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Site Audit Report

Kamay Wharf, Captain Cook Drive, Kurnell and Anzac Parade, La Perouse

Audit Number: MP186

7 July 2023

Document Information

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Senversa acknowledges the traditional custodians of the land on which this work was created and pay our respect to elders past and present.

Contents

List of Acronyms

Acronym	Definition
Measures	
%	per cent
µg/L	Micrograms per Litre
ha	Hectare
km	Kilometres
m	Metre
mbgl	Metres below ground level
mg/kg	Milligrams per Kilogram
mg/L	Milligrams per Litre
ppm	Parts Per Million
General	
ACL	Added Contaminant Limit
ACM	Asbestos Containing Material
ADWG	Australian Drinking Water Guidelines
AF	Asbestos Fines
ALS	Australian Laboratory Services
ANZECC	Australian and New Zealand Environment and Conservation Council
ANZG	Australian and New Zealand Guidelines
ASS	Acid Sulfate Soil
BaP	Benzo(a)pyrene
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes & Naphthalene
CEMP	Construction Environmental Management Plan

Acronym	Definition
CEnvP SP	Certified Environmental Practitioner: Site Contamination Specialist
CLM Act	NSW Contaminated Land Management Act 1997
COC	Chain of Custody
Council	Sutherland Shire and Randwick Council
CPSS CSAM	Certified Professional Soil Scientist Contaminated Site Assessment and Management
CT	Certificate of Title
DA	Development Application
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DGV	Default Guideline Value
DP	Deposited Plan
DQI	Data Quality Indicator
DQO	Data Quality Objective
EDP	EDP Consultants Pty Ltd
EIL	Ecological Investigation Level
EPA	Environment Protection Authority (NSW)
ESL	Ecological Screening Level
Eurofins | mgt	Eurofins
FA	Fibrous Asbestos
GIL	Groundwater Investigation Level
HIL	Health Investigation Level
HSL	Health Screening Level
LCS	Laboratory Control Sample

Acronym	Definition
MBT	Monobutyltin
Mercury	Inorganic mercury unless noted otherwise
Metals	As: Arsenic, Cd: Cadmium, Cr: Chromium, Cu: Copper, Ni: Nickel, Pb: Lead, Zn: Zinc, Hg: Mercury
ML	Management Limits
MS	Matrix Spike
NATA	National Association of Testing Authorities
NEPM	National Environment Protection Measure
NHMRC	National Health and Medical Research Council
NL	Non-Limiting
n	Number of Samples
OCPs	Organochlorine Pesticides
OPPs	Organophosphorus Pesticides
PAHs	Polycyclic Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenyls
PFAS	Per- and Polyfluoroalkyl Substances
pH	A measure of acidity, hydrogen ion activity

Acronym	Definition
PID	Photoionisation Detector
PQL	Practical Quantitation Limit
QA/QC	Quality Assurance/Quality Control
RAP	Remediation Action Plan
RFI	Request for Information
RPD	Relative Percent Difference
SAQP	Sampling Analysis and Quality Plan
SAR	Site Audit Report
SAS	Site Audit Statement
SVOCs	Semi Volatile Organic Compounds
SWL	Standing Water Level
SWMP	Soil and Water Management Plan
TARP	Trigger Action Response Plan
TRHs	Total Recoverable Hydrocarbons
UXO	Unexploded Ordnance
VENM	Virgin Excavated Natural Material
VOCs	Volatile Organic Compounds
-	On tables is "not calculated", "no criteria" or "not applicable"

1.0 Introduction

A site contamination audit has been conducted in relation to the site at the Kamay Wharf, Captain Cook Drive, Kurnell and Anzac Parade, La Perouse NSW.

The audit was conducted to provide an independent review by an EPA Accredited Auditor of:

- the nature and extent of any contamination of the land i.e., a "Site Audit" as defined in Section 4 (1) (b) (i) of the NSW *Contaminated Land Management Act 1997* (the CLM Act).
- the nature and extent of any management of actual or possible contamination of the land i.e., a "Site Audit" as defined in Section 4 (1) (b) (ii) of the CLM Act.

1.1 Planning Approval

Development consent (SSI 10049, issued on 21 July 2022) was granted by the Minister for Planning for the construction of two wharves one at La Perouse and one at Kurnell. The consent was subject to several requirements of which conditions E62 and E63 relate to contamination and require a site audit statement prior to construction as follows:

E62 *The Proponent mist engage a NSW EPA-accredited site Auditor to review contamination reports relating to the site throughout the duration of the project to ensure that any work required in relation to sediment, soil or groundwater contamination is appropriately managed.*

E63 *Prior to the commencement of construction, the Proponent must obtain:*

a Section B1 Site Audit Statement to certify that the nature and extent of the contamination has been appropriately determined; and

a Section B2 Site Audit Statement to certify that the Soil and Water Management Plan required by Condition E61 is appropriate.

A copy must be provided to the Planning Secretary.

EDP Consultants Pty Ltd (EDP) were engaged by McConnell Dowell to provide a Certified Environmental Practitioner: Site Contamination Specialist (CEnvP SP) to review the SWMP. EDP reviewed the SWMP and confirmed that the SWMP complied with Transport for NSW requirements and specifications.

The audit was initiated to comply with those conditions (E62 and E63) of the DA approval and is therefore a statutory audit. Notification of the site audit (MP186) was forwarded to the EPA on 25 August 2022 (EPA Ref: DOC23/540196).

1.2 Scope of the Audit

Details of the Audit are:

Requested by:	Rajun Vutukuri on behalf of Transport for NSW (TfNSW)
Request/Commencement Date:	25 August 2022
Auditor:	Melissa Porter
Accreditation No.:	0803

The scope of the audit included:

- Review of the following reports ('contamination reports' as per E62):
    - 'Kamay Wharf Project, Preliminary Site Investigation – La Perouse Site' dated 6 December 2022 by Environmental Resources Management Australia Pty Ltd (ERM) (PSI La Perouse).
    - 'Kamay Wharf Project, Preliminary Site Investigation – Kurnell Site' dated 6 December 2022 by ERM (PSI Kurnell).
    - 'Kamay Wharf Project - Sediment Investigation, Sampling and Analysis Quality Plan' dated 18 January 2023 by ERM (Sediment SAQP).
    - 'Kamay Wharf Project - Sediment Investigation' dated 5 May 2023 by ERM (Sediment Investigation).
    - 'Re: Response to RFI – Kamay Ferry Wharves' dated 25 April 2023 by Environmental Risk Sciences Pty ltd (EnRisk) (Assessment of Protected Matters).
    - 'Kamay Wharf Project, Targeted Site Investigation' dated 28 June 2023 by ERM (TSI).
- Review of the following report ('Soil and Water Management Plan' as per E63) with respect to works to manage identified contamination in accordance with the scope of a site audit:
    - 'CEMP Appendix B6. Soil, Water and Contamination Management Plan, Kamay Ferry Wharves' dated June 2023 by McConnell Dowell (SWMP).
- Discussions with TfNSW and with ERM who undertook the investigation.

These reports were reviewed progressively during the audit process.

Note that the SWMP and WEMP are subplans of the overall Construction Environmental Management Plan (CEMP).

2.0 Site Details

2.1 Location

The site locality is shown on Attachment 1, Appendix A.

The site details are as follows:

Street address:	Captain Cook Drive, Kurnell NSW 2231and Anzac Parade, La Perouse NSW 2036
Identifier:	Kurnell: N/A – no lot and DP available. La Perouse Headland: Lot 1 DP9154424, Lot 5113 DP 752015, Lot 7045 DP 1026891.
Local Government:	Kurnell: Sutherland Shire Council, La Perouse: Randwick Council
Site Area:	Approximately 28.5 ha (Kurnell) and 11.5 ha (La Perouse).

The boundaries of the site are not well defined by streets/adjoining properties. A survey plan of the site has been provided (Attachment 2, Appendix A).

2.2 Zoning

The current zoning of the site, as provided by ERM, is as follows:

- Kurnell: E1 – National Parks and Nature Reservices, E2 – Environmental Conservation, W1 – Natural Waterways and B1 – Neighbourhood Centres.
- Lea Perouse: E1 – National Parks and Nature Reservices, RE1 – Public Recreation and SP2 - Infrastructure.

2.3 Adjacent Uses

The site is located within an area of residential and recreational land. The surrounding site use includes:

Kurnell

North: Botany Bay.

East: Undeveloped recreational bushland followed by Botany Bay/Pacific Ocean.

South: Low density residential dwellings followed by the former Kurnell refinery (Caltex Kurnell Terminal).

West: Low density residential dwellings followed by undeveloped bushland/wetlands and Botany Bay.

The Caltex Kurnell Terminal is located approximately 225 m to the south east. A clean up notice was issued for the terminal by the NSW EPA. The former Caltex Kurnell Service Station is located approximately 850 m to the south west. A number of historical businesses were noted at or near to the Kurnell site between 1930 and 2010 including chemical, electrical and paint manufacturing, retail grocers, light carriers, dog and cat breeders, glass merchants, carpenters, concrete contractors, patternmakers/engineering, air conditioning, demolition contractors, and nurseries. A NSW EPA surrendered licence for discharge to water was noted for Ausgrid at the site.

La Perouse

North: Frenchmans Bay followed by low density residential dwellings and recreational parkland.

East: Undeveloped recreational bushland followed by Botany Bay/Pacific Ocean.

South: Botany Bay.

West: Botany Bay followed by industrial land comprising fuel/chemical storage located approximately 1.5 km to the west of the site.

Historical businesses were noted at or near to the La Perouse site between 1930 and 2010 including boat launches, equipment, hires and repairs, electrical contractors, printing engineers and pest control services. Surrendered licences were noted near to the site for discharge to waters and water based extractive activities for Ausgrid and the NSW state government. A portion of Botany Bay has also been identified as containing potential unexploded ordnance (UXO) adjacent to the southeast of the site.

It is also noted that Botany Bay has some sources of per- and polyfluoroalkyl substances (PFAS) in the area making it difficult to attribute detections to individual sources.

2.4 Site Condition

ERM noted the following during the TSI:

- The Kurnell site is currently undeveloped recreational and with beach, open grass parkland, vegetated bushland and open water.
- Captain Cook Drive is present along the southern boundary of the Kurnell site.
- The Kurnell site is generally flat with a slight slope to the north/northeast.
- The La Perouse site is currently comprised of undeveloped recreational land including open grass parkland and open water.
- Anzac Parade is present along the southern portion of the La Perouse site.
- The La Perouse site is generally flat with a slight slope to the south/southeast.

2.5 Proposed Development

It is understood that the site is to be redeveloped by Transport for NSW as a ferry wharf in both Kurnell and La Perouse to allow crossing between the two locations.

For the purposes of this audit, the ‘recreational’ land use scenario will be assumed.

3.0 Site History

ERM provided a site history based on aerial photographs, site photographs, NSW EPA records, WorkCover dangerous goods records and/or Certificates of Title (CT) and is summarised in Table 3.1.

Table 3.1: Site History

Date	Activity
1930s	La Perouse – undeveloped land with rock outcroppings. Anzac Parade is present and unsealed. A small jetty is located on the western boundary. The surrounding area is generally undeveloped land with several residential building to the north.
1940s to early 1950s	La Perouse – buildings appear to have been constructed to the east of the site. These are understood to be part of Defence operations in the area. Additional residential properties were constructed to the north. One building from the Defence operations to the east of the site remained by 1951 likely the La Perouse Museum building.
Mid 1950s to 1960s	Kurnell – undeveloped land with scattered vegetation, Caption Cook Drive is present and unsealed. The surrounding area is generally undeveloped bushland with low density residential properties to the west and Kurnell Caltex Terminal to the south. The oil refinery wharf extending from the Kurnell refinery into Botany Bay is located approximately 500m to the west of the site. A small jetty was constructed at the site between 1956 and 1961. La Perouse – Anzac Parade was sealed.
1970 to present	Kurnell – Captain Cook Drive has been sealed. The jetty was removed between 1972 and 1975. Significant sedimentation was noted, this was removed by 1978. La Perouse – The jetty was removed between 1971 and 1975.

