Prepared for
Macquarie Point Development Corporation
ABN: 92 657 409 841

Site Environment Management Plan

Macquarie Point Development Project

22-Oct-2021

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Client: Macquarie Point Development Corporation

ABN: 92 657 409 841

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			Name/Position	Signature
A	15-Oct-2021	Draft	Paul Carstairs Technical Director - Environment	
0	22-Oct-2021	Final	Paul Carstairs Technical Director - Environment	

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List of Acronyms

ACM	Asbestos Containing Material
BCA	Building Code of Australia
BTEX	Benzene, Toluene, Ethylbenzene, Xylene
BTEXN	Benzene, Toluene, Ethylbenzene, Xylene, Naphthalene
CEMP	Construction Environment Management Plan
CNMP	Construction Noise Management Plan
CoPC	Chemicals of Potential Concern
CUTEP	Clean Up to the Extent Practicable
DNAPL	Dense Non-Aqueous Phase Liquid
DP	Douglas Partners
EPA	Environment Protection Authority
GPR	Ground Penetrating Radar
ha	Hectare
HDPE	High Density Polyethylene
JSA	Job Safety Analysis
LNAPL	Light Non-Aqueous Phase Liquid
m bgl	metres below ground level
MPDC	Macquarie Point Development Corporation
PAH	Polycyclic Aromatic Hydrocarbons
PEV	Protected Environmental Value
PPE	Personal Protective Equipment
RC	Remediation Criteria
SEMP	Site Environment Management Plan
SVOC	Semi-volatile Organic Compound
SWL	Standing Water Level
SWMS	Safe Work Method Statement
TPH	Total Petroleum Hydrocarbons
TRH	Total Recoverable Hydrocarbons
UST	Underground Storage Tank
VOC	Volatile Organic Compounds
WHS	Work Health and Safety
WHSP	Work Health and Safety Plan
WMP	Waste Management Plan

1.0 Introduction

1.1 Purpose

This Site Environment Management Plan (SEMP) has been developed by AECOM Australia Pty Ltd (AECOM) on behalf of the Macquarie Point Development Corporation (the Corporation) for implementation at the Macquarie Point site in Hobart, Tasmania (the Site).

The purpose of this SEMP is to identify known areas of contamination on the Site and to provide an overview of appropriate management measures to address potential human health and environmental risks associated with subsurface contamination, and to maintain compliance with relevant environmental management requirements, and related safety management requirements.

The SEMP:

- Documents:
  - The current contamination status of the Site.
  - Environmental management measures (including contaminant management associated with intrusive works such as excavation/disposal of soil, dust and odour control, stormwater and sediment management, noise control and groundwater management).
  - Responsibilities for implementation of the SEMP and for managing identified environmental issues in accordance with the SEMP.
- Defines:
  - Preventative exposure measures for intrusive works (e.g. subsurface excavation) undertaken at the Site.
  - Roles and responsibilities for owner/managers and occupiers/contractors at the Site, or subsections thereof, when undertaking intrusive works.
- Provides a framework for the implementation of measures so that human health and environmental risks to Site users are low and acceptable where the existing preventative exposure barriers and controls remain in place.

All subsurface work and any work that may change the risk profile to receptors on the Site while this SEMP is in place should follow the guidance provided in this SEMP. Maintenance of the SEMP has been identified as a condition of Audit (discussed in **Section 1.6**) for management of human health and environmental risks at the Site.

1.2 Applicability

This SEMP applies to the management of contaminated soil, groundwater and soil vapour on the Site. The following parties should be provided with a copy of the SEMP, prior to undertaking any activities which may interact with soil, groundwater or soil vapour:

- Owners or Managers (and delegates) of the Site or subsections of the Site.
- Workers who undertake subsurface work at the Site during which they may be exposed and/or come into contact with contaminated soil and/or groundwater.

