UrbanGrowth NSW Development Corporation

Remedial Action Plan

The new Sydney Fish Market
1A to 1C Bridge Rd, Glebe and
part 56-60 Pyrmont Bridge Road, Pyrmont, NSW

4 April 2019

54162/113808 (Rev3)

JBS&G Australia Pty Ltd

www.jbsg.com.au

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Executive Summary

JBS&G Australia Pty Ltd (JBS&G) was engaged by UrbanGrowth NSW Development Corporation (UrbanGrowth NSW, the client) to prepare a Remedial Action Plan (RAP) for the proposed new Sydney Fish Market located at the head of Blackwattle Bay between the Pyrmont Peninsula and the foreshore of Glebe (the site). The site is legally identified as Lots 3-5 in DP 1064339, part Lot 107 in DP 1076596 and part Lot 1 in DP835794 as shown on **Figures 1** and **2**. The individual lots fall within City of Sydney (CoS) local government area. The site area is approximately 3.7 Ha, of which 0.7 Ha consists of soil based materials present above the high water mark.

The site has historically been used for a range of commercial/industrial uses. The proposed fish market development will include retail and food and beverage premises, wholesale facilities, auction rooms, offices and commercial space, the Sydney Seafood School, back of house facilities, and car, truck and coach parking facilities.

Previous site contamination investigations as evaluated in JBS&G (2018) in relation to the proposed development have identified that management of a number of potential site contamination issues is required such that at the completion of works, a final validation assessment may confirm the suitability of the site for the proposed use as required under the NSW planning framework.

Given the site conditions and remaining uncertainties, JBS&G (2018) recommended that a RAP be prepared to establish a suitable framework for management of potentially contaminated media and management of material excess to development requirements, such that upon completion of works, the site will be considered suitable for the proposed use. Potential acid sulfate soils (ASS) were also identified within marine soils and sediments underlying the site that will require management in the event of ground disturbance activities. The acid sulfate soil management plan will be issued as a standalone document to complement this RAP.

This RAP document presents a summary of known and suspected site conditions, a conceptual site model (CSM) of contamination conditions and identification of existing data gaps in relation to the proposed development scheme, an evaluation of potential remedial strategies, identification of preferred strategies and details of site management and associated validation requirements to be implemented during the proposed works.

Overall, it is considered that the proposed actions outlined in this RAP conform to the requirements of the *Contaminated Sites Guidelines for the NSW Site Auditor Scheme (3rd Edition)* (EPA 2017) because they are: technically feasible; environmentally justifiable; and consistent with relevant laws policies and guidelines endorsed by NSW EPA.

Subject to the successful implementation of the measures described in this RAP and with consideration to the Limitations presented in **Section 13**, it is considered that the Site can be made suitable for the intended uses and that the risks posed by contamination can be managed in such a way as to be adequately protective of human health and the environment.

Abbreviations

Term	Definition
ACM	Asbestos Containing Materials
AEC	Areas of Environmental Concern
AHD	Australian Height Datum
ASRIS	Australian Soil Resource Information System
ASS	Acid Sulfate Soils
BTEXN	Benzene, Toluene, Ethylbenzene, Xylenes and Naphthalene
CLM Act	Contaminated Land Management Act
COC	Chain of Custody
COPC	Contaminants of Potential Concern
CSM	Conceptual Site Model
DBYD	Dial Before You Dig
DO	Dissolved Oxygen
DP	Development Plan
DQI	Data Quality Indicators
DQO	Data Quality Objectives
DSI	Detailed Site Investigation
EC	Electrical Conductivity
Eh	Redox Potential
EIL	Ecological Investigation Levels
EPA	NSW Environmental Protection Authority
ESA	Environmental Site Assessment
ESLs	Ecological Screening Levels
Ha	Hectare
HAR	Heritage Assessment Report
HILs	Health Investigation Levels
HSLs	Health Screening Levels
JBS&G	JBS&G Australia Pty Ltd
JRA	Job Risk Assessment
LEP	Local Environmental Plan
LOR	Limit of Reporting
NATA	National Accreditation Testing Authority
OCP	Organochlorine Pesticides
OPP	Organophosphate Pesticides
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
PID	Photoionisation Detector
POEO Act	Protection of Environment Operations Act
PSI	Preliminary Site Investigation
QA/QC	Quality Assurance/Quality Control
RFQ	Request for Quote
RPD	Relative Percentage Difference
SAQP	Sampling Analytical and Quality Plan
SCID	Stored Chemical Information Database
SWMS	Safe Work Method Statement
TRH	Total Recoverable Hydrocarbons
UCL	Upper Confidence Limit
UST	Underground storage tank
VOC	Volatile Organic Compounds

1. Introduction & Objectives

1.1 Introduction

JBS&G Australia Pty Ltd (JBS&G) was engaged by UrbanGrowth NSW Development Corporation (UrbanGrowth NSW, the client) to prepare a Remedial Action Plan (RAP) for the proposed new Sydney Fish Market located at the head of Blackwattle Bay between the Pyrmont Peninsula and the foreshore of Glebe (the site). The site is legally identified as Lots 3-5 in DP 1064339, part Lot 107 in DP 1076596 and part Lot 1 in DP835794 as shown on **Figures 1** and **2**. The individual lots fall within City of Sydney (CoS) local government area. The site area is approximately 3.7 Ha, of which 0.7 Ha consists of soil based materials present above the high water mark.

The site is currently used for a variety of commercial and industrial uses, primarily comprising a concrete batching plant and commercial boat hire operations. The site is currently zoned as Ports and Employment under State Environmental Planning Policy (SEPP) No. 26 – City West.

An Environmental Site Assessment (JBS&G 2019[1]) was previously completed for the site, which comprised review and assessment of site condition data from a range of previous investigations. JBS&G (2018) identified no unacceptable health risks with respect to the proposed development. Notwithstanding, additional assessment of a number of identified data gaps in relation to potentially contaminated media specific to the proposed development proposal was recommended to close out a number of uncertainties such that during the development early works phase, remediation/ management of conditions may be completed as necessary to ensure the site is suitable for the proposed use.

Given the site conditions and remaining uncertainties, a RAP was recommended to establish a suitable framework for management of potentially contaminated media, management of material excess to development requirements, etc such that upon completion of works, the site will be considered suitable for the proposed use. Potential acid sulfate soils (ASS) were also identified within marine soils and sediments underlying the site that will require management in the event of ground disturbance activities. The acid sulfate soil management plan will be issued as a standalone document to complement this RAP.

This report has been prepared in accordance with the requirements of the NSW Environment Protection Authority (EPA) published and endorsed guidelines.

1.2 Objective

The objectives of this RAP are to establish a suitable framework for management of potentially contaminated media such that upon completion of works, the site will be considered suitable for the proposed use. As such, the objectives are to: identify the known and/or anticipated extent of environmental impact via presentation of a conceptual site model, identification and evaluation of remedial/management options in relation to regulatory requirements, the development details and overall objectives; and to document the procedures and standards to be followed such that (potentially) contaminated media are appropriately managed whilst ensure the protection of human health and the surrounding environment.

1.3 Proposed Development

The most recent concept plans for the proposed new Sydney Fish Market are provided as **Appendix A**. It is understood that statutory approval for the proposed development scheme will be sought in two stages, comprising the initial concept development application, being for the demolition of existing structures and approval for the proposed development envelope for use of the site as a fish

[1] *Environmental Site Assessment, Proposed Sydney Fish Markets, 1A to 1C Bridge Road Glebe,* JBS&G Australia Pty Ltd, 4 April 2019, Rev 3 (JBS&G 2018)

market. The second development application (Main Works) will seek approval for the construction of the new fish market and associated works.

Specifically, the Concept development application seeks approval for:

- the use of the site for the fish market including waterfront commercial and tourist facilities and ancillary uses and the distribution of uses;
- a gross floor area of up to 30,000m^2 contained within a defined building envelope;
- waterfront structures such as wharves;
- concepts for improvements to the public domain including promenades, access to Blackwattle Bay and landscaping;
- pedestrian cycle and road access and circulation principles; and
- principles for infrastructure provision and waste management.

The development application will also set out details of the first stage of the development being the demolition of land and water-based structures on the site including removal of marine piles and any resulting repairs to the existing sea wall, and related services relocations.

The Main Works development application seeks approval for:

- the construction of a new fish market including land and water-based structures.
- the use of the site for the fish market including waterfront commercial and tourist facilities and ancillary uses and the distribution of uses;
- a gross floor area of approximately 26,000m^2 as calculated according to the definition of GFA under SREP 26 (approximately 25,600m^2 as calculated according to the definition of GFA under the Standard Instrument).
- public domain works including promenades access to Blackwattle Bay and landscaping;
- pedestrian, cycle and road access and circulation;
- infrastructure provision and waste management; and
- associated works as required.

The proposed uses comprise:

Below Ground Level

- Parking for service and delivery, and private vehicles up to approximately 417 vehicles;
- Plant and storage;
- Waste Management facilities; and
- End of journey facilities.

Ground Level - Outside of Building Envelope

- Up to three operational wharves for fishing fleet servicing and product unloading/loading, multi-purpose wharf space, private-operated ferry stop, recreational vehicles and the like;
- Vehicular access driveways; and
- Publicly accessible promenade.

Ground Level - Within Building Envelope

- Wholesale services space including product storage and processing;

- Auction floor and associated refrigeration and handling space.
- Loading dock including time-limited delivery and service vehicle parking area;
- Waste management facilities;
- Office space including buyers room; and
- Staff amenities, plant and storage.

Upper Ground Level (L1)

- Retail premises including fresh food retail, food and drink premises including harbourside dining;
- External/shared dining space;
- Ancillary back of house space and staff amenities; and
- Circulation areas.

Upper Level 2 (Mezzanine)

- Catering space;
- The Sydney Seafood School;
- Tenant and subtenant office space; and
- Plant and storage space.

Specifically, the proposed development works as outlined in plans included in **Appendix A** will include:

- Retention, rehabilitation/repair of the existing sea wall structures;
- Removal/decommissioning of all existing industrial and wharf infrastructure;
- Construction of a new basement level carpark in front of the existing sea wall with appropriate measures to allow the continued discharge of stormwater through existing culverts.
- Foundations for the new structures will be completed as driven steel piles with the basement constructed as a precast stainless steel structure within which a membrane will be fitted and in-situ basement pavements poured resulting in a water tight structure.
- The proposed basement finished floor level (FFL) has been designed at -0.3 m AHD. Allowing for a hydrostatic slab and steel structure, JBS&G has conservatively assumed a base of structure of approximately -1.3 m AHD.
- A coffer dam will be installed around the construction footprint to enclose the site and enable temporary partial dewatering to facilitate construction requirements whilst ensuring that sediments remain saturated.
- To facilitate continued use of the existing stormwater culverts, etc the proposed works will include some dredging of sediment in the vicinity of an existing culvert within the new building footprint. These works will be completed to provide a gap of at least 1 m between the culvert mouth and the new basement structure. It is anticipated that approximately 55 m^3 of sediment/silt will require movement to an elevation of -3.01 m RL. The sediment/silt movement will relocate excess material within the basement footprint so as to minimise the level of disturbance of both the material and ecological receptors. In addition, it is anticipated that approximately 470 m^3 of existing rock revetment will also require removal within the zone along the base of the sea wall. Given the inherent

uncertainties associated with the survey methodology and the potential for movement of sediment/silt within the building footprint between the survey period and commencement of works, the reported volumes requiring removal should be preliminary estimates and contingency allowed should additional material required removal to achieve the drainage/construction objectives.

1.4 Previous Assessments

The RAP has been substantially prepared on the basis of a range of previous assessments. This has included:

- *Environmental Site Investigation Blackwattle Bay Maritime Precinct Blackwattle Bay Maritime Precinct, NSW*, March 2009, Parsons Brinkerhoff (PB 2009);
- *Report to Land and Property Management Authority C/- Government Architects Office on Preliminary Environmental Site Assessment for Proposed Redevelopment – Waterfront at Markets, 56-60 Pyrmont Bridge Road, Pyrmont, NSW.* Ref: E24125Krpt, EIS, August 2010 (EIS 2010b);
- *Sydney Bays Precinct Urban Growth NSW Geotechnical Desktop Review*, 6 August 2014, Jacobs Group (Australia) Pty Limited (Jacobs 2014);
- *UrbanGrowth NSW Environmental Site Assessment The Bays Precinct Urban Transformation Area rev 1*, 18 November 2015, JBS&G Australia Pty Ltd (JBS&G 2015a);
- *UrbanGrowth NSW Site Wide Remedial Concept Plan The Bays Precinct Urban Transformation Area rev 0*, 4 December 2015, JBS&G Australia Pty Ltd (JBS&G 2015b);
- *Bays Market Precinct: Blackwattle Bay & Wentworth Park History, Built Heritage, Archaeology & Landscape Study*, July 2017, City Plan Heritage (CPH 2017);
- *Contamination Investigation The Bays Precinct – Separable Portion 1 Blackwattle Bay, Pyrmont, NSW*, 12 July 2017, Environmental Investigation Services (EIS 2017);
- *Revised Geotechnical Report to Urbangrowth NSW on Geotechnical Investigation for Proposed Bays Market District at Blackwattle Bay & Wentworth Park, Pyrmont, NSW rev 2*, 14 September 2017, JK Geotechnics (JK 2017);
- *Environmental Site Assessment, the new Sydney Fish Markets, 1A to 1C Bridge Road, Glebe, NSW*. 4 April 2019, Rev 3, JBS&G Australia Pty Ltd (JBS&G 2019); and
- *Acid Sulfate Soil Management Plan, the new Sydney Fish Market, 1A to 1C Bridge Rd, Glebe NSW*. 4 April 2019, Rev 2, JBS&G Australia Pty Ltd (JBS&G 2019b).

2. Site Condition & Surrounding Land Uses

2.1 Site Identification

The site location is shown in **Figure 1**, and current site layout is shown in **Figure 2**. The site details are summarised in **Table 2.1** and described in the following sections. It is understood that the land site is currently zoned as Ports and Employment under State Environmental Planning Policy (SEPP) No. 26 – City West and Maritime Waters under Sydney Regional Environmental Plan (Sydney Harbour Catchment) 2005.

Table 2.1: Summary Site Details

Lot / DP	Lots 3-5 in DP 1064339 Part Lot 107 in DP1076596 Part Lot 1 in DP835794
Address	1A to 1C Bridge Road, Glebe NSW and part 56-60 Pyrmont Bridge Road, Pyrmont NSW
Local Government Authority	City of Sydney Council
Approximate MGA Coordinates (MGA 56)	Easting: 332669.678 Northing: 6250259.919
Current Use	Various industrial and commercial uses (concrete batching plant and commercial boat hire operations).
Proposed Use	Commercial use (fish market)
Site Area	Approximately 3.7 Ha

2.2 Site Condition

A detailed site description and environmental setting is provided in JBS&G (2019). At the time of preparing this RAP, the site was still operational as a concrete batching plant and commercial boat hire business as described previously. It has been assumed that all site structures will be demolished in accordance with provisions detailed in a Hazardous Building Material Survey (HMBS) understood to have been completed on site structures prior to any remediation/development works.

2.3 Site History

From a review of the previous investigations, the following summarises the key aspects of the site history with respect to potential contaminating activities:

- The site and Blackwattle Bay were originally reclaimed between 1836 and 1891;
- The site was used for commercial purposes from 1900 that included timber merchants, abattoirs and garbage collectors;
- Lot 3 in DP1064339 located in the eastern portion of the site was used for unloading coal since before 1951. Coal fragments have been reported on the seafloor and within boreholes previously completed at the site;
- The site formerly had five underground storage tanks (USTs) which were removed from the site in 1995. The USTs contained gasoline, distillate, racing fuel, mineral spirit and mineral oil.
- During the UST removal, impacted soils were reportedly excavated and removed from the site. The resulting excavations were reportedly validated for TPH, however it was further reported that heavy metal impacts remained in-situ. At the time of this current assessment, no direct records were available as to the former location of these facilities or the remediation works completed for their removal, as such there remains uncertainty as to the potential for residual infrastructure and/or impacts within the site;
- Demolition of former site structures reportedly resulted in the removal of 700 m^2 of asbestos from the site; and

- The site is currently used as a concrete batching plant and for commercial boat hire operations.

2.4 Geology and Soils

Jacobs (2014) has reported that review of existing geotechnical maps indicate that the area of the site is underlain by a significant depth (>3 m) of fill material, as consistent with historical reclamation of the area from Blackwattle Bay. This is consistent with Wentworth Park as located further south of the site. Hawkesbury Sandstone was anticipated under site filling.

JK (2017a) reported that the 1:100,000 Geological Map of Sydney indicated the site to be underlain by man-made fill and estuarine soils overlying Hawkesbury Sandstone of the Wianamatta Group. The Hawkesbury Sandstone comprises medium to coarse grained quartz sandstone with very minor shale and laminite lenses. It was further noted that at least two dykes were believed to extend through the site in a rough north-west to south-east alignment.

Boreholes in Blackwattle Bay undertaken in JK (2017a) disclosed a subsurface profile generally comprising natural clays and sandy clays of medium to high plasticity and clayey sands overlying sandstone bedrock. In the bay, the boreholes typically encountered no fill from the seabed level, except the boreholes close to the existing shoreline where fill extending up to 4.7m depth was encountered. There generally appears to be a fill layer close to the southern shoreline. The fill was reported to comprise a clayey sand and silty clay with trace amounts of fine to medium grained sand and coal and plastic fragments. Boreholes in the adjoining Wentworth Park identified fill comprising silty sand or sandy clay containing varying amounts of inclusions such as sandstone and igneous gravel, also timber, tile, ceramic, glass, shell, concrete and brick fragments, slag and ash.

Natural soils were encountered either from seabed level or about 0.5m depth in the Bay comprised interbedded layers of silty clay, sandy clay and clayey sand soils. The predominantly clay samples were assessed as having moisture content greater than their plastic limits and based upon hand penetrometer tests completed on the samples, ranged in strength from very soft to very stiff. The clays were assessed as generally being of medium to high plasticity, although more sandy clays were generally of low to medium plasticity. The predominantly sandy samples were assessed as wet and ranged from very loose to dense relative density. The natural soils contained varying amounts of fine to coarse grained gravel, shell fragments and other organic materials.

Sandstone bedrock was encountered underlying natural soils at depths ranging from approximately 5.5-13.4 m bgs (-9.1 to -18.5 m AHD).

2.5 Topography and Hydrology

The site is situated on predominantly flat terrain. Review of topographic information obtained from regional topographic maps available on NearMap spatial information database indicated that southern portion of the site that has been subject to land reclamation and has an elevation of approximately 2 m Australian Height Datum (AHD). The ground surface of the northern portion of the site is situated on piers overlying the surface waters of Blackwattle Bay. Site surface water is anticipated to drain directly into Blackwattle Bay.

2.6 Hydrogeology

A review of the registered bore information (NSW DPI 2017[2]) indicated that there are 14 registered bores within a 500 m radius of the site. The closest wells (approximately 250 m south-west of site) were constructed for monitoring purposes and were reported to contain a standing water level of approximately 0.6 m within shallow fill materials. Groundwater monitoring as undertaken within the extent of the site as part of previous investigations has identified:

[2] NSW Department of Primary Industries, 2015. Groundwater Monitoring Overview Map. Http://allwaterdata.water.nsw.gov.au/water.stm. Accessed 13 February 2018

- Site groundwater to have reported total dissolved solids (TDS) concentrations consistent with saline waters; and
- Standing water levels correspond with tidal surface water levels of Blackwattle Bay in which site groundwater is anticipated to discharge.

2.7 Acid Sulfate Soils

Review of the Acid Sulfate Soil (ASS) Risk Map for Prospect/Parramatta indicates[3] that the subject site is located within an area of 'high probability' of acid sulfate soils within bottom sediments. In such areas, there is a severe environmental risk if bottom sediments are disturbed by activities such as dredging.

PB (2009) noted potential indicators of ASS comprising odorous marine sediments with sea shells in boreholes located in the southern portion of the site (overlying the land portion of the site) and within marine sediments in Blackwattle Bay. Similar observations were reported in JBS&G (2015) and EIS (2017), however no samples were analysed at a laboratory to confirm if the soils comprised actual ASS.

Given the proposed development scheme and the anticipated acid generation characteristics of the sediment and potentially soil at the site, an acid sulfate soil management plan (ASSMP, JBS&G 2019b) has been prepared in conjunction with this RAP.

2.8 Meteorology

A review of average climatic data for the nearest Bureau of Meteorology monitoring location (Observatory Hill[4]) indicates the Site is located within the following meteorological setting:

- Average minimum temperatures vary from 8.1 ^{o}C in July to 18.8 ^{o}C in February;
- Average maximum temperatures vary from 16.4 ^{o}C in July to 26.0 ^{o}C in January;
- The average annual rainfall is approximately 1215.7 mm with rainfall greater than 1 mm occurring on an average of 99.9 days per year; and
- Monthly rainfall varies from 68.4 mm in September to 133.2 mm in June with the wettest periods occurring on average from January to June.

[3] *'Acid Sulfate Soil Risk Map – Prospect/Parramatta, Edition 2',* 1997 1:25 000, NSW Department of Land and Water Conservation (DLWC), Ref 9130N3 (NSW DLWC)

[4] http://www.bom.gov.au/climate/averages/tables/cw_066062.shtml, Commonwealth of Australia, 2013 Bureau of Meteorology, Product IDCJCM0028 prepared on 29 December 2016 and accessed by JBS&G on 5 February 2018

3. Summary of Previous Assessments

A brief summary of a previous assessment that included environmental sampling and analysis from several sources as completed at the site is included below.

3.1 Environmental Site Assessment (JBS&G 2019)

JBS&G conducted an ESA to characterise potential contamination at the site that will require to be addressed by the proposed site preparation and construction works for the fish markets development. The scope of works comprised:

- A review of previous site contamination assessment/investigation reports as made available to JBS&G with respect to the suitability of the data for use in evaluating the current contamination conditions across the various properties within the extent of the site. The ESA was substantially prepared on the basis of previously collected environmental data as documented in PB (2009), JBS&G 2015a and EIS 2017 assessments;
- Review of available geotechnical investigation reports as made available; and
- Development of a conceptual site model (CSM) as specific to the environmental characterisation of the site and the proposed development.