The summary indicates that both the Kurnell and La Perouse sites have largely been undeveloped land. The Caltex Terminal has been located to the south east of the Kurnell site since at least the mid 1950s. The La Perouse site was adjacent to Defence operations during World War 2. Jetties were present at both of the sites however had been demolished by 1975.

In the auditor's opinion, the site history provides an adequate indication of past activities.

4.0 Contaminants of Concern

ERM provided a list of the contaminants of concern and potentially contaminating activities. These have been tabulated in Table 4.1.

Table 4.1: Contaminants of Concern

Area	Activity	Potential Contaminants
Kurnell and La Perouse	Uncontrolled fill	Metals, total recoverable hydrocarbons (TRH), benzene, toluene, ethyl benzene and xylene (BTEX), polycyclic aromatic hydrocarbons (PAHs), organochlorine pesticides (OCPs), organophosphate pesticides (OPPs), phenols, semi volatile organic compounds (sVOCs), volatile organic compounds (VOCs) and asbestos.
Kurnell and La Perouse	Historical onsite and surrounding land uses	Metals, TRH, BTEX, sVOCs, VOCs, nutrients, inorganics, PFAS and tributyltin (TBT).
Kurnell and La Perouse	Hazardous building material	Lead, polychlorinated biphenyls (PCBs) and asbestos.
L**a Perouse**	Adjacent Defence operations	Unexploded ordinances (UXO).

ERM noted that further investigation of potential UXOs indicated that this was outside of the site boundary. Therefore, it was not considered a potential concern.

PCBs have not been analysed for by ERM in the soil. However, given that there are no indications of structures or storage of fuels/oil at the site, the risk of undetected PCBs is considered low. PCBs were analysed within sediments and results indicated below detection (see Section 9).

The auditor considers that the analyte list used by ERM adequately reflects the site history and condition.

5.0 Stratigraphy and Hydrogeology

Following a review of the reports provided, a summary of the site stratigraphy and hydrogeology was compiled as follows.

5.1 Stratigraphy

The nature of the soil is as follows:

- Kurnell – sandy topsoil overlying sandy fill (approximately 0 - 0.7 metres below ground level (mbgl)) overlying sand and clay (typical depths 0.2/0.7 – 2.0 mbgl) and overlying sandstone (approximately 2 m depth).
- La Perouse - sandy topsoil overlying sandy fill (approximately 0 - 0.7 mbgl) overlying sand and clay (typical depths 0.2/0.7 – 2.0 mbgl) and overlying sandstone (approximately 2 m depth).
- Sandy fill had inclusions of plastic, concrete, gravel, glass and ACM identified. Historical roadbase also identified at one location in La Perouse.

Some investigation locations into soil were terminated in fill. However, there is sufficient information overall to determine the likely depth to natural across the site.

The nature of the sediments is as follows:

- Kurnell – shallow sediments primarily consisting of coarse sand and shell fragments.
- La Perouse – shallow sediments primarily consisting of coarse sand and shell fragments (up to 50% shell fragments).

The depth of sediments is approximately around 0.75 m depth overlying rock. Enrisk note that ‘the seabed is likely to be mostly rock which doesn’t easily get disturbed (but may hold small amounts of material that could be disturbed by activities) or sand which can get disturbed but the majority of which rapidly settles due to the size and weight of the particles’.

ERM note there is a high probability of acid sulfate soil (ASS) in the marine sediments. Assessment by ERM has identified a high risk of ASS at the site particularly within the sediments. Management of the potential acid sulfate soil is likely to be required and should be considered in the Soil and Water Management Plan to be implemented as part of the construction works.

The auditor considers that the depth of fill and underlying stratigraphy and nature of the sediment composition have been adequately characterised.

5.2 Hydrogeology

Groundwater investigations at the site have not been undertaken. Depth to groundwater over the site is not known. Groundwater was not encountered during the intrusive investigation. Groundwater is considered likely to flow to Botany Bay at each of the sites.

The nearest surface water receptor is Botany Bay. ERM reported that surface water from the site is likely to flow into the stormwater infrastructure of Captain Cook Drive for the Kurnell site and Anzac Parade for La Perouse site and to infiltrate into the site soil in unsealed portions or flow into Botany Bay.

Registered bores for water supply, domestic, household and monitoring purposes are located within a 2km radius of the Kurnell and La Perouse sites, with 11 and 37, respectively. The search was conducted by Land Insight and Resources on 28 July 2020 and 12 August 2020. Standing water levels (SWLs) for bores within the radius for the Kurnell site were between 0 and 3 mbgl and for the La Perouse site were between 0 and 143 mbgl (with the majority reported between 3 and 8 mbgl).

The auditor concludes that the shallow formation underlying the site is of low permeability and therefore the potential for significant groundwater contamination or migration of contamination is low. Given that significant soil contamination has not been identified at the site (see Section 8), the auditor is satisfied that intrusive assessment of groundwater is not required at the site.

The site is located in a low-lying area and includes Botany Bay. As such groundwater is likely to be tidal, saline and unsuitable for use. Considering this, characterisation of the groundwater is not considered necessary from the perspective of land suitability. ERM (TSI) consider that ‘where groundwater will not be intersected, it is the opinion of ERM that the risk from potential contamination within underlying groundwater aquifers to impact the project is considered to be low’.

6.0 Evaluation of Quality Assurance and Quality Control

The auditor has assessed the overall quality of the data by review of the information presented in the referenced reports, supplemented by field observations. The auditor's assessment follows in Tables 6.1 and 6.2.

Table 6.1: QA/QC – Sampling and Analysis Methodology Assessment

Sampling and Analysis Plan and Sampling Methodology	Auditor's Opinion
Data Quality Objectives (DQO) ERM defined specific DQOs in accordance with the seven-step process outlined in EPA (2017) Guidelines for the NSW Site Auditor Scheme.	Adequate.
Sampling pattern and locations Investigation locations were spaced to target areas within the construction footprint. **Sampling density** Soil: A judgmental sampling approach was adopted for the investigations and to target areas within the proposed construction footprint. 10 locations and 9 locations were advanced for the Kurnell and La Perouse sites respectively. Locations were spaced approximately every 50 m for Kurnell and every 25 m for La Perouse. The sampling densities for asbestos were not doubled based on the Western Australian Department of Health (WADoH) (2009) Guidelines for the Assessment and Management of Asbestos-Contaminated Soils in Western Australia. Samples analysed for asbestos were not collected as outlined in NEPM (2013) (Schedule B1); however, it is noted that 500ml samples were collected for analysis of fibrous asbestos from all soil locations. Sediment: Locations were targeted for areas of the highest potential for disturbance during construction and subsequent site use. Locations were spaced approximately every 26 m for Kurnell and every 19 m for La Perouse. The density was based on the minimum number of sample locations for up to 10,000 m^3 of potential contaminated material to be disturbed as outlined in the National Assessment Guidelines for Dredging (Australian Government, 2009), noting that only pilling is proposed. Elutriate: One surface water (sea water) and three sediment samples were collected from both the Kurnell and La Perouse sites for elutriate testing. The testing was undertaken by the laboratory by mixing the sediment samples with the sea water to determine the potential release of contaminants from sediments when disturbed. Sample numbers are based on the minimum number of sample locations for up to 10,000 m^3 of potential contaminated material to be disturbed as outlined in the National Assessment Guidelines for Dredging (Australian Government, 2009), noting that only pilling is proposed.	The auditor has considered the consistency in results, the magnitude of impacts and the lack of grossly contaminating historical land-based activities and considers the sampling density to be adequate to determine the nature and extent of contamination to support the preparation of a SWMP (and a RAP for asbestos impacts).

Sampling and Analysis Plan and Sampling Methodology	Auditor's Opinion
Sample depths Soil samples were collected and analysed from a range of depths, with the primary intervals being within the shallow fill (0.1-0.2 mbgl) and at and around the sand/clay interface (around 1 mbgl). Sediment samples were collected and analysed from a range of depths, with the primary intervals being at the sediment surface, 0.5 mbgl and 1 mbgl (where possible). Elutriate samples were collected and analysed from the most superficial sediment sample at 0.0 m. Surface water (sea water) samples were collected for elutriate testing.	Adequate to characterise the primary material types.
Sample collection method Soil: Sample collection was directly from the soil bores or excavated test pits, using new nitrile gloves between samples. Sediment: Sample collection was directly from the disposable aluminium sediment cores, using new nitrile gloves between samples. Elutriate: Sediment samples were collected from surface sediment samples. Surface water sample collection was using a dedicated 20 L drum and then decanted into laboratory supplied bottles. New nitrile gloves were used between samples.	Adequate
Decontamination procedures Sampling equipment was cleaned with tap water, detergent, and then tap water between sampling events to prevent cross contamination. New gloves were reportedly used for each new sample.	Adequate.
Sample handling and containers Samples were placed into prepared and preserved sampling containers provided by the laboratory and chilled during storage and subsequent transport to the labs. Samples for asbestos analysis were placed in plastic zip-lock bags.	Adequate.
Chain of Custody (COC) Completed chain of custody forms were provided in the report.	Adequate.
Detailed description of field screening protocols Soil and sediment: Field screening for volatiles was undertaken using a PID. Surface water: A water quality meter was used for field parameters.	Adequate.
Calibration of field equipment The reports indicated that calibration had been undertaken prior to use. Calibration certificates from the equipment supplier were provided for field work in November and December. Field calibration records were provided for field work in September, October and November.	Adequate.
Sampling logs Soil logs are provided within the report, indicating sample depth, PID readings and lithology. Sediment core logs were also provided within the reported, indicating sample depth, PID readings and lithology.	Adequate.

Table 6.2: QA/QC – Field and Lab Quality Assurance and Quality Control

Field and Lab QA/QC	Auditor's Opinion
Field quality control samples Field quality control samples including trip blanks, trip spikes, rinsate blanks, field intra-laboratory and inter-laboratory duplicates were undertaken. Intra- and inter-laboratory duplicates were collected at a frequency exceeding 1 in 20 samples. The intra- and inter-laboratory frequencies for PFAS of 1 in 10 were not met. Rinsate blanks were collected at a rate of one per day where non-dedicated sampling equipment was used. Trip blanks and trip spikes were collected at a rate of one per laboratory batch with the exception of: • One batch for the TSI; and • Three batches for the sediment investigation. Some batches did not include field quality control samples i.e., asbestos , secondary laboratory, or one re-batch. Two batches that didn't include a trip spike were received by the laboratory two to three days after sampling with one batch received at a slightly elevated temperature. One batch didn't specify sample temperature, and the remaining batch was received at an appropriate temperature on the day of sampling.	Although the duplicate frequencies outlined in the NEMP (2.0) for PFAS were not met, this is not considered to affect the usability of the data set. This is in consideration of RPD results (acceptable) and as low concentrations were reported. . Acceptable concentrations were reported for trip spikes and trip blanks where submitted. The potential for loss of volatiles and cross-contamination in the samples is considered by the auditor to be low. The field quality control samples are considered acceptable.
Field quality control results The results of field quality control samples were generally within appropriate limits. The following exceptions were noted: Three batches reported concentrations in the rinsate blank for TRH C10-C14 (0.2 mg/L), TRH F2 (0.12 mg/L), TRH C15-C28 (0.3 mg/L), TRH C29-C36 (0.5 mg/L), and acetone (0.004 mg/L). These concentrations are considered minor and unlikely to affect the overall usability or interpretation of the data set. RPDs for intra- and inter-laboratory soil duplicate samples in the TSI for copper, lead, zinc, and TRH C10-C36 (total) ranged from 33% to 200%. The highest results were adopted for use in the assessment. RPDs for intra- and inter-laboratory sediment duplicate samples in the sediment investigation for total organic carbon, various heavy metals, fluoranthene, chrysene, and total PAH ranged from 34% to 187%. In most cases, the primary result was larger than the duplicate result, indicating the most conservative result was adopted for use. Where the duplicate result was larger than the primary result, the concentrations were below the adopted criteria and are not considered to affect the overall interpretation of the dataset.	Overall, in the context of the dataset reported, the elevated RPD results are not considered significant, and the field quality control results are acceptable.
NATA registered laboratory and NATA endorsed methods Laboratories used included: Eurofins | mgt and National Measurement Institute as the primary laboratories, and ALS as the secondary laboratory. Laboratory certificates were NATA stamped.	Acceptable.