It is noted that this SEMP is an active document, which is to be updated as conditions at the Site change (e.g. development changes, changes to the known contamination status, etc.). If activities to be undertaken at the Site are not covered in this SEMP, the Site Owner or Manager, or owner of smaller areas of the Site, should update the SEMP to include those activities. Alternatively, should the requirement for a more specific application be determined, a Construction Environment Management Plan (CEMP) may be required which specifically addresses the proposed tasks and a framework to mitigate potential environmental impacts posed by the activities to be undertaken.

If a sale or division of areas at the Site occurs in the future, owners of subdivisions at the Site should communicate changes to owners of other Site subdivisions or develop their own SEMP specific to the subdivision in question.

Any significant amendment to this SEMP, or future SEMPs developed for divisions of the Site, should be reviewed by a suitably qualified and experienced Contamination Land Auditor prior to implementation.

1.3 Training and Induction

The appropriate Site representative (i.e. the Owner, Manager or delegates) is to ensure the health, safety and environment (HSE) requirements outlined in this SEMP are met during works.

All persons conducting subsurface work on the Site, including but not limited to Site occupiers, tenants and maintenance workers, will be required to be trained and inducted to this SEMP. All workers must sign the induction form (provided in **Appendix B**) to acknowledge an understanding of the content of this SEMP and completion of the induction.

This training/ induction recommendation is limited to those personnel and contractors who are undertaking subsurface works at the Site. It is not the intention that this document be applied to passive users of the Site such as those using it for the purposes of short-term commercial activities (e.g. market holders), car parking, pedestrian thoroughfare or visitors engaging in public uses of the area.

Training should be structured to ensure that relevant workers understand their obligation to exercise due diligence in relation to environmental matters. The following items should be presented in the induction:

- General overview of the work to be conducted
- Overview of Site contamination issues
- Familiarisation with environmental controls
- Chemicals of Potential Concern (CoPC), and associated exposure risks and potential symptoms of exposure
- Hazard identification and prevention
- Personal Protective Equipment (PPE).

Records of all training should be maintained and include:

- Name of the individual receiving training
- When the individual was trained
- Name of trainer
- A general description of the training content.

It should be noted that this SEMP does not preclude the need for a Safe Work Method Statement (SWMS) for each task, but rather should be included as part of the general training for working on the Site.

1.4 Responsibilities

The distribution and implementation of this SEMP will be the responsibility of the Owner/Manager of the Site, or of future sub-divisions at the Site. The Site Owner/Manager may at times delegate responsibility for individual items or tasks to maintenance contractors and other persons. However, the Site Owner/Manager retains the overall responsibility for the implementation of this SEMP during any subsurface works and ongoing use of the Site or future subdivisions which they hold responsibilities for.

All contractors, including workers engaged in any subsurface works will be responsible for adhering to the management measures described herein.

Table 1 below provides a summary of the key roles and responsibilities associated with the implementation of this SEMP.

Table 1 Roles and Responsibilities

Role	Key Responsibilities
Site Owner/ Manager (or delegate)	• Provide a full copy of the SEMP to Site occupiers/ contractors undertaking subsurface works and discuss as part of the Site induction process. • Manage and/or enforce the SEMP for Site occupiers/ contractors undertaking subsurface works. • Implement and complete corrective actions as required. • Complete and keep up to date all necessary registers and records as required in the SEMP. • Undertake reviews and revision of the SEMP every three years (or more frequently, as deemed appropriate based on-Site activities or changes). • Review evidence of compliance to this SEMP every three years (or more frequently, as deemed appropriate). • Undertake visual inspections of existing controls, such as hardstand areas every three years. • Review and revise the SEMP to reflect changes that occur at the Site.
Site Occupiers/ Contractors Undertaking Subsurface Works	• Implement the requirements of the SEMP. • Complete all necessary registers and records as required in the SEMP. • Complete all activities at the Site in a safe and environmentally responsible manner. • Implement a Work Health and Safety Plan (WHSP) and ensure that suitable PPE is worn, and monitoring is undertaken, where required, for tasks that involve subsurface works. • Ensure all contractors comply with the requirements of the SEMP.

