROOM 2.3
GUEST ROOM 2.4

ACCESSIBLE GUEST ROOM TO MEET BCA REQS.

VINE TRELLIS

PLANTING
PLANT
LIFT OVER RUN

CHAMFERED ROOF TO MINIMISE OVERSHADOWING TO NEIGHBOURING PROPERTIES

FIXED EXTERNAL METAL LOUVRES ON BUILDING C TO PREVENT VIEWS OF NO 29 VICTORIA PDE.

COMMERCIAL
792.3 Sq. m
RL. 12.05

COMM. LIFT
RES. LIFT

POSSIBLE ZONE FOR AMENITIES. REFER FUTURE 'FITOUT' DEVELOPMENT APPLICATION

6m
3.8m
5.1m
4.4m
13.7m
14.4m

WINDOW HOOD TO PREVENT VIEWS ACROSS COURTYARD

D2.1
4B
203.1 Sq. m
ADAPTABLE
24.2 Sq. m

RES. LIFT
RL. 12.30

WINDOW HOOD TO PREVENT VIEWS ACROSS COURTYARD

D2.2
3B
190.2 Sq. m
ADAPTABLE
24.1 Sq. m

12.2m
4.3m

WINDOW HOOD TO PREVENT VIEWS ACROSS COURTYARD

D2.3
3B
190.2 Sq. m
ADAPTABLE
24.1 Sq. m

RES. LIFT
RL. 12.30

WINDOW HOOD TO PREVENT VIEWS ACROSS COURTYARD

D2.4
3B
190.2 Sq. m
ADAPTABLE
24.1 Sq. m

9m
4.9m
3.4m
3.5m
4.6m
2.5m
3.2m

SITE BOUNDARY

SOUTH STEYNE

BEACHFRONT PROMENADE

MANLY VILLAGE PUBLIC SCHOOL
SCHOOL HALL

RESIDENTIAL APARTMENTS
FOUR STOREY BRICK BUILDING

RESIDENTIAL APARTMENTS
THREE STOREY BRICK BUILDING
HERITAGE ITEM, I 241

'NEWSTEAD'
SIX STOREY BRICK BUILDING
HERITAGE ITEM, I 242

'SOUTH STEYNE MEDICAL CENTRE'
TWO STOREY CEMENT RENDERED BUILDING
HERITAGE ITEM, I 226

01 / 125 — 01 / 127 — 01 / 126 — 01 / 128

01 — LEVEL 2 FLOOR PLAN

1:200

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DRAWING ORIGINAL SIZE: A1

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Issue	Date	Description
01.	10.06.2022	DA RFI/E

NORTH

Project: Royal Far West Neighbourhood
Site: 14-22 Wentworth Street & 19-21 South Steyne, Manly
Applicant: Royal Far West

Scale:	Drawn By:	Checked 1:	Checked 2:	Approved:
As shown @ A1	GG, BD, EP	BD	EP	EP

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Registration No. NSW 5773

Drawing: LEVEL 2 FLOOR PLAN
Drawing Number: DA - 114

FOR A DEVELOPMENT APPLICATION ONLY

Job Number: 5899
Issue: 01.

EXISTING
BUILDING A
'C.C.K' BUILDING

EXISTING + EXTENSION
BUILDING B
DRUMMOND HOUSE

PROPOSED
BUILDING C
RESIDENTIAL / COMMERCIAL

PROPOSED
NEW OPEN SPACE

PROPOSED
BUILDING D
RESIDENTIAL

WENTWORTH STREET

SOUTH STEYNE

BEACHFRONT PROMENADE

SITE BOUNDARY

DRUMMOND HOUSE ROOF TO BE REPAIRED AND REINSTALLED TO HERITAGE ARCH APPROVAL.

PLAYSPACE UPGRADE TO LANDSCAPE ARCH REQS.

TWO STOREY BRICK BUILDING
HERITAGE ITEM, I 244

EXISTING PLAY SPACE

EXISTING SHADED DARK GREY

EXISTING C.C.K BUILDING

Acc. WC
LIFT
PLANT

TERRACE
RL 16.66

RL 16.80

NEW ACTIVITIES ROOM
RL 16.66

PLAY AREA

PRIVACY SCREEN TO PLAYSPACE

PLANTING
PLANTING
PLANTING

FALL PREVENTION NETTING TO EXTERNAL TERRACES AND PLAY AREAS.

WINDOW PRIVACY LOUVRES ON BUILDING C WESTERN FACADE ANGLED TO PREVENT VIEWS OF BUILDING B.

WINDOW PRIVACY LOUVRES ON BUILDING C WESTERN FACADE ANGLED TO PREVENT VIEWS OF NEIGHBOURS.

6m
3.8m
5.1m
4.4m
12.7m
10.6m
4.8m
7.3m
4.6m
3.5m
4.9m
3.4m

C3.1 2B 88.9 Sq. m
14.0 Sq. m
C3.2 1B 56.2 Sq. m
COMM DK OVERRUN
RES. LIFT
RL 15.35
8.3 Sq. m
C3.3 2B 101.8 Sq. m
10 Sq. m
C3.4 2B 100.6 Sq. m
10 Sq. m
C3.5 1B 51.3 Sq. m
C3.6 2B 97.1 Sq. m
10 Sq. m
C3.7 2B 95.8 Sq. m
10 Sq. m
C3.8 1B 52.4 Sq. m
C3.9 2B 95.3 Sq. m
10 Sq. m

WINDOW HOOD TO PREVENT VIEWS ACROSS COURTYARD

D3.1 3B 203.1 Sq. m ADAPTABLE
24.2 Sq. m
RES. LIFT
RL 15.45
WINDOW HOOD TO PREVENT VIEWS ACROSS COURTYARD
D3.2 3B 190.2 Sq. m
24.1 Sq. m
WINDOW HOOD TO PREVENT VIEWS ACROSS COURTYARD
D3.3 3B 190.2 Sq. m
24.1 Sq. m
RES. LIFT
RL 15.45
WINDOW HOOD TO PREVENT VIEWS ACROSS COURTYARD
D3.4 3B 190.2 Sq. m
24.1 Sq. m

'MANLY VILLAGE PUBLIC SCHOOL'
SCHOOL HALL

RESIDENTIAL APARTMENTS
FOUR STOREY BRICK BUILDING

RESIDENTIAL APARTMENTS
THREE STOREY BRICK BUILDING
HERITAGE ITEM, I 241

'NEWSTEAD'
SIX STOREY BRICK BUILDING
HERITAGE ITEM, I 242

'SOUTH STEYNE MEDICAL CENTRE'
TWO STOREY CEMENT RENDERED BUILDING
HERITAGE ITEM, I 226

01 125
01 127
01 126
01 128

01 LEVEL 3 FLOOR PLAN
1:200

W
B
M
Y
C

300mm
250mm
200mm
150mm
100mm

DRAWING ORIGINAL SIZE A1

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Issue	Date	Description
01.	10.06.2022	DA RFI/E

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Registration No. NSW 5773

Drawing:
LEVEL 3 FLOOR PLAN

Drawing Number:
DA - 115

FOR A DEVELOPMENT APPLICATION ONLY

Job Number:
5899

Issue:
01.

EXISTING
BUILDING A
'C.C.K' BUILDING

EXISTING + EXTENSION
BUILDING B
DRUMMOND HOUSE

PROPOSED
BUILDING C
RESIDENTIAL / COMMERCIAL

PROPOSED
NEW OPEN SPACE

PROPOSED
BUILDING D
RESIDENTIAL

WENTWORTH STREET

SITE BOUNDARY

TWO STOREY BRICK BUILDING
HERITAGE ITEM, I 244

EXISTING 'C.C.K' BUILDING

WINDOW PRIVACY LOUVRES ON BUILDING C WESTERN FACADE ANGLED TO PREVENT VIEWS OF BUILDING B.

WINDOW PRIVACY LOUVRES ON BUILDING C WESTERN FACADE ANGLED TO PREVENT VIEWS OF NEIGHBOURS.

WINDOW HOOD TO PREVENT VIEWS ACROSS COURTYARD

WINDOW HOOD TO PREVENT VIEWS ACROSS COURTYARD

WINDOW HOOD TO PREVENT VIEWS ACROSS COURTYARD

WINDOW HOOD TO PREVENT VIEWS ACROSS COURTYARD

C4.1 2B 100.2 Sq. m
C4.2 1B 54.5 Sq. m
C4.3 2B 102.4 Sq. m
C4.4 2B 104.0 Sq. m
C4.5 1B 55.7 Sq. m
C4.6 2B 97.8 Sq. m
C4.7 2B 97.1 Sq. m
C4.8 1B 54.2 Sq. m
C4.9 2B 95.8 Sq. m

D4.1 3B 203.1 Sq. m ADAPTABLE
D4.2 3B 190.2 Sq. m
D4.3 3B 190.2 Sq. m
D4.4 3B 190.2 Sq. m

RES. LIFT
RL 18.50
RL 18.60

16.4 Sq. m
9.9 Sq. m
11.6 Sq. m
10.5 Sq. m
24.2 Sq. m
24.1 Sq. m

6m
3.6m
5.1m
4.4m
12m
9.5m
4.8m
6.6m
4.6m
3.5m
4.8m
3.4m

01 125

01 126

01 127

01 128

RESIDENTIAL APARTMENTS
FOUR STOREY BRICK BUILDING

'MANLY VILLAGE PUBLIC SCHOOL
SCHOOL HALL

RESIDENTIAL APARTMENTS
THREE STOREY BRICK BUILDING
HERITAGE ITEM, I 241

'NEWSTEAD'
SIX STOREY BRICK BUILDING
HERITAGE ITEM, I 242

'SOUTH STEYNE MEDICAL CENTRE'
TWO STOREY CEMENT RendERED BUILDING
HERITAGE ITEM, I 226

SOUTH STEYNE

BEACHFRONT PROMENADE

01 LEVEL 4 FLOOR PLAN

1:200

W
B
M
Y
C

300mm
250mm
200mm
150mm
100mm

DRAWING ORIGINAL SIZE A1

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Applicant:
Royal Far West

Scale:	Drawn By:	Checked 1:	Checked 2:	Approved:
As shown @ A1	GG, BD, EP	BD	EP	EP

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Registration No. NSW 5773

Drawing:
LEVEL 4 FLOOR PLAN

Drawing Number:
DA - 116

FOR A DEVELOPMENT APPLICATION ONLY

Job Number:
5899

Issue:
01.