The key findings of the ESA are summarised below:

- Review of currently available previous site assessment documents has identified that there is sufficient existing data to characterise soil, sediment and groundwater conditions within the area of the proposed development in order to establish a CSM. Notwithstanding, a number of data gaps were identified as follows that will require additional data to refine specific management/remedial actions during application of a future RAP:
    - Shallow soils at PBHA01 and PBHA02 with TPH impacts that may pose a risk to groundwater quality discharging from the site;
    - Groundwater assessment hydraulically downgradient from identified PAH and heavy metal impacts and potential risks to off-site ecological receptors;
    - Additional ground gas and soil vapour investigation to assess the inhalation risks to future site users of the commercial building;
    - Additional characterisation of sediment conditions, particularly in areas where proposed construction activities will result in movement or otherwise, disturbance of sediments to facilitate the implementation of appropriate management measures in relation to contaminant concentrations and acid sulfate soil conditions; and
    - Characterisation of site soils with respect to sampling density as provided in EPA (1995) guidance for the land portion of the site and consideration as to the uncertainty associated with the status of historical remediation of former fuel storage facilities. Whilst any potential soil impacts may not affect site suitability (under the proposed development), the impacts (if any) may require appropriate management during development and construction works. Such potential impacts requiring further assessment include asbestos in soils, characterisation of fill material and natural soils for such that material requiring management in future development works can be refined and leachate data of soils to inform potential waste classification of surplus soils to the development.
- Each of the environmental data sets (as sourced from PB (2009), JBS&G (2015a) and EIS (2017) were found to be reliable for the purposes of making decisions as part of this assessment. It is noted that data collected as part of PB (2009) is approximately eight years

old. However, from a review of the site history since 2009, the site use and immediate surrounds have remained relatively unchanged and therefore the data is considered to be sufficiently representative of current conditions for the purposes of developing the CSM. Groundwater analytical results as reported in PB (2009) were also found to have elevated laboratory LORs that did not allow for a direct comparison to the adopted criteria, whilst some sediment analysis data in EIS (2017) had elevated LORs once consideration was given to normalisation to organic carbon concentrations as per CSIRO (2013);

- Based on the CSM presented, the potential exposure pathways for commercial users of the site will include inhalation (gas or vapours) pathways. On-site ecological receptors will be limited as the whole site will be covered in hardstand. Exposure pathways for off-site receptors will include contaminated groundwater (if any) migrating off-site and contaminant up-take from sediments;
- Based on the results and CSM presented, there were no potential unacceptable health risks identified with respect to the proposed development. Notwithstanding, this is required to be confirmed with the results of a data gaps assessment;
- Heavy metal, PAH and TRH contaminated sediments have been identified within the extent of the development site that were reported to exceed both low and high trigger value sediment quality guidelines protective of ecological communities. UNSW (2017) reported sediments within Blackwattle Bay had significant metal and nutrient contamination that were indicative of highly disturbed conditions. This is supported by the results reported in EIS (2017) in which sediment data collected from sampling points outside the proposed development area (but in Blackwattle Bay) had similar levels of impact to those reported within sediments of the site.
- As reported in ANZECC/ARMCANZ (2000) sediment remediation is not straightforward and should only be undertaken where absolutely warranted. To this extent, UNSW (2017) recommended the following with respect to increasing biodiversity and restore ecosystem services within the Bays Precinct:
    - Reduction of contaminant loads through the treatment of storm water and land runoff; and
    - Prevention of the resuspension of sediments during development by minimising sediment disturbance and using sediment curtains during construction activities.
- Consistent with EPA (2017) guidance, in which remediation should not proceed in the event that it is likely to cause a greater adverse effect than leaving the site in its current condition with regard to contamination, it is considered that sediments should not be actively remediated as it will likely result in adverse impacts through requirements for excavation, dewatering, ASS treatment and off-site disposal of the resulting stabilised material to landfill. Moreover, it will likely not result in any meaningful environmental outcomes within the context of the highly disturbed conditions of Blackwattle Bay in which sediments with elevated levels of contaminants have been reported throughout the entire Bay.
- It is noted that sediments adjacent to the existing sea wall and typically beneath the proposed new Sydney Fish Market building envelope will require adjustment in location within the current site extent to facilitate continued discharge from existing stormwater culverts and allow design levels to be reached for the construction of the basement. It is understood that the adjustment sediments will extend to a maximum depth of approximately 1.4 m in minor areas of the site. Review of the existing data has identified that, consistent with sediments more broadly at the site, near surface sediments (0-0.4 m) are impacted with heavy metals, PAHs and TRH. Sediment samples were further collected

from depths of 0.5-1.0 m and 1.0-1.5 m at PBSS05 in which the concentrations of heavy metals and PAHs were consistent with those in the overlying surface sample (0-0.4 m) and additional surface sediment samples collected throughout the investigation area. On this basis, it is considered that these sediments are suitable from a contamination perspective to placed elsewhere within the proposed basement footprint. In addition, the removal of the surface sediments from within these locations is not expected to expose any underlying sediments (at depth) with greater contaminant concentrations that would result in a net-increase in contaminant exposure risks to ecological receptors on or in the vicinity of the site.

Consistent with the previous point, the potential for resuspension of sediments during development works is required to be minimised such that mobilisation of contaminants and associated short-term ecological risks are appropriately managed. To enable an appropriate understanding of sediment characteristics within areas of disturbance, it is recommended that further site investigation activities be undertaken across the development works footprint prior to the commencement of any works that will result in disturbance of the sediments. These additional works will be designed to provide a suitable data set to guide management and if required, rehabilitation of these sediments during/following the required disturbance activities.

- A temporary a coffer dam will be constructed at the limits of the development works area prior to construction activities that will isolate the construction works footprint from the balance of the Bay. This will minimise the risk of any environmental impacts beyond the site boundary. Within the site, potential environmental impacts associated with localised movement of the sediment to achieve the construction requirements will be managed via selection of a methodology to minimise the suspension of sediments in the water column. It is expected that this will include use of either a long arm excavator, clam shell apparatus or similar to collect and locally transport small quantities of saturated sediment across the bed floor, within a silt curtain surround, followed by gentle placement at the final location. Resuspension of sediment will be minimised and with consideration to the continued saturated condition of the sediment, the low concentration of oxygen in water when compared to the atmosphere, the high buffering capacity of the marine Bay waters and the isolated nature of the works area from the balance of the surrounding environment, it is considered that the environmental (contamination and acid sulfate soil) risks associated with disturbance of the sediments may be suitably managed.
- The site is situated within an area of high probability of ASS. Indicators of potential ASS comprising sulfide odours and the presence of sea shells were observed within media inspected from boreholes conducted on both the land and water portion of the site. On this basis, the disturbance of materials during site redevelopment works will be required to be conducted in accordance with an acid sulfate soils management plan (ASSMP)(JBS&G 2019b).

It was recommended that a RAP be prepared to establish a suitable framework for management of potentially contaminated media such that upon completion of works, the site will be considered suitable for the proposed use.

4. Contamination Status / Conceptual Site Model

The conceptual site model (CSM) presented in this Section is based on the assessment and conclusions presented in JBS&G (2018).

4.1 Current Extent of Known Impacts

Soil

The concentration of COPCs within all historical soil samples were below the adopted health based criteria. In addition, with the exception of zinc, the concentration of all COPCs were reported below the adopted ecological criteria. It is noted that under the proposed development there is unlikely to be any land based ecological receptors (see **Section 4.2**) within the site. On this basis, there are no identified impacts to site soils that require management or remediation with respect to making the site suitable for the proposed development.

It is noted that TPH impact was identified in shallow soils at locations PBHA01 and PBHA02 and comprised heavy end TPH fractions (C_{10}-C_{38}) in which the reported fractions did not allow for a direct comparison to the current adopted criteria. To this extent, additional assessment is recommended to establish the potential risks to any receptors from the impact, noting that it is unlikely to pose a health risk in the absence of any exposure pathways (owing to the presence of site pavements and the non-volatile nature of the impact).

Potential indicators of ASS comprising odorous marine sediments and the presence of sea shells were observed within boreholes conducted at the site. Given that the site is located within an area of high probability for the presence of ASS, a default position that fill material and/or natural soils exposed or otherwise disturbed during works will require management for acid sulfate soil has been adopted prior to further assessment to delineate the extent of such soil/sediments. Further characterisation of materials will be completed prior to the commencement of ground disturbance activities to ensure an appropriate data set is available to guide management of the associated environmental risks.

Groundwater

Groundwater with elevated levels of copper, zinc and PAH compounds has been recorded at the site. The elevated zinc levels are considered to most likely reflect urban background conditions or a potential off-site source (possibly comprising fill material underlying Bridge Road and Wentworth Park), as the highest reported concentration was located off-site and hydraulically upgradient from the site. Elevated PAH compounds in groundwater were found to marginally exceed the adopted ecosystem criteria at a single location (PBMWH2) within the central portion of the site.

It is noted that the adopted groundwater criteria have been conservatively applied to this assessment whereby they are intended to be applied at the point of discharge within receiving waters. It is important to note that that the adopted screening criteria are not threshold values at which an environmental problem is likely to occur if exceeded, rather, if the criteria are exceeded, then further action is required which may include additional assessment.

Sediments

Heavy metals, total PAH, (limited) total PCBs and TRH contaminated sediments have been identified within the extent of the development site. A baseline ecological assessment (UNSW 2017[6]) was conducted within the Bays Precinct and included sediment sampling within the greater area of Blackwattle Bay. The report found that the sediments of Blackwattle Bay had significant metal and nutrient contamination that were indicative of highly disturbed conditions. On this basis, the

[6] *Baseline Assessment of Ecological Structure and Environmental Conditions at the Bays Precinct*, University of New South Wales, March 2017 (UNSW 2017).

elevated contaminant concentrations reported in sediments within the subject site are likely reflective of conditions throughout the extent of Blackwattle Bay as a result of historical industrial activities along the foreshore of the Bay.

All sediments are also anticipated to be ASS. As such, management of the potential for acid generation conditions will be required during all ground/sediment disturbance activities completed at the site.

Ground Gases and Vapour

Ground gases were identified as a potentially impacted media due to potentially reclaimed land areas containing high organic matter content as used as fill material or otherwise disturbed so as to result in conditions favouring the generation of ground gases. A screening level gas monitoring event was undertaken at a single location (HHMW1) in September 2015, in which the reported result was indicative of very low risk conditions with reference to the Modified Wilson and Card Classification (EPA 2012).

In addition, VOCs were identified as a COPC in JBS&G (2018). Whilst completed soil and groundwater investigation have not identified the occurrence of significant volatile compound impacts in soil and/or groundwater at the site, to date there has been no specific vapour sampling or analysis undertaken to verify the absence of conditions that would require management prior to, or following the proposed construction works.

4.2 Human and Ecological Receptors

Table 4.1 summarises potential human receptors and associated exposure pathways for the site, based on the range of exposure scenarios that may occur under the proposed commercial redevelopment of the site.

Table 4.1: Summary of Potential Human Exposures

Receptor	Location (redeveloped site)	Media	Potential Exposure Pathways
Commercial patron (adult or child) and Commercial Worker (adult)	Commercial building and land area of the site	Soils	Inhalation (vapours)
		Groundwater	Inhalation (vapours)
Construction worker or intrusive maintenance worker (short duration)	Excavations	Soils	Inhalation (vapours and particulates) Oral Dermal
		Groundwater	Inhalation (vapours) Oral (infiltrating seepage water) Dermal (infiltrating seepage water)
		Sediments	Inhalation (vapours and particulates) Oral Dermal

On-site ecological receptors are limited as it is understood that the whole land area of the site will be paved, with either a building above, or high pedestrian load public domain areas. Potential off-site ecological receptors include impacted groundwater or surface water (if present) migrating from the site to the surface waters of Blackwattle Bay. These receptors can be identified from the water quality objectives (WQO) from the Parramatta River/Sydney Harbour catchment and include:

- Aquatic ecosystems; and
- Aquatic foods.

Typical ecological exposure pathways to sediments are identified in *Handbook for Sediment Quality Assessment*, 2005, CSIRO Environmental Trust (CSIRO 2005). It is reported here that sediment-

dwelling organisms receive contaminant exposures from four sources: overlying water, pore water, sediment particles and food.

4.3 Potential and Complete Exposure Pathways

Future commercial human receptors on the site will be potentially exposed to soil and groundwater contaminants by inhalation pathways only.

Direct contact pathways (oral and dermal) will be limited for most site users. Site plans have revealed that the majority of the site will be sealed, and as such direct contact to contaminated soils or groundwater is limited. In addition, direct contact with sediments underlying the proposed building will also be unlikely owing to the depth of the materials underlying the bay.

It is noted that there is a surface water feature in the south-eastern portion of the site where it is unclear if the pool will be lined such that there will be no direct contact exposures to soils/sediments, or also if swimming in this area will be permitted. Notwithstanding, soil and sediment data were compared to direct contact criteria (where available), whereby all results were identified to be below the adopted criteria under a recreational use scenario.

Potential construction and future intrusive / excavation worker exposures could occur for soils, groundwater and sediments.

Inhalation pathways will only be relevant where asbestos, volatile or semi-volatile COPCs and ground gases are present. The results of soil, groundwater and ground gas investigations to date indicate concentrations of COPCs are less than relevant screening assessment criteria.

With regard to potentially completed ecological exposure pathways on-site, the majority of the site will be sealed as a result of building and/or accessway construction. If present, vegetation will likely be constructed in raised planter beds or similar, rather than within site soils. As such there are considered to be no direct exposure pathways for ecological receptors to soil.

It is further noted that the proposed development will include construction of a suspended basement structure at or above the approximate sediment bed level within the site. As such, it reasonable to presume that there will be no complete ecological exposure pathways to marine life and/or aquatic foods within the site upon completion of development works.

4.4 Potential for Migration from Site

Contaminants generally migrate from site via a combination of windblown dusts, rainwater infiltration, groundwater migration, lateral vapour/gas migration and surface water runoff. The potential contaminants of concern identified as part of the site history review and site inspection are in solid (e.g.: asbestos, metals), dissolved (e.g.: TPH, VOCs) and/or gas form.

The ground surface of the land area of the site will be covered in hardstand. As such, there is a low potential for windblown contaminants or entrainment in surface runoff to migrate from the site, or for contaminants to leach through the soil profile and impact and subsequently migrate via groundwater.

The groundwater encountered during investigations is inferred to comprise a shallow system in which all wells contained groundwater with total dissolved solids consistent with marine levels. The standing water levels were observed to be influenced by tidal movements of Blackwattle Bay, where site groundwater is anticipated to ultimately discharge.

As discussed in Section 6.1, groundwater with elevated levels of copper, zinc and PAH compounds have been recorded at the site. It has not been established whether these impacts are relatively isolated or have the potential to be migrating from site.

In-situ sediment within the site has previously been considered generally consistent in contaminant character to sediments across the broader Blackwattle Bay area. It is anticipated that the potential

for migration of sediments will primarily occur via suspension as a result of disturbance during construction works, which will require addressing during works. However, it is also noted that the proposed development will result in changes in sediment bed levels and the movement of vessels within the Bay. This may lead to changes in hydrodynamic flow conditions, such that surficial sediments may at times be disturbed/re-suspended in different areas of the Bay, resulting in localised changes in sediment/water chemistry and ecosystem condition. Further consideration as to the potential environmental impacts of such changes are beyond the scope of this assessment, but may require further consideration during the broader design of the development.

4.5 Data Gaps

With consideration to the proposed development and the CSM described herein, the only potential human health exposure pathways for commercial users of the site will comprise inhalation (of gas/vapour) pathways. To date, only a limited hazardous ground gas assessment has been completed at the site. Additional investigation is required to assess any spatial or temporal variations within ground gas conditions that may exist within the land portion of the site. In addition, a soil vapour survey is required to assess for the presence of potential VOCs in vapour that were identified as potential COPCs as part of the initial site history review (JBS&G 2018).

With respect to data gaps surrounding the assessment of potential risks to ecological receptors at the site, this is limited to potential groundwater migrating from the site (if any) and discharging to Blackwattle Bay as soil conditions are sufficiently well understood from an ecological view point with regard to establishing site suitability. An additional groundwater assessment is required at locations downgradient of previously identified heavy metal and PAH impacts to assess for potential off-site migration. In addition, the risk posed to groundwater from previously identified TPH impacts (PBHA01 and PBHA02) in shallow soils requires assessment.

The current development proposal will result in the movement of some bed sediments within the development footprint to facilitate continued use of a stormwater discharge culvert. The existing data set is considered sufficient to characterise conditions broadly within the development area in regard to site suitability, however to ensure sediment conditions are suitably understood from a contamination and acid sulfate soils viewpoint, such that appropriate management measures may be employed during the proposed construction works, it is recommended that further characterisation activities be completed prior to the commencement of any activities that may result in disturbance of the sediment bed within the site. During these activities, additional surface water quality data should also be collected to provide a baseline data set by which to monitor the success of management measures to be implemented during construction activities.

Further data gaps with respect to characterisation of site soils are listed following:

- The sampling density within the land-based portion of the site, with approximate area of 0.76 Ha is less than the recommended number of sampling locations. For sites with an approximate area of 0.76 Ha, EPA (1995[7]) sampling guidelines recommends a minimum of 19 sampling points. To date, only 8 sample points have been completed within the land portion of the site. On this basis, certain COPCs have not been adequately assessed within site soils. Whilst any potential soil impacts may not affect site suitability (under the proposed development), the impacts (if any) may require appropriate management during development and construction works;
- Characterisation of fill materials for the presence of asbestos via quantification in accordance with the procedures included in NEPC (2013) as derived from *Guidelines for the Assessment Remediation and Management of Asbestos Contaminated Sites in Western Australia*. May 2009, Western Australia Depart of Health (WA DOH) (DOH 2009) is

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

recommended to determine the asbestos management requirements (if any) during the site development works;

- There is uncertainty as to the historical location of fuel infrastructure known to have previously been located at the site. Whilst there is indirect evidence that such facilities were removed, the original documentation associated with the remediation and validation works is no longer available. As such, there remains uncertainty as to the nature and extent of any residual impacts that may remain in the vicinity of these former features. Given the current characterisation data, further investigation to address the density of soil sampling data available for the site should consider the potential for fuel infrastructure related contamination;
- Characterisation of fill material and natural soils for ASS has not been completed to date and is required to verify the extent of material requiring management in future development works and assist with refinement of the acid sulfate soil management plan (ASSMP) required to be implemented during development activities. Whilst all sediments are expected to be ASS, specific characterisation of the conditions has not been completed to date, which may assist with refining lime (or other material) addition requirements; and
- Additional leachate data will be required to confirm waste classifications for the potential off-site disposal of surplus materials as part of the development works.

5. Data Gap Investigation

JBS&G (2018a) identified that available previous site assessment documents contained sufficient existing data to characterise soil, sediment and groundwater conditions within the area of the proposed development in order to establish a CSM. Notwithstanding, a number of data gaps were identified with regard to site conditions as follows that will require additional data to refine specific management/remedial actions during application of a future RAP.

The following areas have been identified as data gaps on the site requiring additional investigation:

- Shallow soils at PBHA01 and PBHA02 with TPH impacts that may pose a risk to groundwater quality discharging from the site;
- Groundwater assessment hydraulically downgradient from identified PAH and heavy metal impacts;
- Additional ground gas and soil vapour investigation to assess the inhalation risks to future site users of the commercial building; and
- Additional soil characterisation within the land portion of the site to identify/refine potential impacts that potentially require management during development construction works.

It is recommended that investigation activities be undertaken to close out the data gaps prior to the commencement of remedial works. Further, the scope of the work should be documented prior to the commencement of a field investigation within a Sampling Analytical and Quality Plan (SAQP). The sections below provide an overview of the proposed investigation requirements.

5.1 Soil Investigation

For a site of approximately 0.72 Ha (land portion of the site), the EPA sampling guidelines require a minimum of 19 systematic soil sampling locations, based on detection of circular contamination 'hotspots'. To adequately assess the site condition, it is proposed to complement the 8 existing soil sampling locations with an additional 11 locations utilising a combination of systematic and targeted sampling regimes.

Investigations will be completed by auger of sufficient diameter to enable assessment of potential asbestos in soil impacts including collection of 500 mL samples for laboratory analysis, consistent with NEPC (2013) and WA DOH (2009) guidance on asbestos assessment.

Soil samples will be collected as appropriate based on observations to adequately characterise fill and natural materials (including natural sediments) to depths below the standing water level at low tide. Soil samples are required to be screened for potential volatile organic compound (VOC) using a portable photoionisation detector (PID). During the collection of soil samples, features such as seepage, discolouration, staining, odours and other indicators of contamination should be noted.

Soil samples will then be immediately transferred to laboratory supplied sample jars and sealed with a Teflon-lined screw closure. The sample containers will be placed in a pre-chilled esky for sample preservation prior to transportation to the testing laboratory. Preservation of the primary soil and QA/QC samples obtained during the investigation will be completed in accordance with the protocols outlined in NEPC 2013.

The samples will be transported under standard JBS&G chain-of-custody protocols to Eurofins MGT, a laboratory accredited by the National Association of Testing Authority (NATA) for the proposed analyses.

Samples will be analysed in accordance with the analytical schedule (**Table 5.1**).

5.2 Groundwater Investigation

The groundwater investigation is required to delineate the lateral extent of groundwater potentially impacted by site-related contaminants to assess the potential for off-site migration of impacted groundwater. It is further required to assess the potential impacts of groundwater as associated with shallow soils impacted with TPH at PBHA01 and PBHA02. The proposed locations are shown on **Figure 4**.

Boreholes for well installation will be advanced to the nominated depth using solid flight augers in fill and shallow sandy soils. Bores will be advanced to the target depth based on conditions encountered (lithology/geology conditions encountered, PID screening) during drilling.

The wells will be constructed in accordance with relevant NSW EPA endorsed guidance such as National Uniform Drillers Licensing Committee, 2012, *Minimum Construction Requirements for Water Bores in Australia*, and Victoria EPA, 2000, *Publication 669 Groundwater Sampling Guidelines*.

Monitoring wells will be constructed out of Class 18 uPVC (50mm) screen (3 m) and casing. A gravel filter pack will be placed adjacent to the screened interval with a 0.5 m bentonite seal above. The remaining bore annulus in shallow wells will be backfilled with soil cuttings to the ground surface. The wells will be finished with a lockable gas cap (see **Section 5.3**) and a flush-mounted gatic cover.