1.5 Site Environment Management Plan Revision

This SEMP will remain in place indefinitely, and will require revision:

- In the event that areas of the Site undergoes remediation or land use changes.
- Following changes to the conditions at the Site which may change the risk of exposure to contamination on the Site.
- In response to additional data to inform the understanding of the contamination status of the Site.

Regardless of the above-listed considerations, this SEMP should be reviewed (and updated if required) every three years. It is recommended that a suitably qualified environmental practitioner be engaged to review evidence of compliance to this SEMP, including records of works on the Site and compliance with the conditions of implementation contained within **Section 5.5** of this SEMP. A visual inspection of the Site should be conducted as part of this review, as described in **Section 5.1**.

1.5.1 Previous SEMPs

This SEMP combines and supersedes the following SEMPs which have been previously issued for some or all of the Site:

- *Site Environmental Management Plan, Macquarie Point Development Project* (AECOM, 2018)
- *Site Environmental Management Plan, Macquarie Point – Audit Area 1* (AECOM, 2019)
- *Audit Area 4 – Site Environmental Management Plan, Macquarie Point Development Project* (AECOM, 2020a)
- *Lot E and Underground Carpark – Site Environmental Management Plan, Macquarie Point Development Project* (AECOM, 2021a)

The information and management procedures within the previous documents have been combined in this SEMP.

1.6 Environmental Audit

In conjunction with the amendment of the *Macquarie Point Development Corporation Act 2012*, the Corporation has engaged a Contaminated Land Auditor, David Lam of Coffey Environments (the Auditor). David is included on the Director of the Tasmanian Environment Protection Authority (EPA) Register of Interstate Contaminated Land Auditors and is considered suitably qualified by EPA to undertake an Environmental Audit to review the progress of environmental assessment, remedial planning and execution works at the Site.

The role of the Auditor is to ensure that the works are carried out in compliance with local Tasmanian legislation and guidelines with consideration given to the requirements of the Victorian EPA Environmental Audit framework in the absence of an Audit scheme in Tasmania. It is noted that Victoria legislation which defines the Audit process was updated and superseded by the *Environment Protection Act 2017* (the EP Act), which came into effect on 1 July 2021, and contains significant changes to Audit methodology and terminology under the Victorian framework. Under Section 478 of the EP Act, existing Audits where an Auditor has been engaged prior to 1 July 2021, and the Audit has not been completed by 1 July 2021, can be conducted under either the EP Act or the previous framework. To maintain continuity with the portions of the Audit already completed, the Site Audit will continue under the previous framework and terminology.

The overarching outcome required for the Environmental Audit is a Contaminated Land Audit Report (i.e. sign off) prepared by the Environmental Auditor confirming that Clean Up to the Extent Practicable (CUTEP) has been achieved and that the Site is suitable for the intended future uses.

As part of the Environmental Audit, implementation of a SEMP is required to manage potential human health and environmental risks associated with subsurface contamination associated with historic Site activities.

Contaminated Land Audit Reports have been received for the areas of Site (described in **Section 2.2**) as listed on **Table 2** below.

Table 2 Status of Environmental Audit by Area

#	Area	Contaminated Land Audit Report	
		Status	Report
1	The Goods Shed and Yard	Issued	*Contaminated Land Audit Report – Macquarie Point Development Project – Audit Area 1* (Coffey, 2019)
2	The Escarpment (Audit Area 4 West)	Issued	*Contaminated Land Audit Report – Macquarie Point Development Project – Audit Area 4 West* (Coffey, 2020)
3	The Promenade and Underground Carpark	Issued	*Contaminated Land Audit Report – Macquarie Point Development Project – Lot E and Underground Carpark* (Coffey, 2021)
4	The Precinct North	Pending[1]	
5	The Precinct South	Pending	
6	The Gateway	Pending	
7	Audit Area 4 East	Pending	

Notes: [1]CUTEP assessment submitted to Auditor

2.0 Site Details and Background

2.1 Site Identification and Layout

The Site details are provided in **Table 3** below:

Table 3 Site Details

Item	Description
Site Identification	• Macquarie Point
Site Address	• 10 Evans Street, Hobart, Tasmania (refer to the Site Location plan provided as **Figure F1** in the **Figures** section)
Site Area	• Approximately 9.3 ha
Current Site Owner	• State of Tasmania (Crown Land)
Current Zoning (1)	• Mixed Use Area – Sullivans Cove Planning Scheme 1997
Current Uses	The following is noted with regard to Site use and features: • The Site is generally flat with three main tiers as follows: - The upper (northern western) tier consisting of a gravel surface with former rail tracks. - The second (middle) tier consisting mostly of an asphalt and gravel surface. - The third (south eastern) tier consisting of an asphalt and gravel surface and a series of sheds including the Goods Shed, Red Shed and SeaRoads Shed. • The majority of the Site is currently vacant and is covered with a combination of asphalt, concrete and gravel surfacing, as well as backfill and clean fill material from previous soil remediation works. • A series of sheds are located along the southern boundary of the Site: - the Goods Shed; occupied by the Corporation and subject to intermittent uses including public events. - the Red Shed; occupied by Hobart Brewing Company. - the Long House; occupied by commercial and cultural tenants. - the SeaRoads Shed; currently used for storage. • A public carpark is present in the south eastern portion of the Site. • Public events including markets and concerts have intermittently occurred at the Site. • An access road (the Northern Vehicular Access) is located in the north and northwest sections of the Site. • Access stairs to the adjacent Hobart Cenotaph are being constructed in the northwest corner of the Site.
Closest Surface Water Body	• Sullivans Cove to the southwest (170 m) • River Derwent to the southeast (280 m) and to the northeast (25 m).
Site Layout	• **Figure F2** in the Figures Section

2.1.1 Surrounding Land Uses

The surrounding land use comprises a number of aspects including public access and cultural significance; commercial and professional services; retailing; health care; port facilities; light industry; marine industry; fishing industry; and education. The immediate local setting is summarised in **Table 4**.

Table 4 Surrounding Land Uses

Direction from Site	Land Use
North	• The Site is bound to the north by the Hobart Cenotaph and associated public open space. • A Wastewater Treatment Plant and River Derwent are located in a general northeast direction from the Site.
South	• The Site is bound to the south by Evans Street, with residential apartments and commercial properties beyond, which extend towards Hunter Street and Sullivans Cove.
East	• The Site is bound to the east by the Tasports' port operations and further east by the River Derwent. • The Wastewater Treatment Plan is located in a general northeast direction from the Site.
West	• The Site is bound to the west by a public bike path and Davey Street, with commercial properties beyond.

2.2 Areas of Site

For the purpose of assessment and completion of the Environmental Audit, the Site has been divided into seven sub-areas for assessment based on the nature of identified contamination, historic activity, and the intended future uses of each area. Each area may have specific development controls or work requirements, which are discussed in **Section 4.0**. The sub-areas of the Site are shown on **Figure 1** below.