EXISTING
BUILDING A
'C.C.K' BUILDING

EXISTING + EXTENSION
BUILDING B
DRUMMOND HOUSE

PROPOSED
BUILDING C
RESIDENTIAL / COMMERCIAL

PROPOSED
NEW OPEN SPACE

PROPOSED
BUILDING D
RESIDENTIAL

WENTWORTH STREET

01 / 127

01 / 126

01 / 128

SITE BOUNDARY

TWO STOREY BRICK BUILDING
HERITAGE ITEM, I 244

01 / 125

EXISTING 'C.C.K' BUILDING

WINDOW PRIVACY LOUVRES ON BUILDING C WESTERN FACADE ANGLED TO PREVENT VIEWS OF BUILDING B.

WINDOW PRIVACY LOUVRES ON BUILDING C WESTERN FACADE ANGLED TO PREVENT VIEWS OF BUILDING B.

6m

3.6m

4.6m

3.5m

C5.1 2B 100.2 Sq. m
16.4 Sq. m
C5.2 1B 61.4 Sq. m
C5.3 2B 100.0 Sq. m
C5.4 2B 100.6 Sq. m
C5.5 1B 55.7 Sq. m
C5.6 2B 99.4 Sq. m
C5.7 2B 98.1 Sq. m
C5.8 1B 56.7 Sq. m
C5.9 2B 97.6 Sq. m

RES. LIFT
RL. 21.65

10.5 Sq. m
10.0 Sq. m

RL. 22.10

NON-TRAFFICABLE ROOF PLANTING
PHOTOVOLTAIC SOLAR PANELS
SKYLIGHT
PLANT

RESIDENTIAL APARTMENTS
FOUR STOREY BRICK BUILDING

'MANLY VILLAGE PUBLIC SCHOOL'
SCHOOL HALL

RESIDENTIAL APARTMENTS
THREE STOREY BRICK BUILDING
HERITAGE ITEM, I 241

'NEWSTEAD'
SIX STOREY BRICK BUILDING
HERITAGE ITEM, I 242

'SOUTH STEYNE MEDICAL CENTRE'
TWO STOREY CEMENT RENDERED BUILDING
HERITAGE ITEM, I 226

SOUTH STEYNE

BEACHFRONT PROMENADE

W
B
M
Y
C

300mm
250mm
200mm
150mm
100mm

DRAWING ORIGINAL SIZE: A1

DRAWING ORIGINAL

01 LEVEL 5 FLOOR PLAN

1:200

Note:
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Issue	Date	Description
01.	10.06.2022	DA 60/LE

NORTH

Project:
Royal Far West Neighbourhood

Site:
14-22 Wentworth Street & 19-21 South Steyne, Manly

Applicant:
Royal Far West

Scale:	Drawn By:	Checked 1:	Checked 2:	Approved:
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Architect:
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F: 02 9283 7477
Registration No. NSW 5773

Drawing:
LEVEL 5 FLOOR PLAN

Drawing Number:
DA - 117

FOR A DEVELOPMENT APPLICATION ONLY

Job Number:
5899

Issue:
01.

EXISTING
BUILDING A
'C.C.K' BUILDING

EXISTING + EXTENSION
BUILDING B
DRUMMOND HOUSE

PROPOSED
BUILDING C
RESIDENTIAL / COMMERCIAL

PROPOSED
NEW OPEN SPACE

PROPOSED
BUILDING D
RESIDENTIAL

WENTWORTH STREET

01 / 127

01 / 126

01 / 128

01 / 125

SITE BOUNDARY

NEW ROOFTOP PHOTOVOLTAIC PANELS INSTALLED AT A LOW PITCH.

TWO STOREY BRICK BUILDING
HERITAGE ITEM, I 244

EXISTING C.C.K BUILDING

NEW ROOFTOP PHOTOVOLTAIC PANELS INSTALLED AT A LOW PITCH.

WINDOW PRIVACY LOUVRES ON BUILDING C WESTERN FACADE ANGLED TO PREVENT VIEWS OF BUILDING B.

WINDOW PRIVACY LOUVRES ON BUILDING C WESTERN FACADE ANGLED TO PREVENT VIEWS OF NEIGHBOURS.

6m

3.6m

4.6m

3.5m

C6.1
2B
100.2 Sq. m

16.4 Sq. m

C6.2
1B
68.7 Sq. m

RES. LIFT

RL 24.80

11.7 Sq. m

C6.3
2B
104.8 Sq. m

13.5 Sq. m

C6.4
2B
105.9 Sq. m

13.5 Sq. m

C6.5
1B
61.6 Sq. m

RES. LIFT

RL 24.80

12.3 Sq. m

C6.6
2B
99.1 Sq. m

13.5 Sq. m

C6.7
2B
98.8 Sq. m

13.5 Sq. m

C6.8
1B
62.7 Sq. m

RES. LIFT

RL 24.80

12.3 Sq. m

C6.9
2B
97.8 Sq. m

13.5 Sq. m

SITE BOUNDARY

SOUTH STEYNE

PROMENADE

BEACHFRONT

'MANLY VILLAGE PUBLIC SCHOOL'
SCHOOL HALL

RESIDENTIAL APARTMENTS
FOUR STOREY BRICK BUILDING

RESIDENTIAL APARTMENTS
THREE STOREY BRICK BUILDING
HERITAGE ITEM, I 241

'NEWSTEAD'
SIX STOREY BRICK BUILDING
HERITAGE ITEM, I 242

'SOUTH STEYNE MEDICAL CENTRE'
TWO STOREY CEMENT RENDERED BUILDING
HERITAGE ITEM, I 226

01 / — LEVEL 6 FLOOR PLAN
1:200

W B M Y C

300mm 250mm 200mm 150mm 50mm

DRAWING ORIGINAL SIZE: A1

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T: 02 9969 1999

No.	Description	Date
01.	DA ISSUE	10.06.2022

NORTH

Project:
Royal Far West Neighbourhood

Site:
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F: 02 9283 7477
Registration No. NSW 5773

Drawing:
LEVEL 6 FLOOR PLAN

Drawing Number:
DA - 118

FOR A DEVELOPMENT APPLICATION ONLY

Job Number:
5899

Issue:
01.

EXISTING
BUILDING A
'C.C.K' BUILDING

EXISTING + EXTENSION
BUILDING B
DRUMMOND HOUSE

PROPOSED
BUILDING C
RESIDENTIAL / COMMERCIAL

PROPOSED
NEW OPEN SPACE

PROPOSED
BUILDING D
RESIDENTIAL

WENTWORTH STREET

SITE BOUNDARY

TWO STOREY BRICK BUILDING
HERITAGE ITEM, I 244

'MANLY VILLAGE PUBLIC SCHOOL'
SCHOOL HALL

RESIDENTIAL APARTMENTS
FOUR STOREY BRICK BUILDING

RESIDENTIAL APARTMENTS
THREE STOREY BRICK BUILDING
HERITAGE ITEM, I 241

'NEWSTEAD'
SIX STOREY BRICK BUILDING
HERITAGE ITEM, I 242

'SOUTH STEYNE MEDICAL CENTRE'
TWO STOREY CEMENT RENDERED BUILDING
HERITAGE ITEM, I 226

SOUTH STEYNE

BEACHFRONT PROMENADE

WINDOW PRIVACY LOUVRES ON BUILDING C WESTERN FACADE ANGLED TO PREVENT VIEWS OF BUILDING B.

WINDOW PRIVACY LOUVRES ON BUILDING C WESTERN FACADE ANGLED TO PREVENT VIEWS OF NEIGHBOURS.

6m

3.6m

4.6m

3.5m

C7.1 3B 131.5 Sq. m
16.4 Sq. m

C7.2 3B 136.2 Sq. m ADAPTABLE
13.5 Sq. m

C7.3 3B 132.8 Sq. m ADAPTABLE
13.5 Sq. m

C7.4 3B 131.3 Sq. m ADAPTABLE
13.1 Sq. m

C7.5 3B 144.3 Sq. m ADAPTABLE
13.1 Sq. m

C7.6 3B 130.5 Sq. m ADAPTABLE
13.5 Sq. m

RES. LIFT

RL 27.95

01 / 125

01 / 126

01 / 127

01 / 128

01 LEVEL 7 FLOOR PLAN
1:200

W B M Y C 300mm 250mm 200mm 150mm 50mm

DRAWING ORIGINAL SIZE: A1

DRAWING ON ORIGINAL

Note.
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01.	10.06.2022	DA ISSUE
Issue	Date	Description

NORTH

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Royal Far West Neighbourhood

Site:
14-22 Wentworth Street & 19-21 South Steyne, Manly

Applicant:
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Registration No. NSW 5773

Drawing:
LEVEL 7 FLOOR PLAN

Drawing Number:
DA - 119

FOR A DEVELOPMENT APPLICATION ONLY

Job Number: 5899

Issue: 01.

EXISTING
BUILDING A
'C.C.K' BUILDING

EXISTING + EXTENSION
BUILDING B
DRUMMOND HOUSE

PROPOSED
BUILDING C
RESIDENTIAL / COMMERCIAL

PROPOSED
NEW OPEN SPACE

PROPOSED
BUILDING D
RESIDENTIAL

WENTWORTH STREET

01 / 127

01 / 126

01 / 128

SITE BOUNDARY

TWO STOREY BRICK BUILDING
HERITAGE ITEM, I 244

01 / 125

6m

PLANTING

RES. LIFT

RL 31.40

PLANTING

METAL SCREENING TO ROOF TOP PLANT AREAS TO ACOUSTIC CONSULT RECMMDS.

COMMUNAL OPEN SPACE

PLANT

PLANTING

PLANTING

RL 31.40

RES. LIFT OVERRUN

METAL SCREENING TO ROOF TOP PLANT AREAS TO ACOUSTIC CONSULT RECMMDS.

PHOTOVOLTAICS CELLS

PLANT

RL 31.14

4.60m

RES. LIFT OVERRUN

PLANT

3.5m

SITE BOUNDARY

RESIDENTIAL APARTMENTS
FOUR STOREY BRICK BUILDING

'MANLY VILLAGE PUBLIC SCHOOL'
SCHOOL HALL

RESIDENTIAL APARTMENTS
THREE STOREY BRICK BUILDING
HERITAGE ITEM, I 241

'NEWSTEAD'
SIX STOREY BRICK BUILDING
HERITAGE ITEM, I 242

'SOUTH STEYNE MEDICAL CENTRE'
TWO STOREY CEMENT RENDERED BUILDING
HERITAGE ITEM, I 226

SOUTH STEYNE

BEACHFRONT PROMENADE

01 / — LEVEL 8 FLOOR PLAN
1:200

W B M Y C 300mm 250mm 200mm 150mm 50mm

DRAWING ORIGINAL SIZE: A1

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01. Issue | 10.06.2022 | DA RSUE Description

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Royal Far West Neighbourhood
Site:
14-22 Wentworth Street & 19-21 South Steyne, Manly
Applicant:
Royal Far West

Scale: As shown @ A1 | Drawn By: GG, BD, EP | Checked 1: BD | Checked 2: EP | Approved: EP

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info@candalepas.com.au
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Registration No. NSW 5773

Drawing:
LEVEL 8 FLOOR PLAN (ROOF TERRACE)
Drawing Number:
DA - 120

FOR A DEVELOPMENT APPLICATION ONLY

Job Number: 5899
Issue: 01.