Well Development

Subsequent to well construction, each newly installed monitoring well will be developed to remove fines, settle the filter pack and ensure representative groundwater samples will be able to be collected. Well development will be undertaken using an inertial pump to remove a volume of water until visible indicators of turbidity and field-measured water quality parameters (electrical conductivity, pH, dissolved oxygen, redox and temperature) have stabilised.

Wastewater will be required to be appropriately managed and disposed of in accordance with relevant regulatory requirements.

Groundwater Sampling

Following a five-day (at least) stabilisation period, sampling will be undertaken including measurement of the depth to standing water and assessment of the presence of light non-aqueous phase liquid (LNAPL)/dense non-aqueous phase liquid (DNAPL) using an interface probe.

Wells will be purged and sampled using a low-flow methodology. Purging will be undertaken to ensure the sample collected is representative of groundwater. Field parameters of pH, conductivity, redox and temperature will be measured using a flow cell and samples obtained once the parameters have stabilised such that:

- Consecutive EC readings are within 3 %;
- Consecutive Eh readings are within 10 mV;
- Consecutive DO readings are within 10 %; and
- Consecutive pH readings are within 0.5.

A low-flow peristaltic pump with dedicated tubing will be used to purge and sample wells. Submersible micro-purge sample pumps may be used when the depth to water exceeds 6 m. It is noted that EPA Victoria (2000) indicates use of pumps which induce a vacuum are not preferred in Victoria for assessment of volatile organic compounds. However, JBS&G considers that there will not be a measurable loss of VOCs when sampling at low flow rates, with small diameter tubing and shallow groundwater; and there is a lower risk of cross-contamination between locations due to use of dedicated materials.

Collected groundwater samples will be immediately transferred to laboratory supplied sample bottles in the order of those for most-volatile to least volatile contaminants. Field filtering using a 0.45 µm filter will be undertaken for metals/metalloid samples. The sample containers will then be transferred to a chilled iced box for sample preservation prior to and during shipment to the testing laboratory. A chain-of-custody form will be completed and forwarded with the samples.

A record of gauging data, sample observations (including colour, odour, presence of phase separated hydrocarbons (PSH)) and sampling method details will be recorded.

Duplicate groundwater samples will be collected at a rate of one per 20 primary samples. A trip spike BTEX only) and rinsate blank (for non-dedicated equipment) will be collected per batch of samples.

5.3 Ground Gas Investigation

The ground gas assessment will be conducted within monitoring wells installed in the vicinity of the commercial building footprint as shown on **Figure 4**.

Subsurface gases will be measured using a landfill gas meter to record levels of methane, carbon dioxide, carbon monoxide, hydrogen sulphide and oxygen, in accordance with *Benchmark Technique 15 'Subsurface Gas Monitoring Devices'* and *Benchmark Technique 16 'Subsurface Gas Monitoring Program'* provided in NSW EPA (1996) .

Each of the monitoring wells will be monitored for gas flow rates and concentrations. The monitoring will be required to be conducted over a number of rounds in order to capture any temporal variability as could potentially occur with climatic conditions. The sampling will be required to be undertaken in a period of dropping or low atmospheric pressure in order to sample potential 'worst case' conditions. The following testing procedure will be undertaken at each well:

- The sampling ports on the gas analyser (GFM435 or similar) will be connected to the well cap via the gas sampling port using disposable tubing.
- Initial gas flow rates will be reported and then flow rates will be monitored for a period of approximately 5 minutes with variation in flow rates documented.
- The analyser unit will then be disconnected from the gas sampling port and the meter connection changed to the concentration sampling port prior to reconnection to the gas well. Initial gas concentration readings will be collected from the monitoring wells after a 10 second period (where possible) and then again once the gas concentrations stabilised (methane concentrations were stable for greater than 10 seconds). The gas meter will then be disconnected from the gas sampling port.

5.4 Vapour Investigation

The vapour assessment will comprise a sub-slab vapour assessment with the proposed sampling locations shown on **Figure 4**. Given the uncertainty associated with the former fuel infrastructure locations and the general historical industrial use of lubricants, fuels etc, the proposed investigation locations will be placed on a generally systematic grid spacing within the vicinity of the proposed building footprint within the land portion of the site.

The sub-slab vapour investigation will be conducted by the following methodology:

- Recording of location;
- Coring of concrete slab (20 mm diameter); and
- Placement of a section of 6 mm diameter Teflon tube fixed with a Teflon sample tip into the cored hole to below the base of the slab, then sealing the core hole with air-drying clay and an overlying layer of bentonite slurry. The sub-slab point will be purged and sampled immediately following installation.

The following methodology will be adopted for the sampling of sub-slab vapour points:

- Placement of a shroud around the sample point, and sealing by placement of clay or 'blue-tack' around the shroud edge;
- Purging of the sub-slab vapour point or soil vapour probe for a period using a calibrated photo-ionisation detector (PID) (10.6 eV lamp) and multi-gas meter to measure and record oxygen and methane (as lower explosive limit, LEL) concentrations until the parameters stabilise;
- Assessment of leaks, by placing a rag soaked in 2-propanol around the probe/tubing within the shroud at the ground surface and continue purging with the PID. In the event of PID readings increasing significantly this would be considered to indicate a potential leak and mitigation measures will be required to adequately seal the point. The 2-propanol soaked rag and shroud remained in place during the sampling process as an indicator of leaks;
- Removal of tips from a carbon sorbent tube and connect to vapour point tubing. Connection of the downstream end of carbon sorbent tube to a closed three-way valve and syringe of known volume (100 mL);
- Collection of an approximate 6 L volume vapour sample by hand use of the syringe to draw the vapour sample through the carbon sorbent tube, using the three-way valve to prevent back-flow from the syringe through the tube. The volume of air can be confirmed by the known volume of the syringe used to collect samples and by counting the number of syringe volumes passed through the carbon tube;
- Disassembly of the syringe and tubing, removal of the carbon tube, replacement of tube caps and placement in Zip-Lock bag; and
- Submission carbon tube for analysis as per **Table 5.1**.

Duplicate vapour samples will be collected at a rate of one per 20 primary samples by splitting the flow into three carbon tubes using a three-way valve. One field blank will be collected by sampling a 6 L volume of ambient air.

5.5 Laboratory Analyses

JBS&G will contract project laboratories which are NATA accredited for the required analyses. In addition, the laboratories will be required to meet JBS&G's internal Quality Assurance requirements. The proposed analytical schedule has been developed in accordance with the current knowledge of the site (**Table A**).

Table 5.1: Proposed Sampling and Analytical Program

Sample Type	No. of Sampling Locations	Analyses (exc. QA/QC)
Soil	11 locations	Heavy metals – 18 samples Polycyclic aromatic hydrocarbons (PAHs) – 18 samples Total recoverable hydrocarbons (TRH) – 18 samples Tributyltin (TBT) – 11 samples Asbestos – 18 samples SPOCAS (acid sulfate soils) – 11 samples Toxicity characteristic leaching procedure (TCLP) for heavy metals and PAHs (waste classification).
Groundwater	6 locations	PAH – 6 samples Heavy metals – 6 samples TRH/BTEX – 6 samples pH, EC, total alkalinity– 6 samples
Ground gases	6 locations	Field monitoring: Methane – 6 samples Carbon dioxide – 6 samples Oxygen – 6 samples Hydrogen Sulphide – 6 samples
Sub-slab/soil vapour	20 locations	VOC 8260 – 20 samples Isopropanol (tracer) – 20 samples Field monitoring of methane, carbon dioxide, oxygen and hydrogen sulfide – 20 samples

Pending further design of the proposed development work and evaluation of construction methods, it is anticipated that a site sampling program to further characterise sediments in areas of the site to be the subject of disturbance will be undertaken. The scope and nature of the assessment will be sufficient to enable a suitable data set to guide management of potential contaminant and acid release during the construction works.

6. Remediation Options

6.1 Remedial Goals

The goal of the site management/remediation works is to ensure that the following is achieved:

- Prevention of exposure of human populations occupying/working on/using the site to impacted soils etc underlying the site;
- Prevent potential phyto-toxicity effects on flora and fauna contact to impacted soils and/or sediments;
- Appropriate management and/or disposal of soil, water and/or sediment disturbed during development activities in accordance with in force regulations and relevant EPA guidelines;
- Removal of potential ongoing sources of environmental contamination (unexpected finds such as historical sub-surface petroleum storage, if encountered); and
- Validation of site management and remedial works in accordance with the relevant EPA guidelines; and
- Documentation of works as completed is appropriate to demonstrate the suitability of the site for the proposed land use and compliance with applicable legislation, regulations, guidelines and development consent conditions as may apply to the site.

6.2 Guidance Framework

The RAP has been prepared with consideration to the following list of NSW EPA endorsed guidelines:

- *National Environment Protection (Assessment of Site Contamination) Measure 1999, Amendment No.1 2013,* National Environment Protection Council (NEPC 2013).
- *Contaminated Sites: Sampling Design Guidelines, September 1995* (EPA 1995).
- *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites, 2011* (OEH 2011).
- *Contaminated Sites: Guidelines for NSW Site Auditor Scheme*, 3rd edition October 2017 (NSW EPA 2017).
- *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZAST 2018).
- *Guidelines for the Assessment and Management of Groundwater Contamination*, DECC March 2007 (DECC 2007).

In addition, consideration is also required to guidelines made or endorsed by the EPA under the Protection of the Environment Operations (POEO) Act 1997 and associated regulations, including:

- *Guidelines for Implementing the POEO (Underground Petroleum Storage Systems) Regulation 2008*.
- *Waste Classification Guidelines, Part 1 - Classifying Waste*. NSW EPA 2014
- *Waste Classification Guidelines, Part 2 – Immobilising Waste*. NSW EPA 2014
- *Waste Classification Guidelines, Part 3 - Waste Containing Radioactive Material*. NSW EPA 2014
- *Waste Classification Guidelines, Part 4 – Acid Sulfate Soils*. NSW EPA 2014.

Other guidance that should also be considered in relation to site conditions includes:

- *Work Health and Safety Act 2011 and Work Health and Safety Regulation 2011.*

- *Managing Land Contamination, Planning Guidelines, SEPP 55 – Remediation of Land* (DUAP 1998).
- *Code of Practice for the Safe Removal of Asbestos, SafeWork NSW,* September 2016 (SafeWork 2011).
- *Guidelines for the Assessment and Management of Sites Impacted by Hazardous Ground Gases*, NSW EPA (2012); and
- *Acid Sulfate Soil Manual*, Acid Sulfate Soil Management Advisory Committee 1998.
- *Organotin Waste Materials Chemical Control Order 1989.*
- *National Acid Sulfate Soils Guidance – Guidelines for the Dredging of acid sulfate soil sediments and associated dredge spoil management*. Water Quality Australia, June 2018 (WQA, 2018a)
- *National Acid Sulfate Soils Guidance – Guidance for dewatering of acid sulfate soils in shallow groundwater environments.* Water Quality Australia, June 2018 (WQA, 2018b)

6.3 Regulatory and Planning Requirements

Where a proponent seeks approval for a change of permitted use of the land, either in the form of a rezoning, sub-division or project approval, it is required that the proponent satisfies the consent authority, and relevant regulator (including the NSW EPA), that contamination conditions as may be present at the site will be appropriately managed such that the site may be considered suitable for the proposed use.

6.3.1 Requirements in Relation to Planning Approvals

Under SEPP55 it is noted that the consent authority must not consent to the carrying out of development on the subject land unless:

a) *It has been considered whether the land is contaminated; and*

b) *If the land is contaminated that the planning authority is satisfied that the land is suitable in its contaminated state (or will be suitable, after remediation) for all purposes for which the development is proposed to be carried out; and*

c) *If the land requires remediation to be made suitable for the purpose for which the development is proposed to be carried out, the planning authority is satisfied that the land will be remediated prior to use for that purpose.*

Further, it is required that the planning authority obtains from the proponent a report specifying the findings of an investigation of the land prepared in accordance with the contaminated land planning guidelines. The consent authority may also require the applicant to provide further information if the findings of the preliminary investigation warrant such additional assessment.

With regard to classification as Category 1 or 2 works, given the proposed remediation works are considered to be “ancillary to the proposed development works” development consent for the remediation works will be obtained as part of the broader State Significant Development (SSD) and as such are de facto Category 1 works.

6.3.2 Other Requirements

In addition to the requirements of SEPP55 as outlined above, consideration of the regulatory requirements under NSW legislation will also necessary as briefly outlined following:

- *POEO Act (1997)* – All potential discharges from the site during remediation works will require to be maintained below applicable assessment criteria/threshold guidelines during the remediation/development works. This would apply to potential emissions in air,

water and discharges to surface and groundwater. Levels of discharges are typically assessed at a site boundary. The RAP prepared for the assessment area has provided a process to be followed during the remediation activities and subsequent development works to ensure that the beneficial re-use of materials does not cause pollution of groundwater and/or waters by reference to any applicable criteria as may be used to assess pollution under the POEO Act (including s120).

Evaluation of the proposed remediation/validation activities in relation to the categories and/or thresholds presented in Schedule 1 of this Act. Where works trigger one or more categories presented in Schedule 1, the works will require to be licensed by the EPA in addition to the requirements of the consent authority. These activities may for this project relate to: the treatment of contaminated soil and/or groundwater, dredging and/or quarrying activities, etc.
The proposed remediation/validation activities are not expected to require a license given the will not treat more than 1000 m^3 per year of contaminated soil received from off-site, or involve the treatment of contaminated soil originating on-site with the capacity: (i) to incinerate more than 1000 m^3 per year of contaminated soil, or (ii) to treat (otherwise than by incineration) and store more than 30 000 m^3 of contaminated soil, or (iii) disturb an aggregate area of 3 hectares of contaminated soil

- *Water Management Act (2000)* – Where remediation works require the extraction (and treatment, reinjection or otherwise) of groundwater, consent for these works may be required under a temporary dewatering licence even if the triggers for an EPL are not met. Such requirements may potentially be stipulated as a condition of the development consent via the integrated development approvals process.
- *POEO (Waste) Regulation 2014* – In addition to triggers for an EPL, consideration will be needed with respect to the POEO Waste Regulation in relation to non-licensed waste activities and waste transporting. This includes requirements for management of asbestos waste during transport/disposal, the approval of methods associated with the immobilisation of specific waste streams etc. as may be required under this RAP.
- *Work Health and Safety Act 2011* and associated *Regulations* including those related to Asbestos – Where asbestos impacts in soil are identified during either site investigation works, or during/following demolition of existing improvements, the site will be required to be considered as having asbestos contaminated soils and appropriate protections implemented with respect to the exposure of site workers and nearby sensitive receptors. In such instances, management requirements are outlined in *How to Manage and Control Asbestos in the Workplace Code of Practice*, WorkSafe NSW (2016). Given asbestos in soil has not currently been identified during limited intrusive investigation activities, should asbestos be identified, its occurrence will be assessed and managed via application of the Unexpected Finds Protocol (UFP) outlined in **Section 8.6**.
- *Waste Classification Guidelines (2014)* - All wastes generated and proposed to be disposed offsite shall be assessed, classified and managed in accordance with this guideline. Where wastes require immobilisation prior to offsite disposal (to reduce waste classifications) an immobilisation approval shall be sought in accordance with Part 2 of this guideline. Immobilisations are only anticipated to be required with unexpected finds that cannot be retained on site and cannot be disposed directly offsite to a licensed facility. Material identified as ASS will be required to be disposed of from the site in accordance with Part 4 of this guideline.
- *Protection of the Environment Operations (Underground Storage Systems UPSS) Regulation 2014* - The removal of USTs and associated infrastructure will be undertaken in accordance with WorkSafe NSW requirements and a validation report will be provided in

accordance with the provisions of the *Protection of the Environment Operations (UPSS) Regulation 2014* as per guidance provided in DECCW (2009). The removal of underground petroleum storage infrastructure will be undertaken in accordance with *The Removal and Disposal of Underground Petroleum Storage Tanks – Australian Standard 4976-2008*.

- *City of Sydney (2004) "Contaminated Land Development Control Plan"* - The Council development control plan (DCP) provides a number of environmental and site management provisions required to be employed during remediation works. These have been incorporated into this RAP as minimum standards for the environmental management of remediation works.
- *Organotin Waste Materials Chemical Control Order 1989 (CCO)* – The CCO defines the management requirements for activities related to waste material contaminated with organotin contaminated waste, including the manufacture, storage and disposal of such waste. This includes material containing tributyltin or other organotin compounds either individually or in combination, including but not limited to paint waste, soil/sediment/water contaminated with organotins and materials to which paint remains adhered. Where appropriate, the requirements of this CCO have been incorporated into this RAP.

6.4 Extent of Remediation and/or Management Required

6.4.1 Soil

The identified environmental impacts at the site that require management will generally comprise material (fill material and natural soil) identified during the early works and future main works periods as excess to site requirements. This is anticipated to generally comprise piling spoil, trenching spoil associated with foundations, services infrastructure, or other works requiring below ground activities to achieve construction objectives. Based on the existing general site observations, it is anticipated that such materials will also require treatment in accordance with the ASSMP (JBS&G 2018a) prior to off-site disposal.

It is noted that some data gaps were identified in **Section 4.5** that will require further assessment as per **Section 5** prior to the finalisation of the complete appropriate definition of the management/ remedial scope.

Given the preliminary nature of inground design activities to date, no specific identified areas of the site requiring management have been specifically identified, however it is noted that there is the potential that some areas of bay sediments may require movement to adjust sediment bed levels to facilitate ongoing use of the existing stormwater culvert and construction of the suspended basement structure.

For the purposes of this RAP, it has been assumed that soil and sediment conditions at the site may require some remediation and/or management where disturbed during development activities to ensure the site is suitable upon completion of the development works. It is envisaged that once the proposed detailed development scheme (Construction Certificate stage civil/structural design) information is available, the extent of site areas/proposed works requiring management will be apparent.

6.4.2 Sediment

As discussed in **Section 4.1**, sediments at the site and in the surrounding Blackwattle Bay are impacted with heavy metals, total PAHs and (limited total PCBs) and TRH with regard to ecological concerns. The elevated contaminant concentrations reported in sediments within the subject site are considered to be likely reflective of conditions throughout the extent of Blackwattle Bay as a result of historical industrial activities along the foreshore of the Bay. On this basis, no active remediation of the in-situ sediment is required.

Notwithstanding, a minor area of sediment located adjacent to the existing sea wall beneath the proposed new Sydney Fish Market building envelope will require adjustment in location to facilitate continued discharge from existing stormwater culverts. These works will require management, from both a contamination and ASS view point. The management measures will primarily comprise controlling the potential for resuspension of sediments during development works such that mobilisation of contaminants and changes in the sulfate-sulfide equilibrium of the sediment are minimised such that associated short-term ecological risks are appropriately mitigated. It is expected that best-practice management procedures will be informed by development of a site-specific CEMP based on management principles provided in a separate ASSMP (JBS&G 2019b) and therefore the appropriate management of sediments during development works requires no further detail herein.

6.5 Consideration of Possible Remedial Options

The preferred hierarchy of options for remediation (clean up) and/or management adopted by NSW EPA has been established within the NEPC (2013) Assessment of Site Contamination Policy Framework as follows:

- On-site treatment of the material so that the contaminant is either destroyed or the associated risk is reduced to an acceptable level; and
- Off-site treatment of excavated material so that the contaminant is either destroyed or the associated hazard is reduced to an acceptable level, after which the soil is returned to the site; or

if the above options are not practicable:

- Consolidation and isolation of the material on site by containment with a properly designed barrier; and
- Removal of contaminated material to an approved site or facility, followed, where necessary, by replacement with appropriate material; or
- Where the assessment indicates remediation would have no net environmental benefit or would have a net adverse environmental effect, implementation of an appropriate management strategy.

In addition, when deciding which option to choose, consideration is also required to be given to the sustainability (environmental, economic and social) aspects of each option to ensure an appropriate balance between the benefits and effects of undertaking remedial/management options.

In cases where no readily available or economically feasible method is available for remediation, it may be possibly to adopt appropriate regulatory controls or develop other forms of remediation.

Consideration of each of the approaches (EPA 2017), is presented in **Table 6.1**.

Table 6.1: Remedial Options Screening Matrix

Remedial Option	Applicability	Assessment
1. On-site treatment so that the contaminants are either destroyed or the associated hazards are reduced to an acceptable level.	Soils Although any excavated soils will require on-site management in accordance with an ASSMP (JBS&G 2018a), there are surplus soils on-site with respect to the proposed development. These surplus materials will originate from piling spoil, installation of services, and excavation of land-based soils to accommodate a portion of the basement.	Not a viable option.
2. Off-site treatment so that the contaminants are either destroyed or the associated hazards are reduced to an acceptable level, after which the soil is returned to the site.	Soils As above (**Option 1**).	Not a viable option.
3. On-site in-situ management of the material by capping and cover, and ongoing management.	Soils As with Option 1, the material requires management as it has been identified as surplus material on-site with respect to the proposed development. On this basis, this is not a viable option.	Not a viable option.
4. Excavation and off-site removal of the impacted material.	Soils/Sediments For this option material is required to be transported to a facility lawfully able to accept the type of waste and associated fees including government waste levies apply. There are facilities within the Sydney region able to accept material classified as General Solid Waste (GSW), Special (asbestos) Waste and Restricted Solid Waste (RSW). In the unlikely event that material is identified to be impacted such that contaminant concentrations exceed the thresholds for characterisation as GSW, GSW mixed with Special or RSW, material may require to be treated prior to off-site disposal to a lawful facility as discussed above. Social impacts, including high volume truck movements and potential environmental emissions associated with on-site activities and vehicle movements also require consideration with regard to this strategy. Material will also require management in accordance with the ASSMP (JBS&G 2018a) requirements prior to removal from the site.	This is the preferred option for all surplus materials.

Should the data gaps investigation (**Section 5**) identify any impacts that require remediation, the remedial options screening matrix in **Table 6.1** will be required to be reviewed. Notwithstanding, it is anticipated that any impacts will be relatively isolated and could be appropriately managed through the controlled excavation and off-site disposal of impacted materials acting as source material. On this basis, the data gaps identified in **Section 4.5** are not considered to affect the successful execution of this RAP.

7. Remediation Plan

A summary of the remedial scope of works is provided in the following sections.

7.1 Data Gap Assessment

In order to refine the finalised remedial scope, a data gaps assessment is required prior to any remedial works. The details of the required data gaps assessment are provided in **Section 5**.