Field and Lab QA/QC	Auditor's Opinion
Analytical methods Analytical methods were included in the laboratory test certificates. Analytical methods were included in the laboratory test certificates. Some methods used by Eurofins were not NATA accredited, however, these were total or summations of analytes, and it is noted that the individual analyte methods were NATA accredited. Asbestos identification was conducted by Eurofins using polarised light microscopy with dispersion staining by method AS4964-2004 Method for the Qualitative Identification of Asbestos Bulk Samples.	The analytical methods are considered acceptable for the purposes of the site audit, noting that the AS4964-2004 is currently the only available method in Australia for analysing asbestos. DOH (2009) and enHealth (2005) state that "until an alternative analytical technique is developed and validated the AS4964-2004 is recommended for use".
Holding times Review of the COCs and laboratory certificates indicate that the holding times were generally met with the exception of two batches where holding times were exceeded by 6 days for vinyl chloride and styrene, and holding times for TRH, BTEX, PAHs, OCPs, and OPPs were exceeded by 9 days. ERM reported that holding times have generally been met. For vinyl chloride and styrene, this batch was from the secondary laboratory, therefore, it is not expected to affect the overall reliability of the data. It is noted that the trip spike included in the batch that exceeded holding times by 9 days for TRH, BTEX, PAHs, OCPs, and OPPs were within acceptable recoveries, therefore, the potential for loss of volatiles due to the exceeded holding times is considered low.	Acceptable.
Practical Quantitation Limits (PQLs) Soil: PQLs were less than the threshold criteria for the contaminants of concern except the below: Asbestos: The limit of detection for asbestos in soil was 0.01% w/w. TRH F1 200 mg/kg, trigger value 145-180 mg/kg. TRH F2 2500 mg/kg, trigger value 120 mg/kg and 170 mg/kg. Sediment: PQLs were less than the threshold criteria for the contaminants of concern. Surface Water: The following trigger values were less than the PQLs: Toxaphene 5 µg/L, trigger value 0.2 µg/L. PFOS 0.01 µg/L, trigger value 0.00023 µg/L. Cadmium 2 µg/L, trigger value 0.2 µg/L. Chromium 50 µg/L, trigger value 0.2 µg/L and 2 µg/L. Cobalt 10 µg/L, trigger value 1 µg/L. Copper 10 µg/L, trigger value 1.4 µg/L. Lead 10 µg/L, trigger value 3.4 µg/L. Mercury 1 µg/L, trigger value 0.06 µg/L. Zinc 50 µg/L, trigger value 8 µg/L. Chlordane 2 µg/L, trigger value 0.001 µg/L. Chlorpyrifos 2 µg/L, trigger value 0.009 µg/L. DDT 0.2 µg/L, trigger value 0.0004 µg/L. Endrin 0.2 µg/L, trigger value 0.008 µg/L. Fenitrothion 2 µg/L, trigger value 0.001 µg/L. Heptachlor 0.2 µg/L, trigger value 0.0004 µg/L. Hexachlorobenzene 0.2 µg/L, trigger value 0.1 µg/L. Methoxychlor 0.2 µg/L, trigger value 0.004 µg/L. Aldrin 0.2 µg/L, trigger value 0.003 µg/L.	The elevated TRH PQLs were raised due to the high concentration of the analytes in one sample. It is noted that no other samples reported exceedances for TRH F1 or F2, so this is unlikely to affect the overall usability of the data set. Asbestos: In the absence of any other validated analytical method, the detection limit for asbestos is considered acceptable. A positive result would be considered to exceed the "no asbestos detected in soil" criteria, providing this is applied within a weight of evidence approach to assess the significance of the exceedance, accounting for the history of the site and frequency of the occurrence. Surface Water: The elevated PQLs were marginally elevated above the trigger values and in the context of the results reported and site history, these discrepancies do not materially affect the outcome of the audit. It is noted that the PFOS PQL exceeds the 99% species protection guideline but meets the 95% species protection guideline of 0.13 µg/L. The exceedance of the 99% guideline is not considered significant as PFOS is not a chemical of concern for the site and the PFAS analysis was done as a broad screen of contamination.

Field and Lab QA/QC	Auditor's Opinion
Laboratory quality control samples Laboratory quality control samples including laboratory control samples, matrix spikes, surrogate spikes, blanks, internal standards and duplicates were undertaken by the laboratory. One batch for the sediment investigation which was a re-batch did not include matrix spike or surrogate analysis.	The re-batch that didn't include matrix spike or surrogate analysis is not considered to affect the usability of the data as these tests were undertaken in the original batch and were acceptable. Overall, the laboratory quality control samples undertaken is considered acceptable.
Laboratory quality control results The results of laboratory quality control samples were generally within appropriate limits, with the following exceptions: Spike recoveries were below the control limits for chromium, copper, nickel, and mercury in soil, and PFPeS, PFHxS, and PFOS in water (for a rinsate sample). Laboratory duplicate RPDs for copper, lead, mercury, zinc, benzo(a)anthracene, and total organic carbon for soil, and PFUnDA, PFBS, PFPrS, TRH >C10-C16, TRH >C16-C34, and nickel in water were outside the control limits Laboratory quality control results for N-2-fluorenylacetamide, benz(a)anthracene, chrysene, diethyl phthalate, phenacetin, 2-nitroaniline, 4-nitroaniline, beta-BHC, and dimethoate in two secondary batches reported recoveries 2-6% above the data quality indicators. Laboratory quality control results for 2-methylphenol, 2,4-dinotrophenol, m&p-cresol, and PFPeS in water reported recoveries above the data quality indicators in a primary soil batch. Surrogate recoveries for several PFAS analytes reported recoveries above and below the data quality indicators in eight batches. Surrogate recoveries for some phenols analytes reported recoveries below data quality indicators in four batches. Surrogate recoveries for some VOC analytes reported recoveries above and below data quality indicators in one batch.	The spike recoveries that are below the laboratory data quality indicators are not considered to affect the overall usability of the data the exceedances were due to matrix interference, or the sample was anonymous and from a secondary laboratory batch, or the sample was a field QC sample and not representative of the primary matrix. The RPD exceedances are not considered to affect the overall usability of the data as all exceedances passed the laboratories internal acceptance criteria. The laboratory control spike exceedances are not expected to affect the overall usability of the data as exceedances are either considered minor or were from a field QC water sample in a soil batch. The exceedances of surrogate recoveries are not considered to affect the usability of the data as the laboratory states that the PFAS exceedances were reviewed, and no data was affected. For remaining analyte groups, the potential for under-reporting is considered minimal as concentrations for all other analytes were reported below the PQL.
Data Quality Indicators (DQI) and Data Evaluation (completeness, comparability, representativeness, precision, accuracy) Predetermined data quality indicators (DQIs) were set for laboratory analyses including blanks, replicates, duplicates, laboratory control samples, matrix spikes, surrogate spikes and internal standards. These were discussed with regard to the five category areas. There was limited discussion regarding actions required if data do not meet the expected objectives.	An assessment of the data quality with respect to the five category areas has been undertaken by the auditor and is summarised below.

In considering the data as a whole the auditor concludes that:

- The data is likely to be representative of the overall conditions of the site.
- The data is complete.
- There is a high degree of confidence that data is comparable for each sampling and analytical event.
- The primary laboratory provided sufficient information to conclude that data is of sufficient precision.
- The data is likely to be accurate.

7.0 Environmental Quality Criteria

The auditor has assessed the results against Tier 1 criteria from National Environmental Protection Council (NEPC) National Environmental Protection (Assessment of Site Contamination) Measure 1999, as Amended 2013 (NEPM, 2013). Other guidance has been adopted where NEPM (2013) is not applicable or criteria are not provided. Based on the proposed development, the criteria for 'recreational landuse' has been referred to.

The auditor has assessed the **soil** data provided with reference to Tier 1 (screening) criteria from the following:

- Human Health Assessment
    - Health Based Investigation Levels (HIL C)
    - Soil Health Screening Levels (HSL C) for Vapour Intrusion. The most conservative criteria were adopted i.e. assumed depth to source < 1 m and sand.
    - CRC CARE (2011) Direct Contact (HSL C and intrusive maintenance worker).
    - Asbestos Health Screening Levels (HSL C).
- Ecological Assessment
    - Ecological Screening Levels (ESL Urban Residential) assuming coarse/fine soil.
    - Ecological Investigation Levels (EIL Urban Residential). In the absence of site-specific soil data on pH, clay content, cation exchange capacity and background concentrations, the published range of the added contaminant values have been applied as an initial screen.
- Management Limits (ML Residential/Open Space) assuming coarse soil.
- HEPA, 2020. PFAS National Environmental Management Plan (NEMP) released by the National Chemicals Working Group of the Heads of EPAs Australia and New Zealand (HEPA).
- Aesthetics
    - The auditor has considered the need for remediation based on the 'aesthetic' contamination as outlined in the NEPM (2013).

The auditor has assessed the **sediment** data provided with reference to Tier 1 (screening) criteria from the following:

- The Default Guideline Values and the Guideline Value-High criteria, for sediment quality in the Australian and New Zealand Guidelines for Freshwater and Marine Water Quality (ANZG 2018).
- Australian Government (2009) National Assessment Guidelines for Dredging (NAGD 2009).
- Simpson et al (2021) Chronic effects and thresholds for estuarine and marine benthic organism exposure to perfluorooctane sulfonic acid (PFOS)-contaminated sediments: Influence of organic carbon and exposure routes. This paper includes derivation of a sediment guideline for PFOS.
- US Dept Commerce National Oceanic and Atmospheric Administration (NOAA) Screening Quick Reference Tables (SQuiRTs). NOAA have developed preliminary screening values to identify impacts to coastal resources and habitats likely to be affected by hazardous wastes. These screening levels have been used where a concentration is above the PQL and no Australian guidance is available.

The auditor has assessed **surface water** validation data in reference to the following Tier 1 (screening) criteria:

- Human Health Assessment.
    - ADWG (2011) criteria with a factor of 10 for recreational use (non-volatiles only). With respect to screening criteria for recreational use, the NEPM (2013) refers to the National Health and Medical Research Council (NHMRC) (2008) 'Guidelines for Managing Risks in Recreational Water' (GMRRW). The GMRRW (NHMRC 2008) indicates that a qualitative assessment of recreational use can be undertaken using 10 times the concentrations of chemicals stipulated in the Australian Drinking Water Guidelines (ADWG) (NHMRC 2011). This is based on an assumed contribution for swimming equivalent to 10% of drinking water consumption.
    - WHO (2008) Petroleum Products in Drinking-water.
    - WHO (2011) Guidelines for drinking-water quality, fourth edition.
    - USEPA RSL (on-line) Residential Tap Water Criteria, applicable where the ADWG are not available, amended by a factor of 10 for recreational contact.
    - HEPA, 2020. PFAS NEMP. Values for recreational contact have been used .
- Ecological Assessment
    - Groundwater Investigation Levels (GILs) listed in NEPM (2013) for protection of aquatic ecosystems referenced in ANZECC (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality. The ANZECC 2000 guidelines have been updated in ANZG (2022) Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia. (Available at www.waterquality.gov.au/anz-guidelines). The Default Guideline Values (DGV) provided are concentrations of toxicants that should have no significant adverse effects on the aquatic ecosystem. The marine value for slightly to moderately disturbed ecosystems was adopted. This provides a 95% species protection level with some values modified based on bioaccumulation or acute-toxicity or potential toxicity to particular species.
    - HEPA, 2020. PFAS NEMP. The guideline value (GV) for slightly to moderately disturbed ecosystems with a 95 % level of protection was adopted for assessing direct toxicity and the 99 % value is adopted to assess bioaccumulation.