Appendix C

Remediation Action Criteria

Appendix C
Remediation Action Criteria

C1.0 Introduction

The Remediation Action Criteria (RAC) applied in the current investigation are informed by the CSM which identified human and environmental receptors to potential contamination on the site. Analytical results are assessed (as a Tier 1 assessment) against the RAC comprising primarily the investigation and screening levels of Schedule B1 of NEPC (2013).

As the site has a mixed land use different RAC shall apply to different areas of the site. A conservative approach has been adopted for Drummond House including Building B and the CCK Building (note the CCK building has been completed and is not included in the current project area) which shall be treated as residential with accessible soils (including primary schools) for a contamination risk perspective as the guest rooms may include at risk children with health conditions.

The proposed new commercial (ground floor) and residential towers (from the 1st floor), Buildings C and D, may have some ground floor court yards and landscaped areas that the residents of the residential towers have access to so shall be treated as a high density residential development, (in regards to the selection of a HIL) and in accordance the NEPC (2013), HSLD shall be applied for vapour intrusion due to the proposed basement which extends below the proposed new commercial / residential towers (Buildings C and D) and the proposed extension to Drummond House (Building B).

The following Table 1 provides selected key relevant inputs to the selection and / or derivation of the RAC.

Table 1: Inputs to the Selection and / or Derivation of RAC

Area	Variable	Input	Adopted Criteria
CCK Building and Drummond House Building B	Land use	Residential (including primary schools)	HILA, HSLA, ML A_B_ C EIL A_B_C ESL A_B_C
	Soil type	Sand	
Proposed New Buildings Building C and D	Land use	Mixed used (basement parking, commercial ground floor and residential apartments)	HILB, HSLD, ML D EIL D ESL D
	Soil type	sand	

C2.0 Soils

The soil investigation and screening levels applied in the current investigation comprise levels adopted for a generic land use scenario.

C2.1 Health Investigation and Screening Levels

The generic health investigation levels (HIL) and health screening levels (HSL) are considered to be appropriate for the assessment of human health risk via all relevant pathways of exposure associated with contamination at the site. The adopted soil HIL and HSL for the contaminants of concern are presented in Table 3 and Table 4, with inputs into their derivation shown in Table 2.

Table 2: Inputs to the Derivation of Health Screening Levels

Variable	Input	Rationale
Potential exposure pathway	Soil vapour intrusion (inhalation) / Direct contact *	
Depth to contamination	0 m to <1 m / 1 m to <2 m / 2 m to <4 m / 4 m+	

Notes: * Developed by CRC CARE (2011)

Table 3: Health Investigation Levels (mg/kg)

Contaminant	HIL-A	HIL-B
Metals		
Arsenic	100	500
Cadmium	20	150
Chromium (VI)	100	500
Copper	6000	30 000
Lead	300	1200
Mercury (inorganic)	40	120
Nickel	400	1200
Zinc	7400	60 000
PAH		
B(a)P TEQ	3	4
Total PAH	300	400
Phenols		
Phenol	3000	45 000
Pentachlorophenol	100	130

Contaminant	HIL-A	HIL-B
OCP		
DDT+DDE+DDD	240	600
Aldrin and dieldrin	6	10
Chlordane	50	90
Endosulfan	270	400
Endrin	10	20
Heptachlor	6	10
HCB	10	15
Methoxychlor	300	500
OPP		
Chlorpyrifos	160	340
PCB		
PCB	1	1

Table 4: Health Screening Levels (mg/kg)

Contaminant	HSL-A&B	HSL-A&B	HSL-A&B	HSL-A&B
SAND	**0 m to <1 m**	**1 m to <2 m**	**2 m to <4 m**	**4 m+**
Benzene	0.5	0.5	0.5	0.5
Toluene	160	220	310	540
Ethylbenzene	55	NL	NL	NL
Xylenes	40	60	95	170
Naphthalene	3	NL	NL	NL
TRH F1	45	70	110	200
TRH F2	110	240	440	NL

Notes: TRH F1 is TRH F1 minus BTEX

TRH F2 is TRH F2 minus naphthalene

The soil saturation concentration (Csat) is defined as the soil concentration at which the porewater phase cannot dissolve any more of an individual chemical. The soil vapour that is in equilibrium with the porewater will be at its maximum. If the derived soil HSL exceeds Csat, a soil vapour source concentration for a petroleum mixture could not exceed a level that would results in the maximum allowable vapour risk for the given scenario. For these scenarios, no HSL is presented for these chemicals and the HSL is shown as 'not limiting' or 'NL'

Table 5: Health Screening Levels (mg/kg)

Contaminant	HSL-D	HSL-D	HSL-D	HSL-D
SAND	**0 m to <1 m**	**1 m to <2 m**	**2 m to <4 m**	**4 m+**
Benzene	3	3	3	3
Toluene	NL	NL	NL	NL
Ethylbenzene	NL	NL	NL	NL
Xylenes	230	NL	NL	NL
Naphthalene	NL	NL	NL	NL
TRH F1	260	370	630	NL
TRH F2	NL	NL	NL	NL

Notes: TRH F1 is TRH F1 minus BTEX
TRH F2 is TRH F2 minus naphthalene
The soil saturation concentration (Csat) is defined as the soil concentration at which the porewater phase cannot dissolve any more of an individual chemical. The soil vapour that is in equilibrium with the porewater will be at its maximum. If the derived soil HSL exceeds Csat, a soil vapour source concentration for a petroleum mixture could not exceed a level that would results in the maximum allowable vapour risk for the given scenario. For these scenarios, no HSL is presented for these chemicals and the HSL is shown as 'not limiting' or 'NL'

The HSL for direct contact derived from CRC CARE (2011) are in Table 6.

Table 6: Health Screening Levels for Direct Contact (mg/kg)

Contaminant	DC HSL-A	DC HSL-B	DC HSL-D	DC HSL-IMW
Benzene	100	140	430	1100
Toluene	14 000	21 000	99 000	120 000
Ethylbenzene	4500	5900	27 000	85 000
Xylenes	12 000	17 000	81 000	130 000
Naphthalene	1400	2200	11 000	29 000
TRH F1	4400	5600	26 000	82 000
TRH F2	3300	4200	20 000	62 000
TRH F3	4500	5800	27 000	85 000
TRH F4	6300	8100	38 000	12 000

Notes: TRH F1 is TRH F1 minus BTEX
TRH F2 is TRH F2 minus naphthalene
IMW intrusive maintenance worker

C2.2 Ecological Investigation and Screening Levels

Based the proposed land use and planned development the ecological risk would generally be limited to transitory wildlife. Furthermore, the proposed development will include basement excavations and / or pavements which would largely limit any potential exposure or impact on local ecology within the proposed building footprint.

Therefore, remediation in respect to ecological investigation levels (EILs) and ecological screening levels is considered to be unlikely to be necessary. Notwithstanding, given the proximity of the site to Manly Beach EILs and ESL should be considered. Exceedances of the EILs / ESLs may warrant further investigation / consideration. The EILs / ESL will only be applicable outside the basement footprint in landscaped areas.

C2.2.1 Ecological Investigation Levels

Ecological Investigation Levels (EIL) and Added Contaminant Limits (ACL), where appropriate, shall be derived in NEPC (2013) for arsenic, copper, chromium (III), nickel, lead, zinc, DDT and naphthalene. The adopted EIL are shown in Table 8 with inputs into their derivation shown in Table 7.

Table 7: Inputs to the Derivation of the Ecological Investigation Levels

Variable	Input	Rationale
Age of contaminants	“Aged” (>2 years) / “new” (<2 years)	Source of contamination, if present likely to be from fill and USTs which have been present for greater than 2 years
pH	8.9	Site Measured
CEC	17.1 meq/100g	Site measured
Clay content	5%	Assumed
Traffic volumes	high	
State / Territory	NSW	

Table 8: Ecological Investigation Levels (mg/kg)

Contaminant	EIL-A-B-C	EIL-D
Metals		
Arsenic	100	160
Copper	230	330
Nickel	240	420
Chromium III	330	540
Lead	1100	1100
Zinc	740	1100

Contaminant	EIL-A-B-C	EIL-D
PAH		
Naphthalene	170	370
OCP		
DDT	180	640

C2.2.2 Ecological Screening Levels

Ecological Screening Levels (ESL) are used to assess the risk of selected petroleum hydrocarbon compounds, BTEX and benzo(a)pyrene to terrestrial ecosystems. The adopted ESL are shown in Table 9.

Table 9: Ecological Screening Levels (mg/kg)

Contaminant	Soil Type	EIL-A-B-C	EIL-D
TRH F1	Coarse / Fine	180*	215*
TRH F2	Coarse / Fine	120*	170*
TRH F3	Coarse	300	1700
TRH F4	Coarse	2800	3300
Benzene	Coarse	50	75
Toluene	Coarse	85	135
Ethylbenzene	Coarse	70	165
Xylenes	Coarse	105	180
B(a)P	Coarse	0.7	1.4

Notes: ESL are of low reliability except where indicated by * which indicates that the ESL is of moderate reliability
TRH F1 is TRH F1 minus BTEX
TRH F2 is TRH F2 minus naphthalene

C2.3 Management Limits

In addition to appropriate consideration and application of the HSL and ESL, there are additional considerations which reflect the nature and properties of petroleum hydrocarbons, including:

- Formation of observable light non-aqueous phase liquids (LNAPL);
- Fire and explosion hazards; and
- Effects on buried infrastructure e.g., penetration of, or damage to, in-ground services.

The adopted management limits (ML) are in Table 10.

Table 10: Management Limits (mg/kg)

Contaminant	Soil Type	ML-A-B-C	ML-D
TRH F1	Coarse	700	700
TRH F2	Coarse	1000	1000
TRH F3	Coarse	2500	3500
TRH F4	Coarse	10 000	10 000

Notes: TRH F1 is TRH F1 including BTEX
TRH F2 is TRH F2 including naphthalene

C2.4 Asbestos in Soil

Due to the history of widespread use of ACM products across Australia, ACM can be encountered unexpectedly and sporadically at a site. Therefore, the presence or absence of asbestos at a limit of reporting of 0.1 g/kg (AS 4964) has been adopted for this investigation / assessment as an initial screen.

The HSL for asbestos in soil are based on likely exposure levels for different scenarios published in NEPC (2013) for the following forms of asbestos:

- Bonded asbestos containing material (ACM); and
- Fibrous asbestos and asbestos fines (FA and AF).

The HSL are in Table 11.