7.2 Site Establishment

All safety and environmental controls are to be implemented as the first stage of remediation works. These controls will include, but not be limited to:

- Locate and isolate all required underground utilities within the site such that excavation works can safely proceed;
- Assess the potential impacts of the excavation works to neighbouring properties. It is recommended that a suitably qualified engineer be consulted prior to any excavation works, such that appropriate controls (if required) can be implemented;
- Assess need for traffic controls;
- Work area security fencing;
- Site signage and contact numbers; and
- Sediment fencing (attached to security fencing) and silt curtains adjacent to the site in Blackwattle Bay.

7.3 Buildings and Structure Demolition

Existing structures on the site require demolition and removal from the site prior to remedial works. The key processes are briefly summarised below:

- Consult the findings and recommendations of a pre-demolition HMBS prepared for all structures to be demolished in order to safely and lawfully remove hazardous material previously identified prior to commencement of general demolition activities;
- Removal and disposal of hazardous materials in accordance with relevant regulatory guidance including SWA 2016 and the Waste Classification Guidelines 2014 (EPA 2014);
- Conduct hazardous materials clearances to confirm the successful removal of all HBMs;
- Demolish remainder of buildings/structures and remove redundant infrastructure;
- Beneficial reuse of environmentally validated material onsite (i.e., reuse of crushed recycled concrete) or lawfully remove all materials off-site; and
- Expose underlying soils as required to facilitate the commencement of construction activities.

7.4 Disturbed/Excavated Material Management Principles

As part of site remediation/redevelopment works it is anticipated that material excavated during works will fall into one of a number of categories, comprising material:

- required to be removed from the site as a result of contaminant characteristics identified during the data gap and/or unexpected find investigation activities. Such material is characterised as having contaminant concentrations in exceedance of site validation criteria for the proposed landuse and so will require disposal to a lawful waste facility; or

- required to be removed from the specific location to achieve site development objectives (ie. piling spoil, material excavated for foundations, services installation etc), that could potentially be reused within the broader development site should material be required, but will otherwise require disposal as waste if it could not be reused on site.

Appropriate sampling protocols including the required density of sampling for differing materials types, sampling methodology and documentation requirements will be required for each material type to ensure compliance with NSW EPA Regulations and guidance.

Based on assessment outcomes, material falling within the first category will automatically require classification and off-site disposal to a lawful facility. Tracking of this material will be required with resulting documentation to be included in the relevant validation report. Material for the second category will require management under a material tracking plan appropriate to document the source, temporary storage and final placement locations for inclusion of such information in the final validation report.

7.5 Excavation of Impacted Materials / Generation of Material Excess to Site Requirements

Should the data gaps assessment identify the requirement to remediate environmental impacts, it will be required to be undertaken through the controlled excavation of impacted materials. The excavation will be designed to remove source material as potentially causing impacts to soil, soil gas and/or groundwater. Remediation activities associated with the removal of impacted source materials will include:

- Excavation of the contaminated material to the depth of identified contamination as delineated via visual/olfactory observations by the remediation consultant during remedial works. The excavated material will be required to be stockpiled on plastic sheeting with appropriate environmental controls.
- Excavations are to be validated as per **Section 8.2.1** by the remediation consultant. Should validation fail, the failed wall/s or base of the excavation will be excavated a further 0.3 m in the direction of the failure, or as otherwise indicated by visual/olfactory observations and the validation process repeated until validation is achieved.
- Following validation of the excavation as outlined in **Section 8.2.1**, the excavations generated by the removal of impacted soil will be backfilled using fill material validated in accordance with **Section 8.2**.
- Stockpiled (impacted) material is to be sampled by the remediation consultant for the purposes of waste classification for off-site disposal to an appropriately licensed facility lawfully able to accept the waste in accordance with EPA (2014).

It is noted that depending on the nature of the impact (soil, soil gas or groundwater), final validation will be required to be tailored to confirm that the affected media has been successfully remediated.

7.6 Off-site Disposal

Material identified as requiring management/remediation is proposed to be disposed of off-site to a facility lawfully able to receive it. Materials shall be classified in accordance with EPA (2014) requirements or an appropriate exemption as created under the *Protection of the Environment Operations (Waste) Regulation* 2015.

Details of completed additional assessment activities including material characterisation reports will be included in the final validation documentation to be prepared in accordance with the requirements of an area specific RAP. Records associated with material tracking, including trucking receipts, landfill disposal records, etc will also be reviewed to ensure material removed from the site can be accounted for and has been disposed of lawfully.

7.7 Material Importation

Based on the scope of remedial works described herein, it is not anticipated that there will be a significant requirement to import materials to establish site levels. However, it is noted that detailed excavations may result in requirements for importation of select materials, potentially including trench backfill aggregate, pavement backfill, growing media, etc, such materials.

Prior to importation of all material, appropriate assessment of such materials must be completed to demonstrate the material is both fit for purpose and suitable from a contamination view point. In accordance with EPA requirements, the extent of assessment will be determined by the type of material proposed to be imported. Whilst it is anticipated that an appropriate assessment strategy (including sampling methodology, density and analysis details) will be developed at a site specific RAP level once details of likely importation details can be considered, the following overall principles will require consideration.

Where material proposed to be imported is Virgin Excavated Natural Material (VENM), an assessment must demonstrate that the material is compliant with the definition of VENM as presented in the POEO Act 1997, adopting in the minimum requirements for characterisation of fill material as presented in EPA (1995).

Where material proposed to be imported has been characterised under the Resource Recovery Framework (Order/Exemption), the material must firstly be demonstrated by the supplier as suitable for use in accordance with the requirements of the Order via provision of a statement of compliance. Such materials are anticipated to comprise, but will not necessarily be limited to: excavated natural material – ENM, recycled aggregate, basalt fines, compost, mixed organic waste, pasteurised garden organics and recovered fines, with reference to the list of current orders and exemptions on the NSW website required to be reviewed.

In addition to the testing completed by the supplier, given the low frequency of compliance testing required under these Exemptions, the specific material proposed to be imported will require an additional compliance assessment prior to approval to import. The additional assessment is required to ensure that the incoming material does not pose an unacceptable risk to human health and/or environment at the placement site and is therefore suitable for use. It is anticipated that such assessment activities will include visual inspections, representative sampling and laboratory analysis of material to demonstrate the material meets the requirements to be outlined in the site specific RAP in relation to use of material on-site. As for VENM assessments, it is considered suitable to define such requirements on a specific site basis given the potential variability of project site requirements.

Material tracking records in addition to the import assessment report are required to be included in the final validation report for each site specific area.

7.8 Validation

Validation of the remedial works will be conducted by the Remediation Consultant to demonstrate the remediation/management objectives have been achieved and to document the final condition of the site at the completion of works such that conclusions may be drawn on the end use suitability of the site for the proposed development. Details of the validation program are provided in **Section 8**.

7.9 Site Dis-establishment

On completion of the remediation works all plant/equipment and safety/environmental controls shall be removed from the site. Details are provided in the Site Management Plan in **Section 9**.

8. Validation Plan

Data will be required to be collected during remediation/management and developments works to assess the effectiveness of the implemented management actions and document the final condition of the site at the completion of all works such that conclusions may be drawn on the end suitability of the site for the proposed development use. The general principles to be implemented with regard to the validation assessment are discussed in accordance with EPA (2017) requirements in the following sections.

It is anticipated that the validation assessment will be required to address the following broad issues:

- Confirm the site conditions are consistent with those identified during previous site investigation activities as documented herein and characterise identified data gaps identified in preparation of this RAP via implementation of the assessment as discussed in **Section 5**;
- Removal of any contaminated material and/or contamination sources as may be identified during the data gap assessment;
- Verification that uncapped / accessible soils (including imported filling and growing media) are suitable for the proposed use;
- Characterisation and off-site disposal and/or beneficial use of materials excess to development requirements;
- Characterisation of material required to be imported to achieve development objectives, potentially including subgrade material, trench aggregate, growing media, etc to demonstrate its suitability for use at the site; and
- Assessment and close out of any Unexpected Finds assessments.

8.1 Data Quality Objectives

Data quality objectives (DQOs) have been developed for the validation assessment, as discussed in the following sections.

8.1.1 State the Problem

The site, which has historically been used for a range of commercial/industrial uses, is proposed to be redeveloped as the Sydney Fish Markets. Previous investigations as evaluated in JBS&G (2018) have identified that management of a number of potential site contamination issues is required such that at the completion of works, a final validation assessment may confirm the suitability of the site for the proposed use as required under the NSW planning framework.

As such, during remediation activities, sufficient validation of site activities is required to demonstrate that the identified environmental and health based risks (if any) to site users have been adequately managed to render the site suitable for the proposed land use.

8.1.2 Identify the Decision

The following decisions are required to be made during the validation works:

- Are there any unacceptable risks to future on-site receptors from any residual contamination following the implementation of the proposed in-ground development works at the site?
- Have all aesthetic issues been addressed?
- Has the potential for migration of contaminants from the site been appropriately addressed?

- Have the Site remediation activities been undertaken in compliance with the regulatory requirements set by the EPA, WorkSafe NSW, local government and other agencies?
- Was the impacted/surplus materials classified and disposed off-site to a facility licensed to accept the classified waste?
- Has all material imported to site to achieve development objectives been demonstrated as suitable for use?
- Have Site works been completed in accordance with the RAP requirements, or where variations to the works required by the RAP have occurred, have these been appropriate to meet the objectives of the RAP, with respect to site validation?
- Is the site suitable for the proposed land use?

During the remediation/management activities, sufficient validation of Site activities is required to demonstrate that the identified environmental and health based risks to future use(s) of the Site have been adequately managed to render the Site suitable for the proposed land use and future construction works.

8.1.3 Identify Inputs to the Decision

The inputs to the decisions are:

- Previous investigation results including the data gaps assessment to be completed prior to the remediation works;
- Field observations in relation to inspection of all excavation bases, walls and stockpiles for odours, sheen, discolouration, and other indicators of potential contamination;
- Environmental data as collected from the validation of remedial excavations (if required);
- Waste classification and material characterisation data obtained during assessment of surplus material prior to off-site disposal;
- Disposal dockets and relevant documents in relation to appropriate disposal of material to be removed from site as part of the remediation works (landfill dockets, beneficial reuse / recycling dockets, trade waste disposal, etc.);
- Material characterisation data (including field observations, sampling and analytical data) obtained during assessment of material proposed to be imported to the site;
- Relevant guideline criteria for validation and waste classification; and
- Data quality indicators (DQIs) as assessed by quality assurance / quality control (QA/QC).

Specifically, sufficient data needs to be collected from each of the identified potentially impacted media (e.g. fill material and natural soils) across the Site for associated COPC (**Section 4**).

8.1.4 Define the Study Boundaries

The validation study boundaries are restricted to the lateral extent of the approved development works, comprising the site as shown on **Figure 1**. The vertical extent of the validation study is anticipated to be restricted to soils extending to the maximum depth of disturbance as part of piling activities.

Due to the nature of potential contaminants identified, temporal variables will not be assessed as part of this investigation. The temporal boundaries of this investigation will be limited to the period of field validation assessment works.

8.1.5 Develop a Decision Rule

The decision rules adopted to answer the decisions identified in **Section 8.1.2** are discussed below.

Table 8.1: Summary of Decision Rules

Decision Required to be Made	Decision Rule
1. Are there any unacceptable risks to future on-site receptors from any residual contamination following the remediation of contaminated materials on-site?	Environmental analytical data will be compared against EPA endorsed criteria established as validation criteria. For the validation sample sets, statistical analysis of the data will be undertaken in accordance with relevant guidance documents, as appropriate, to facilitate the decisions. The following statistical criteria will be adopted: Either: the reported concentrations will be all below the site criteria; Or: the average site concentration for each analyte will be below the adopted HILs / HSLs criterion; no single analyte concentration exceeded 250% of the adopted site criterion; and the standard deviation of the results will be less than 50% of the site criteria. And: the 95% UCL of the average concentration for each analyte will be below the adopted site criteria. If the statistical criteria stated above is satisfied, the answer to the decision will be No. If the statistical criteria are not satisfied, the answer to the decision will be Yes.
2. Are there any aesthetic issues remaining following remediation works?	If there are any remaining unacceptable inclusions or soil discolouration, the answer to the decision will be Yes. Otherwise, the answer to the decision will be No.
2. Are there any unacceptable risks to future off-site receptors from site impacted groundwater and/or soil vapour?	Are site-related contaminants present in groundwater and/or soil vapour migrating off-site at concentrations exceeding levels found to present a potential health risk (recreational exposure) or ecological risk? If the answer to the decision is Yes, further assessment and/or management is required. Otherwise, the answer to the decision is No.
3. Are there any outstanding regulatory compliance issues associated with Site remediation activities?	Qualitative assessment of the works in relation to EPA, WorkSafe NSW, Department of Planning, etc. approvals will be undertaken during and following the completion of remediation/management activities. If there are any outstanding requirements with respect to the regulatory approvals, the answer to the decision will be Yes. Otherwise, the answer to the decision will be No.
4. Was all material required to be removed from site classified and disposed of off-site to a facility lawfully able to accept the classified waste?	Soil/sediment analytical data will be compared against EPA (2014) criteria. Statistical analysis of the data in accordance with relevant guidance documents will be undertaken, where appropriate, to facilitate the decisions (as detailed above). Documentation from the operation receiving the material including the dates, tonnage and classification of the accepted material will be required to facilitate the decision. If the statistical criteria stated above are satisfied, the decision is Yes, and if receipts are provided recording the disposal of material to an off-site licensed facility, the decision is Yes. If the material fail the criteria, and no disposal receipts are provided, the answer is No.

Decision Required to be Made	Decision Rule
5. Where material is imported to site for development purposes are there any outstanding issues identified in relation to documentation of the material's suitability for use?	Analytical data sets and inspection data will be reviewed for each proposed material type/source against established definitions for acceptable material (ie. VENM, resource recovery exemptions, etc) and EPA endorsed criteria as established in the RAP as validation criteria. If the complete data set for the applicable material meet the requirements relevant to the material type, the answer to the decision is No and material may be imported to site. If the data set exceeds the adopted criterion, the answer to the decision is Yes and the material cannot be imported to site for use in development activities.
6. Have remedial works met requirements of the RAP?	Were any of the answers to Question 1 to 5 Yes, the answer to the decision is No. Further assessment is required to establish the nature and extent of additional remediation/management as may be required. If the RAP requirements were addressed, and there are no outstanding issues, the answer to the decision is Yes.
7. Is the Site considered suitable for the proposed use?	With the exception of question 6, is the answer to any of the above decisions Yes? If yes, have the outstanding issues appropriately addressed by further assessment/remediation/management or implementation of an EMP? If the issues have been appropriately addressed, the answer to the decision is Yes, potentially subject to ongoing implementation of the EMP. Otherwise, the decision is No and the requirements for further remediation of the Site and/or implementation of additional management measures (as documented in an amended EMP) are required to be documented such that the answer to the decision can be Yes.

8.1.6 Specify Limits of Decision Error

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

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

To assess the usability of the data prior to making decisions, the data will be assessed against pre-determined DQIs for to precision, accuracy, representativeness, comparability, completeness and sensitivity (PARCCS parameters). The acceptable limit on decision error is 95% compliance with DQIs.

The pre-determined DQIs established for the project are discussed below in relation to the PARCC parameters, and are shown in **Table 8.2**.

- **Precision** - measures the reproducibility of measurements under a given set of conditions. The precision of the laboratory data and sampling techniques is assessed by calculating the Relative Percent Difference (RPD[8]) of duplicate samples.

[8] $$RPD(\%) = \frac{|C_o - C_d|}{C_o + C_d} \times 200$$

Where C0 is the analyte concentration of the original sample
Cd is the analyte concentration of the duplicate sample

- **Accuracy** - measures the bias in a measurement system. The accuracy of the laboratory data that are generated during this study is a measure of the closeness of the analytical results obtained by a method to the 'true' value. Accuracy is assessed by reference to the analytical results of laboratory control samples, laboratory spikes and analyses against reference standards.
- **Representativeness** –expresses the degree which sample data accurately and precisely represent a characteristic of a population or an environmental condition. Representativeness is achieved by collecting samples on a representative basis across the site, and by using an adequate number of sample locations to characterise the site to the required accuracy.
- **Comparability** - expresses the confidence with which one data set can be compared with another. This is achieved through maintaining a level of consistency in techniques used to collect samples; and ensuring analysing laboratories use consistent analysis techniques; and reporting methods.
- **Completeness** – is defined as the percentage of measurements made which are judged to be valid measurements. The completeness goal is set at there being sufficient valid data generated during the study.
- **Sensitivity** – expresses the appropriateness of the chosen laboratory methods, including the limits of reporting, in producing reliable data in relation to the adopted site assessment criteria.

Table 8.2: Summary of Data Quality Indicators

Data Quality Indicators	Frequency	Data Quality Criteria
Precision		
Split duplicates (intra laboratory)	1 / 20 samples	<50% RPD[1]
Blind duplicates (inter laboratory)	1 / 20 samples	<50% RPD[1]
Laboratory Duplicates	1 / 20 samples	<50% RPD[1]
Accuracy		
Surrogate spikes	All organic samples	70-130%
Laboratory control samples	1 per lab batch	70-130%
Matrix spikes	1 per lab batch	70-130%
Representativeness		
Sampling appropriate for media and analytes	All samples	-[2]
Samples extracted and analysed within holding times.	All samples	Soil: organics (14 days), inorganics (6 months) Water: organics (7 days to extract and 14 days to analyses). Metals (6 months)
Laboratory Blanks	1 per lab batch	<LOR
Trip spike	1 per lab batch	70-130% recovery
Storage blank	1 per lab batch	<LOR
Rinsate sample	1 per sampling event/media	<LOR
Comparability		
Standard operating procedures for sample collection & handling	All Samples	All Samples
Standard analytical methods used for all analyses	All Samples extracted and analysed within holding times	NATA accreditation
Consistent field conditions, sampling staff and laboratory analysis	All Samples	All samples[2]
Limits of reporting appropriate and consistent	All Samples extracted and analysed within holding times	All samples[2]

Data Quality Indicators	Frequency	Data Quality Criteria
Completeness		
Sample description and COCs completed and appropriate	All Samples	All samples[2]
Appropriate documentation	All Samples	All samples[2]
Satisfactory frequency and result for QC samples		95% compliance
Data from critical samples is considered valid	-	Critical samples valid
Sensitivity		
Analytical methods and limits of recovery appropriate for media and adopted Site assessment criteria	All samples	LOR<= Site assessment criteria

(1) If the RPD between duplicates is greater than the pre-determined data quality indicator, a judgment will be made as to whether the excess is critical in relation to the validation of the data set or unacceptable sampling error is occurring in the field.

(2) A qualitative assessment of compliance with standard procedures and appropriate sample collection methods will be completed during the DQI compliance assessment.

8.1.7 Optimise the Design for Obtaining Data

The purpose of this step is to identify a resource-effective field validation sampling design that generates data that are expected to satisfy the decision performance criteria, as specified in the preceding steps of the DQO process. The output of this step is the sampling design that will guide development of the field sampling and analysis plan. This step provides a general description of the activities necessary to generate and select data collection designs that satisfy decision performance criteria.

The remediation validation and subsequent laboratory analysis program as outlined in the following sections will need to be implemented during site remediation activities to demonstrate the successful completion of works in compliance with the RAP goals. The validation / characterisation sampling and analytical program for the site is outlined in **Table 8.3** in **Section 8.2** below.

8.2 Validation Inspections and Sampling

The validation inspections, sampling and analysis required for remediation of potential impacts arising from the data gaps assessment are summarised in **Table 8.3** and detailed in the following sections.

Table 8.3: Validation Sampling Plan

Item	RAP Sampling Frequency			Analytical Suite
Potential Source Removal Remedial Excavation				
	Excavation Floors	Excavation Walls	Materials	
Excavations formed by the removal of impacted materials	1 / 100 m^2 (10 m grid)	1 / 10 m (from each distinct horizon / material type / 1 m vertical soil profile)	N/A	As determined by the nature of the impact
Materials Importation				
Imported VENM	Minimum of 3 samples per source site / material type to 500 m^3 then 1 sample per 500 m^3 thereafter			TRH/BTEX PAH Heavy Metals OCP/PCBs Asbestos (500 ml)
Quarry VENM Materials (e.g. blue metal, sandstone, shale)	Confirmation that the material is quarried rock (VENM) prior to importation, and visual confirmation.			Site Inspection required.
Material subject to a NSW EPA Resource Recovery Order/Exemption	Confirmation by the supplier that the material meets the terms of the order. Then Remediation Consultant sampling at a minimum of 3 samples per source site / material type to 500 m^3 then 1 sample per 500 m^3 thereafter, prior to importation			TRH/BTEX PAH Heavy Metals OCP/PCBs Asbestos (500 ml)

Item	RAP Sampling Frequency	Analytical Suite
Export of Materials		
Surplus materials for off-site disposal are to be classified in accordance with NSW EPA (2014) and ASSMP (JBS&G 2018a)	Stockpiled materials for off-site disposal require a sampling density of 1/100 m^3 to 500 m^3 then 1 sample per 500 m^3 thereafter	TRH/BTEX PAH Heavy Metals OCP/PCBs Asbestos sPOCAS / pH

Notes: 1) The sampling density proposed for assessment of stockpiles is derived from Table 4 of Schedule 2 from the NEPM. The measure recommends that three samples are collected from homogeneous material suspected of contamination to a maximum volume of 75 m^3. Given the anticipated type and quantities of material a reduced rate has been adopted where less than 75 m^3 of material is produced.

In addition to the validation sampling required in **Table 8.3,** with respect to soil gas and groundwater impacts, the final successful validation of the impacts will be required to be demonstrated by the installation and sampling of either a groundwater monitoring well or soil gas monitoring well or probe in the area of the previously identified impact**.**

8.2.1 Impacted Material Removal

The validation program for the removal of impacted materials (should they be identified in the data gaps assessment) comprises:

- Inspection of the excavated areas by a suitably trained and experienced environmental consultant to confirm the extent of potentially impacted materials have been removed. If additional potentially impacted material is identified, further excavation will be conducted and the affected area will be re-inspected until such time as visual and olfactory validation is obtained.
- Following visual and olfactory validation, soil or soil gas (as appropriate to the nature of the impact) samples will be collected from the remediation area walls at a rate of 1 sample per 10 linear m, and from the excavation bases at a rate of 1 sample per 100 m^2;
- Excavation validation samples will be analysed at a laboratory NATA accredited for the required analyses. If the concentration of COPCs are identified in any of the excavation validation samples exceeding criteria, then the soils will be excavated 0.3 m further in the direction of failure and the validation process repeated. Alternatively, where impact exceeding criteria is not identified by the laboratory, the remedial areas will be deemed to have been successfully remediated and validated;
- Excavated soils shall be stockpiled and the materials will be required to be classified in accordance with NSW EPA (2014) and disposed off-site to a facility legally able to accept the waste.