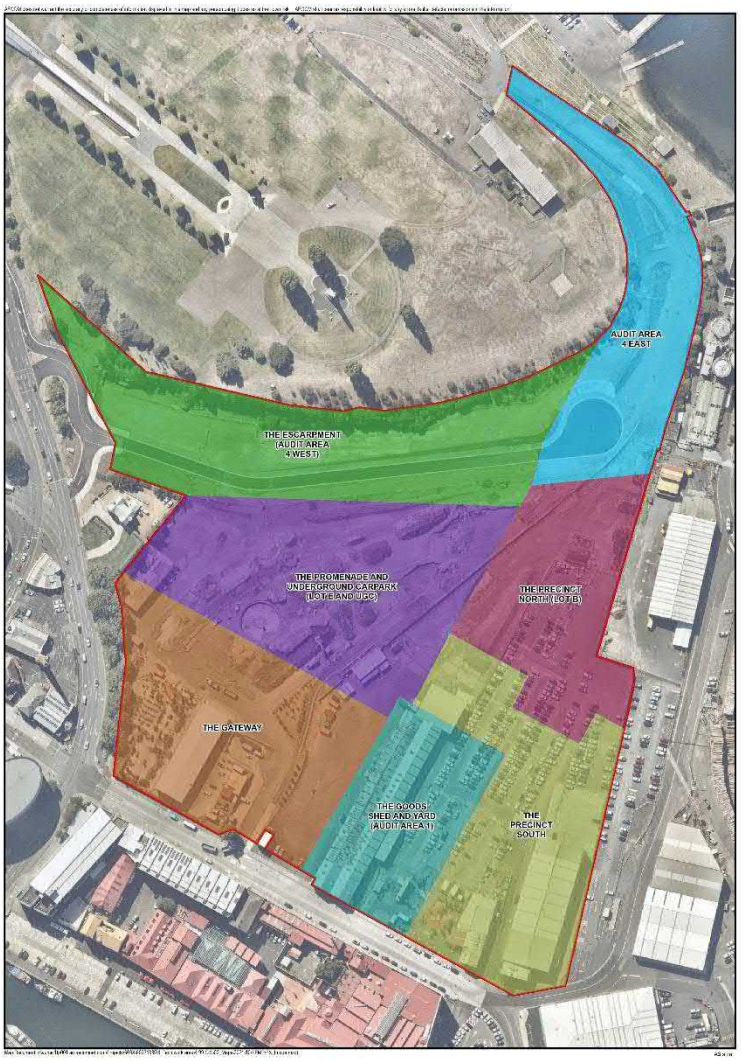

Figure 1 Site Areas

It is noted that the Site was previously divided into Audit Areas (named Audit Area 1 to Audit Area 7) for assessment. Due to changes in the remediation approach and planned development of the Site, these have been replaced with the sub-areas above. However, the locations of the former Audit Areas are shown on **Figure F3** for reference to earlier documents.

2.3 Future Land Use

As part of the Environmental Audit, CUTEP documentation has or will be prepared for all areas and submitted to the Environmental Auditor for review and issue of a Contaminated Land Audit Report. As a condition of Audit, restrictions on land use or development type have been specified in the Contaminated Land Audit Report for each area, based on the based on the *Master Development Plan* (MPDC, 2015). Any person planning development of an area should consult the Contaminated Land Audit Report specific to the area of works and ensure that planned works conform with Audit requirements and restrictions. This controls are summarised below.

Under the *Master Development* Plan, the Site is intended to be developed for a mix of uses comprising:

- Residential, including medium to high density
- Commercial, including visitor accommodation, retail, arts and institutional
- Open space, including parks and recreations areas

- Transport, including roads, light rail, cycleway, and pedestrian access
- An Underground Carpark will be constructed in the Promenade and Underground Carpark Area.

The proposed development layout of the Site is shown on **Figure F2** in the **Figures** section.

2.4 Subsurface Features

Table 5 below provides a summary of currently known subsurface features that may present contaminant source risks or influence subsurface hydrogeology/contaminant transport mechanisms. A plan showing the current known location of subsurface infrastructure is presented in **Figure F5**.

It should be noted that during Site investigations, the Corporation has encountered redundant pipe works and other abandoned services which are not on any records and the origin and purpose of which remains unknown. The potential for unidentified pipe networks or other features to be present below the Site should be considered during future excavation works.

Table 5 Subsurface Feature Summary

Feature	Comment
Gasworks Infrastructure	• Historical gasworks infrastructure is located beneath the Gateway area and former gasworks subsurface infrastructure has been backfilled as part of previous Site development.
Roundhouse	• A former Roundhouse was located in the western portion of the Site on the boundary of the Gateway and the Promenade and Underground Carpark areas, and subsurface infrastructure associated with the Roundhouse was been backfilled as part of previous Site development. Parts of remaining Roundhouse infrastructure (the central turntable) were excavated and remain exposed by works in 2021.
Underground Storage Tanks (USTs)	• USTs have been formerly located at the Site. • The following is noted: - Two USTs and associated infrastructure were previously located in the central southern portion of the Precinct South and have been removed. A backfilled former UST pit, associated hydrocarbon odour and residual impact were identified during the target investigation undertaken in this area in 2014. - A UST and associated infrastructure were present in the south east corner of the Gateway and were removed in 2019. - A review of historical information indicates that potentially two USTs and associated infrastructure were planned for installation in the north western portion of the Escarpment. It is not known if this infrastructure was installed, however no evidence of these USTs was identified, and it is not considered likely that they were constructed. • There is the potential that more USTs are present at the Site that have not yet been identified.
Fuel Transfer Lines	• Disused fuel transfer lines are currently present in the Precinct South and in Audit Area 4 East. Removal of these line is planned prior to completion of the Environmental Audit of these areas. • Portions of these fuel lines were present in the Precinct North and in the eastern section of the Promenade and Underground Carpark area but were excavated and removed in 2020.