Table 11: Health Screening Levels for Asbestos

Form of Asbestos	HSL-A	HSL-B	HSL-D
ACM	0.01%	0.04%	0.05%
FA and AF	0.001%	0.001%	0.001%
FA and AF and ACM	No visible asbestos for surface soil *	No visible asbestos for surface soil *	No visible asbestos for surface soil *

Notes: * Based on site observations at the sampling points and the analytical results of surface samples.

C3.0 Groundwater

The Groundwater Investigation Levels (GIL) used for interpretation of the groundwater data are based on the risks posed by contaminated groundwater, at or down-gradient of the site, as well as the potential beneficial uses of groundwater, as follows:

- Risk to aquatic ecosystems: based on general site topography and interpolated groundwater flow direction, groundwater that flows beneath the site is anticipated to discharge to Manly Beach. The 'marine water' guidelines (DGV - default guideline value) have therefore been applied for the protection of aquatic ecosystems, consistent with the marine discharge point;
- Risk to human health;
- Exposure to VOC (including TRH and BTEXN) via the vapour intrusion pathway is considered a risk to human health, therefore the groundwater HSL for vapour intrusion have been applied for protection of human health;
- Recreational waters given that Manly Beach is used for recreational purposes; and
- Given the brackish to saline groundwater it is not considered to be potable and therefore drinking water guidelines have not been adopted. In this regard the groundwater is also not considered suitable for irrigation and therefore irrigation guidelines have not been adopted.

The following table provides the rationale for the selection of GIL.

Table 12: Groundwater Investigation Level Rationale

Risk / Beneficial Use	GIL Type	Source	Comments / Rationale
Aquatic ecosystem	DGV	ANZG (2018)	Marine water 99% LOP for bioaccumulative contaminants 95% LOP for non-bioaccumulative contaminants
Vapour intrusion	HSL	NEPC (2013)	2 m to <4 m / 4 m to <8 m / 8 m+ Depth of groundwater to be confirmed during data gap assessment. If the depth of groundwater is above the basement floor level, then the HSLs do not apply. In this case a quantitative risk assessment may be required to evaluate risks from seepage and direct volatilisation.
Recreational waters	GV	NHMRC (2008)	Based on the NHMRC (2018) values x10 to account for ingestion of water whilst undertaking recreational activities.

C3.1 Groundwater Investigation Levels for Aquatic Ecosystems

The DGV for the protection of aquatic ecosystems derived from ANZG (2018) are in Table 13. The threshold will be revaluated at the time of investigation as ANZG is subject to frequent updates and revisions. Note: the 99% levels of species protection (LOSP) are protection levels are only applicable to contaminants that bioaccumulate but are listed for reference.

Table 13: Groundwater Investigation Levels for Protection of Aquatic Ecosystems (µg/L)

Group	Analyte	Units	ANZG (2018) Marine Water 95% LOSP Toxicant DGVs	ANZG (2018) Marine water 99% LOSP Toxicant DGVs	ANZG (2018) Marine Water Unknown LOSP Toxicant DGVs
Metals	Arsenic (Filtered)	mg/L	0.024*		
	Cadmium (Filtered)	mg/L	0.0055	0.0007	
	Chromium (III+VI) (Filtered)	mg/L	0.027/0.00044^		
	Copper (Filtered)	mg/L	0.0013	0.0003	
	Lead (Filtered)	mg/L	0.0044	0.0022	
	Mercury (Filtered)	mg/L	0.0004	0.0001	
	Nickel (Filtered)	mg/L	0.07	0.007	
	Zinc (Filtered)	mg/L	0.015	0.007	
OCP	Aldrin	mg/L			0.000003
	DDT	mg/L	0.00001*		0.0000004
	Endrin	mg/L	0.000008	0.000004	
	g-BHC (Lindane)	mg/L	0.002*		0.000007
	Heptachlor	mg/L	0.00009*		0.0000004
	Hexachlorobenzene	mg/L	0.0001	0.00005	
	Methoxychlor	mg/L			0.00004
OPP	Azinophos methyl	mg/L	0.00002*		
	Chlorpyrifos	mg/L	0.000009	0.0000005	
	Diazinon	mg/L	0.00001*		
	Dimethoate	mg/L	0.00015*		
	Fenitrothion	mg/L	0.0002*		0.000001
	Malathion	mg/L	0.00005*		
	Parathion	mg/L	0.000004*		

Group	Analyte	Units	ANZG (2018) Marine Water 95% LOSP Toxicant DGVs	ANZG (2018) Marine water 99% LOSP Toxicant DGVs	ANZG (2018) Marine Water Unknown LOSP Toxicant DGVs
PAH	Anthracene	mg/L	0.0004	0.00001	
	Benzo(a) pyrene	mg/L	0.0002	0.0001	
	Fluoranthene	mg/L	0.0014	0.001	
	Naphthalene	mg/L	0.07	0.05	
	Phenanthrene	mg/L	0.002	0.0006	
PCB	Arochlor 1242	mg/L	0.0006*		
	Arochlor 1254	mg/L	0.00003*		
Phenols	Phenolics Total	mg/L	400		
VOC and BTEX	1,1,1-trichloroethane	mg/L	0.27	0.13	
	1,1,2,2-tetrachloroethane	mg/L	0.4	0.2	
	1,1,2-trichloroethane	mg/L	1.9	0.14	
	1,1-dichloroethene	mg/L	0.7	0.5	
	1,2,3-trichloropropane	mg/L			
	1,2,4-trichlorobenzene	mg/L	0.08	0.02	
	1,2-dichlorobenzene	mg/L	0.16*		
	1,2-dichloroethane	mg/L	1.9	1	
	1,2-dichloropropane	mg/L	0.9	0.6	
	1,3-dichlorobenzene	mg/L	0.26*		
	1,3-dichloropropane	mg/L	1.1	0.7	
	1,4-dichlorobenzene	mg/L	0.06*		
	Benzene	mg/L	0.7	0.5	
	Carbon tetrachloride	mg/L	0.24	0.15	
	Chlorobenzene	mg/L	0.055	0.015	
	Chloroform	mg/L	0.77	0.37	
	Ethylbenzene	mg/L	0.08	0.05	
	Isopropylbenzene	mg/L	0.03	0.02	

Group	Analyte	Units	ANZG (2018) Marine Water 95% LOSP Toxicant DGVs	ANZG (2018) Marine water 99% LOSP Toxicant DGVs	ANZG (2018) Marine Water Unknown LOSP Toxicant DGVs
	Trichloroethene	mg/L	0.33	0.22	
	Tetrachloroethene	mg/L	0.07	0.04	
	Toluene	mg/L	0.18	0.11	
	Vinyl chloride	mg/L	0.1	0.07	
	Xylene (o)	mg/L	0.35*		

Notes:

* 95% Fresh water guideline adopted in lieu of marine standard

^ Chromium III/Chromium VI

C3.2 Health Screening Levels for Vapour Intrusion

The HSL to evaluate potential vapour intrusion risks derived from NEPC (2013) are in Table 19 and 20.

Table 14: Groundwater Health Screening Levels for Vapour Intrusion (µg/L)

Contaminant	HSL-A&B	HSL-A&B	HSL-A&B	Solubility Limit
SAND	2 m to <4 m	4 m to <8 m	8 m+	-
Benzene	800	800	900	59 000
Toluene	NL	NL	NL	61 000
Ethylbenzene	NL	NL	NL	3900
Xylenes	NL	NL	NL	21 000
Naphthalene	NL	NL	NL	170
TRH F1	1000	1000	1000	9000
TRH F2	1000	1000	1000	3000

Notes: TRH F1 is TRH F1 minus BTEX

TRH F2 is TRH F2 minus naphthalene

The solubility limit is defined as the groundwater concentration at which the water cannot dissolve any more of an individual chemical based on a petroleum mixture. The soil vapour that is in equilibrium with the groundwater will be at its maximum. If the derived groundwater HSL exceeds the water solubility limit, a soil vapour source concentration for a petroleum mixture could not exceed a level that would result in the maximum allowable vapour risk for the given scenario. For these scenarios, no HSL is presented for these chemicals and the HSL is shown as 'not limiting' or 'NL'.

Table 15: Groundwater Health Screening Levels for Vapour Intrusion (µg/L)

Contaminant	HSL-D	HSL-D	HSL-D	Solubility Limit
SAND	2 m to <4 m	4 m to <8 m	8 m+	-
Benzene	5000	5000	5000	59 000
Toluene	NL	NL	NL	61 000
Ethylbenzene	NL	NL	NL	3900
Xylenes	NL	NL	NL	21 000
Naphthalene	NL	NL	NL	170
TRH F1	6000	6000	7000	9000
TRH F2	NL	NL	NL	3000

Notes: TRH F1 is TRH F1 minus BTEX

TRH F2 is TRH F2 minus naphthalene

The solubility limit is defined as the groundwater concentration at which the water cannot dissolve any more of an individual chemical based on a petroleum mixture. The soil vapour that is in equilibrium with the groundwater will be at its maximum. If the derived groundwater HSL exceeds the water solubility limit, a soil vapour source concentration for a petroleum mixture could not exceed a level that would result in the maximum allowable vapour risk for the given scenario. For these scenarios, no HSL is presented for these chemicals and the HSL is shown as 'not limiting' or 'NL'.

C3.3 Groundwater Investigation Levels for Recreational Water

The GV for recreational water derived from NHMRC (2008) are in Table 16.

Table 16: Recreational Investigation Levels

Contaminant	Action Level	Action Level Min
Arsenic	50	
Asbestos	0	
Barium	1000	
Boron	1000	
Cadmium	5	
Chromium	50	
Cyanide	100	
Lead	50	
Mercury	1	
Nickel	100	
Nitrate-N	10000	
Nitrite-N	1000	

Contaminant	Action Level	Action Level Min
Selenium	10	
Silver	50	
Benzene	10	
Benzo(*a*)pyrene	0.01	
Carbon tetrachloride	3	
1,1-Dichloroethene	0.3	
1,2-Dichloroethane	10	
Pentachlorophenol	10	
Polychlorinated biphenyls	0.1	
Tetrachloroethene	10	
2,3,4,6-Tetrachlorophenol	1	
Trichloroethene	30	
2,4,5-Trichlorophenol	1	
2,4,6-Trichlorophenol	10	
Aluminium	200	
Ammonia (as N)	10	
Chloride	400000	
Copper	1000	
Oxygen	9.1	6.5
Hardness (as CaCO3)	500000	
Iron	300	
Manganese	100	
pH	8.5	6.5
Phenolics	2	
Sodium	300000	
Sulfate	400000	
Sulfide	50	
Surfactant (MBAS)	200	
Total dissolved solids	1000000	
Zinc	5000	
Aldrin	1	

Contaminant	Action Level	Action Level Min
Chlordane	6	
Chlorpyrifos	2	
2,4-D	100	
DDT	3	
Diazinon	10	
Dieldrin	1	
Endosulfan	40	
Endrin	1	
Heptachlor	3	

C4.0 Acid Sulfate Soil Action Criteria

The following section provides the action criteria to determine if the material is classified as PASS / ASS and therefore if acid sulfate soil management is required.