8.0 Evaluation of Soil Analytical Results

Soil samples were analysed for a variety of contaminants including petroleum hydrocarbons, PAHs, asbestos and heavy metals. The analytical results are summarised below in Table 8.1.

The results have been assessed against the environmental quality criteria. Soil sampling locations are shown as Attachment 3, Appendix A.

Table 8.1: Evaluation of Soil Analytical Results – Summary Table (mg/kg)

Analyte	N	Detections	Maximum	n > Human Health Screening Criteria	n > Terrestrial Ecological Screening Criteria
Lead	32	29	220	0 above HIL C of 600 mg/kg	0 above Generic ACL (public open space) of 1100 mg/kg
Benzene	32	0	<PQL	0 above HSL C 0-1 m, sand of NL	0 above ESL (public open space (fine) of 65 mg/kg
Toluene	32	0	<PQL	0 above HSL C 0-1 m, sand of NL	0 above ESL (public open space (fine) of 105 mg/kg
Ethyl benzene	32	0	<PQL	0 above HSL C 0-1 m, sand of NL	0 above ESL (public open space) (fine) of 125 mg/kg
Total Xylenes	32	0	<PQL	0 above HSL C 0-1 m, sand of NL	0 above ESL (public open space (fine) of 45 mg/kg
TRH C6-C10	32	0	<PQL	0 above ML (public open space) of 800 mg/kg	
TRH C10-C16	32	0	<PQL	0 above ML (public open space) of 1000 mg/kg	
F1 (TPH C6–C10 minus BTEX)	32	0	<PQL	0 above HSL C 0-1 m, sand of NL	0 above ESL (public open space) (coarse/fine) of 180 mg/kg
F2 (TPH >C10–C16 minus naphthalene)	32	0	<PQL	0 above HSL C 0-1 m, sand of NL	0 above ESL (public open space) (coarse/fine) of 120 mg/kg
F3 (TRH C16-C34)	32	6	**6800**	**1 above ML (public open space) of 3500 mg/kg**	**2 above ESL (public open space) (coarse) of 300 mg/kg**
F4 (TRH C34-C40)	32	4	**250**	0 above ML (public open space) of 10,000 mg/kg	0 above ESL (public open space) (coarse) of 1700 mg/kg
Naphthalene	32	1	0.9	0 above HSL C 0-1 m, sand of NL	0 above Generic ESL (public open space) of 170 mg/kg
Benzo(a)pyrene	32	5	84	-	**2 above ESL (public open space) (coarse/fine) of 0.7 mg/kg**

Analyte	N	Detections	Maximum	n > Human Health Screening Criteria	n > Terrestrial Ecological Screening Criteria
BaP TEQ	32	5	120	**3 above HIL C 3 mg/kg**	-
Total PAHs	32	8	**691**	**1 above HIL C 300 mg/kg**	-
Pentachlorophenol	32	0	<PQL	0 above HIL C 120 mg/kg	-
Total Phenols	32	0	<PQL	0 above HIL C 40,000 mg/kg	-
Arsenic	32	10	6.8	0 above HIL C 300 mg/kg	0 above Generic EIL (public open space of 100 mg/kg
Cadmium	32	2	0.8	0 above HIL C 90 mg/kg	-
Chromium	32	13	28	0 above HIL C 300 mg/kg	0 above most conservative ACL (public open space) of 190 mg/kg
Copper	32	19	**150**	0 above HIL C 17,000 mg/kg	**3 above most conservative ACL (public open space) of 60 mg/kg**
Mercury	32	8	0.4	0 above HIL C 80 mg/kg	-
Nickel	32	8	**49**	0 above HIL C 1200 mg/kg	**1 above most conservative ACL (public open space) of 30 mg/kg**
Zinc	32	24	**930**	0 above HIL C 32,000 mg/kg	**3 above most conservative ACL (public open space) of 70 mg/kg**
Total OCPs	32	0	<PQL	0 above HIL C	0 above EIL (DDT only)
Total OPPs	32	0	<PQL	0 above HIL C	-
sVOCs	32	0	<PQL	-	-
VOCs	32	0	<PQL	-	-
PFOS/PFHxS	32	5	0.0083	0 above NEMP (public open space) of 1 mg/kg	-
PFOA	32	0	<PQL	0 above NEMP (public open space) of 10 mg/kg	0 Above NEMP of 10 mg/kg
PFOS	32	5	0.0083	-	0 above NEMP (direct exposure) of 1 mg/kg 0 above NEMP (indirect exposure) of 0.01 mg/kg
Asbestos (FA/AF)	28	0	<PQL	0 above HSL 0.001%	-
Asbestos (ACM)	28	1	0.0018%	0 above HSL 0.02%	-

Analyte	N	Detections	Maximum	n > Human Health Screening Criteria	n > Terrestrial Ecological Screening Criteria
Asbestos (presence/absence)	**7**	**7**	Present	**-**	-

n number of samples

- No criteria available/used

NL Non-limiting

<PQL Less than the practical quantitation limit

*Note: The numbers presented in the above table have been complied and transcribed manually from data tabulated by the consultants and thus some errors may be present. Any such errors are not considered by the auditor to be significant in the overall context and amount of data reviewed and conclusions drawn regarding the site during the audit.

ERM (TSI) note that during onshore testing pitting works, builders waste and potential asbestos containing materials (ACM) were identified within fill at several test pits at both the Kurnell and La Perouse sites. This included seven locations, three within Kurnell and four within La Perouse. These locations were adjacent to roads at both sites.

Metals were detected in fill and natural soil with copper, nickel and zinc reported above the ecological criteria. Given the conservative criteria applied, these exceedances are considered unlikely to pose an unacceptable ecological risk. TRH and PAHs were also detected in fill. Exceedances of TRH and PAHs were reported at one location considered to be associated with roadbase from an historical road. ERM noted that PID readings were 0 ppm at this location. ERM state that the TRH and PAHs are unlikely to indicate widespread impacts. BTEX, phenols, OCPs, OPPs, sVOCs and VOCs were not reported above the detection limits.

In the auditor's opinion, the soil analytical results are consistent with the site history. The nature and extent of contamination within the soil at the site has been adequately characterised. Soil impacted by asbestos containing material requires remediation/management (refer to Section 13).

9.0 Evaluation of Sediment Analytical Results

Sediment samples were analysed for a variety of contaminants including petroleum hydrocarbons (BTEX, TRH PAHs), OPPs, OCPs, PCBs, TBT, MBT, VOCs, PFOS, asbestos and heavy metals. The analytical results are summarised below in Table 9.1.

The results have been assessed against the environmental quality criteria. Sediment sampling locations are shown as Attachment 3, Appendix A.

Table 9.1: Evaluation of Sediment Analytical Results – Summary Table (mg/kg)

Analyte	N	Detections	Maximum	n > ANZG Sediment Quality DGV 'High'	n > ANZG Sediment Quality DGV 'Low' / Dredging Guidelines, 2009 / Simpson et al (2021)
BTEX	41	0	<PQL	-	-
TRH C10-C36 (Sum)	41	0	<PQL	-	0 above DGV 280 mg/kg
Total PAHs	41	2	5.5	0 above DGV-High 50, mg/kg @1% TOC	0 above DGV 10, mg/kg @1% TOC
Arsenic	41	28	8.4	0 above DGV-High 70 mg/kg	0 above DGV 20 mg/kg
Boron	41	34		38	- -
Cadmium	41	0	<PQL	0 above DGV-High 10 mg/kg	0 above DGV 1.5 mg/kg
Chromium	41	22	63	0 above DGV-High 370 mg/kg	0 above DGV 80 mg/kg
Copper	41	5	36	0 above DGV High 270 mg/kg	0 above DGV 65 mg/kg
Lead	41	36		17	0 above DGV-High 220 mg/kg 0 above DGV 50 mg/kg
Manganese	41	36		46	0 above 260 mg/kg* -
Mercury	41	6	**0.2**	0 above DGV-High 1 mg/kg	**2 above DGV 0.15 mg/kg**
Nickel	41	1	21	0 above DGV-High 52 mg/kg	0 above DGV 21 mg/kg
Zinc	41	36	59	0 above DGV-High 410 mg/kg	0 above DGV 200 mg/kg
TBT	40	0	<PQL	0 above DGV-High 0.070 mg/kg @1% TOC	0 above DGV 0.009 mg/kg @1% TOC
Monobutyltin (MBT)	40	18		0.0024	0 above DGV-High 0.070 mg/kg @1% TOC (TBT GV used as surrogate) 0 above DGV 0.009 mg/kg @1% TOC (TBT DGV used as surrogate)

Analyte	N	Detections	Maximum	n > ANZG Sediment Quality DGV 'High'	n > ANZG Sediment Quality DGV 'Low' / Dredging Guidelines, 2009 / Simpson et al (2021)
Total DDT	41	0	<PQL	0 above DGV-High 46 mg/kg	0 above DGV 1.2 mg/kg
Chlordane	40	0	<PQL	0 above DGV-High 6 mg/kg	0 above DGV 4.5 mg/kg
Dieldrin	41	0	<PQL	0 above DGV-High 270 mg/kg	0 above DGV 2.8 mg/kg
Endrin	41	0	<PQL	0 above DGV-High 120 mg/kg	0 above DGV 2.7 mg/kg
Lindane	36	0	<PQL	0 above DGV-High 1 mg/kg	0 above DGV 0.9 mg/kg
Other OCPs	41	0	<PQL	-	-
Total PCBs	36	0	<PQL	0 above DGV High 280 mg/kg	0 above DGV 34 mg/kg
Total sVOCs	5	0	<PQL	-	-
Total VOCs	5	0	<PQL	-	-
PFOS	40	1	0.0004	-	0 above Simpson et al (2021) 0.06 mg/kg @1% TOC
PFOA	40	0	<PQL	0 above NEMP (public open space) of 10 mg/kg	-
PFHxS+PFOS	40	1	0.0004	0 above NEMP (public open space) of 1 mg/kg	-

n	number of samples
-	No criteria available/used
NL	Non-limiting
<PQL	Less than the practical quantitation limit
@1% TOC	Guideline normalised for 1% total Organic Carbon
*	Screening Quick Reference Tables (SQuiRTs) NOAA

*Note: The numbers presented in the above table have been complied and transcribed manually from data tabulated by the consultants and thus some errors may be present. Any such errors are not considered by the auditor to be significant in the overall context and amount of data reviewed and conclusions drawn regarding the site during the audit.

Concentrations of contaminants were generally low, either below the nominated criteria or below the PQL. Metals were detected in the sediment generally below the nominated criteria with the exception of mercury in two samples (1 m depth) from the Kurnell site which had a concentration of 0.2 mg/kg which is above the above the DGV value for mercury but below the DGV high criteria.

PFOS was detected in one surface sediment sample at the La Perouse site however the concentration was below nominated criteria. Concentrations of TRH, BTEX, OCPs, PCB and VOCs reported below detection.

TBT has been encountered in Botany Bay during earlier studies and modelling in the EIS is understood to have been conducted on assumed concentrations. TBT was not reported above the DGV in the sediment samples however there where detections of monobutyltin (MBT) which is a breakdown product from TBT. There are no guidelines for MBT so the concentrations were screened using the TBT guideline. This is a conservative approach as TBT is considered more toxic than MBT. MBT was not reported above the TBT guideline.

In the auditor's opinion, that the nature and extent of contamination within the sediments has been sufficiently established and that the concentrations of contaminants are generally low. Sediments may comprise ASS however it is understood that the estimated level of sediment that would be brought to the surface is low and, therefore, it is unlikely that ASS will pose a significant issue if material is not exposed to oxygen. If the construction method is inconsistent with this assumption, then the RAP should consider additional appropriate management controls and procedures and monitoring.

Further assessment was undertaken to determine the potential release of contaminants from sediments when disturbed, through elutriate sampling, as discussed in Section 10.

10.0 Evaluation of Elutriate and Surface Water Analytical Results

Elutriate and surface water samples were analysed for a variety of contaminants including petroleum hydrocarbons (TRH, BTEX, PAHs), OCPs, PFAS and heavy metals. The analytical results are summarised below in **Table 10.1**.