8.2.2 Sampling Methodology

<u>Soil</u>

The soil sampling method shall be determined by the Remediation Consultant as consistent with the observations of the site sub-surface and appropriate to generate representative samples. The soil sampling method shall be consistent with the data quality indicators in **Section 8.5**.

Where sample locations are placed by boreholes, undisturbed samples as collected by push tube or SPT sampler, are preferred if able to be effectively implemented. Otherwise samples may be recovered from solid flight augers (sampled off the piling auger in concurrence with the piling operations), via test pitting or direct sampling of stockpiles as per the below. Re-usable equipment shall require to be decontaminated between sampling locations.

Samples of near surface material and stockpiled soils shall be collected by appropriately trained and experienced personnel by the use of a stainless steel hand trowel. The hand trowel will be

thoroughly decontaminated using phosphate free detergent and distilled water before each sample is collected. Where deeper soil samples are required from excavation walls or floor, the material shall be retrieved using an excavator. Samples of the retrieved material shall be collected from the centre of the excavator bucket ensuring that no part of the sample has contacted the sides of the excavator bucket.

Sufficient sample material will be collected to allow both field and laboratory analyses. Additional samples will be collected from any soil horizons which exhibit staining, odours, or other physical evidence of potential contamination.

During the collection of soil samples, features such as seepage, discolouration, staining, odours and other indications of contamination will be noted on the field documentation. Collected soil samples will be immediately transferred to laboratory supplied sample jars, which will be sealed with Teflon lined screw closures. The sample containers will be transferred to a chilled esky for sample preservation prior to and during shipment to the testing laboratory. A chain-of-custody form will be completed and forwarded with the samples to the testing laboratory.

Soil Gas and Groundwater

As per the methods outlined in **Section 5**.

8.2.3 Laboratory Analyses

Laboratory methods and LOR as summarised in **Table 8.4** are proposed to be adopted for analysis of soil samples collected during remediation/validation activities. All laboratories are required to be National Association of Testing Authorities (NATA) registered for the relevant analyses. . Appropriate methods and LORs are required for comparison to relevant criteria.

Table 8.4: Soil Laboratory Analysis Methods (all units in mg/kg unless stated)

Analyte	Limit of Reporting	Laboratory Method
METALS		
Arsenic	4.0	ICP-AES (USEPA 200.7)
Cadmium	1.0	ICP-AES (USEPA 200.7)
Chromium (total)	1.0	ICP-AES (USEPA 200.7)
Chromium (VI)	1.0	Alkali leach colorimetric (APHA3500-Cr/USEAP3060A)
Copper	1.0	ICP-AES (USEPA 200.7)
Lead	1.0	ICP-AES (USEPA 200.7)
Nickel	1.0	ICP-AES (USEPA 200.7)
Zinc	1.0	ICP-AES (USEPA 200.7)
Mercury (inorganic)	0.05	ICP-AES (USEPA 200.7)
TRH		
F1 C_6-C_{10}	10	Purge Trap-GCMS (USEPA8260)
F2 >C_{10}-C_{16}	50	Purge Trap-GCFID (USEPA8000)
F3 >C_{16}-C_{34}	100	Purge Trap-GCFID (USEPA8000)
F4 >C_{34}-C_{40}	100	Purge Trap-GCFID (USEPA8000)
BTEX		
Benzene	1.0	Purge Trap-GCMS (USEPA8260)
Toluene	1.0	Purge Trap-GCMS (USEPA8260)
Ethylbenzene	1.0	Purge Trap-GCMS (USEPA8260)
Total Xylenes	3.0	Purge Trap-GCMS (USEPA8260)
PAH		
Benzo(a)pyrene as TEQ	0.5	GCMS (USEPA8270)
Total PAHs	0.5	GCMS (USEPA8270)
PCBs		
PCBs (total)	0.9	GCECD (USEPA8140,8080)
OCP/OPP		
Aldrin + Dieldrin	0.2	GCECD (USEPA8140,8080)
Chlordane	0.1	GCECD (USEPA8140,8080)
DDT + DDD + DDE	0.3	GCECD (USEPA8140,8080)
Heptachlor	0.1	GCECD (USEPA8140,8080)

Analyte	Limit of Reporting	Laboratory Method
PHENOLS		
Total Phenols	5	Distillation-Colorimetric (APHA 5530)
VOC		
PCE	1.0	Purge Trap-GCMS (USEPA8260)
TCE	1.0	Purge Trap-GCMS (USEPA8260)
Cis 1,2 DCE	1.0	Purge Trap-GCMS (USEPA8260)
Trans 1,2 DCE	1.0	Purge Trap-GCMS (USEPA8260)
VC	1.0	Purge Trap-GCMS (USEPA8260)
OTHER		
Asbestos	Presence/0.1 g/kg	PLM / Dispersion Staining as per AS4964:2004
Soil pH	0.1	5:1 leach

8.3 Validation Criteria

The site is to be used for commercial purposes and is required to be validated as suitable for commercial and industrial land use, pursuant to the NEPC (2013). As such, health-based criteria for Commercial/Industrial (HIL-D) will be adopted for remedial excavation / site validation. The criteria are based on NSW EPA endorsed investigation levels which, while being used as clean-up levels instead of site-specific criteria derived through a process of risk assessment, are considered adequately conservative for the purposes of characterising and validating the site.

Decisions with respect to criteria have been developed based on the proposed end uses as follows:

- HILs for commercial/industrial land use - HIL-D;
- HSL for petroleum hydrocarbons considering potential for vapour intrusion, coarse grained soil for commercial/industrial land use at 0.0-1.0 m depth;
- As a conservative measure, generic and site specific EILs derived through the added contaminant limits for commercial/industrial land use;
- Management Limits for TRH, coarse grained soils for commercial/industrial land use;
- ESLs for TRH fractions, BTEX and benzo(a)pyrene in coarse grained soil for commercial/industrial land use; and
- Where there are no NSW EPA endorsed thresholds the laboratory LOR has been adopted as an initial screening value for the purposes of this assessment.

Given the adopted validation criteria will in some instances be dependent upon soil texture and depth below final ground level, final site validation criteria will only be defined at the time of data evaluation.

Where consideration of potential ecological risk is required for validation of sediment and/or exposed soil media, representative soil samples will be the subject of total organic carbon (TOC %), cation exchange capacity (CEC) and soil pH analysis to support the development of the assessment criteria. Where multiple soil validation criteria can be derived based on the above, as for example in the case for F4 TRH, the lowest of the possible applicable values will be adopted as the validation criteria.

Where a valid data set can be generated as based on assessment of the soils within the Site and the potential exposure scenarios, the following statistical criteria will apply:

Either:

- all contaminant concentrations were less than the adopted site assessment criteria,

Or:

- The 95 % upper confidence limit (UCL) average concentrations shall be below the soil criteria;
- The standard deviation of the generated data set shall be below 50 % of the soil criteria; and
- The maximum concentration shall be below 250 % of the soil criteria.

Existing data for chemical constituents (not asbestos) from materials remaining at the Site shall also be included in analytical data sets created for the soils.

In the event of accessible soils, further consideration is also required to the following, observations will also supplement the validation process:

- There shall be no visible asbestos in addition to laboratory analyses results; and
- Soils shall not emit recognisable odours, be discoloured as a result of contamination and/or have any significant additional aesthetic concerns with respect to future site users.

8.4 Validation Reporting

At the completion of the remedial works, a validation report will be prepared in general accordance with the *Guidelines for Consultants Reporting on Contaminated Sites* (OEH 2011), documenting the works as completed. The report will contain information including:

- Update relevant portions of the site description and CSM as prepared in this RAP to the condition of the validation assessment footprint at the time of the validation assessment;
- Present all sampling field notes and laboratory data including calibration certificates for field monitoring equipment, environmental monitoring etc.;
- Undertake an assessment of QA/QC of analytical data generated by the works and identify data that is reliable for use in characterising the applicable portion of the Block 15 Site;
- Sort data into data sets as required by the decision rules;
- Assess whether sufficient data has been obtained to meet required limits on decision error;
- Undertake assessment to the decision rules and identify any environmental data which causes decision rules to be failed;
- Provide a summary of waste disposal/off-site removal activities and volumes of material removed from the Site including supply of all waste disposal dockets confirming final waste disposal/landfill destination;
- Provide a summary of material importation activities (general fill soil/crushed rock, growing media, earthworks aggregates, drainage backfill etc), including material source, type, assessment of suitability, approximate quantities, date of importation and final placement location;
- Details of the remediation works conducted;
- Information demonstrating that the objectives of the RAP have been achieved, in particular the validation sample results and assessment of the data against both the pre-defined data quality objectives and the remediation acceptance (validation) criteria;
- Information demonstrating compliance with appropriate regulations and guidelines;
- Document any variations to the strategy undertaken during the implementation of the remedial works;
- Details of any environmental incidents occurring during the course of the remedial works and the actions undertaken in response to these incidents;

- Other information as appropriate, including requirements (if any) for ongoing monitoring / management; and
- Provide a comment on the suitability of the Block 15 Site (or portions thereof) for the proposed use and requirements for any ongoing monitoring/management (where applicable).

The report will serve to document the remediation works for future reference.

8.5 Contingency Plan

Given the development history of the site and that the existing assessment data does have a number of identified data gaps, consideration has been given to the potential for additional small scale issues that may arise during works (from a contamination viewpoint). Contingency plans for a range of potential identified scenarios are discussed following to ensure firstly the safety and health of people and the environment and secondly that the overall project objectives are achieved.

8.5.1 Identification of an Underground Storage Tank

There is the potential that one or more USTs may be encountered during demolition of the pavements or subsequent earthworks. In the event of such an occurrence, the Unexpected Finds Protocol as presented below (**Figure 8.1**) will be implemented and remedial actions defined EPA (2014b[9]) implemented as summarised below.

In general, the procedure will comprise:

- Documentation of work instructions and preparation of relevant permits to work prior to the commencement of decommissioning works;
- Removal of any tank and pipework contents using equipment suitable for operation in hazardous areas and off-site disposal of resulting liquid by a licensed contractor;
- Isolation of ground level connections to the tanks (if present) via sealing and exposure of subsurface lines back to the tank via removal of concrete/asphalt pavements;
- Purging of vapours within the tank removal of all pipework, followed by plugging of openings, other than one hole to act as a pressure equalising vent;
- Excavation to expose the total width and length of the tank and removal of any identified anchors (where present);
- Removal of the tank from the excavation followed by cleaning down to remove any excess soil to provide for inspection of the tank base condition. Identified holes should be patched/plugged prior to loading onto a transport vehicle for off-site disposal to a licensed destruction facility. The tank should be appropriately labelled with spray paint to warn of its previous contents and the associated dangers.
- Excavation and stockpiling of surrounding and underlying backfill and apparent impacted natural soils using observations including odour, staining/discolouration and/or a photo-ionisation detector (PID).

Subsequent to the removal of the petroleum infrastructure and associated backfill, validation requirements, consistent with NSW EPA (2014b) shall include:

- Sample locations from the walls of excavations formed by the removal of USTs/backfill sands at the frequency of one sample per 5 m of excavation wall, with a minimum of one per wall;

[9] *Technical Note: Investigation of Service Station Sites.* NSW EPA dated April 2014 (EPA 2014b)

- Sample locations from the base of excavations formed by the removal of USTs at the frequency of one sample per 25 m^2, with a minimum of one per former UST location;
- Discrete sample locations under other petroleum infrastructure (i.e. remote fill points, fuel dispensers). In the event that significant impacted soil volumes are removed from these areas, the adopted sampling frequency for excavation bases and walls following UST removal will be adopted; and
- Sample locations at a linear spacing of 5 m underlying pipelines.

Soil samples shall be analysed for TRH, lead and VOCs.

Excavated backfill/surrounding soils shall be characterised in accordance with EPA (2014a) Waste Classification Guidelines.

8.5.2 Identification of Oily Materials

In the event that oily materials are encountered, the provisions outlined in the unexpected finds protocol will be implemented, comprising inspection, testing and appropriate action as advised by the Remediation Consultant (**Figure 8.1**).

Any suspected oily materials must be segregated from other excavated materials and placed in a designated area with appropriate odour and sediment controls until such time as appropriate assessment is completed and a methodology is confirmed for their appropriate management. In the event that the oily materials do not meet the Site Validation Criteria, then they shall removed from the site and disposed of at an appropriately licensed facility.

8.5.3 Material Storage Breach

In the event that any materials storage containment controls are breached and stockpiled materials classified as asbestos contaminated soil or otherwise have escaped (or have the potential to escape), then the management controls shall be rectified and investigations undertaken to review the adequacy of the controls and any improvements implemented. The REMP (**Section 9.1**) shall include a documented process for identifying and responding to such incidents.

8.5.4 Emissions Complaints

Due to the nature of the activities and type of contaminants identified at the Site, there is a potential for complaints to be received from members of the public relating to environmental emissions including:

- Odour emissions arising from handling of malodorous soil;
- Noise and vibration arising from excavation, piling and other works;
- Dust emissions arising from excavation, material handling and placement; and
- Visibly impacted surface water quality in stormwater system in proximity of the site.

Monitoring of all environmental emissions shall be undertaken during the works as detailed in the REMP (discussed in **Section 9.1**) and appropriate actions taken to further control emissions following receipt of a complaint. Such additional controls may include the following actions, required to be detailed in the REMP (discussed in **Section 9.1**):

- Increased application of odour masking chemicals on odorous materials;
- Revision of odour control provided to open excavations, stockpiled materials, etc;
- Disturbance of soils during meteorologically favourable periods only; and/or
- Covering highly impacted soils which are potentially generating asbestos fibres.

8.5.5 Groundwater Dewatering

As referenced above in **Section 6.3**, in the event that groundwater is encountered during redevelopment works that will require dewatering, a dewatering license shall be obtained in accordance with the *Water Management Act 2000*. The license must be obtained prior to the installation of the dewatering system. The license application must be submitted to the WaterNSW, and a Dewatering Management Plan should be included as part of the submitted licence application.

It is noted that excavation dewater may require treatment prior to disposal, potentially including pH correction, sediment concentrations and potentially chemical contaminants. Procedures for treatment and validation of water will be documented in the Dewatering Management Plan.

In accordance with the Council development controls, no wastewater, chemicals or other substances harmful to the environment shall be permitted to discharge to Council's stormwater system. Only clean, unpolluted water is permitted for discharge. Wastewaters not suitable for discharge to stormwater must be the subject of on-site treatment to address contaminant concentrations prior to stormwater disposal, disposed of using a licensed liquid waste contractor or alternatively directed to the sewer of the Sydney Water Corporation (SWC) under a Trade Waste Agreement (TWA). The pre-treatment of wastewater may be a requirement of SWC prior to discharge.

8.5.6 Excavation Validation Failure

In the unforeseen event that the proposed remediation works do not meet the validation criteria, or if the selected remedial strategy is unsuccessful, the following actions will be considered to ensure firstly the safety and health of people and the environment and secondly that the overall project objectives are achieved:

- Continued controlled excavation and off-site disposal or treatment until validation is achieved; and
- Reassessment of remedial options for excavated materials, including:
- Alternate on-site treatment options; and/or
- Onsite containment.

8.6 Unexpected Finds Protocol (UFP)

It is acknowledged that previous investigations of the site have been undertaken to assess the identified contaminants of potential concern. However, ground conditions between sampling points may vary, and further hazards may arise from unexpected sources and / or in unexpected locations during remediation. The nature of any residual hazards which may be present at the site are generally detectable through visual or olfactory means, for example:

- The presence of significant aggregates of friable asbestos materials (visible) as ACM and or AF/FA impacted material;
- Bottles / containers of chemicals (visible);
- Ash and/or slag and/or tar contaminated soils / fill materials (visible);
- Drums, waste pits, former pipework or unrecorded USTs (visible); and
- Volatile organic compound (VOC) contaminated soils (odorous) and vapours.

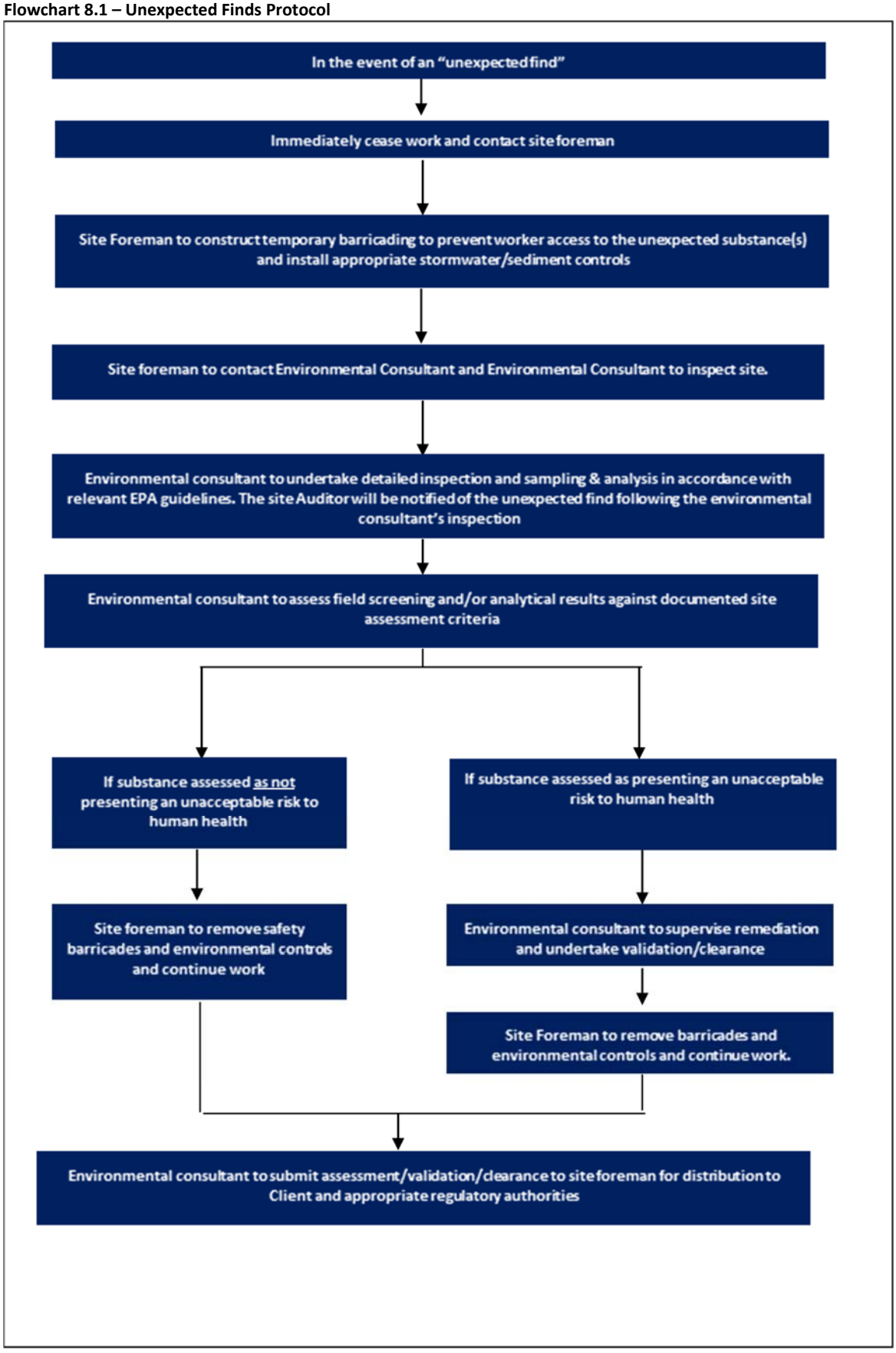
As a precautionary measure to ensure the protection of the workforce and surrounding community, should any of the abovementioned substances be identified (or any other unexpected potentially hazardous substance), the procedure summarised in **Flowchart 8.1** is to be followed.

An enlarged version of the unexpected finds protocol, suitable for use on-site, should be posted in the site office and referred to during the site specific induction by the remedial / principal contractor.

The sampling strategy for each “unexpected find” shall be designed by a suitably qualified environmental consultant. The strategy will, however, be aimed at determining the nature of the substance – that is, is it hazardous and, if so, is it at concentrations which pose an unacceptable risk to human health or the environment.

The sampling frequency of the identified substance/materials shall meet the minimum requirements outlined in EPA (1995) in addition to those outlined in **Section 8.2**. In the event of an Unexpected Find, it is anticipated that the suitability of the implemented characterisation assessment and the proposed validation strategy be discussed with the site auditor prior to finalisation of the Unexpected Find works.

Flowchart 8.1 – Unexpected Finds Protocol



9. Site Management Plan

This section contains procedures and requirements that are to be implemented as a minimum requirement during the remedial works at the site.

9.1 Hours of Operation

It is understood that the hours of operation for remedial works will be conducted in accordance with the recommended site hours suggested by the EPA[10], however hours may vary from typical hours of operation which will be subject to approval.

Typical hours of operation for remedial works are:

- Monday to Friday: 7am to 6pm.
- Saturday: 8 am to 1 pm.
- Sunday and public holidays: No work permitted.

9.2 Preparation of a Remediation Environmental Management Plan

Prior to commencement of any ground disturbance works, a site specific REMP shall be prepared by the early works Principal Contractor, which documents the environmental monitoring and management measures required to be implemented during the remediation and construction related activities associated with the construction of development. The Contractor is required to have the REMP reviewed and endorsed as acceptable by the Environmental Consultant and/or the Site Auditor prior to the commencement of remediation works.

The REMP shall address each of the nominated items in **Section 9.2.1** and shall include the Contingency Plan, referred to in **Section 8**, above.