C4.1 Field Screening

Field screening indicators do not form part of the Assessment Criteria as such but can be used to provide an indication of the ASS status and to assist in selecting samples for laboratory testing.

Field screening is indicative only and can give false positive and false negative indications of the presence of ASS. False positives can be caused by organic matter, which often “froths” during oxidation. False negatives can be caused by shells in the soil. Indicators of ASS from field screening comprise:

- Field pH is less than or equal to pH 4;
- pHfox is less than 3.5;
- A decrease of more than 1 pH unit from the field pH to the pHfox;
- Bubbling, production of heat or release of sulphur odours during pHfox testing; and
- Change in colour from grey to brown tones during oxidation.

C4.2 Laboratory Analysis

The action criteria are the basis for determining if a ASSMP is required. They are based on Net Acidity. As clay content tends to influence a soil's natural buffering capacity, the action criteria are grouped by three broad texture categories - coarse, medium and fine. If the Net Acidity of any individual soil material tested is equal to or greater than the action criterion then the contingency actions for the handling and treatment of ASS outlined in this ASSMP would be triggered.

The test results can be used to evaluate the presence / absence of ASS in accordance with the action criteria in Table 17. If the results indicate the absence of ASS treatment is not required. The following Table 17 provides the action criteria.

Table 17: Action Criteria

Type of Material		Net Acidity#			
		1-1000 t materials disturbed		>1000 t materials disturbed	
Texture Range (NCST 2009)*	Approximate Clay Content %)	% S-equiv (oven dried basis)	Mol H+/t (oven dried basis)	% S-equiv (oven dried basis)	Mol H+/t (oven dried basis)
Fine: light medium to heavy clay	>40	≥ 0.1	≥ 62	≥ 0.03	≥ 18
Medium: clayey sand to light clays	5-40	≥ 0.06	≥ 36	≥ 0.03	≥ 18
Coarse and Peats: sands to loamy sands	<5	≥ 0.03	≥ 18	≥ 0.03	≥ 18

* If bulk density values are not available for the conversion of cubic meters to tonnes of soil, then the default bulk densities based on the soil texture in Table D2, may be used.

Net Acidity can only include a soil material's measured Acid Neutralising Capacity where this measure has been corroborated by other data (for example slab incubation data) that demonstrates the soil material does not experience acidification during complete oxidation under field conditions. Where the Acid Neutralising Capacity has not been corroborated, the Net Acidity must be determined.

Source: Sullivan *et al* (2018)

Table 18: Default Bulk Densities Based on Soil Texture.

Texture	Bulk Density (t/m^3)
Sand	1.8
Loamy Sand	1.8
Sandy Loam	1.7
Loam	1.6
Silty Loam	1.5
Clay Loam	1.5
Clay	1.4
Peat	1.0

Source: Sullivan *et al* (2018)

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Appendix D

Sampling Methodology for Data Gap Assessment

Appendix D
Proposed Data Gap Assessment Field Methodology

D1.0 Test Bore Drilling and Sampling Methods

Test bores are to be drilled to a depth of 4 m to 8 m using undisturbed sampling methods (pushtubes).

Soil sampling is carried out in accordance with standard operating procedures. The general sampling and sample management procedures comprise:

- Collect soil samples directly from the push tube at the nominated sample depth/s;
- Transfer samples in laboratory-prepared glass jars with Teflon lined lids by hand, capping immediately and minimising headspace within the sample jar;
- Collect replicate samples in zip-lock bags for PID screening;
- Collect ~500 ml samples for FA and AF analysis;
- Collect ~40 g to 50 g samples in zip-lock bags for asbestos (presence / absence) analysis;
- Wear a new disposable nitrile glove for each sample point thereby minimising potential for cross-contamination;
- Collect replicate samples as per the requirements of the RAP;
- Label sample containers with individual and unique identification details, including project number, sample location and sample depth (where applicable);
- Place samples into a cooled, insulated and sealed container for transport to the laboratory; and
- Use chain-of-custody documentation.

D2.0 Test Pit Excavation and Sampling Methods

Test pits are to be excavated to a depth of 2.0 m or 0.5 m below the fill / natural soil interface (whichever is greater).

Soil sampling is carried out in accordance with standard operating procedures. The general sampling and sample management procedures shall comprise:

- Collect soil samples directly from the excavator bucket at the nominated sample depth;
- Transfer samples in laboratory-prepared glass jars with Teflon lined lids by hand, capping immediately and minimising headspace within the sample jar;
- Collect replicate samples in zip-lock bags for PID screening;
- Collect ~500 ml samples for FA and AF analysis;

- Collect bulk (~10 L) soil samples for ACM field sieve test;
- Collect ~40 g to 50 g samples in zip-lock bags for asbestos (presence / absence) analysis;
- Wear a new disposable nitrile glove for each sample point thereby minimising potential for cross-contamination;
- Collect 10% replicate samples for QC purposes;
- Label sample containers with individual and unique identification details, including project number, sample location and sample depth (where applicable);
- Place samples into a cooled, insulated and sealed container for transport to the laboratory; and
- Use chain-of-custody documentation.

D2.1 Field Testing

Field testing is carried out in accordance with DP standard operating procedures. The general sampling and sample management procedures comprise:

PID Field Test

- Calibrate the PID with isobutylene gas at 100 ppm and with fresh air prior to commencement of each successive day's field work;
- Allow the headspace in the PID zip-lock bag samples to equilibrate; and
- Screen using the PID and include results on bore/test pit and sample logs.

Samples from test pits are to be subject to assessment of subsurface ACM according to the following procedure:

- Collect at least one bulk (~10 L) soil sample per metre of fill from each test pit;
- Weigh each bulk sample;
- Screen each bulk sample through a ≤7 mm aperture sieve;
- Weigh all retrieved potential ACM fragments; and
- Calculate the asbestos concentration (% w/w) in soil as per the procedure described in NEPC (2013).

D3.0 Groundwater Sampling

D3.1 Monitoring Well Installation

Monitoring wells shall be constructed using class 18 uPVC machine slotted screen and blank sections with screw threaded joints. The screened section of each well is backfilled with a washed sand filter pack to approximately 0.5 m above the screened interval. Each well is completed with a hydrated bentonite plug of at least 0.5 m thick and then bentonite / cement grout to the surface, finished as a stick-up (no monument).

D3.2 Monitoring Well Development

Groundwater monitoring wells are developed as soon as practicable following well installation. The purpose of well development is to remove sediments and / or drilling fluid introduced to the well during drilling and to facilitate connection of the monitoring well to the aquifer. The wells are developed by pumping / bailing to remove a minimum of five well volumes, or until dry.

D3.3 Groundwater Sampling

Groundwater sampling is to be carried out in accordance with standard industry practice. Groundwater samples are to be collected using a positive displacement low flow bladder pump via the micro-purge (minimal drawdown) method. The method minimises aeration of the sample and disturbance to the water column thereby enhancing the quality of results for oxygen sensitive analytes. The sampling method is described as follows:

- Measure the static water level using an electronic interface probe and record the thickness of any LNAPL (if encountered);
- Decontaminate the interface probe and cable between monitoring wells by rinsing in a diluted Decon-90 / Liquinox solution and then rinsing in demineralised water;
- Fit the pump with a well-dedicated bladder and tubing. Lower the pump into the well then clamp at a level estimated to be 1 m below the top of the water column (provided the depth of the pump is within the screened section) or to the approximate mid-point of the well screen;
- Set the pump at the lowest rate possible that could produce laminar flow to minimise drawdown of the water column;
- Measure physical parameters by continuously passing the purged water through a flow cell; and
- Following stabilisation of the field parameters, collect samples in laboratory-prepared bottles minimising headspace within the sample bottle and cap immediately.

Decontaminate the interface probe, pump and cable between monitoring wells by rinsing in a diluted Decon-90 / Liquinox solution and then rinsing in demineralised water.

The general groundwater sample handling and management procedures shall comprise:

- Collect 10% replicate samples for QC purposes;
- Label sample containers with individual and unique identification details, including project number and sample location;
- Place the sample jars into a cooled, insulated and sealed container for transport to the laboratory; and
- Use chain-of-custody documentation.

D4.0 Acid Sulfate Soils

Further acid sulfate soil investigation is not considered necessary. However, if materials are encountered that are suspected of containing ASS samples shall be collected of the suspect material per the following:

- Samples must be stored in air tight containers and delivered to the laboratory within 24 hours or frozen pending dispatch;
- All samples must be subject to field screening for field pH an pHfox (oxidised pH), refer to method in D4.1 and D4.2; and
- Selected / representative samples that exceed the field screening will be subject to Chromium Reducible Sulphur suite analysis.

D4.1 Field pH Test Method

- Calibrate battery powered field pH meter according to manufacturer's instructions.
- Prepare the test tubes in a tube rack. Mark the rack with the depths to identify the top and bottom of the profile. Use separate racks for the pHF and pHFOX tests to prevent cross contamination from violent pHFOX reactions.
- Conduct tests at intervals on the soil profile of 0.25 m, or at least one test per soil layer / horizon, whichever is lesser.
- For each layer place approximately half a teaspoon of soil into each of the tubes. It is important the two sub-samples come from the same depth and are similar in characteristics.
- Place enough deionised (DI) water in the pHF test tube to make a paste similar to 'grout mix' or 'white sauce'; stir the soil:water paste to ensure all soil 'lumps' are removed (demineralised water can be substituted; never use tap water). Water must be added to the soil samples within 10 minutes of sampling to reduce the risk of reduced inorganic sulphur (RIS) oxidation; monosulfidic material may start to oxidise in less than 5 minutes, substantially affecting pHF results.
- Immediately place the pH spear point electrode into the soil:water paste, ensuring the spear point is completely submerged. Never stir the paste with the electrode as this may damage the semi-permeable glass membrane.
- Measure the pHF with the calibrated pH meter.
- Wait for the reading to stabilise and record the pH measurement.
- All measurements should be recorded on a data sheet.

D4.2 Oxidised pH (pHfox) Test Method

It is recommended that 30% hydrogen peroxide (H2O2) be used in the pHFOX test.

Hydrogen peroxide (30%) is highly corrosive and care should be taken when handling and using the peroxide. Safety glasses and gloves should be worn when handling and using peroxide. All chemical bottles should be clearly labelled, and Safety Data Sheets (SDS) should be kept with the chemicals at all times. Appropriate health and safety precautions should be adhered to. Peroxide should be kept in the fridge when not in use.