The results have been assessed against the environmental quality criteria in Table **10.1**. Surface water sampling locations are shown as Attachment 3, Appendix A.

Table 10.1: Summary of Elutriate and Surface Water Analytical Results (µg/L)

Analyte	n	Detections	Maximum	n > ANZG (2018)	n > adopted criteria for recreational contact
TRH C_6-C_{10} less BTEX (F1)	8	0	<PQL	-	0 above 90 µg/L
TRH >C_{10}-C_{16} less naphthalene (F2)	8	0	<PQL	-	0 above 900 µg/L
F3 (TRH >C16-C34)	8	0	<PQL	-	0 above 900 µg/L
F4 (TRH >C34-C40)	8	0	<PQL	-	0 above 900 µg/L
Benzene	8	0	<PQL	0 above 950 µg/L	0 above 1 µg/L
Toluene	8	0	<PQL		0 above 800 µg/L
Ethyl benzene	8	0	<PQL		0 above 300 µg/L
Xylene (total)	8	0	<PQL	0 above 200 µg/L	0 above 600 µg/L
Naphthalene	8	0	<PQL	0 above 16 µg/L	
Benzo(a)pyrene	8	0	<PQL	-	-
Arsenic	8	2	2	0 above 13 µg/L	0 above 100 µg/L
Boron	8	2 (surface water)	4100	-	0 above 41,000 µg/L
Cadmium	8	0	<PQL	0 above 0.2 µg/L	0 above 20 µg/L
Chromium	8	0	<PQL	0 above 0.2 µg/L	0 above 500 µg/L
Copper	8	0	<PQL	0 above 1.4 µg/L	0 above 20,000 µg/L
Lead	8	1 (surface water)	1	0 above 3.4 µg/L	0 above 100 µg/L

Analyte	n	Detections	Maximum	n > ANZG (2018)	n > adopted criteria for recreational contact
Manganese	8	1 (surface water)	6	0 above 80 µg/L	0 above 50 µg/L
Mercury	8	0	<PQL	0 above 0.06 µg/L	0 above 10 µg/L
Nickel	8	0	<PQL	0 above 11 µg/L	0 above 200 µg/L
Zinc	8	1 (surface water)	5	0 above 8 µg/L	-
Total OCPs	8	0	<PQL	0 above criteria	
PFOS	8	0	<PQL	0 above 0.13 µg /L*	-
PFOA	8	0	<PQL	0 above 19 µg /L	0 above 10 µg/L
PFOS/PFHxS	**8**	0	<PQL	-	0 above 2 µg/L

n number of samples
- No criteria available/used
<PQL Less than the practical quantitation limit
* PQL above the 99% SPP of 0.00023 µg/L.

Concentrations of analytes (TRH, BTEX, PAHs, PFAS, OCP. OPPs, TBT and most metals) in the surface water samples (background sample) from both Kurnell and La Perouse where less than the PQL. Minor detections of metals (arsenic, boron, lead, manganese and zinc) below the nominated guidelines were identified in the surface water samples. There is no marine guideline for boron however the ANZG 2018 technical brief for the freshwater guideline states that typical seawaters have concentrations of boron around 5,000 µg /L. The auditor considers that the metal concentrations in surface water to be consistent with that expected of seawater.

Concentrations of analytes in the elutriate from both Kurnell and La Perouse where less than the PQL, noting that higher PQLs for some chemicals were required than for the background samples due to the nature of the elutriate sample.

In the auditor's opinion, the non-detects of all contaminants in the elutriate, are considered consistent with the low concentrations reported for the sediment samples. Further assessment of the likely dispersal pathways of contaminants during construction and operation and the potential ecological risks was undertaken as discussed in Section 11.0.

11.0 Assessment of Ecological Risk

The ecological risks were specifically evaluated in the letter titled 'Response to RFI- Kamay Ferry Wharves' dated 25 April 2023 by EnRisks (EnRisks 2023). The letter was commissioned to respond to a request for information (RFI) from the Department of Climate Change, Energy, the Environment and Water (DCCEEW). The objectives of the work were to:

- Review existing data on the project.
- Provide input into the SAQP for sediment sampling.
- If contamination exceeded guidelines, to provide a report that satisfied the DCCEEW RFI specifically with regard to the following:
  - 'Describes the likely dispersal pathways during construction and operation for contaminants identified in the sediment analysis.
  - Discusses the potential impacts of contamination on protected matters during construction and operation, including *Posidonia australis* Seagrass Meadows of the Manning-Hawkesbury Ecoregion, White's Seahorse (*Hippocampus whitei*), Cauliflower Soft Coral (*Dendronephthya australis*), and Black Rockcod (*Epinephelus daemelii*).
  - Demonstrates how contamination will be managed to ensure construction and operation do not impact protected matters'.

11.1 Data Review

EnRisks reviewed the following data:

- Existing data from the EIS which included five sediment samples collected from Kurnell and La Perouse at depths ranging from 1 m to 8 m below the surface. Samples were analysed for petroleum hydrocarbons, metals, OCPs, organophosphorus pesticides OPPs and tributyltin related compounds.
- Additional information collected by ERM as part of the RFI. ERM developed an SAQP in response the RFI which included collection and analysis of sediment, elutriate and water samples:
  - Sediment samples were collected in 6 locations along the footprint of the proposed wharf at Kurnell and at La Perouse. Cores were taken to 1 m depth and sub sampled to provide the laboratory with 3 samples for analysis (surface, 0.5 m and 1 m depth).
  - Elutriate was generated from sediment samples collected at the surface of 2 locations at La Perouse and 4 locations at Kurnell.
  - Surface water samples were collected, 1 sample from each proposed wharf location.
  - Samples were analysed for petroleum hydrocarbons (BTEX and TRH), PAHs, metals, OCPs. OPPs, PCBs, PFAS and tributyltin related compounds.

EnRisks stated '*This evaluation identified that the data were of suitable quality for interpretation. Given the site history, the data collected provide sufficient data to determine if contamination exists in the area*.'

The auditor agrees the data collected was sufficient to identify if contamination is present.

11.2 Evaluation of Results

EnRisks referenced the following guidelines to evaluate the concentrations in sediment, surface water and elutriate samples.

- Australian Government (2009) National Assessment Guidelines for Dredging (NAGD 2009).
- ANZG, Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG 2018)
- Simpson, SL, Batley, GB & Chariton, AA (2013), Revision of the ANZECC/ARMCANZ Sediment Quality Guidelines, CSIRO Land and Water Science (Simpson, S.L. et al. 2013)
- ASC NEPM, National Environmental Protection Measure – Assessment of Site Contamination (NEPC1999 amended 2013a, 1999 amended 2013b)
- US Dept Commerce National Oceanic and Atmospheric Administration (NOAA) Screening Quick Reference Tables (SQuiRTs).

Where guidelines were not available, the PQL was used as a screening level. This approach is appropriate and consistent with that used by the auditor and presented in **Sections 9.0 and 10.0.**

11.2.1 Elutriate and Surface Water Samples

No chemicals were detected above the limits of reporting in any of the elutriate samples.

Minor detections of metals (boron, manganese and zinc) below the nominated guidelines were identified in the surface water samples. All other chemical concentrations were below the PQL. EnRisks identify that metals are naturally occurring in rocks and soil, and it is not unexpected that these chemicals detected in surface water.

11.2.2 Sediment Samples

Analytical results from deeper sediments (up to 8 m depth), collected as part of the EIS, show the concentrations of BTEX and TRH, PAHs, OCPs. OPPs, and TBT where below the PQL. The only chemicals that were detected above PQL in at least one sample were metals and MBT (at 1 location in Kurnell).

MBT is a breakdown product from TBT that was (prior to 2008) used as in antifouling paint on boats. There is no guideline for MBT so the value was compared to the TBT criteria, which is conservative as TBT is more toxic to marine life than MBT. All MBT results where an order of magnitude lower than TBT criteria, and therefore not considered to represent a risk to marine organisms.

The metal results were all below the nominated criteria and EnRisks note the metal concentrations are at concentrations that are at '*normally expected levels*'.

The auditor considers that the results from sampling conducted as part of the EIS confirm that the deeper sediment within the project footprint do not contain elevated levels of contaminants and that the effects to any organisms, should those sediments be disturbed, would be negligible.

Analytical results from the shallow samples collected as part of the RFI investigations show the concentrations of BTEX and TRH, OCPs. OPPs, PCBs, and TBT where below the PQL. The only chemicals that were detected above PQL in at least one sample were metals, MBT and total PAHs (at 1 location at La Perouse). PFOS was detected at 1 location at La Perouse below the nominated guideline, PFAS compounds at all other locations were below the PQL.

The concentrations of PAHs and MBT where below the nominated criteria and therefore not considered to represent a risk to marine organisms. The metal results, with the exception of mercury at two locations, were below the nominated criteria and EnRisks note the metal concentrations are at concentrations that are at '*normally expected levels*'.

The mercury concentration at the two locations at Kurnell (KS03-1m and KS04-0.9m) were reported at 0.2 mg/kg, above the DGV of 0.15 mg/kg, but below the high GV of 1 mg/kg. In assessing the exceedance EnRisks identify that:

- Laboratories only report results for mercury to one significant figure – i.e., the method is not sensitive enough to report to two significant figures (i.e. 0.15 mg/kg, for example). This means a result of 0.1 or 0.2 mg/kg could actually be 0.15 mg/kg depending on the rounding undertaken and the resolution of the result compared to the noise in the equipment.
- Results at around the limit of reporting have a larger measurement error than results that are well above the limit of reporting. This means results such as 0.1 mg/kg and 0.2 mg/kg are essentially the same as the limit of reporting (within the measurement error).

The auditor also considers that the samples adjacent to the elevated results at KS02, KS01 and KS05 had concentrations below the DGV, as did the samples collected from a shallower depth (KS04-0.5 and KS03-0.5) The deeper sediments, analysed from Kurnell during the development of the EIS also had concentrations of mercury below the PQL. The extent of the elevated mercury concentrations is therefore expected to be small. Overall EnRisks did not identify a risk associated with the mercury concentrations. The auditor agrees with this conclusion.

Overall En Risks conclude '*Analysis of shallow sediments from the footprints of both wharf locations, collected as part of the RFI investigation, confirm the sediment does not contain chemicals at concentrations above nominated guidelines'*.

The auditor agrees the ecological risk associated with contaminants in the sediment is low.

11.3 Evaluation of Listed Species

The evaluation of listed species focused on those identified in the RFI. EnRisks reviewed the ecology technical note prepared by ARUP (ARUP 2022) to understand the potential for these species to be living in a location relevant to the project and their potential to interact with sediments or be affected by sediment movement from the project:

- Black Rockcod. No areas identified within the project footprint that have the characteristics preferred by this species. There are locations close to the project footprint that may be relevant for this species.
- Seagrass Meadows of the Manning-Hawkesbury Ecoregion. Such species are present within the project footprint.
- Whites seahorse. Surveys undertaken during the preparation of the EIS did not find this species present in the project footprint. There were observations of the seahorse in areas adjacent to the project footprint.
- Cauliflower Soft Coral. Observations of this soft coral have been made in areas somewhat adjacent to the project footprint in areas where higher current flows would be expected. The Cauliflower Soft Coral is not expected in areas where seagrass meadows are located.

For all four species the key consideration was the '*potential for loss/degradation of habitats due to the movement of sediments or for sediments containing contaminants to move toward such habitats*.' An evaluation of the sediment disturbance is provided below.

11.3.1 Contamination Potential of the Sediment

The sediment, surface water and elutriate sampling results confirmed the low potential for contamination in the sediment. EnRisks also provided some additional discussion on the chromium and mercury concentrations identified in the sediment. Overall, EnRisks concluded the '*sediments, if disturbed, will not impact on any organisms in the project area, even the specific species of importance*.'

The auditor agrees with this conclusion.