9.2.1 Required Elements

An assessment of the proposed activities and the associated elements required to be incorporated into the REMP is provided in **Table 9.1**. The REMP is required to address each of the required elements and procedures in full detail and to include detailed monitoring processes and procedures, corrective actions and reporting requirements. **Table 9.1** below has been developed with consideration of City of Sydney (2004) 'Contaminated Land Development Control Plan'. Following receipt of the Development Consent, any additional terms and conditions not discussed below should be incorporated in the REMP.

Table 9.1 Required Elements of the REMP

Element	Specific Minimum Requirements to be included in REMP
1. Dust and Airborne Hazard Control	Asbestos air monitoring Provisions for dust control based on monitoring results In accordance with DA conditions
2. Flora and Fauna	As appropriate
3. Heritage/Archaeological	In accordance with relevant heritage/archaeological studies
4. Visual Impacts	Visual monitoring at site boundary Specific colour requirements for various controls/measures, including PPE
5. Emergency Response	As appropriate Procedures required for spill incident response including material storage breach
6. Noise Control	Hours of operation, consistent with the consent conditions Boundary monitoring at commencement of work site activities with potential for environmental noise emissions Potential noise monitoring at nearest receptors Procedures for control and management of noise emissions, as appropriate (e.g., restricted hours)

[10] *Interim Construction Noise Guideline.* Department of Environment & Climate Change NSW. DECC 2009/265. July 2009.

Element	Specific Minimum Requirements to be included in REMP
	In accordance with DA conditions, all works must be carried out in accordance with the appropriate Demolition/Construction management plan documentation prepared at Consent Stage. Reference should be made to DA conditions with regards to control measures, noise criteria, hours during which noisy works can occur and Council/Community liaison requirements
7. Traffic	Controls on vehicle movements on public roads Reference should be made to Consent Condition requirements including loads covering and vehicle cleaning requirements
8. Protection of Adjoining Structures	As appropriate and in accordance with any DA conditions (where relevant)
9. Odour Control	Enclosure of all potential odour generating activities (i.e., excavation of petroleum hydrocarbon contaminated soils) with appropriate odour controls incorporating safeguards and monitoring Daily monitoring of odour levels at boundary during handling of malodorous materials. Procedures for addressing elevated odour monitoring results, including, but not limited to: reduction in earthworks activities within odorous material areas during adverse meteorological conditions; application of odour masking solutions at the odour source or between identified source(s) and receptor(s); review of stockpiling measures and covering identified potential odour sources by hydromulching or with less odorous materials
10. Handling of Contaminated Soil and Sediment and Water	Soil and water management (stockpiling, site access, excavation pump out, reinstatement). Reference should be made to DA conditions. No wastewaters, chemicals or other substances harmful to the environment shall be permitted to be discharged to Blackwattle Bay or the stormwater system. Only unpolluted water is permitted to discharge from the site
11. Soil Storage/Placement Areas	Soil and water management (stockpiling, site access, excavation pump out, reinstatement) Bunding. Heavy vehicle/personnel decontamination Interim storage requirements for materials requiring later treatment Site drainage requirements, incorporating clean/dirty areas and modifications to existing surface water and drainage controls beneath retained pavements Monitoring as required
12. Sediment Control	Bunding Collection/treatment/handling impacted sediments Reference should be made to DA conditions
13. Acid Sulfate Soil/Sediments	All site activities with the potential to disturb known or suspected ASS/PASS material will be required to comply with the procedures and management controls presented in the ASSMP.
14. Operation of Site Office	As appropriate
15. Decontamination of Heavy Equipment	As appropriate Reference should be made to DA conditions
16. Environmental Monitoring	Monitoring of dusts, noise, odour and fibres Monitoring as required for vibration and water releases Inspection checklists and field forms Reference should be made to DA conditions
17. Environmental Criteria	Soil criteria as sourced from RAP
18. Material Classification	As detailed in this RAP which have included NSW EPA and Consent authority requirements Materials tracking, including QA/QC inspection and sampling
19. Community Relations Plan	Refer to project specific communication commitments, incorporating nomination of specific contact persons & details and requirements for communications/response register Reference should be made to DA requirements
20. Incident Reporting	As appropriate, including standard form/checklist
21. Security and Signage	Secure site perimeter Site boundary signage
22. EMP Review	As appropriate
23. Training	As appropriate
24. Contact Details	Company/personnel details, including names/phone numbers for: - Principal Contractor - Site Auditor - Remediation Consultant - Remediation Contractor - OH&S Compliance - Environmental Compliance

9.3 Health and Safety

9.3.1 Work Health and Safety Management Plan

A WHSP shall be prepared by the early works Principal Contractor prior to commencement of any ground disturbance works. The Plan shall contain procedures and requirements that are to be implemented as a minimum during the works, in addition to the Contingency Plan, referred to in **Section 8**.

The objectives of the WHSP are:

- To apply standard procedures that minimises risks resulting from the works;
- To ensure all employees are provided with appropriate training, equipment and support to consistently perform their duties in a safe manner; and
- To have procedures to protect other site workers and the general public.

These objectives will be achieved by:

- Assignment of responsibilities;
- An evaluation of hazards;
- Establishment of personal protection standards, mandatory safety practices and procedures;
- Monitoring of potential hazards and implementation of corrective measures; and
- Provision for contingencies that may arise while operations are being conducted at the Site.

9.3.2 Additional Site-Specific Elements/Procedures

In addition to the normal construction-related matters, the WHSP shall address the following site-specific specific hazards associated with the works relating to the management of contaminated soil and groundwater:

- Use of plant and machinery within confined spaces (i.e. remedial excavations);
- Potential for contact to asbestos contaminated soils and/or airborne fibres;
- Contact with contaminated soil (incl. dust), groundwater and vapours, including requirements for specific Personal Protective Equipment (PPE);
- Potential for under/aboveground services, specifically former petroleum infrastructure (if encountered); and
- Heat/cold stress.

9.4 Air Quality

During remedial works, dust emissions and any odours will be confined within the site boundary. This will be assessed by a program of air monitoring undertaken during remediation works (if asbestos impacts are identified) and implemented by air emission controls as required by the Contractor. Air monitoring requirements are summarised in this section.

9.4.1 Air Monitoring

Where asbestos and/or contaminated soil is being disturbed during the proposed works, applicable air monitoring activities will be employed on a daily basis at relevant locations to demonstrate the suitable application of contaminant migration control measures. Monitoring activities as may be employed are discussed following.

During the remedial works, perimeter asbestos in air monitoring will be conducted at each applicable remedial works area boundary when soils impacted with asbestos are being disturbed.

Air monitoring will be conducted on a daily basis at relevant locations during any ground disturbance activities within impacted soil within the Site to verify that implementation of appropriate control measures have been successful at managing the risk of air borne fibre generation.

Air monitoring will be undertaken in accordance with the requirements of the National Occupational Health and Safety Commission (NOHSC) *Asbestos Code of Practice* and Guidance Notes, in particular the *Guidance note for the estimation of airborne asbestos dust* [NOHSC 3002:2005]. Air filters shall be analysed by a NATA accredited laboratory and results shall be required to be below 0.01 fibres/mL. All detections of fibres shall be further analysed by scanning electron microscope (SEM) to confirm the fibres are asbestos.

Should friable asbestos be identified, air monitoring will be conducted by Licensed Asbestos Assessor (LAA, as per Safe Work NSW requirements).

In establishing site trigger levels for evaluation of the monitoring results, reference is made to the appropriate TWA (NOHSC) levels:

- Amosite - 0.1 fibre/mL;
- Chrysotile – 0.1 fibre/mL;
- Crocidolite - 0.1 fibre/mL;
- Other forms of asbestos - 0.1 fibre/mL; and
- Any mixture of these, or where the composition is unknown - 0.1 fibre/mL.

With consideration to these levels the following trigger levels have been developed:

- If airborne fibre levels reach 0.01 fibres/mL the source of fibre release is to be found and rectified. Work in the affected area does not have to stop; and
- If airborne fibre levels reach 0.02 fibres/mL work in the work area should stop and additional controls measures employed. This will involve additional water spraying during excavations.

Air monitoring results will be obtained within 24 hours of sample collection on week days. While this precludes “real time” monitoring, inspections will be made during all excavation works and, if there are any visible dusts, light water sprays will be used to wet the excavation and prevent the release of any airborne asbestos fibres.

If respirable asbestos fibres are confirmed and present between 0.01 and 0.02 fibres/mL, the following controls must be implemented by the licensed asbestos removalist, in accordance with SWA 2016;

- Review control measures;
- Investigate the cause; and
- Implement controls to eliminate or minimise exposure and prevent further release.

If respirable asbestos fibres are confirmed and present above 0.02 fibres/mL, the following controls must be implemented by the licensed asbestos removalist, in accordance with SWA 2011;

- Stop removal work;
- Notify Safe Work NSW by phone, then by fax or written statement that work has ceased;
- Investigate the cause;
- Implement controls to eliminate or minimise exposure and prevent further release; and
- Do not recommence removal work until further air monitoring is conducted and fibre levels are detected below 0.01 fibres/mL.

A daily report air monitoring report will be prepared documenting the previous/same days airborne asbestos fibre air monitoring results. This report will be made available to all relevant stakeholders, upon request, including but not limited to:

- Site workers;
- Council and, WorkSafe NSW and/or EPA officers;
- Neighbouring facilities; and
- Unions.

9.4.2 Additional Consideration of Chemical Contaminants

In addition to general assessment of the potential for exposure to chemical contaminants, the WHSP should also include specific consideration of additional contaminants such as PAHs and heavy metal distributed throughout fill materials.

As a precautionary measure, the WHSP should include the requirement for the plan to be revised in the event of an unexpected find of contaminated material during remediation and/or construction.

When working with contaminated materials in general, care needs to be taken to ensure that the contamination is not introduced to the worker via ingestion, inhalation or absorption. The WHSP must detail the PPE and decontamination requirements to be followed to control the risks posed by potential exposure to chemical contaminants at the site.

9.5 Materials Tracking

It is anticipated that disturbed materials will require removal from the site or placement in other areas of the site. A Materials Compliance Management System (MCM) shall be developed for the documentation of material movement and reuse of materials at the site to ensure that it can be demonstrated all material has been appropriately managed. The MCM is required to consider both the quality and quantity of material for each element.

The MCM will include the following specific details:

- Definition of responsibilities, including the early works Principal Contractor(s), other contractor(s) e.g. Remediation Consultant (JBS&G) and the Site Auditor;
- Procedures for confirming material quality, summarising existing analytical (in-situ) data, additional analytical (ex-situ) data, additional observations to satisfy other acceptance criteria (e.g., occurrence of asbestos containing materials) and alignment of any environmental data to enable beneficial re-use of the material at the point of placement (where appropriate) and/or provide a waste classification for off-site removal of the material;
- Procedures for confirming where the materials have originated and what classification have they been given, noting that source depths are not critical if tied to material type, while placement depths are critical since tied to potential future exposures on the site;
- Procedures for recording where the materials have been placed (lateral & vertical limits) and inspections during placement and/or where the material has been disposed of;
- Identification of hold points where materials are proposed to be temporarily stockpiled;
- Procedures for recording the quantity of placed materials;
- Site grid squares or sub zones/site survey data (GPS/GIS), noting size of grid and elevations;
- Frequency of data collection, with consideration to both program (time) and area/material type;

- Material Tracking Records;
- Standard forms/documentation;
- Non-conformances/Unexpected Finds; and
- QA/QC.

The MCMS may also need to include or make reference to additional material placement requirements to meet design elements such as those relating to subsurface drainage or compatibility with service corridors, and engineering properties of materials to be placed, which are outside the scope of this RAP.

9.6 Disposal of Waste Material

All waste materials including soil, sediment and liquids to be removed from the site will classified, managed and disposed in accordance with the requirements of the *NSW Protection of the Environment Operations Act 1997* (POEO Act), the *NSW POEO Waste Regulation* (2015) and/or exemptions issued under these regulations. Waste materials will be classified in accordance with the requirements of the *Waste Classification Guidelines* (EPA 2014) prior to off-site disposal. In addition, given the probability of encountering acid sulfate soils at the site, all materials requiring off-site disposal will require to be managed and classified in accordance with Part 4 of this guideline.

Consideration will also be required of the potential for the waste to contain organotins, in which case, liaison will be required with the NSW EPA waste unit and potential receiving facilities to ensure appropriate disposal of the material.

For discharge of collected surface water, appropriate monitoring and validation of conditions will be required such that it can be demonstrated water quality is suitable for discharge to the environment in accordance with the POEO Act provisions on water pollution. Where water does not meet the appropriate standards, consideration will be required to either on-site treatment opportunities, or alternatively off-site disposal as liquid waste to an appropriately licensed facility.

Documentary evidence for all waste disposal shall be kept for inclusion in the Validation Report/s.

10. Environmental and Health and Safety Management

10.1 Environmental Management

10.1.1 Environmental Management Plan

Prior to commencement of remediation works on the site, a Construction Environmental Management Plan (EMP) or similar shall be prepared by the remedial contractor, which documents the environmental monitoring and management measures required to be implemented during remediation of the site.

The EMP shall address each of the nominated items in **Section 10.1.2** and shall include the contingency plan, referred to in **Section 8.5** above.

10.1.2 Required Elements/Procedures

An assessment of the proposed activities and the associated elements required to be incorporated into the EMP is provided in **Table 10.1**. The EMP is required to address each of the required elements and procedures in full detail and to include detailed monitoring processes and procedures, corrective actions and reporting requirements.

Table 10.1: Required Elements of the EMP

Element	Specific Minimum Requirements to be included in EMP
1. Dust and Airborne Hazard Control (for asbestos materials disturbance and/or removal – if required)	Asbestos air monitoring (if conducted). Provisions for dust control based on monitoring results.
2. Flora and Fauna	Consider requirements as drafted in Marine Ecology Assessment (MEA 2018[11]) and subsequent plans
3. Heritage/Archaeological	Consider requirements as drafted in Maritime Heritage Impact Statement (MHIS 2018[12]) and subsequent reports/plans as may be developed specific to the project
4. Visual Impacts	Potential surface water impacts in Blackwattle Bay from site based run-off.
5. Emergency Response	As appropriate. Procedures required for spill incident response including material storage breach.
6. Noise Control	Hours of operation. Boundary monitoring at commencement of work site activities that have the potential for excessive environmental noise emissions. Potential noise monitoring at nearest receptors if required. Procedures for control and management of noise emissions, as appropriate (e.g., restricted hours).
7. Traffic	Site access to be restricted to authorised personnel only
8. Protection of Adjoining Structures	As appropriate after consideration to the required remediation works and potential effects (if any) to neighbouring properties.
9. Odour Control	Procedures for management of potentially odorous works.
10. Handling of Contaminated Soil and Groundwater	Soil and water (if encountered) management (stockpiling, site access, excavation pump out, reinstatement).
11. Soil Storage/Placement Areas	Soil and water management (stockpiling, site access, excavation pump out, reinstatement). Bunding. Heavy vehicle/personnel decontamination. Interim storage requirements for materials requiring later treatment. Site drainage requirements, incorporating clean/dirty areas and modifications to existing surface water and drainage controls beneath retained pavements. Monitoring as required.

[11] *Marine Ecology Assessment – Stage 1 Concept and Demolition*, Sydney Fish Market, Eco Logical Australia Pty Ltd, 20 February 2018 (MEA 2018)

[12] *Maritime Heritage Impact Statement*, Sydney Fish Market Redevelopment, Comber Consultants Pty Ltd, February 2018 (MHIS 2018)

Element	Specific Minimum Requirements to be included in EMP
12. Sediment Control	Bunding and silt curtains within land and surface water areas respectively. Collection/treatment/handling impacted sediments.
13. Acid Sulfate Soil/Sediments	All site activities with the potential to disturb known or suspected ASS/PASS material will be required to comply with the procedures and management controls presented in the ASSMP.
14. Operation of Site Office	As appropriate.
15. Asbestos Works (if any)	Required notifications, permits, signage and exclusion zones. Required personal (e.g. Class A removalist). PPE and decontamination. Staging of asbestos and non-asbestos works.
16. Environmental Monitoring	Monitoring of dusts, noise, odour and fibres (if required). Monitoring as required for vibration and water releases. Surface water quality monitoring in Blackwattle Bay as required. Inspection checklists and field forms.
17. Environmental Criteria	Soil criteria as sourced from RAP.
18. Material Classification	As detailed in this RAP.
19. Waste Management	All waste materials classified in accordance with the RAP are required to be disposed of at a licensed waste facility that are lawfully able to accept such materials. Material tracking in the form of disposal dockets will be required for the purposes of satisfying the validation report.
20. Community Relations Plan	Client to provide project specific communication protocols, incorporating nomination of specific contact persons & details and requirements for communications/response register.
21. Incident Reporting	As appropriate, including standard form/checklist.
22. Security and Signage	Secure site perimeter. Site boundary signage. Remediation exclusion zone signage where required.
23. EMP Review	As appropriate.
24. Training	As appropriate. Contamination awareness training for all workers.
25. Contact Details	Company/personnel details, including names/phone numbers for: - Principal Contractor - Site Auditor (if involved) - Environmental Consultant - Contractor - OH&S Compliance - Environmental Compliance

10.2 Health and Safety Management

A Work Health & Safety Management Plan (WHSP) shall be prepared by the contractor prior to commencement of remediation works on the site. The Plan shall contain procedures and requirements that are to be implemented as a minimum during the works.

The objectives of the WHSP are:

- Ensure all regulatory requirements for the proposed works are satisfied;
- To apply standard procedures that minimises risks resulting from the works;
- To ensure all employees are provided with appropriate training, equipment and support to consistently perform their duties in a safe manner; and
- To have procedures to protect other site workers and the general public.

These objectives will be achieved by:

- Assignment of responsibilities;
- An evaluation of hazards;
- Establishment of personal protection standards, mandatory safety practices and procedures;

- Monitoring of potential hazards and implementation of corrective measures; and
- Provision for contingencies that may arise while activities are being conducted at the site.

11. Conclusions

Overall, it is considered that the proposed actions outlined in this RAP conform to the requirements of the *Contaminated Sites Guidelines for the NSW Site Auditor Scheme (3rd Edition)* (EPA 2017) because they are: technically feasible; environmentally justifiable; and consistent with relevant laws policies and guidelines endorsed by NSW EPA.

Subject to the successful implementation of the measures described in this RAP and with consideration to the Limitations presented in **Section 12**, it is considered that the Site can be made suitable for the intended uses and that the risks posed by contamination can be managed in such a way as to be adequately protective of human health and the environment.

12. Limitations

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

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

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

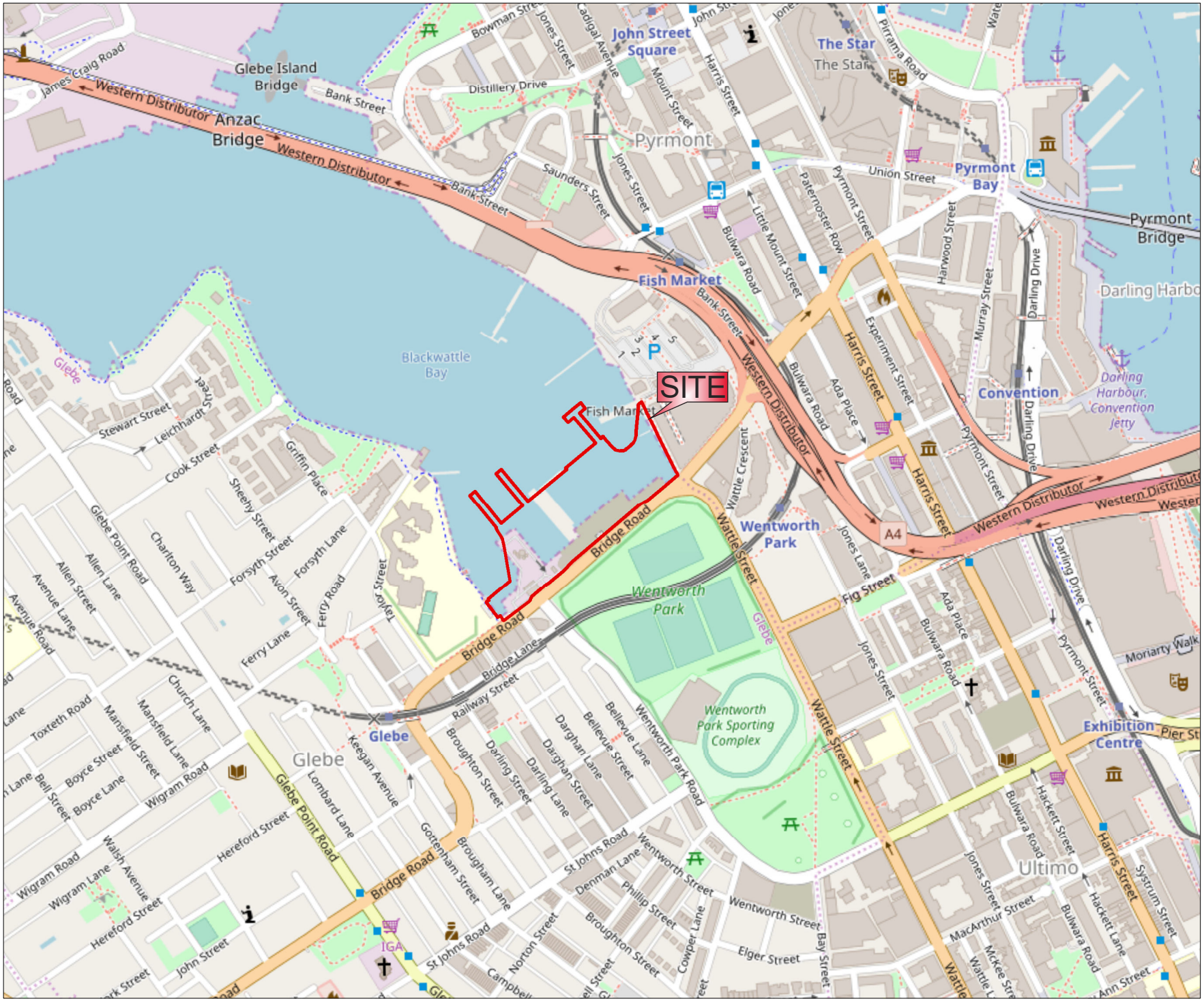
Sampling and chemical analysis of environmental media is based on appropriate guidance documents made and approved by the relevant regulatory authorities. Conclusions arising from the review and assessment of environmental data are based on the sampling and analysis considered appropriate based on the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