The procedure for the field pH peroxide test (pHFOX) is outlined below:

- Adjust the pH of the H_2O_2 to between 4.5 and 5.5 before going into the field. While stirring, add a few drops of dilute NaOH and regularly check the pH with a calibrated electrode until the correct range is reached. Allow the peroxide to stand for 15 minutes and then recheck the pH. As H_2O_2 degrades over time, only buffer small quantities at a time and refrigerate when not in use.
- Calibrate battery powered field pH meter according to manufacturer's instructions.
- Prepare heat-resistant tubes in a tube rack. Mark the rack with the depths to identify the top and bottom of the profile. Use separate racks for the pHF and pHFOX tests to prevent cross contamination from violent pHFOX reactions.
- Conduct pHFOX tests at intervals on the soil profile of 0.25 m or at least one per horizon, whichever is lesser.
- To the pHFOX tube, prepared while sampling for pHF, add sufficient 30% H_2O_2 (at room temperature) to cover the soil, then stir the mixture.
- Rate the reaction of soil and peroxide using the reaction scale in Table 1.
- Allow approximately 15 minutes for any reactions to occur. The reaction may be rapid and vigorous if substantial RIS is present. If the reaction is violent and the soil:peroxide mix may overtop the tube, use a wash bottle to add small amounts of deionised or demineralised water to cool and calm the reaction. Do not add too much water as this may dilute the mixture and affect the pH value.
- Add a further 1–2 mL of H_2O_2, mix, allow to react for 15 minutes and rate the reaction. Continue this process until the soil:peroxide mixture reaction has slowed. This will ensure most of the RIS have reacted.
- If there is no initial reaction, individual tubes containing the soil:peroxide mixture can be placed in direct sunlight. This may encourage the initial reaction to occur.
- Wait for the soil:peroxide mixture to cool. This may take up to 10 minutes as the reaction can exceed 90 °C. Check the temperature rating of the pH meter and probe as high temperatures can damage the electrode and result in inaccurate readings. A more accurate pH is recorded if a temperature probe is used, however, this may be impractical in some field situations.
- Place the spear point pH electrode into the soil:peroxide mixture, ensuring the spear point is completely submerged. Never stir the paste with the electrode as this may damage the semipermeable glass membrane.
- Measure the pHFOX with the calibrated pH meter.
- Wait for the reading to stabilise and record the pHFOX measurement.
- All measurements should be recorded on a data sheet.

Table 1: Soil Reaction Rating Scale for the pHFOX Test.

Reaction Scale	Rate of Reaction
L	Low Reaction
M	Medium Reaction
H	High Reaction
X	Extreme Reaction
V	Volcanic Reaction

The rate of the reaction generally indicates the level of RIS present but depends also on texture and other soil constituents. A soil containing very little RIS may only have a slight reaction (L), however, a soil containing high levels of RIS (remember the exact level of RIS cannot be determined using the pHFOX test) is more likely to have an extreme / volcanic reaction (X–V), although there are exceptions. This rating scale alone should not be used to identify ASS. It is not a very reliable feature in isolation as there are other factors including manganese and organic acids which may trigger reactions. Reactions with organic matter tend to be more 'frothing' and do not tend to generate as much heat as sulfidic reactions. Manganese reactions can be quite extreme, but do not tend to lower the Phfox.

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Appendix E

Unexpected Finds Protocol

APPENDIX E: Unexpected Finds Protocol

1.1 General Contingencies

In view of the limited data available in relation to the extent of contamination (or otherwise) unexpected finds protocols have been devised to cater for a few unexpected scenarios, as follows.

An "Unexpected Finds Protocol" has been established to deal with unexpected findings and / or unplanned situations. This protocol is also applicable to any unexpected finds relating to potentially contaminated soils with a historical uncertainty that may be encountered during excavation works with the entire Site. The protocol is as follows:

1. The contractor(s) undertaking any remediation, civil or construction works will be provided with a copy of the RAP, including this UFP. The contractor(s) will nominate their site (project) manager who will be responsible for implementing the UFP;
2. Upon discovery of suspected contaminated material, the site (project) manager is to be notified and the affected area closed off by the use of barrier tape and warning signs (if appropriate) and sediment controls. Warning signs shall be specific to the findings and potential hazards and shall comply with the Australian Standard 1319-1994 - Safety Signs for the Occupational Environment;
3. A qualified environmental consultant is to be notified by the site manager to inspect the area and confirm the presence or otherwise of hazards or contamination, and to determine the method and extent of investigation or remediation works to be undertaken. A report detailing this information will be compiled by the environmental consultant and provided to the site manager, who will disseminate to the Principal (or their representative) and the site auditor;
4. All work associated with the contaminated soil will be undertaken by an appropriately licensed contractor, as stipulated by the environmental consultant;
5. All works must comply with the provisions of the relevant legislation and guidelines;
6. Validation samples must be collected for the identified contaminants of concern. Collect validation samples from the remedial excavation at a minimum rate of one location per side wall or one sample per soil type and at the depth of observed groundwater, whichever is the greater and at least one sample in the excavation base. Note that the actual number of samples may vary depending on the size of the remedial excavation and the degree of contamination, the soil profile encountered and the presence of groundwater;
7. Documentary evidence (weighbridge dockets) of appropriate disposal of the material is to be provided to the Principal (or their representative) if disposal occurs;
8. Details of all relevant activities are to be recorded in the site record system; and
9. Details of the remediation and validation works undertaken with respect to the unexpected find must be incorporated into the final Validation Assessment Report prepared by a suitably qualified environmental consultant.

1.2 Waste Exceeding the Disposal Threshold

If spoil is assessed to have exceeded the threshold criteria for disposal as Restricted Solid Waste (as defined in EPA 2014) and cannot be directly disposed off-site, these materials will be held on site pending the determination of alternative disposal arrangements.
The contingency plan to manage contaminated spoil materials that fails to meet the above criteria is therefore as follows:

1. Excavated material which cannot be disposed in a landfill directly i.e., those which are awaiting TCLP results or which fail the combined specific concentration and TCLP test, or require storage pending treatment will be placed in separate demarcated stockpiles.
2. Disposal arrangements will be determined based on sampling results as follows:
   - Material which meets the disposal levels of EPA (2014) shall be collected and disposed directly to a landfill;
   - Material which exceeds the disposal guideline levels shall be tested for TCLP. If the TCLP and total concentration are within the disposal requirements of General Solid Waste or Restricted Solid Waste, the materials will be dispatched off-site. Materials which fail the criteria will be segregated into separate stockpiles for alternate disposal arrangements; and
   - Those materials which exceed the leachability criteria for landfill disposal, shall be stockpiled separately on impermeable surface and bunded to prevent leachate generation and be subject to further treatment.
3. Consent as to the appropriateness of the treatment and disposal method for materials exceeding the leaching guidelines may need to be obtained from the NSW EPA, and if required a disposal consent must be sought from the Authority prior to the removal of such wastes from the site.

1.3 Discovery of Additional Underground Storage Tanks

In the event that an underground storage tank (UST) is unexpectedly discovered during site excavation works the following procedure should be adopted:

1. Works in the area should cease and the Site Manager informed. The area should be closed off by the use of barrier tape and warning signs that comply with the Australian Standard 1319-1994 - Safety Signs for the Occupational Environment;
2. Prior to the removal of a UST, any residual product (liquid / vapour) will be removed from the tank and disposed of appropriately in accordance with Australian Standard (AS 4976 - 2008 *The Removal and Disposal of Petroleum Underground Storage Tanks*). Records of disposal should be provided for the validation report;
3. The UST will be exposed and examined for potential leaks and general condition. A suitably qualified environmental consultant should be engaged to inspect the UST prior to its removal;
4. The UST will be removed, and the structures disposed of by a qualified contractor in accordance with AS 4976 - 2008. Disposal records should be provided to the environmental consultant for inclusion in the validation report;
5. All associated infrastructure (i.e., the remnants including fuel lines etc) will be removed and disposed in a similar manner if present;

6. Excavate and stockpile impacted materials (based on field observations to the practical extent possible based on structural engineers' recommendations and materials backfilled around the tank for classification. Materials which meet the remediation criteria in the RAP can be retained on site. Materials that fail the remediation criteria in the RAP will require off-site disposal to a licensed landfill unless otherwise advised by the environmental consultant. Land farming of impacted soils may be considered upon further advice from the environmental consultant based on the nature and extent of impacted soils;
7. Collect validation samples from the tank pit at a minimum rate of one location per side wall or one sample per soil type and at the depth of observed groundwater, whichever is the greater and at least one sample in the excavation base. Note that the actual number of samples may vary depending on the size of the tank pit excavation and the degree of contamination, the soil profile encountered and the presence of groundwater;
8. Collect validation samples below the fuel lines (following removal). Validation samples should be collected at a rate of one sample per 5 m linear metres of the fuel lines;
9. The validation samples will be analysed at a NATA accredited laboratory for the following analytical scope; Total recoverable hydrocarbons (TRH), polycyclic aromatic hydrocarbons (PAH), monocyclic aromatic hydrocarbons (benzene, toluene, ethylbenzene and xylenes - BTEX), lead and volatile organic compounds (VOC). Additional analysis may be required as advised by the environmental consultant based on the contents of the tank;
10. Excavated material from the tank pits/fuel line will be placed into a stockpile for assessment for potential reuse and / or waste classification as appropriate. If excavated soils exhibit signs of contamination during excavation (such as hydrocarbon odours or staining) then the soil should be segregated from soils that are not impacted into a separate stockpile and placed on impermeable surface (concrete or plastic) and bunded to prevent leachate generation. All stockpile samples will be analysed for heavy metals, PAH, TPH, BTEX, phenols, polychlorinated biphynels (PCB), organochlorine pesticides (OCP) and asbestos (to determine if the materials are suitable to be retained on site and / or disposed to landfill;
11. If water is encountered in the pit, a grab sample will be collected. The grab sample will be analysed for heavy metals, TPH, BTEX, PAH, PFAS, VOC and hardness; and
12. A UPSS validation report will be prepared by a suitably qualified environmental consultant in accordance with the *Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation 2008 (UPSS Regulation)* under the POEO Act 1997.