11.3.2 Evaluation of Sediment Disturbance

The likely sediment disturbance during construction and operation of the wharves was evaluated. EnRisks provided a multiple lines of evidence approach which is summarised below:

- Natural conditions in Botany Bay and in the vicinity of the wharves. The background suspended solids concentration in Botany Bay is around 5 mg/L on average and up to 25 mg/L under extreme conditions. The sediment in the two wharf locations is primarily coarse sand with shell fragments with refusal on rock as shallow as 0.75m in some locations. Which suggests the limited sediment that would be disturbed would settle rapidly due to the size and weight of the particles.
- Construction methodology for the wharves and suspended sediment modelling during construction provided in the EIS. The modelling suggests that a change in suspended sediment load due to construction piling may result in an additional sediment load of between 0.1 and 4 mg/L. Changes in sediment load would not be visible at the smallest modelled distance of 20m. The changes in sediment load is well within the normal sediment load experienced by the local marine ecology.
- Refined evaluation of sediment disturbance by EnRisks. A temporary causeway is to be constructed during early works at Kurnell. The design of the causeway has changed since the EIS modelling, it will now be much smaller as more of the piling will be undertaken using equipment on barges or similar. The sediment disturbance during these works will be short (days to weeks) and the modelling in the EIS will have over-estimated the disturbance due to the change in design. The EIS modelling estimates that 20m from the works suspended solids of 2-22mg/L are expected. The actual suspended solid concentrations are expected to be less due to the change in design however even the worst case of 22 mg/L is within the normal range for Botany Bay.
- Calculations of suspended sediment during ferry/wharf operations provided by EnRisks. EnRisks consider it is possible that up to around 1 m of sediment may be disturbed from each berth area over the first year of operation. This will depend on whether sediments are present to that depth in those areas – it is possible that rock will be exposed at shallower depths which would limit the amount of sediment that could be disturbed. EnRisks estimate that the additional suspended solids that would settle out due to ferry movements around the berth is equivalent to 20 mg per square centimetre, which is negligible.

EnRisks concludes the potential for smothering of organisms of importance due to excess movement of sediment is extremely low/negligible during both construction of the wharves and operation of the ferry. The auditor agrees with this conclusion.

11.3.3 Uncertainties.

EnRisks provide a qualitative assessment of uncertainties that concludes that assessment is expected to result in an overestimate of actual exposure. Given the level of assessment and variable considered int e EIS modelling the qualitative assessment is considered adequate.

11.4 Conclusions

EnRisks concluded:

- *'the potential for sediment to be disturbed by these works is low and in line with naturally occurring sediment movement already occurring in Botany Bay*
- *the potential for contaminants to move from the sediment into the water column during disturbance is negligible (no detections for elutriate samples)*
- *the added levels of example contaminants that could move into areas adjacent to the project areas is negligible (calculations indicate added levels will be below the limit of reporting for the chemical).*

As a result, the potential for levels of contaminants in shallow sediments that might be disturbed during these works to impact on species of importance is low/negligible.'

The assessment by EnRisks does stipulate that the typical controls to reduce suspended sediment (such as silt curtains) should be employed during wharf construction. Suspended sediment controls should be consistent with:

- WA Environmental Protection Authority, Technical Guidance Environmental Impact Assessment of Marine Dredging Proposals (WA EPA 2016)
- EPA Victoria, Best Practice Environmental Management, Guidelines for Dredging (EPA Victoria 2001).

11.5 Auditors Opinion

Based on assessment of results against relevant guidelines and consideration of the overall investigation, it is the auditor's opinion that the contamination risk (other than asbestos) to human health and the environment associated with construction and operation of Kamay Wharves is low.

The auditor concludes that the risk to marine ecosystems, including the listed species, associated with the construction and operation of the ferry wharf is low. This conclusion is based on:

- The concentrations of contaminants in sediment, surface water and elutriate sampling were low and below the nominated criteria. The mercury concentrations in two sediment samples above the criteria was not considered significant.
- The coarse sandy sediment around the wharves would settle rapidly due to the size and weight of the particles.
- Sediment disturbed during construction pilling is expected to be within the range experienced within Botany Bay under natural conditions.
- Sediment disturbed by ferry operations pilling is expected to be within the range experienced within Botany Bay under natural conditions.

Normal suspended sediment controls during the wharf construction will need to be employed. The controls will need to comply with the following:

- WA Environmental Protection Authority, Technical Guidance Environmental Impact Assessment of Marine Dredging Proposals (WA EPA 2016)
- EPA Victoria, Best Practice Environmental Management, Guidelines for Dredging (EPA Victoria 2001).

12.0 Compliance with Regulatory Guidelines and Directions

The auditor has used guidelines currently approved by the EPA under Section 105 of the NSW Contaminated Land Management Act 1997 (Appendix C).

The investigation was generally conducted in accordance with SEPP (Resilience and Hazards) 2021 and reported in accordance with the NSW EPA (2020) Consultants Reporting on Contaminated Sites Contaminated Land Guidelines. The checklist included in that document has been referred to. The EPA's Checklist for Site Auditors using the EPA Guidelines for the NSW Site Auditor Scheme 2017 (October 2017) has also been referred to.

13.0 Conclusions and Recommendations

Based on the information presented in the contamination reports, the auditor concludes that:

- The nature and extent of contamination has been appropriately determined and that the risk from contaminants, other than asbestos, to human health and the environment associated with construction and operation of Kamay Wharves is low.
- Remediation of asbestos contamination is required and it is recommended that a Remedial Action Plan be prepared in accordance with the guidelines made and approved under section 105 of the Contaminated Land Management Act 1997. This RAP should be reviewed by an EPA-accredited Site Auditor. This process is contemplated and required in Conditions E64 to E69 of the planning consent.

Key elements required relating to the Remedial Action Plan are outlined in **Table 13.1.**

Table 13.1: Key Elements - Remedial Action Plan

Key RAP Elements	
Remediation required	Asbestos-containing material (ACM) in soil requires remediation. It is understood through discussions that further asbestos quantification assessment is not proposed and that the likely options are either excavation, validation and off-site disposal or encapsulation with a marker layer/suitable capping material under a long-term environmental management plan. The auditor considers that remediation of asbestos through these options is common practice and could be achieved. The RAP must be reviewed by the Site Auditor prior to implementation. Further comment and consideration will be given following review of the RAP.
Acid Sulphate Soil and Potential Acid Sulphate Soil	The Remediation Action Plan should consider ASS/PASS where likely to be encountered and disturbed during any proposed remedial works. The RAP must confirm the proposed extent of remedial works likely to intersect PASS/ASS, the nature and extent of testing required to confirm PASS/ASS prior to excavations, confirmation of the likely need for treatment and re-use or off-site disposal and ensure an Environmental Work Method Statement is prepared.
Off-Site Disposal	A waste classification report should be prepared and be provided to the auditor prior to implementation of the RAP, inclusive of an updated waste disposal tracking matrix. On completion of the works, all waste disposal documentation for material excavated from the audit area must be collated, reported on in an auditable format by the environmental consultant and provided to the auditor.
Unexpected Finds Protocol	An unexpected finds protocol (UFP) should be included in the RAP inclusive of a detailed flow chart and list roles and responsibilities of all parties involved. On completion of the works, the register should be provided to the auditor for review. Any additional RAP's prepared in response to unexpected finds would require auditor review.
Imported Material	The RAP should confirm that imported material must either be VENM, ENM or be classified under a Resource Recovery Exemption. The density of testing would need to be commensurate with the documentation provided and the consistency of the results. Visual inspection post arrival on site is required.
Environmental Safeguards	Environmental safeguards should be outlined specifically addressing the nature of the asbestos remedial works and disturbance of acid sulfate soils. Where additional environmental safeguards are required in response to unexpected finds of contamination, these should be provided to the auditor.

- The Soil Water Management Plan is considered suitable for the purposes of gaining planning approval. As the concentrations of chemical contaminants in the soil, sediment and elutriate samples were found to be low or non-detect, the Soil Water Management Plan is not considered directly relevant to the identified contamination from the auditor's perspective. It is considered that the identified contamination can be appropriately dealt with through the proposed remedial action plan.

14.0 Other Relevant Information

This audit was conducted on the behalf of TfNSW for the purpose of providing an independent review by an EPA Accredited Auditor of the nature and extent of any contamination of the land and the nature and extent of any management of actual or possible contamination of the land i.e., a “Site Audit” as defined in Section 4 (1) (b) (i) and (ii) of the CLM Act.

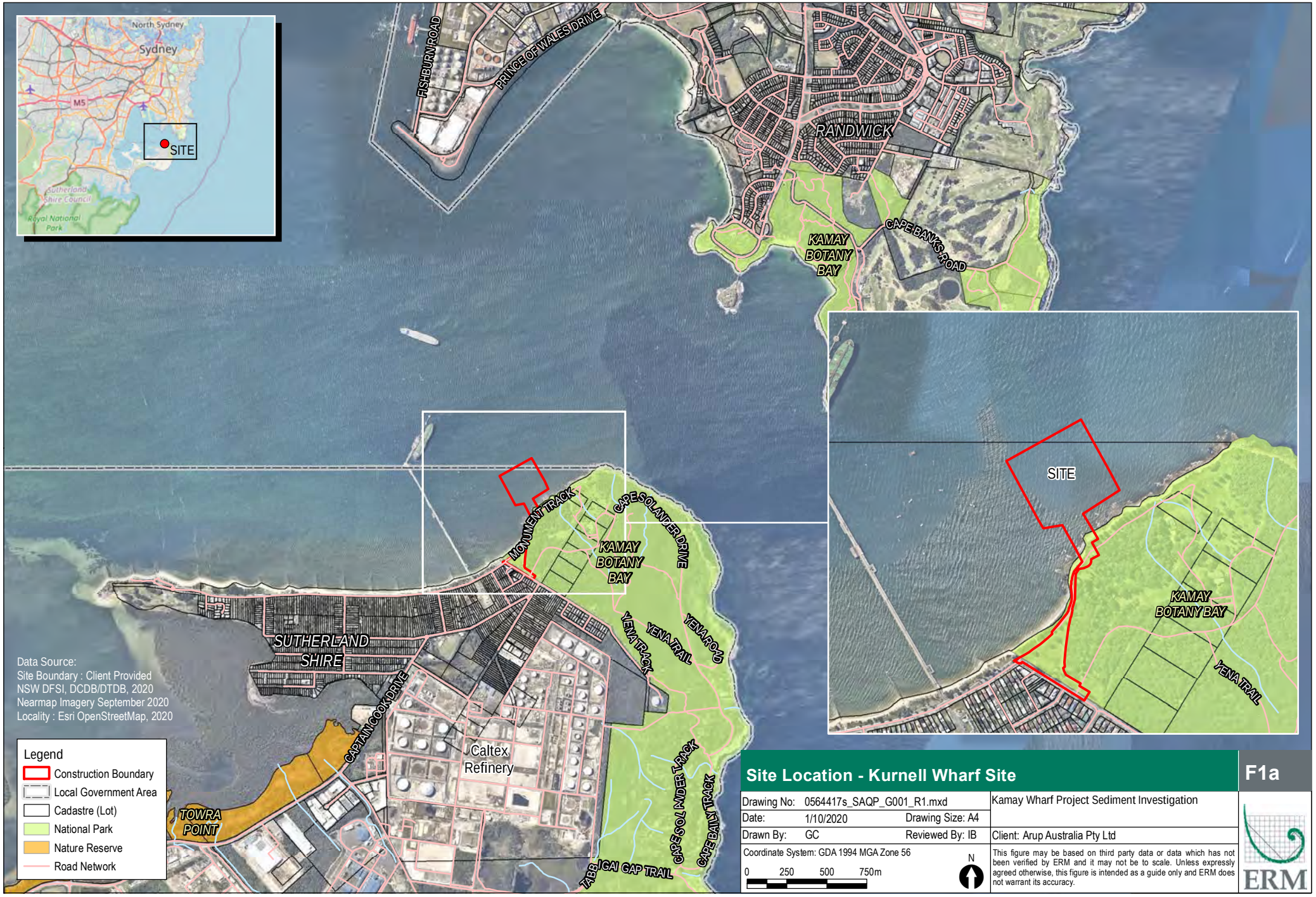
This summary report may not be suitable for other uses. ERM included limitations in their report. The Audit must also be subject to those limitations. The auditor has prepared this document in good faith, but is unable to provide certification outside of areas over which the auditor had some control or is reasonably able to check.