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

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

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

Figures



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JBS&G

Job No: 54578

Client: UrbanGrowth NSW

Version: R02 Rev 2	Date: 27-Mar-2019
Drawn By: RF	Checked By: JR

Scale 1:8,000

0 100 200
metres

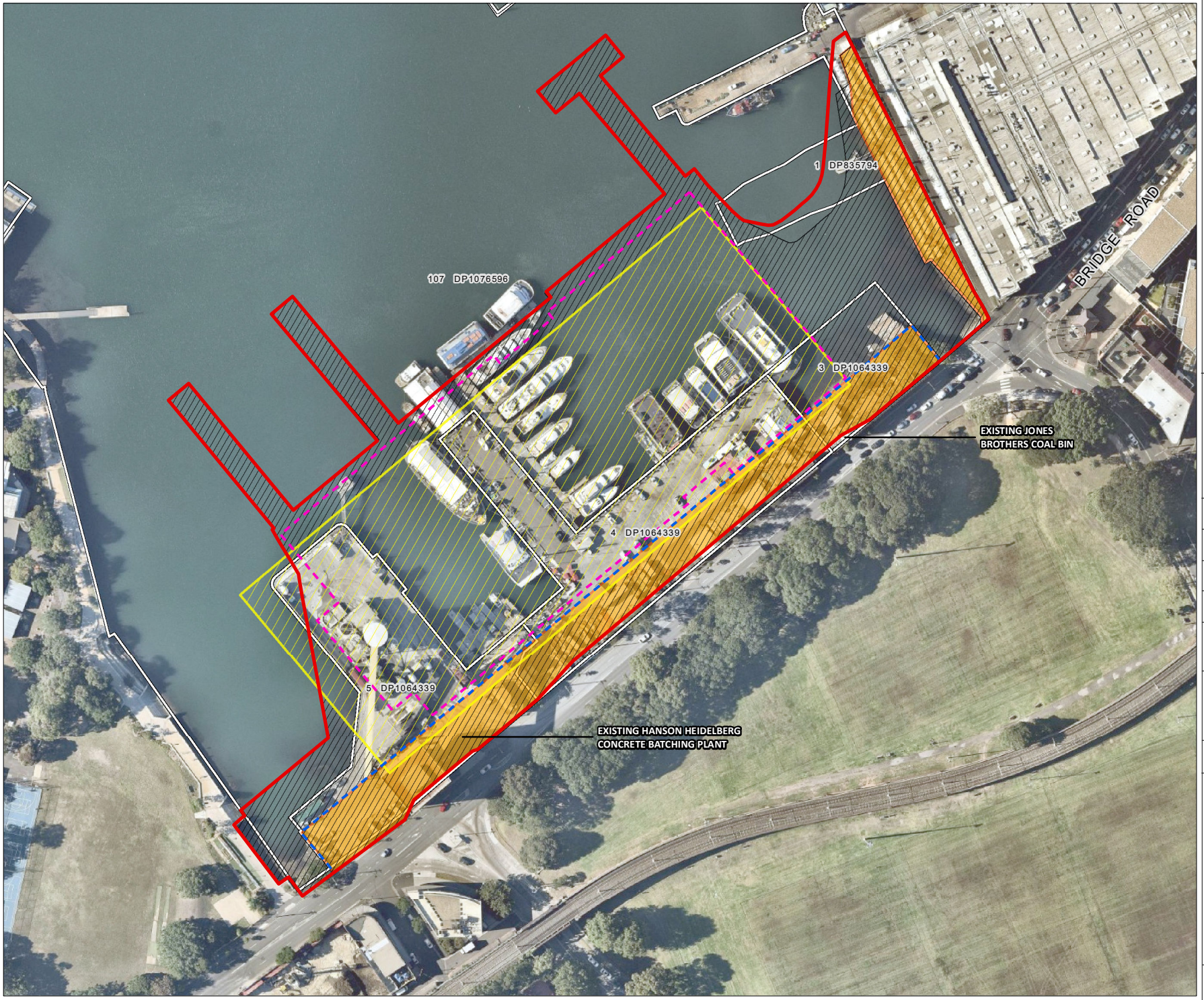
Coor. Sys. GDA 1994 MGA Zone 56

1A-1C Bridge Road
Glebe, NSW

SITE LOCATION

FIGURE 1

File Name: 54578_01



Legend:

- New Sydney Fish Market Development Footprint
- Cadastral Boundary
- Approximate Land Area
- Approximate Seawall Extent

Proposed Landuse

- Fish Market Building Envelope
- Public Domain
- Approximate Fish Market Basement Footprint

JBS&G

Job No: 54578

Client: UrbanGrowth NSW

Version: R02 Rev 2	Date: 27-Mar-2019
Drawn By: RF	Checked By: JR

Scale 1:2,000

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metres

Coor. Sys. GDA 1994 MGA Zone 56

1A-1C Bridge Road
Glebe, NSW

SITE LAYOUT

FIGURE 2

File Name: 54578_02
Reference: Near Map - http://www.nearmap.com.au/. Imagery - 18-01-2018.

Legend:

- New Sydney Fish Market Development Footprint
- Approximate Land Area
- Approximate Seawall Extent

Proposed Landuse

- Fish Market Building Envelope
- Public Domain
- Approximate Fish Market Basement Footprint

Sample Locations

- BAYS MARKET DISTRICT - EIS (2017)
- BAYS MARKET DISTRICT - EIS (2010b)
- BAYS MARKET DISTRICT - EIS (2010c)
- BAYS MARKET DISTRICT - PB (2009)
- BAYS MARKET DISTRICT - Umwelt (2008)
- Soil Sampling / Monitoring Well - JBS&G 2015

JBS&G

Job No: 54578

Client: UrbanGrowth NSW

Version: R02 Rev 2	Date: 27-Mar-2019
Drawn By: RF	Checked By: JR

Scale 1:2,000

0 25 50
metres

Coor. Sys. GDA 1994 MGA Zone 56

1A-1C Bridge Road
Glebe, NSW

HISTORICAL SAMPLE LOCATIONS

FIGURE 3

File Name: 54578_03
Reference: Near Map - http://www.nearmap.com.au/. Imagery - 18-01-2018.

Legend:

- New Sydney Fish Market Development Footprint
- Approximate Land Area
- Approximate Seawall Extent

Proposed Landuse

- Fish Market Building Envelope
- Public Domain
- Approximate Fish Market Basement Footprint

Proposed Sample Locations

- Groundwater and Ground Gas Monitoring Well Location
- Soil Sample Location
- Sub-Slab Vapour Sample Location

Sample Locations

- BAYS MARKET DISTRICT - PB (2009)
- Soil Sampling / Monitoring Well - JBS&G 2015

JBS&G

Job No: 54578

Client: UrbanGrowth NSW

Version: R02 Rev 2	Date: 27-Mar-2019
Drawn By: RF	Checked By: JR

Scale 1:2,000

0 25 50
metres

Coor. Sys. GDA 1994 MGA Zone 56

1A-1C Bridge Road
Glebe, NSW

PROPOSED SAMPLE LOCATIONS FOR DATA GAP ASSESSMENT

FIGURE 4

File Name: 54578_04
Reference: Near Map - http://www.nearmap.com.au/. Imagery - 18-01-2018.

Appendix A – Proposed Development Plans

N E W S Y D N E Y F I S H M A R K E T

STATE SIGNIFICANT DEVELOPMENT APPLICATION STAGE 1

SHEET LIST_STAGE 1

SHEET NUMBER	SHEET NAME	REVISION	REVISION DATE	A1 SCALE	REVISION DESCRIPTION
S1-A00 AAA-01	COVER SHEET	A	22/03/19	NTS	ISSUE FOR SSD-DA
S1-A20 AAA-01	SITE SURVEY	A	22/03/19	1:1000	ISSUE FOR SSD-DA
S1-A20 AAA-02	LOCALITY / CONTEXT PLAN	A	22/03/19	1:2500	ISSUE FOR SSD-DA
S1-A20 AAA-03	SITE PLAN	A	22/03/19	1:1000	ISSUE FOR SSD-DA
S1-A21 L00-01	DEMOLITION PLAN	A	22/03/19	1:1000	ISSUE FOR SSD-DA
S1-B10 L00-01	FLOOR PLAN GROUND	A	22/03/19	1:500	ISSUE FOR SSD-DA
S1-B10 L01-01	FLOOR PLAN UPPER GROUND	A	22/03/19	1:500	ISSUE FOR SSD-DA
S1-B10 L02-01	FLOOR PLAN MEZZANINE	A	22/03/19	1:500	ISSUE FOR SSD-DA
S1-B10 L10-01	TOP OF BUIDLING ENVELOPE	A	22/03/19	1:500	ISSUE FOR SSD-DA
S1-C10 AAA-01	EAST & WEST ELEVATION	A	22/03/19	1:500	ISSUE FOR SSD-DA
S1-C10 AAA-02	NORTH & SOUTH ELEVATION	A	22/03/19	1:500	ISSUE FOR SSD-DA

3XN BVN

NOTE
CONTRACTOR TO CHECK AND VERIFY ALL DIMENSIONS ON SITE PRIOR TO COMMENCEMENT OF WORK OR PREPARATION OF SHOP DRAWINGS. DO NOT SCALE THIS DRAWING

ISSUE	DATE	FOR
A	22/03/19	ISSUE FOR SSD-DA

CONSULTANT
STRUCTURAL - MOTT MACDONALD
TEL +61 (0) 2 9098 6800
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CONSULTANT
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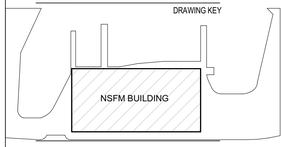
PROJECT MANAGER
TBC
CLIENT
URBAN GROWTH NSW
CLIENT NUMBER
TEL +61 (0) 2 9216 5700
PROJECT
NEW SYDNEY FISH MARKET
1B BRIDGE RD, GLEBE NSW
BVN PROJECT NUMBER
1611013

DRAWING KEY



GRAPHIC SCALE
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STATE SIGNIFICANT DEVELOPMENT APPLICATION
DRAWING

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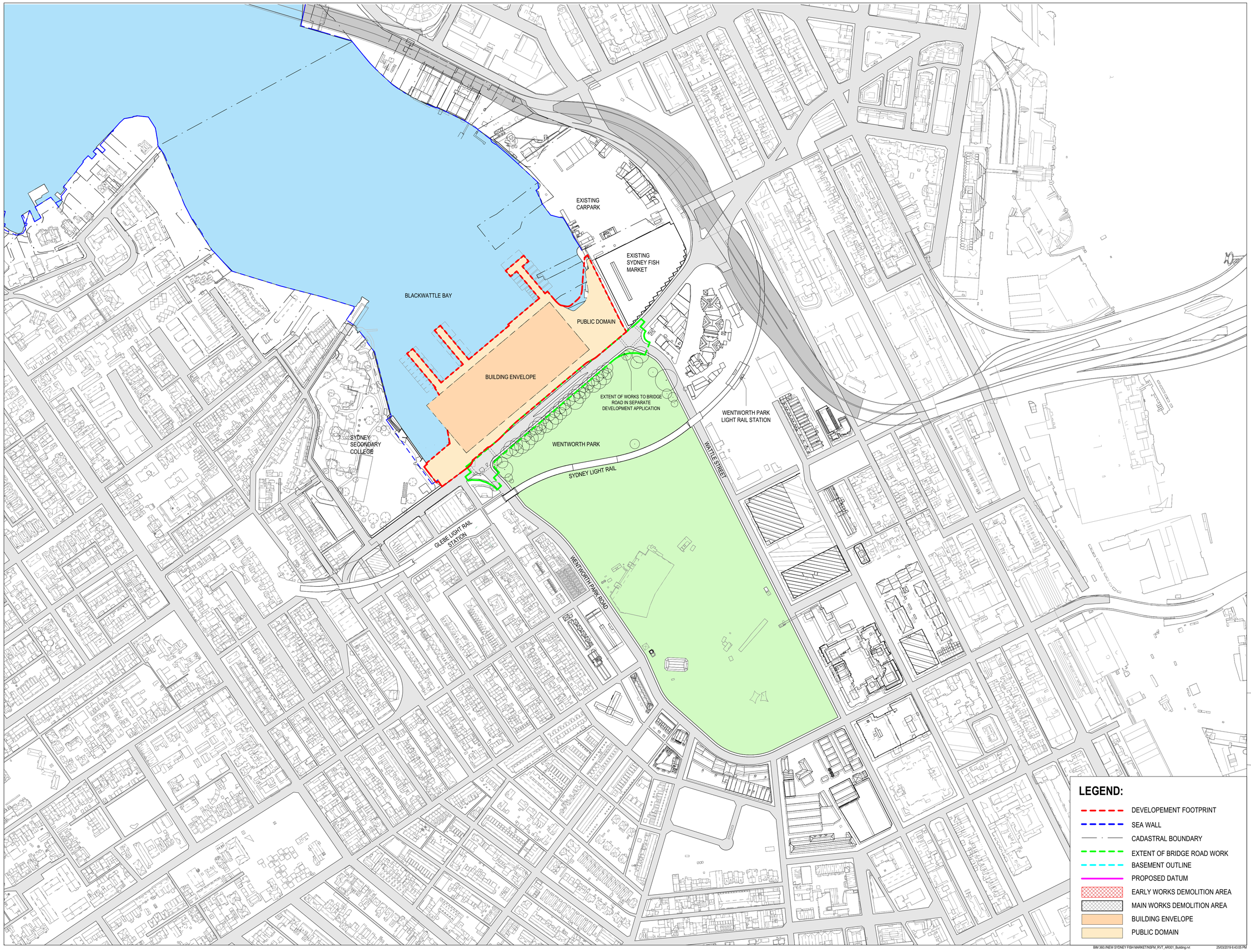

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NOTE

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A	22/03/19	ISSUE FOR SSD-DA

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PROJECT
NEW SYDNEY FISH MARKET
1B BRIDGE RD, GLEBE NSW

BVN PROJECT NUMBER
1611013

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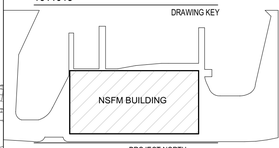

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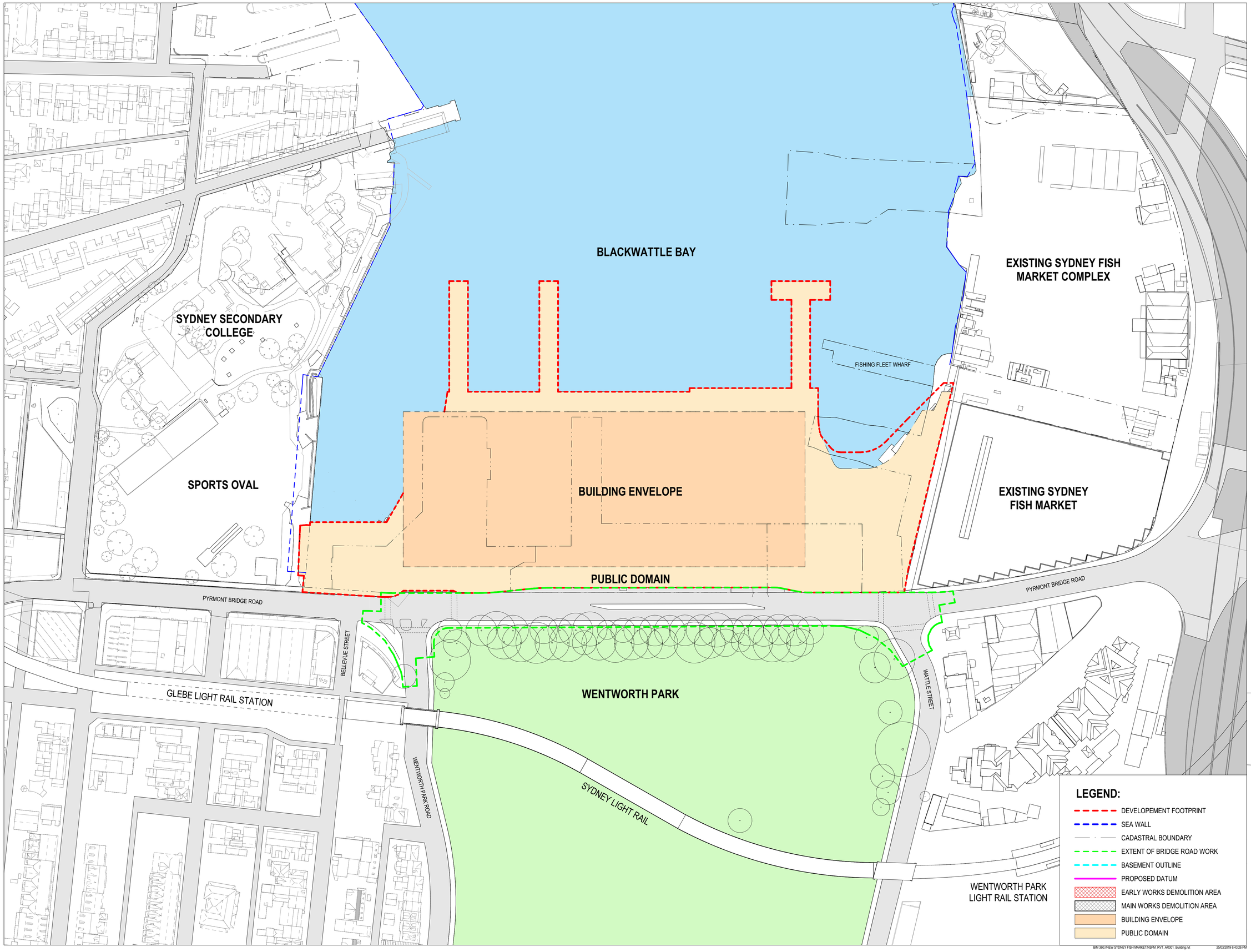

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A	22/03/19	ISSUE FOR SSD-DA

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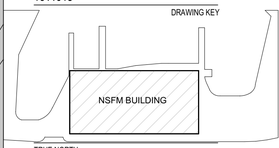

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SITE PLAN

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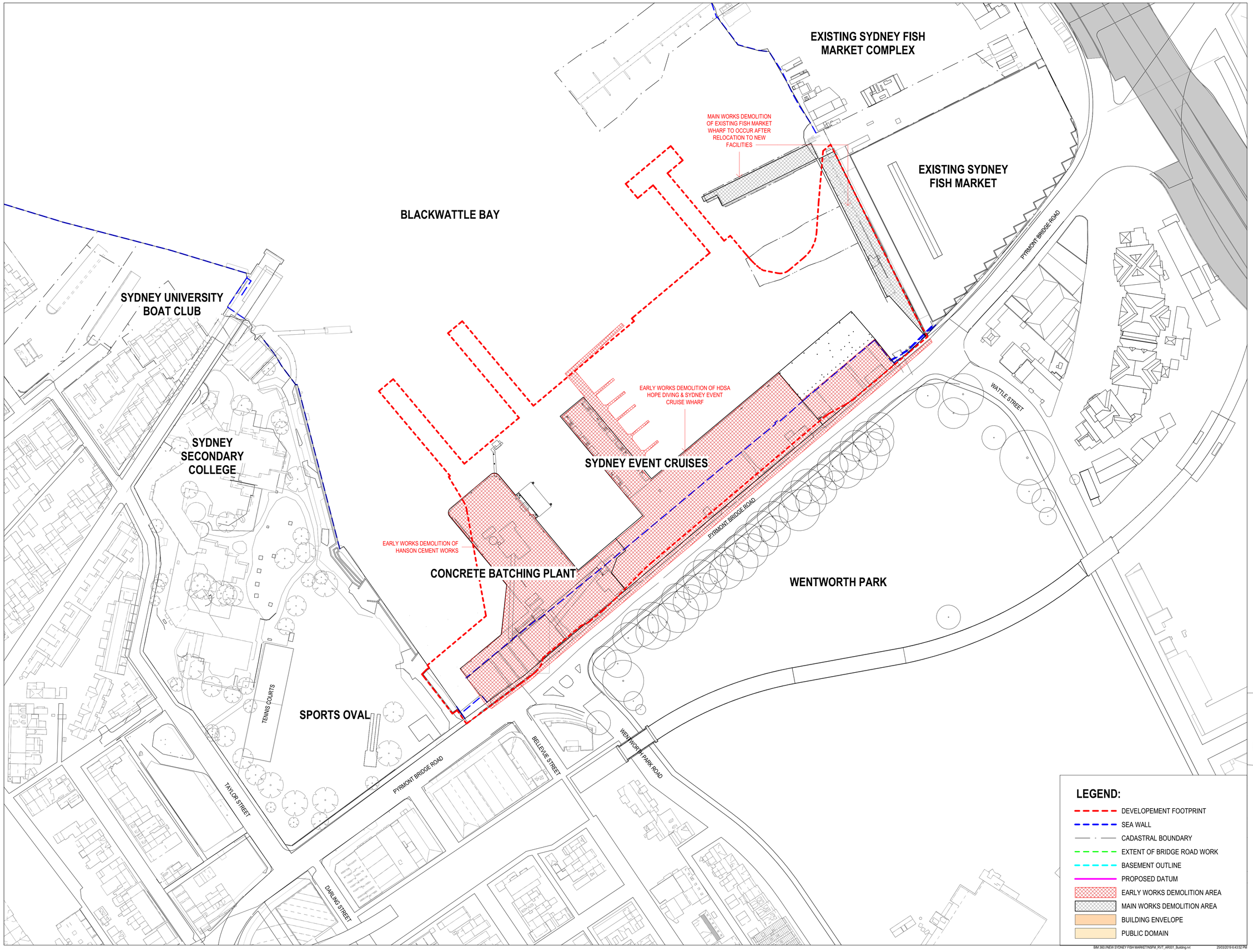

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ISSUE	DATE	FOR
A	22/03/19	ISSUE FOR SSD-DA

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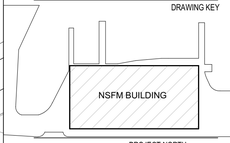