1.4 Unexpected Asbestos Finds Protocol

It is possible that asbestos-based materials may be uncovered in previously unidentified locations. In the event that this occurs the following 'Unexpected Asbestos Finds Protocol' has been established:

1. Upon discovery of suspected asbestos containing material, the site manager is to be notified and the affected area closed off by the use of barrier tape and warning signs. Warning signs shall be specific to asbestos hazards and shall comply with the Australian Standard 1319-1994 - Safety Signs for the Occupational Environment;

2. An Occupational Hygienist is to be notified to inspect the area and confirm the presence of asbestos (and type of asbestos) and determine extent of remediation works to be undertaken. A report detailing this information will be compiled by the Occupational Hygienist and provided to the site manager;
3. The impacted soil will be stockpiled for waste classification purposes (including sampling and chemical analysis) and will be disposed of, as a minimum, as asbestos waste at an appropriately licensed solid waste landfill site. In dry and windy conditions, the stockpile will be lightly wetted and covered with plastic sheet whilst awaiting disposal;
4. All work associated with asbestos in soil will be undertaken by a contractor holding a class AS1 Licence and all workers working in the asbestos impacted zone must meet the following minimum PPE requirement (unless otherwise advised by the hygienist):
   - Steel-capped lace-less boots;
   - Hard hat meeting AS1801-1981 and AS/NZS 1801:1997 / Amdt 1:1999 requirements;
   - High visibility clothing;
   - Half-face P2 rated respirator or similar;
   - Disposable full length body coveralls with elasticated hood and cuffs (Tyvek suit or equivalent); and
   - Gloves.
5. Monitoring for airborne asbestos fibres is to be carried out during the soil excavation. Asbestos air monitoring will be undertaken in accordance with *Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres 2nd Edition* [NOHSC: 3003 (2005)] and sampling density and locations will be determined by the Occupational Hygienist. All filters will be submitted to a NATA accredited laboratory for analysis. Air samples will be collected from the breathing zone of a person, over a minimum of four hours duration;
6. Documentary evidence (weighbridge dockets) of correct disposal is to be provided to the construction manager;
7. At the completion of the excavation, a clearance inspection is to be carried out and written certification is to be provided by the Occupational Hygienist that the area is safe to be accessed and worked. Clearance will include soil samples and asbestos analysis. If required, the filling material remaining in the inspected area can be covered / sealed by an appropriate physical barrier layer of non-asbestos containing material prior to sign-off;
8. Details of the incident are to be recorded in the site record system; and
9. The area may be reopened for further excavation or construction work.

Appendix F

Asbestos Work Health and Safety Plan

APPENDIX F: Asbestos Work Health and Safety Plan

It is possible that asbestos contaminated soils will be encountered during excavation and / or remediation works. In this event the asbestos work health and safety plan should be enacted as outlined herein.

1.1 Overview and Required Plans

All site work must be undertaken in a controlled and safe manner with due regard to potential hazards, training and safe work practices. To assist in achieving this goal the following plans, as a minimum, shall be developed by the Contractor (or the relevant subcontractors and provided to the Contractor for approval):

- Work Health and Safety Plan (WHSP): detailing the WHS procedures for the site, this may incorporate or include references to the below plans;
- Safe Works Method Statement (SWMS): which will be specific to individual tasks undertaken at the site;
- Asbestos Removal Control Plan (ARCP): as detailed further below; and
- Emergency Response Plan: detailing the procedures to be implemented in an emergency.

The above plans will all comply with regulatory requirements, including the WHS Regulation and SafeWork NSW requirements.

The ARCP must be provided to the person who commissioned the works. The ARCP must include:

- Details of how the asbestos removal will be carried out, including the method to be used and the tools, equipment and personal protective equipment to be used, and
- Details of the asbestos to be removed, including the location, type and condition of the asbestos.

The licensed asbestos contractor must keep the ARCP in accordance with the WHS Regulations.

Furthermore, consultation with site workers when drafting the above plans is to be undertaken to address issues which may be otherwise overlooked. Moreover, if issues are raised by workers during the works, then these plans should be reviewed and updated accordingly to take into consideration site conditions.

1.2 Induction

All site personnel must be inducted. The induction is to include, but not be limited to, general hazards associated with construction works, hazards specific to asbestos, evacuation and emergency response plans, first aid providers, what to do in the case of unexpected finds and any aspects of this AMP applicable to their tasks.

1.3 Hazards at the Site

Various hazards can be present at construction sites and should be identified by the Contractor prior to commencement of works. Hazards present at the site may include the following:

- Heat exposure;
- Excavations;
- Buried services;
- Noise;
- Dust;
- Electrical Equipment;
- Heavy Equipment and Truck Operation;
- Asbestos and asbestos fibres; and
- Chemical hazards (no chemical hazards identified from the contamination assessment).

1.4 Licensed Contractor and Training

All asbestos works greater than 10 m^2 must be undertaken by an asbestos contractor with a Class B asbestos removal licence issued by SafeWork NSW. The asbestos contractor must ensure that the remedial work is adequately supervised and carried out in a safe manner. Supervisory personnel shall have a detailed knowledge of the precautions and procedures outlined in *Code of Practice: How to Safely Remove Asbestos* (Safe Work Australia 2011) and shall, in light of this knowledge and experience, assume the responsibilities as detailed in the Code. These include planning, directing and monitoring asbestos removal works to ensure the required controls are implemented, in addition to ensuring that the consultant is reliably and regularly informed of the progress of the removal works.

Prior to engagement in the work, all asbestos remediation workers shall be instructed in the relevant aspects of asbestos health hazards, safe working procedures, and the wearing and maintenance of protective clothing and equipment.

The asbestos remediation contractor should keep a written record of all training provided to each of their asbestos removal workers and ensure these records are readily accessible.

Asbestos remediation contractor should also provide the following information to all of their asbestos removal workers and to all applicants for employment as an asbestos removal worker:

- The health risks associated with exposure to asbestos;
- The need for, and details of, health surveillance, including medical examinations in accordance with the Guidelines for Health Surveillance [NOHSC:7039 (1995)]; and
- Details of legislation and codes of practice relating to the control and safe removal of asbestos.

1.5 Notification

SafeWork NSW must be notified five days in advance of any asbestos works.

The Asbestos Contractor must, before commencing the licensed asbestos removal work, inform the following people that asbestos removal works are to be conducted and the date the work will commence:

- The person with management or control of the workplace and any adjacent occupied buildings; and
- The entity / person who commissioned the asbestos removal work.

The person with management or control of the workplace must inform workers and any other persons in the workplace.

1.6 Fencing and Signage for Asbestos Areas

Prior to the commencement of the asbestos works, the area will be delineated from the rest of the site with the use of hazard tape and warning signage and shall be specific to Asbestos Hazards. Further delineation with hazard tape and warning signage will be required for the asbestos contaminated stockpiles refer to Section 10.3.

All warning signs must comply with AS 1319 *Safety Signs for the Occupational Environment* and the National Code of Practice *How to Manage and Control Asbestos in the Workplace (Safe Work Australia 2011)*.

Appropriate fencing must also be placed around any deep excavations or unstable areas in accordance with WHS Regulations.

1.7 Restriction of Access to Asbestos Works Area

Access to the asbestos works site will be restricted to:

- Workers engaged in the asbestos removal work;
- Other persons associated with the asbestos removal work such as Occupational Hygienist or Asbestos Assessor; and
- Anyone allowed under the WHS Regulation or another law to be in the asbestos removal area.

1.8 Personal Protective Equipment

As a minimum, all personnel on site will be required to wear the following personal protective equipment (PPE) at all times during asbestos works involving friable asbestos. Some relaxing of the PPE requirements (at the discretion of the Occupational Hygienist) may be possible for bonded asbestos works:

- Steel-capped lace-less boots;
- Hard hat meeting AS1801-1981 and AS/NZS 1801:1997/Amdt 1:1999 requirements;
- High visibility clothing;
- Half-face P2 rated respirator or similar;
- Disposable full length body coveralls with elasticated hood and cuffs (Tyvek suit or equivalent); and
- Gloves.

Clothing made from wool or other materials that attract fibrous dusts should not be worn in the asbestos work area. Regardless of whether gloves are used, asbestos removal workers must clean their hands and fingernails thoroughly after work. The level of respiratory protection required (e.g., P1, P2 and P3 supplied air respirators) should be determined by a Competent Person in accordance with the asbestos remediation task to be undertaken. Appendix B of the Code provides for more information on the selection of suitable respiratory protection for particular removal tasks. This should be recorded on the Asbestos Removal Control Plan for the specific job and must be adhered to at all times. Workers in excavator cabs with recycled AC facilities may not require use of RPE but should have appropriate RPE and PPE on hand for emergency use.

The following additional PPE shall be used as considered necessary:

- Safety glasses or safety goggles;
- Hearing protection;
- Sunscreen;
- Sun visor / brim; and
- Long sleeve shirts and pants.

The PR is to ensure that respirator, overalls and gloves are available at the entry / exit point to the exclusion area. The Asbestos Contractor must ensure that personal protective equipment used during the fill excavation and removal works is disposed of as asbestos waste or decontaminated in accordance with the WHS Regulations.

1.9 Asbestos Remediation Equipment

A constant low-pressure water supply is required for wetting down asbestos or asbestos containing soils. This can be achieved with a mains-supplied garden hose fitted with a pistol grip. If no water supply is readily available, a portable pressurised vessel, such as a pump-up garden sprayer or water tanker, may be suitable.

1.10 Airborne Asbestos Monitoring

Monitoring for airborne asbestos fibres is to be carried out by an independent Occupational Hygienist during the earthworks that disturb the asbestos contaminated soils. Monitoring must commence prior to commencement earthworks in asbestos contaminated areas and monitors are to be positioned locations as nominated by the Occupational Hygienist. Where occupational exposure to asbestos materials is likely to occur, exposure is not to exceed half the occupational exposure standards for each hazardous building materials type or category as published by the National Occupational Health and Safety Commission (Safe Work Australia).

Asbestos air monitoring will be undertaken in accordance with Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres *2nd Edition* [NOHSC: 3003 (2005)] and sampling density and locations will be determined by the Occupational Hygienist. All filters will be submitted to a NATA accredited laboratory for analysis. Air samples will be collected from the breathing zone of a person, over a minimum of four hours duration.

The current National Exposure Standards TWA for asbestos are:

- Chrysotile (white) asbestos - 0.1 fibres/ml;
- Amosite (brown) asbestos - 0.1 fibres/ml;
- Crocidolite (blue) asbestos - 0.1 fibres/ml; and
- Other forms of asbestos or a mixture of asbestos types - 0.1 fibres/ml.

Throughout the duration of the works, air test results should return results below 0.01 fibres/ml.

The following table shows the actions to be taken should the fibre levels exceed the action level of 0.01 fibres/ml.

Table 1: Allowable Fibre Levels

Action level (fibres/ml)	Control / Action
< 0.01	Continue with control measures
≥ 0.01 ≤ 0.02	Review control measures, investigate cause and implement controls to minimise further release
≥ 0.02	Stop removal work and notify the regulator. Investigate cause including enclosure & equipment where present and clean immediate area. Do not recommence work until air test results return readings of < 0.01 fibres/ml

Given the sensitivity of the environment, it is recommended that air monitoring take place during all remediation and / or handling of involving known or suspected ACM.