In drawing conclusions, the auditor used reasonable care to avoid reliance upon data and information that may be inaccurate, however a degree of uncertainty is inherent in all subsurface investigations and there remains the possibility that variations may occur between sample locations. The audit and this report are limited by and rely upon the scope of the review, and the information provided by the Client and their consultants and representatives through documents provided to the auditor. The audit is based on a review of the subsurface condition of the site at the time of assessment, as described in the assessment reports attached to the audit report and site inspections conducted by the auditor and their representatives. The auditor’s conclusions presented in this report are therefore based on the information made available to them and arising from their own observations conducted during the audit. If the auditor is unable to rely on any of those documents, the conclusions of the audit could change.

It is not possible in a Site Audit Report to present all data which could be of interest to all readers of this report. Readers are referred to the referenced reports for further data. Users of this document should satisfy themselves concerning its application to, and where necessary seek expert advice in respect to, their situation.

In reaching their conclusions about the site, the Client and NSW EPA may use this audit report and site audit statement. The scope of work performed as part of the audit process may not be appropriate to satisfy the needs of any other person. Any other person’s use of, or reliance on, the audit document and report, or the findings, conclusions, recommendations or any other material presented or made available to them, is at that person’s sole risk.

Appendix A: Attachments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Sydney
M5
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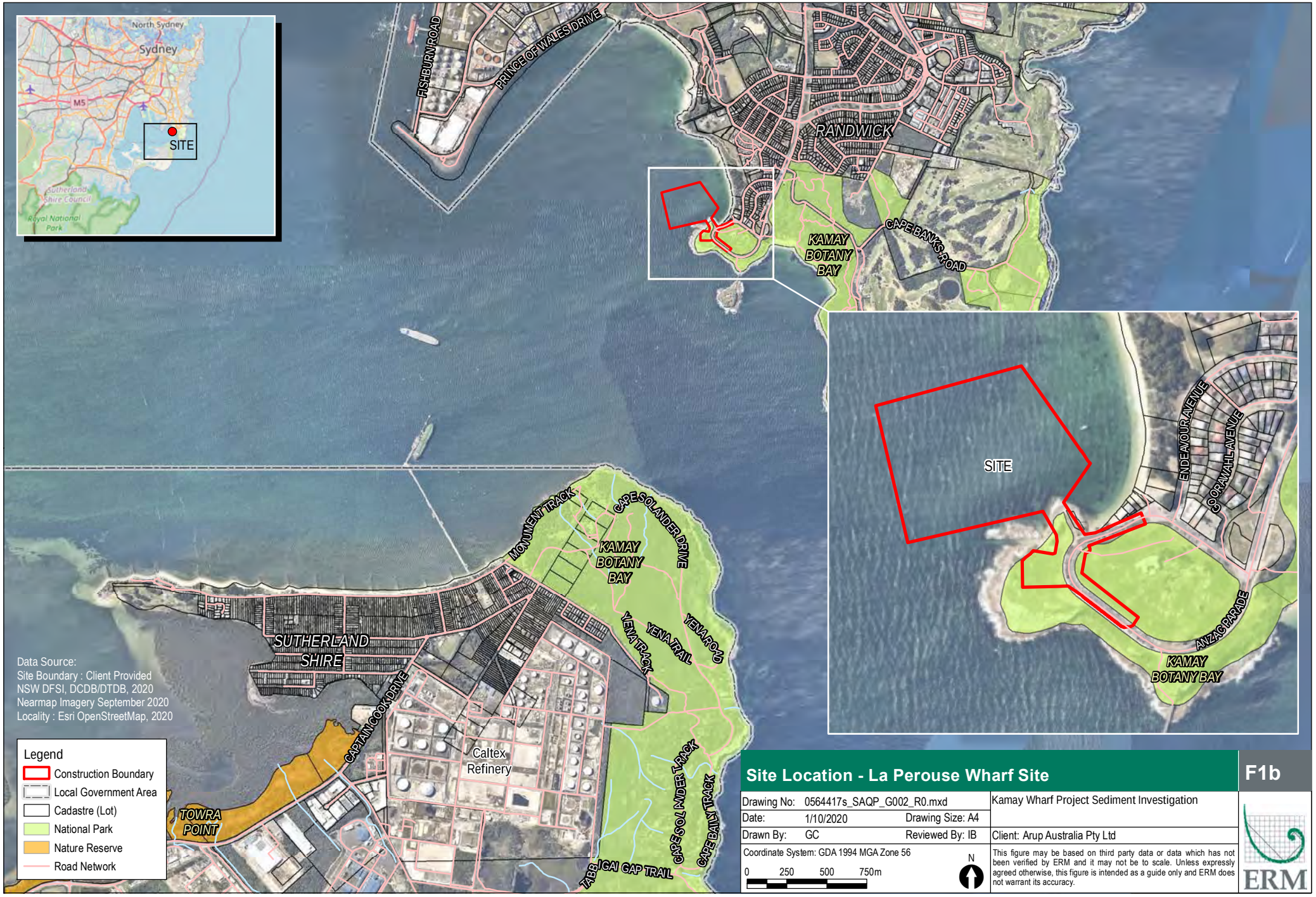
Sutherland Shire Council
Royal National Park
FISHBURN ROAD
PRINCE OF WALES DRIVE
RANDWICK
KAMAY BOTANY BAY
CAPE BANKS ROAD
SITE
KAMAY BOTANY BAY
YENA TRAIL
MONUMENT TRACK
CAPE SOLANDER DRIVE
KAMAY BOTANY BAY
YENA TRACK
YENA TRAIL
YENA ROAD
SUTHERLAND SHIRE
CAPTAIN COOK DRIVE
Caltex Refinery
TOWRA POINT
CAPE SOLANDER TRACK
CAPE BAILY TRACK
TABBIGAI GAP TRAIL
Data Source:
Site Boundary : Client Provided
NSW DFSI, DCDB/DTDB, 2020
Nearmap Imagery September 2020
Locality : Esri OpenStreetMap, 2020
Legend
Construction Boundary
Local Government Area
Cadastre (Lot)
National Park
Nature Reserve
Road Network
Site Location - Kurnell Wharf Site
F1a
Drawing No: 0564417s_SAQP_G001_R1.mxd
Date: 1/10/2020
Drawing Size: A4
Drawn By: GC
Reviewed By: IB
Coordinate System: GDA 1994 MGA Zone 56
0 250 500 750m
N
Kamay Wharf Project Sediment Investigation
Client: Arup Australia Pty Ltd
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM



Site Location - La Perouse Wharf Site

F1b

Drawing No:	0564417s_SAQP_G002_R0.mxd		Kamay Wharf Project Sediment Investigation
Date:	1/10/2020	Drawing Size: A4	
Drawn By:	GC	Reviewed By: IB	Client: Arup Australia Pty Ltd

Coordinate System: GDA 1994 MGA Zone 56

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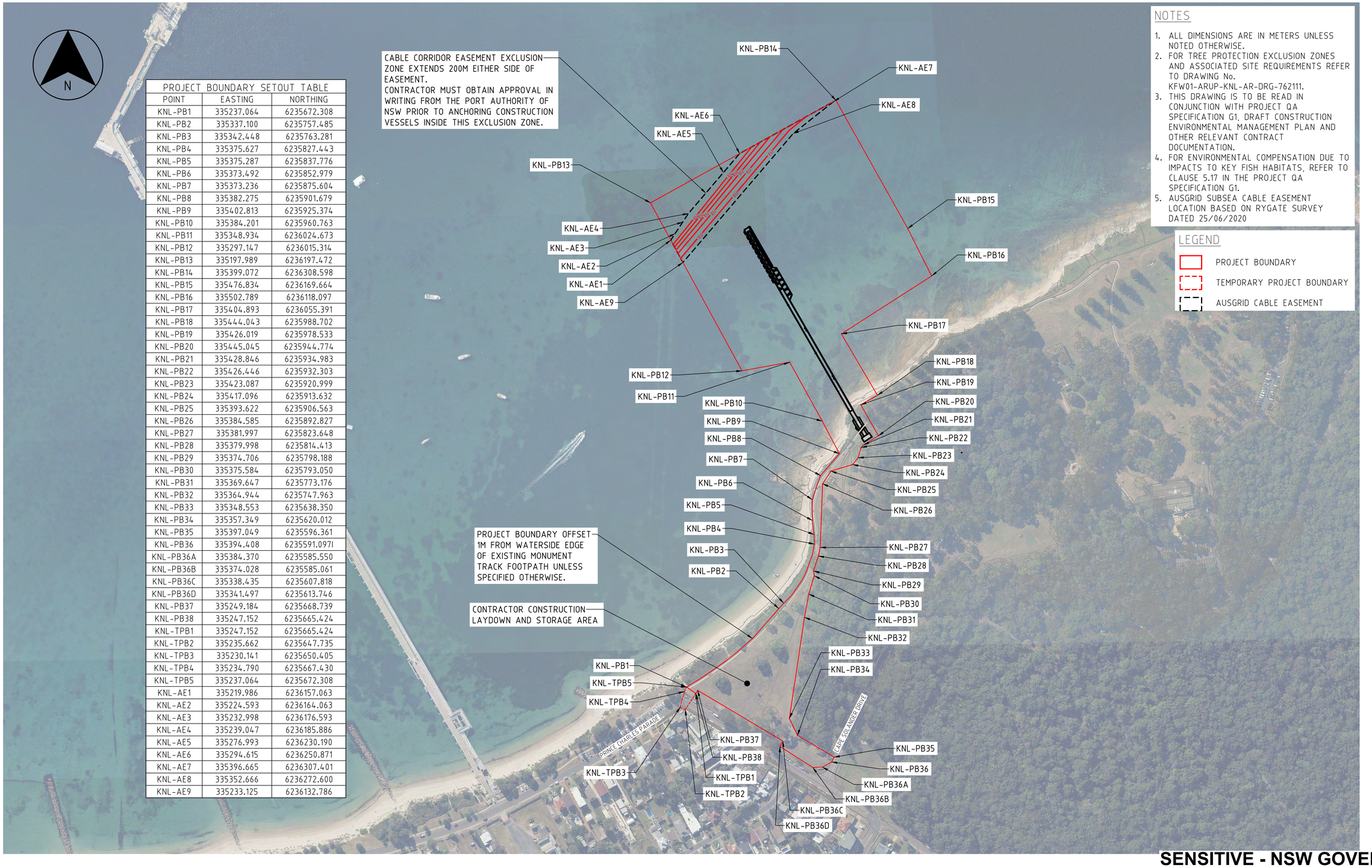

PROJECT BOUNDARY SETOUT TABLE		
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KNL-PB13	335197.989	6236197.472
KNL-PB14	335399.072	6236308.598
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KNL-AE3	335232.998	6236176.593
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NOTES

1. ALL DIMENSIONS ARE IN METERS UNLESS NOTED OTHERWISE.
2. FOR TREE PROTECTION EXCLUSION ZONES AND ASSOCIATED SITE REQUIREMENTS REFER TO DRAWING No. KFW01-ARUP-KNL-AR-DRG-762111.
3. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH PROJECT QA SPECIFICATION G1, DRAFT CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN AND OTHER RELEVANT CONTRACT DOCUMENTATION.
4. FOR ENVIRONMENTAL COMPENSATION DUE TO IMPACTS TO KEY FISH HABITATS, REFER TO CLAUSE 5.17 IN THE PROJECT QA SPECIFICATION G1.
5. AUSGRID SUBSEA CABLE EASEMENT LOCATION BASED ON RYGATE SURVEY DATED 25/06/2020

LEGEND

- PROJECT BOUNDARY
- TEMPORARY PROJECT BOUNDARY
- AUSGRID CABLE EASEMENT

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FOR CONSTRUCTION

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CO-ORDINATE SYSTEM: MGA ZONE 56 | HEIGHT DATUM: A.H.D | SCALE: 1:2000

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DRAWN	ANDREW CROUCH	23.06.21
DESIGNED	ANDREW CROUCH	23.06.21
DRG CHECK	ANDREW CROUCH	15.10.21
DESIGN CHECK	ANDREW CROUCH	15.10.21
APPROVED	DAVID DACK	15.10.21

KAMAY FERRY WHARVES

KURNELL WHARF
PROJECT BOUNDARY PLAN

FILE No.	SHEET: 1 OF 1	A1
STATUS: ISSUED FOR CONSTRUCTION		©
DRG No. KFW01-ARUP-KNL-AR-DRG-762205	0	EDMS No.