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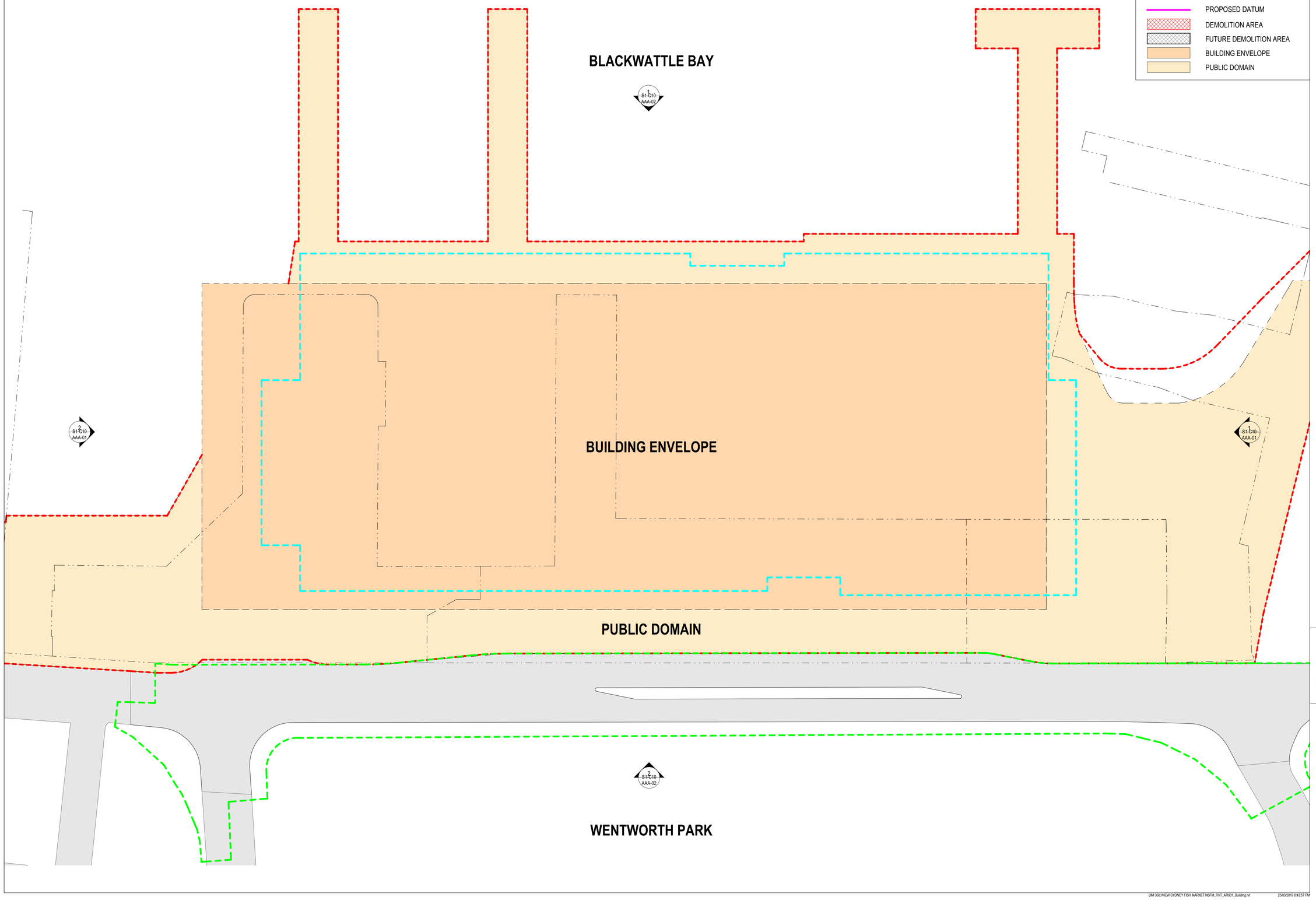
STATUS
STATE SIGNIFICANT DEVELOPMENT APPLICATION
DRAWING

DEMOLITION PLAN

	ISSUE
AR-S1-A21 L00-01	A

LEGEND:

- DEVELOPEMENT FOOTPRINT
- SEA WALL
- CADASTRAL BOUNDARY
- EXTENT OF BRIDGE ROAD WORK
- BASEMENT OUTLINE
- PROPOSED DATUM
- DEMOLITION AREA
- FUTURE DEMOLITION AREA
- BUILDING ENVELOPE
- PUBLIC DOMAIN



NOTE

CONTRACTOR TO CHECK AND VERIFY ALL DIMENSIONS ON SITE PRIOR TO COMMENCEMENT OF WORK OR PREPARATION OF SHOP DRAWINGS. DO NOT SCALE THIS DRAWING

ISSUE	DATE	FOR
A	22/03/19	ISSUE FOR SSD-DA

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1B BRIDGE RD, GLEBE NSW

BVN PROJECT NUMBER
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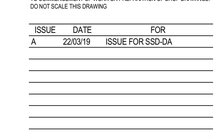
DRAWING KEY



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DRAWING
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ISSUE
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N E W S Y D N E Y F I S H M A R K E T

STATE SIGNIFICANT DEVELOPMENT APPLICATION STAGE 2

DRAWING INDEX

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S2-A20 AAA-01	SITE SURVEY	A	22/03/19	1:500	ISSUE FOR SSD-DA
S2-A20 AAA-02	LOCALITY / CONTEXT PLAN	A	22/03/19	1:2500	ISSUE FOR SSD-DA
S2-A20 AAA-03	SITE PLAN	A	22/03/19	1:1000	ISSUE FOR SSD-DA
S2-A20 L01-01	PUBLIC DOMAIN GROUND	A	22/03/19	1:1000	ISSUE FOR SSD-DA
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S2-B10 L01-01	FLOOR PLAN UPPER GROUND	A	22/03/19	1:500	ISSUE FOR SSD-DA
S2-B10 L02-01	FLOOR PLAN MEZZANINE	A	22/03/19	1:500	ISSUE FOR SSD-DA
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S2-B10 L10-01	ROOF PLAN	A	22/03/19	1:500	ISSUE FOR SSD-DA
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S2-C10 AAA-01	EAST AND WEST ELEVATION	A	22/03/19	1:500	ISSUE FOR SSD-DA
S2-C10 AAA-02	NORTH AND SOUTH ELEVATION	A	22/03/19	1:500	ISSUE FOR SSD-DA
S2-D10 AAA-01	CROSS SECTIONS	A	22/03/19	1:500	ISSUE FOR SSD-DA
S2-D10 AAA-02	LONG SECTIONS	A	22/03/19	1:500	ISSUE FOR SSD-DA
S2-E43 AAA-01	AUCTION & OFFICE SECTION	A	22/03/19	1:50	ISSUE FOR SSD-DA
S2-E43 AAA-02	FOOD & BEVERAGE SECTION	A	22/03/19	1:50	ISSUE FOR SSD-DA
S2-E43 AAA-03	STAGING & OFFICE SECTION	A	22/03/19	1:50	ISSUE FOR SSD-DA
S2-E43 AAA-04	WHOLESALE & CATERING SECTION	A	22/03/19	1:50	ISSUE FOR SSD-DA
S2-L10 AAA-01	GFA MEASUREMENT SREP 26	A	22/03/19	1:1000	ISSUE FOR SSD-DA
S2-L10 AAA-02	GFA STANDARD INSTRUMENT	A	22/03/19	1:1000	ISSUE FOR SSD-DA
S2-L10 AAA-03	OPERATIONAL AREAS	A	22/03/19	1:1000	ISSUE FOR SSD-DA
S2-L10 AAA-04	RETAIL AREAS	A	22/03/19	1:1000	ISSUE FOR SSD-DA

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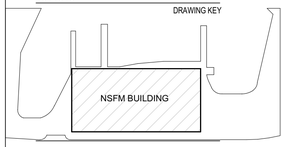
CLIENT NUMBER
TEL +61 (0) 2 9216 5700
PROJECT
NEW SYDNEY FISH MARKET
1B BRIDGE RD, GLEBE NSW
BVN PROJECT NUMBER
1611013

DRAWING KEY



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DRAWING
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ISSUE
AR-S2-A00 AAA-01
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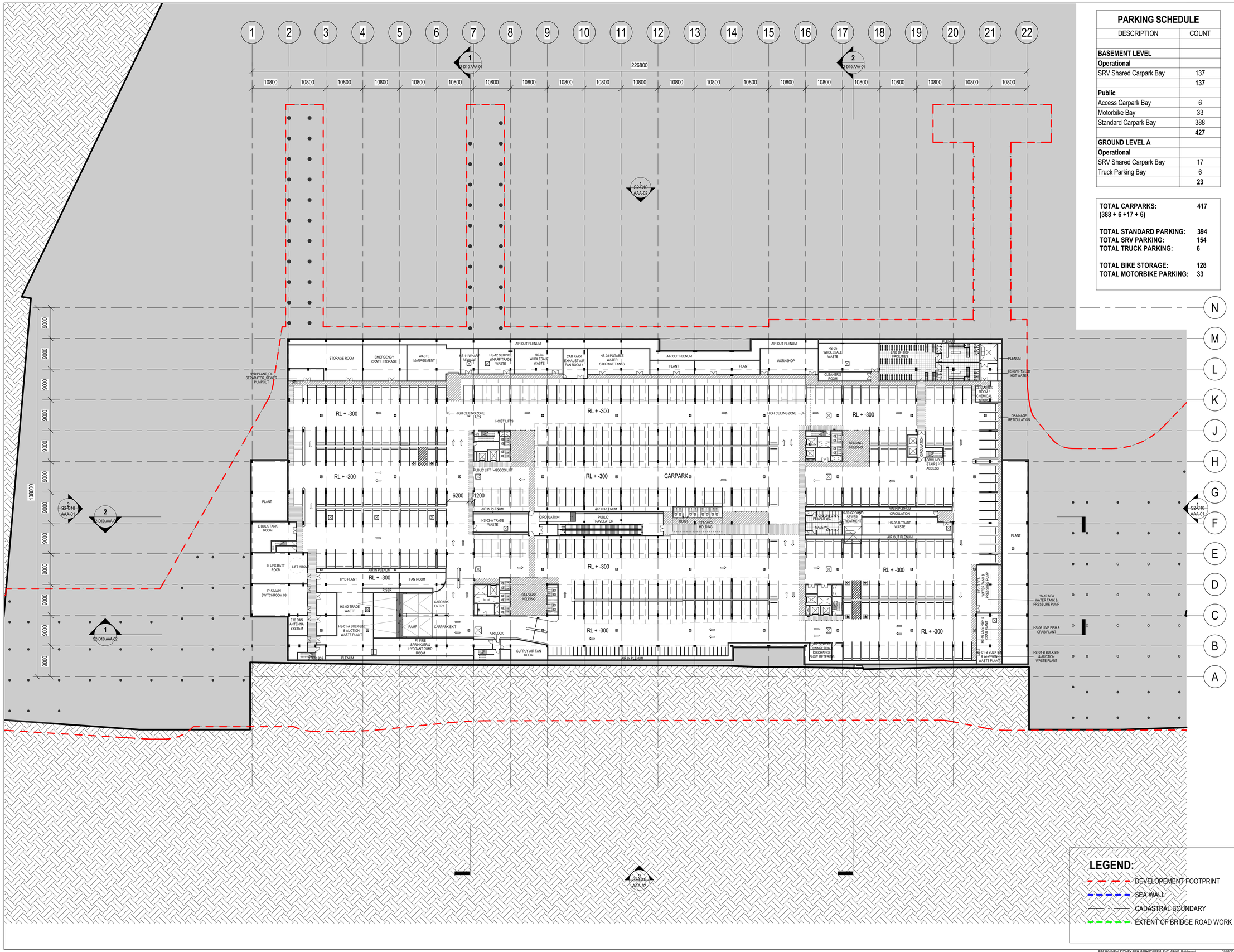

PARKING SCHEDULE

DESCRIPTION	COUNT
BASEMENT LEVEL	
Operational	
SRV Shared Carpark Bay	137
	137
Public	
Access Carpark Bay	6
Motorbike Bay	33
Standard Carpark Bay	388
	427
GROUND LEVEL A	
Operational	
SRV Shared Carpark Bay	17
Truck Parking Bay	6
	23

TOTAL CARPARKS: (388 + 6 +17 + 6)	**417**
TOTAL STANDARD PARKING:	**394**
TOTAL SRV PARKING:	**154**
TOTAL TRUCK PARKING:	**6**
TOTAL BIKE STORAGE:	**128**
TOTAL MOTORBIKE PARKING:	**33**

LEGEND:

- DEVELOPEMENT FOOTPRINT
- SEA WALL
- CADASTRAL BOUNDARY
- EXTENT OF BRIDGE ROAD WORK

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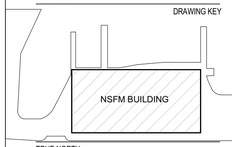

TRUE NORTH
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STATUS
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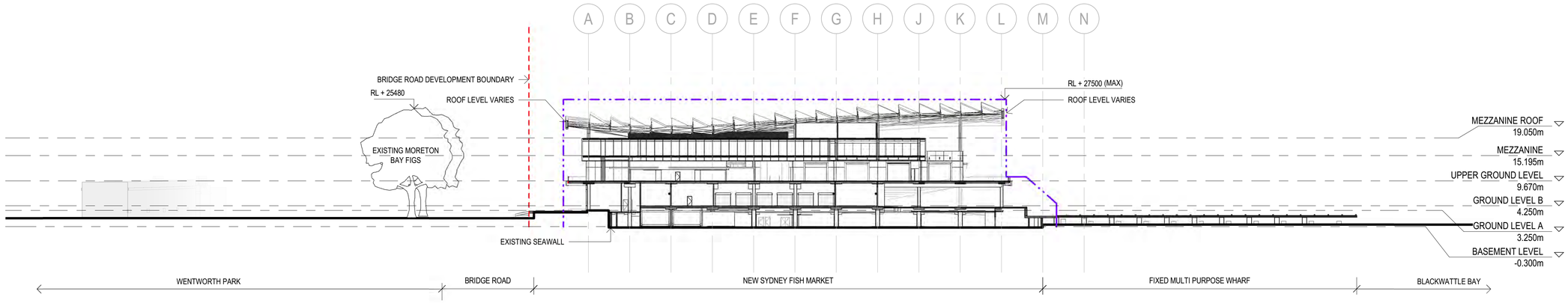
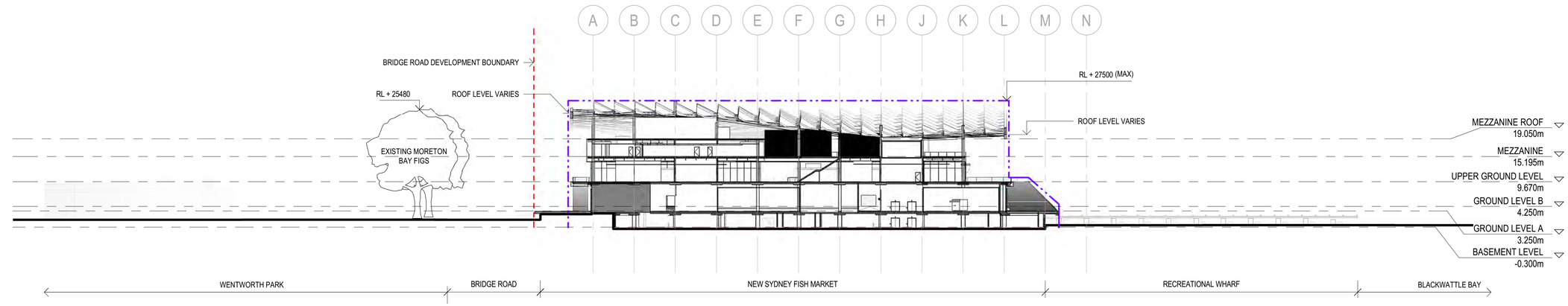
DRAWING
FLOOR PLAN BASEMENT

	ISSUE
AR-S2-B10 LB1-01	A



1 S2_SECTION BB



2 S2_SECTION DD

LEGEND:

- BUILDING ENVELOPE
- BRIDGE ROAD DEVELOPMENT BOUNDARY

NOTE
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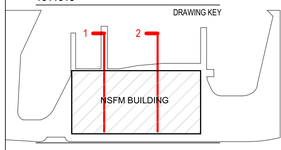

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STATUS
STATE SIGNIFICANT DEVELOPMENT APPLICATION
DRAWING
CROSS SECTIONS
ISSUE
AR-S2-D10 AAA-01 A

GLAZING
METAL CASSETTE CANOPY
CERAMIC TILES FASCIA
TIMBER BEAMS
MEMBRANE ROOF
A
B
C
MEZZANINE ROOF
19.050m
1155
2700
MEZZANINE
15.195m
1225
GLAZED FACADE
OFFICE
INTERNAL GLAZED FACADE
GLASS FACADE
4300
PUBLIC PROMENADE
AUCTION HALL
TRIPLE HEIGHT ROOM
FRAMELESS GLASS BALUSTRADE WITH STANCHIONS AND HANDRAILS
UPPER GROUND LEVEL
9.670m
645
CERAMIC FASCIA
GRC PANELS TO EXTERNAL SOFFIT
LOUVRES
CLEAR FIXED GLASS
TIERED SEATING
4775
SHARED PEDESTRIAN WALKWAY
SOUTHERN PROMENADE STAIRS
CLEANER'S ROOM/ STORAGE
PUBLIC DOMAIN LEVEL VARIES
(REFER TO LANDSCAPE ARCHITECT DRAWING)
GROUND LEVEL B
4.250m
1000
GROUND LEVEL A
3.250m
EXISTING SITE
LEVEL (VARIES)
APROXIMATE LOCATION OF SEA WALL
SUPPLY INTAKE PLENUM
BASEMENT PARKING
3550
BASEMENT LEVEL
-0.300m

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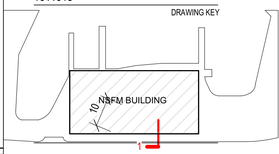

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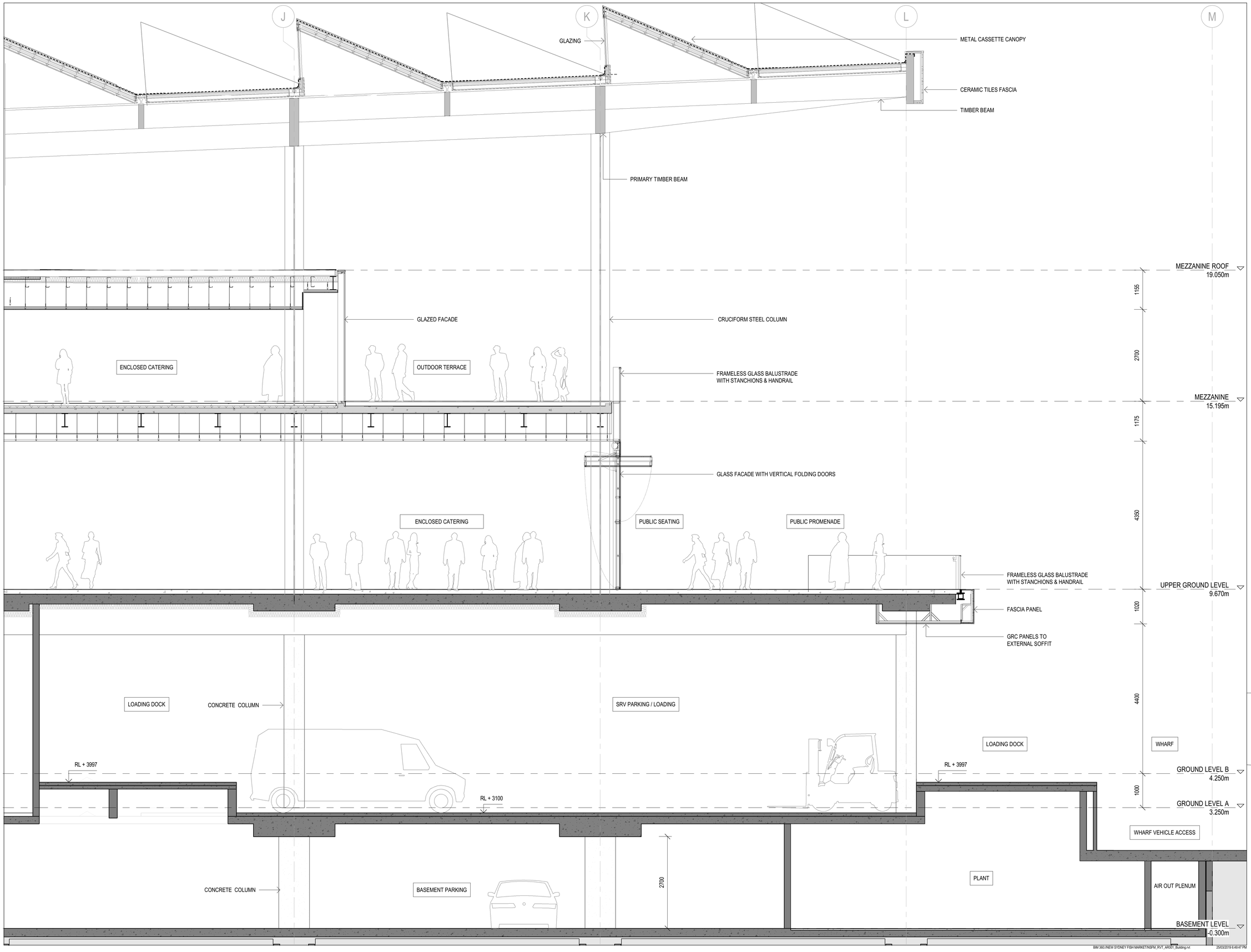
STATUS
STATE SIGNIFICANT DEVELOPMENT APPLICATION
DRAWING

AUCTION & OFFICE SECTION

	ISSUE
AR-S2-E43 AAA-01	A



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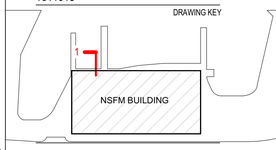

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STATUS
STATE SIGNIFICANT
DEVELOPMENT APPLICATION

DRAWING
FOOD & BEVERAGE SECTION

AR-S2-E43 AAA-02 | ISSUE A

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Document Status

Rev No.	Author	Reviewer	Approved for Issue		
		Name	Name	Signature	Date
A	Chris Bielby	Joanne Rosner	Draft for UrbanGrowth NSW review		01/03/2018
0	Chris Bielby	Joanne Rosner	Joanne Rosner		03/09/2018
1	Chris Bielby	Joanne Rosner	Joanne Rosner		02/11/2018
2	Chris Bielby	Joanne Rosner	Joanne Rosner		29/03/2019
3	Chris Bielby	Joanne Rosner	Joanne Rosner		04/04/2019

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