Following the completion of the landscaping works in the asbestos contaminated areas asbestos fibre monitoring can be discontinued.

1.11 Decontamination

When exiting the taped and sign-posted exclusion area, which is to be via the one entry / exit point (currently located at the north-east corner of the site (on the north site sheds)), each person is to decontaminate at the entry / exit point. Note that future works may entail delineated exclusion areas and other entry / exit points within the site. Personal decontamination involves the following:

- Rinsing boots in the bucket filled with detergent solution at the entry / exit point. Rinsing is to remove mud from the boots;
- Removing overalls, gloves and then respirator and placing in the plastic bags within the provided disposal bin located at the entry / exit point. For privacy this can be undertaken in the designated decontamination area surrounded by black plastic at the entry / exit point; and
- Thoroughly washing of hands (including under nails) with detergent.

A water supply for decontamination purposes is to be maintained at the entry/exit point at all times. The amount of potential waste water generated is liable to be minimal and can be lightly spread (not sprayed) periodically within the middle of the exclusion zone where asbestos impacted material is exposed, is yet to be capped and hence is subject to this AMP. Any contaminated water collected as part of these works that cannot be disposed of in this fashion is to be double bagged, placed in a leak proof drum or skip and disposed of as asbestos waste.

With respect to any plant or equipment used in the asbestos removal exclusion zone area, these are to be appropriately decontaminated at the edge of the area prior to leaving the exclusion zone. Vehicles, excavators, etc. are to be washed down and all mud removed, with particular attention given to tyres, tracks, underside of the vehicle's body and other areas which would have come in contact with the ACM impacted materials (e.g., excavator buckets). This is to be undertaken at the entry / exit gate to the exclusion zone and monitored by the removalist supervisor. The amount of water generated from these decontamination activities is not expected to be significant and hence will infiltrate into the surface within the exclusion zone. However, if sufficient water is used which would cause surface migration then the exclusion zone is to be bunded to prevent water migrating outside the exclusion zone.

Any other equipment leaving the exclusion zone is to be decontaminated. Where possible this should be done with a detergent solution (e.g., shovels) within the exclusion zone. If not possible (e.g., electrical equipment), the equipment is to be wiped down with a damp cloth and the cloth disposed of in the asbestos waste bin at the entry / exit point to the exclusion zone.

1.12 Asbestos Waste

All asbestos waste (if any), including used disposable coveralls, masks, dust sheets and items deemed contaminated with asbestos is to be kept wet until sealed and wrapped in plastic sheeting or bags (at least 0.2 mm thick). This does not include the asbestos impacted soils which will be capped at the site. The bagged waste shall be appropriately labelled as containing asbestos and removed from site as soon as practicable.

Asbestos waste (if any) shall not be allowed to accumulate excessively within the work area but shall be bagged or placed in appropriate receptacles as the work proceeds. Controlled wetting of waste shall be used to eliminate asbestos dust emission during bag sealing or in case of subsequent rupture of a bag. Solid asbestos waste (if any) shall be placed in approved heavy-duty 200 µm minimum thickness clear polythene bags of a maximum size 1200 mm in length by 900 mm in width. The bags shall be labelled with an appropriate warning statement that the bag contains asbestos and that dust creation and inhalation shall be avoided. Bags, which have contained asbestos material, shall not be reused. Bags marked for asbestos waste shall not be used for any other purpose.

Asbestos waste bags shall not be filled more than half full, in order to minimise the risk of bag tearing / splitting and to assist in manual handling of bags. The neck end of each bag shall be twisted tightly, folded over and the neck secured in the folded position with wire ties, adhesive tape or any other effective method. Each bag shall be washed free of any visible asbestos residue. Each bag shall then be placed in a second waste bag, which shall be sealed. The external surface of each bag shall be cleaned to remove any adhering dust before the bags are removed from the work area. Hard and sharp asbestos waste shall require preliminary sealing or protective covering prior to placement in asbestos waste bags.

All drums or bins used for the storage and disposal of asbestos waste (if required) should be in a good condition, with lids and rims in good working order, and free of hazardous residues. The drums or bins should be lined with plastic (minimum 200 µm thickness), and labels warning of the asbestos waste should be placed on the top and side of each drum or bin, with the words, 'Danger: Asbestos. Do not break seal'. This may be substituted with a similar warning. If the drum or bin is to be re-used, the asbestos waste must be packed and sealed so that when the drum or bin is emptied there is no residual asbestos contamination. Controlled wetting of the waste should be used to reduce asbestos dust emissions. Where possible, the drums or bins should be placed in the asbestos work area before work on ACM begins. The drums or bins should have their rims sealed and their outer surfaces wet wiped and inspected before they are removed from the asbestos work area. If it is not possible to locate the drums or bins inside the asbestos work area, they should be located as close to the work area as possible. Routes for moving the waste from the asbestos work area to the waste drums or bins should be designated prior to the commencement of each task. Drums or bins used to store asbestos waste should be stored in a secure location within the asbestos removal site when they are not in use. Drums or bins should not be moved manually once they have been filled. Trolleys or drum lifters should be used.

1.13 Asbestos for Disposal to be Separated, Wrapped and Labelled

Contaminated asbestos waste (if any) must be:

- Separated from other material for disposal where that is reasonably practicable;
- Wrapped or contained in a manner that prevents asbestos fibres entering the atmosphere during transportation by road; and
- Labelled or marked with the words "CAUTION ASBESTOS" in letters no less than 50 millimeters high.

Current requirements for asbestos waste disposal must be adhered to as shown in the following subsections. Copies of asbestos waste disposal certificates / receipts must be provided.

1.14 Emergency Plan

A site-specific emergency plan, reflecting the risks involved, should be developed before any asbestos removal work commences. Workers should be trained for emergency situations. Decontamination procedures can be temporarily waived in the event of an emergency. Emergency planning should include provisions for emergency and fire evacuation, including exit arrangements and emergency communications such as audible alarms. These alarms should be used for emergencies only.

Emergency exit arrangements need to be adequate for the risks involved. Barriers and signs or other warning devices can be used to communicate emergency arrangements.

A first aid kit and first aid officer should be readily available at all times with sufficient suitable fire extinguishers and hoses available at strategic locations. The locations of fire extinguishers and hoses should be displayed in written and/or graphic format.

The emergency plan should also incorporate measures and actions to be taken in the case of unforeseen circumstances directly related and affecting the removal works such as loss of power / lighting and accidental leakage of fibres from the works area. These measures must be included within the Asbestos Removal control Plan with all operatives aware and able to implement in the event of an incident.

1.15 Reportable Incidents

All reportable WHS incidents will be reported to the PR in a timely manner and to the appropriate authority and in accordance with regulatory requirements.

Appendix G

Spoil and Remediation Environmental Management Plan

APPENDIX G: Outline Spoil and Remediation Environmental Management Plan

1.1 Overview

The work shall be undertaken with all due regard to the minimisation of environmental impacts and to meet all regulatory requirements. The Contractor shall have in place a Construction Environmental Management Plan (CEMP) detailing how the works are to comply with the requirements of relevant legislation.

The contractor shall also be responsible to ensure that the site works comply with the following conditions:

- Wastes arising at the site are disposed in an appropriate manner;
- Fugitive dust potentially leaving the confines of the site is managed appropriately;
- No water containing any suspended matter or contaminants leaves the site in a manner which could pollute the environment; and
- Vehicles shall be cleaned and secured so that no mud, soil or water are deposited on any public roadways or adjacent areas.

1.2 Hours of Operation

All work should be conducted within the hours specified by the local council or the relevant authority and appropriate development conditions.

1.3 Stockpiling of Soils

All stockpiles of asbestos contaminated soil shall be lightly conditioned by sprinkler to prevent dust emissions. The stockpiles will be cordoned off with hazard tape and asbestos warning signage. If excessive dust is generated from the stockpiles or if friable asbestos is detected the stockpile/s should be covered with 200 micron thick plastic sheeting or damp geotextile cover.

Should the stockpile remain on site for over 8 hours, geotextile silt fences or hay bales should be erected around each stockpile / the stockpile area to prevent any egress of contaminated fill by surface erosion, and an appropriate cover must be maintained on all excavated filling stockpiles.

Wherever possible, excavated spoil materials will be excavated and placed as separate stockpiles at demarcated and contained locations to maintain clear and distinct segregation with stockpiles of asbestos contaminated soil.

1.4 Loading and Transport of Contaminated Material

Should site restrictions necessitate that some stockpiles of contaminated waste must be removed from site then transport of all material to and from the site shall be via a clearly delineated, pre-defined haul route.
Removal of waste materials (including excavated filling) from the site shall only be carried out by a licensed contractor holding appropriate licences, consents or approvals as required by, and with the appropriate approvals obtained from NSW EPA and SafeWork NSW, if required.

The work will be conducted such that all site vehicles:

- Conduct deliveries during the specified hours of works, or in accordance with Roads and Maritime Services as appropriate;
- Are securely covered to prevent spillage and dust emissions;
- Are securely sealed to prevent any dust or odour emissions during transportation (transport of asbestos contaminated filling);
- Are decontaminated prior to leaving the site to ensure spoil is not tracked/ spilled onto public roads or footpaths; and
- Exit the site in a forward direction where possible.

Details of all soils removed from the site (including VENM) shall be documented by the Contractor in accordance with regulatory requirements and Section 11.

1.5 Disposal of Material

All materials removed from the site (if any) shall be disposed to a location legally allowed to receive them in accordance with the POEO Act.

Documentation will be obtained and recorded in accordance with regulatory requirements and Section 11 and will be provided to the receiving site prior to transport and / or acceptance of the materials.

1.6 Dust Control

Dust emissions should be confined within the site boundary. The following dust control procedures will be employed to comply with this requirement as necessary:

- Ceasing works during periods of high winds;
- Erection of dust screens around the perimeter of the site;
- Securely covering all loads entering or exiting the site;
- Use of water sprays across the site to suppress dust;
- Covering of all excavated filling stockpiles remaining onsite more than 8 hours;
- Keeping excavation and stockpile surfaces moist; and

- Regular checking of the fugitive dust to ensure compliance. Immediate implement measures to rectify any cases of fugitive dust.

1.7 Odour Control

No odours should be detected at any boundary of the site during works by an authorised Council Officer relying solely on sense of smell. The following procedures should be employed to comply with this requirement as required:

- Use of appropriate covering techniques such as plastic sheeting, polythene or geotextile membranes to cover excavation faces or stockpiles which exhibit odour;
- Fine spray of water on any impacted areas / materials;
- Restriction of uncovered stockpile heights to 2 m above surrounding site level;
- Adequate maintenance of equipment and machinery to minimise exhaust emissions; and
- Regular checking for potential odour issues and implementing remedial measures if odour is detected.