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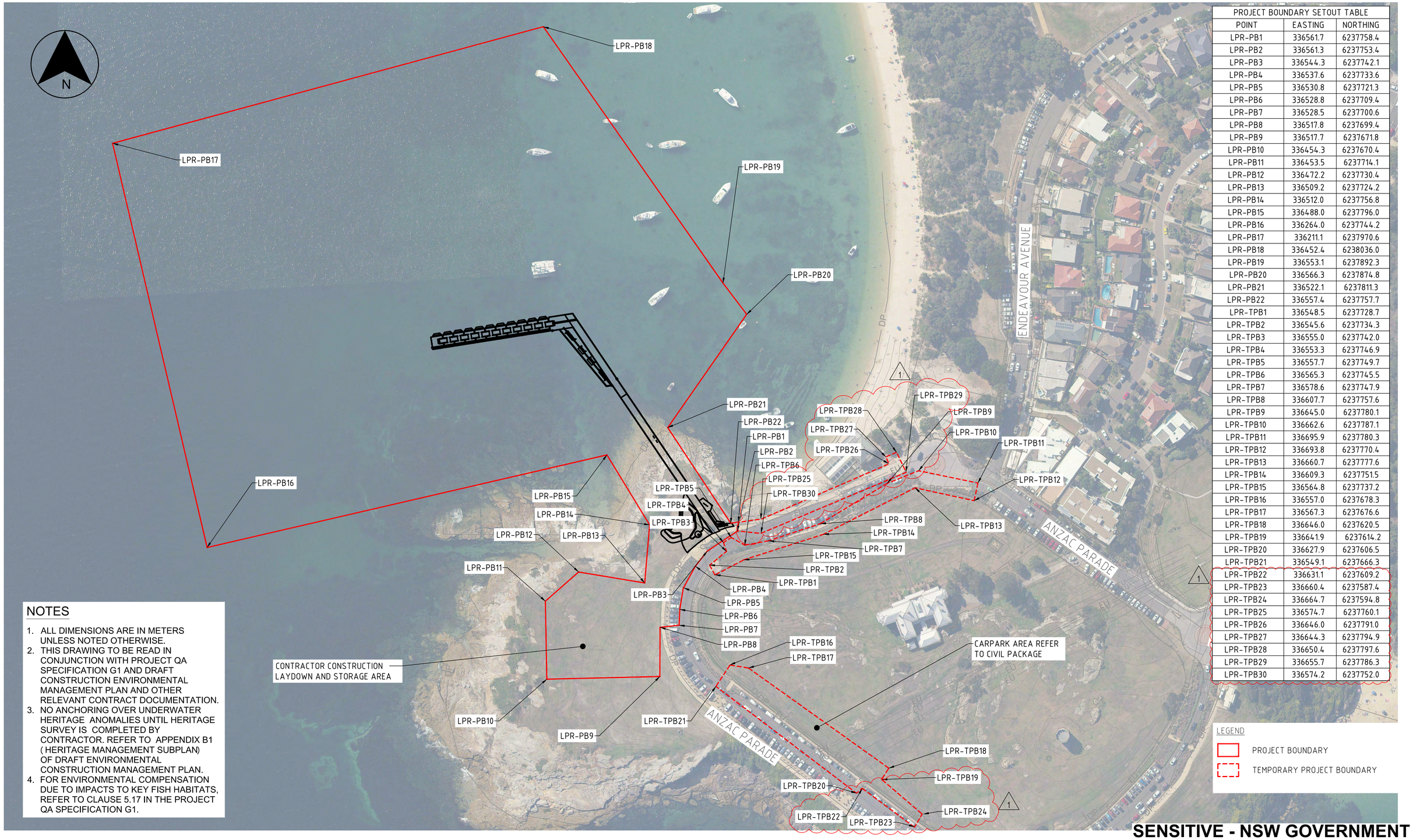

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LEGEND

PROJECT BOUNDARY

TEMPORARY PROJECT BOUNDARY

NOTES

1. ALL DIMENSIONS ARE IN METERS UNLESS NOTED OTHERWISE.
2. THIS DRAWING TO BE READ IN CONJUNCTION WITH PROJECT QA SPECIFICATION G1 AND DRAFT CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN AND OTHER RELEVANT CONTRACT DOCUMENTATION.
3. NO ANCHORING OVER UNDERWATER HERITAGE ANOMALIES UNTIL HERITAGE SURVEY IS COMPLETED BY CONTRACTOR. REFER TO APPENDIX B1 (HERITAGE MANAGEMENT SUBPLAN) OF DRAFT ENVIRONMENTAL CONSTRUCTION MANAGEMENT PLAN.
4. FOR ENVIRONMENTAL COMPENSATION DUE TO IMPACTS TO KEY FISH HABITATS, REFER TO CLAUSE 5.17 IN THE PROJECT QA SPECIFICATION G1.

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AMD	DESCRIPTION	DESIGNER SIGN./DATE	VERIFIED SIGN./DATE	APPROVED SIGN./DATE
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0	ISSUED FOR CONSTRUCTION	AC 15.10.21	AC 15.10.21	DD 15.10.21

CO-ORDINATE SYSTEM: MGA ZONE 56 | HEIGHT DATUM: A.H.D | SCALE: 1:1000

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ARCHITECTURAL DESIGN

DRAWN	ANDREW CROUCH	19.10.21
DESIGNED	ANDREW CROUCH	19.10.21
DRG CHECK	ANDREW CROUCH	19.10.21
DESIGN CHECK	RHYS LEWIS	19.10.21
APPROVED	DAVID DACK	19.10.21

KAMAY FERRY WHARVES

LA PEROUSE WHARF

PROJECT BOUNDARY PLAN

FILE No. | SHEET: 1 OF 1 | A1

STATUS: ISSUED FOR CONSTRUCTION ©

DRG No. KFW01-ARUP-LPR-AR-DRG-742205 | 1 | EDMS No.

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KU-BH03
KU-BH01
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KU-TP05
KU-TP04
KU-TP03
KU-TP02
KAMAY
BOTANY BAY
Legend
Project Area
National Park
Ferry Design (Concept)
Soil Bore
Test Pit
Data Source:
Site Layout : Client Provided
NSW DFSI, DCDB/DTDB, 2020
Nearmap Imagery September 2020
Sampling Locations - Kurnell Wharf Site
F3a
Drawing No: 0564417s_DSI_G005_R0.mxd
Date: 20/12/2022
Drawing Size: A3
Drawn By: GC
Reviewed By: IB
Coordinate System: GDA 1994 MGA Zone 56
0 25 50 75m
N
Detailed Site Investigation - Kamay Wharf Project
Kurnell, NSW
Client: Arup Australia Pty Ltd
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM

Sampling Locations - La Perouse Wharf Site

F3b

Drawing No:	0564417s_DSI_G006_R0.mxd		Detailed Site Investigation - Kamay Wharf Project La Perouse, NSW
Date:	20/12/2022	Drawing Size: A3	
Drawn By:	GC	Reviewed By: IB	Client: Arup Australia Pty Ltd
Coordinate System: GDA 1994 MGA Zone 56			This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

0 25 50 75m

N

ERM

K_SED01
K_SED02
K_SED03
K_SED04
K_SED05
K_SED06

KAMAY
BOTANY BAY

Legend
- Construction Boundary
- National Park
- Ferry Design (Concept)
- Sediment Core Location

Data Source:
Site Layout : Client Provided
NSW DFSI, DCDB/DTDB, 2020
Nearmap Imagery September 2020

Sampling Locations - Kurnell Wharf Site

F3a

Drawing No:	0564417s_SAQP_G007_R0.mxd		Kamay Wharf Project Sediment Investigation
Date:	1/10/2020	Drawing Size: A3	
Drawn By:	GC	Reviewed By: IB	Client: Arup Australia Pty Ltd

Coordinate System: GDA 1994 MGA Zone 56

0 25 50 75m

N

ERM

Sampling Locations - La Perouse Wharf Site

F3b

Drawing No: 0564417s_SAQP_G008_R0.mxd	Kamay Wharf Project Sediment Investigation
Date: 1/10/2020 Drawing Size: A3	
Drawn By: GC Reviewed By: IB	Client: Arup Australia Pty Ltd
Coordinate System: GDA 1994 MGA Zone 56	This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

0 25 50 75m

N

ERM

Appendix B: EPA Guidelines

Guidelines made or approved by the EPA under section 105 of the *Contaminated Land Management Act 1997*

(as of: 12 August 2022)

Section 105 of the Contaminated Land Management Act 1997 (CLM Act) allows the EPA to make or approve guidelines for purposes connected with the objects of the Act. The EPA must consider these guidelines whenever they are relevant. Other people must also consider the guidelines, namely, accredited site auditors when conducting a site audit; contaminated land consultants when investigating, remediating, validating and reporting on contaminated sites; and those responsible for land contamination with a duty to notify the EPA.

A current list of guidelines made or approved by the EPA under the CLM Act appears below.

Guidelines made by the EPA

- Assessment and management of hazardous ground gases: Contaminated land guidelines (PDF 4MB)
- Guidelines for the vertical mixing of soil on former broad-acre agricultural land (PDF 148KB)
- Contaminated land sampling design guidelines part 1 – application (PDF 3.3MB)
- Contaminated land sampling design guidelines part 2 – interpretation (PDF 1MB)
- Guidelines for assessing banana plantation sites (PDF 586KB)
- Consultants reporting on contaminated land: Contaminated land guidelines (PDF 1MB)
- Guidelines for assessing former orchards and market gardens (PDF 172KB)
- Guidelines for the NSW Site Auditor Scheme, 3rd edition (PDF 999KB)
- Guidelines for the assessment and management of groundwater contamination (PDF 604KB)
- Guidelines on the duty to report contamination under the Contaminated Land Management Act 1997 (PDF 412KB)

Guidelines that refer to the:

- Australian Water Quality Guidelines for Fresh and Marine Waters (ANZECC, October 2000), are replaced as of 29 August 2018 by the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG, August 2018), with the exception of the water quality for primary industries component, which still refer to the ANZECC & ARMCANZ (2000) guidelines
- National Environment Protection (Assessment of Site Contamination) Measure 1999 are replaced as of 16 May 2013 by the National Environment Protection (Assessment of Site Contamination) Measure 1999 (April 2013).

Guidelines approved by the EPA

- Australian and New Zealand Guidelines for Fresh and Marine Water Quality, ANZG (August 2018)
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Volume 3, Primary Industries - Rationale and Background Information (ANZECC & ARMCANZ (October 2000)
- Composite sampling, Lock, W. H., National Environmental Health Forum Monographs, Soil Series No.3, 1996, SA Health Commission, Adelaide. Email enHealth.Secretariat@health.gov.au for a copy of this publication.

- Environmental health risk assessment: Guidelines for assessing human health risks from environmental hazards, Department of Health and Ageing and EnHealth Council, Commonwealth of Australia (June 2012)
- National Environment Protection (Assessment of Site Contamination) Measure 1999 (April 2013)* (ASC NEPM)
- Guidelines for the Assessment and Clean Up of Cattle Tick Dip Sites for Residential Purposes, NSW Agriculture and CMPS&F Environmental (February 1996)
- Australian Drinking Water Guidelines, NHMRC and Natural Resource Management Ministerial Council of Australia and New Zealand (2011)

*The ASC NEPM was amended on 16 May 2013.

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