Feature	Comment
Sewer (Main Hobart Pipeline)	• The Sewer (Main Hobart Pipeline) currently traverses the central portion of the Site from southwest to northeast. Lead impacts are known to be present in soil around this sewer in the Precinct North area. • A realignment of this sewer is planned to occur in 2022. • A sewer line also runs from the Main Workshop area connecting to the Sewer (Main Hobart Pipeline) in the general central portion of the Site.
Stormwater	• Stormwater infrastructure is located in the general central portion of the Site traversing the Site in a north-south and east–west direction.
Seawalls/ Engineers Jetty	• Seawalls: Historically established for land reclamation purposes. • Engineers Jetty: Constructed on the historical outer edge of the former slaughter yard. • GHD, 2014 identified the likely location of the Engineers Jetty in the general central portion of the Site and a seawall on the eastern Site boundary.
Former Building Footings	• Remnant infrastructure associated with former buildings (such as footings) located across the Site. • It is noted that select structures may have archaeological significance.
Telecommunications services	• Telecommunications enter the Site in the north western portion of the Escarpment. An exclusion zone of 2 m applies around this telecommunications cable, and works should not be completed within this radius without consultation with the asset owner (Telstra Tasmania). • Soil with lead impacts is known to be present within the exclusion zone. • The depths of these services are typically between 0.6 m – 1.2 m below ground level (bgl).
Other Services	• Water, electricity, gas and communications services are located across the Site.

2.5 Geology

2.5.1 Fill Material

The Site has been subject to significant filling (controlled or otherwise) since the early 1800's with up to 600 m of land reclaimed in stages from the original 1800's shoreline (Department of the Environment, *Australian Heritage Database*, 2007). Fill material has been encountered across the Site to depths of up to approximately 12.0 m bgl.

Fill material has been described as generally containing a combination of clays, sands, gravels, cobbles and bricks. Virgin Excavated Natural Material (VENM) consisting of crushed dolerite, or reused inert construction materials (crushed concrete and bitumen), has been used as backfill in areas in the Escarpment, the Precinct North, and the Promenade and Underground Carpark Area. The thickness of fill is variable across the Site (0.2 – 12.0 m bgl) and generally increases from north to south across the Site consistent with historical land reclamation activities.

Deeper fill material generally consists of silty sands, similar to the underlying natural marine deposits, indicating that the deeper fill material may be associated with reworked natural material or dredged material.

Staining and odours consistent with gasworks and fuel storage has also been encountered in fill material at select locations.

2.5.2 Natural Soil

Two main natural soil types have been encountered at the Site including marine deposits (silty sands) and slope deposits (weathered Dolerite including clays, gravels and cobbles).

Marine deposits have generally been encountered in the south east portion of the Site, ranging in depth from 3.7 to 15.0 m bgl. Slope deposits generally underlay the marine deposits (with the exception of the northern portion of the Site where the marine deposits are absent). The slope deposits are generally encountered at near surface to 1.4 m bgl in the northern portion of the Site and 11.2 to 19.0 m bgl in the south eastern portion of the Site.

Dolerite bedrock underlies the fill and natural soils at the Site. Dolerite has generally been encountered at near surface in the northern portion of the Site and slopes down in the southerly and south easterly direction and has been encountered at depths up to 25.0 m bgl (GHD, 2014). GHD, 2014 also notes that there are potentially three bedrock highs (i.e. 'reefs') in the general central portion of the Site. The dolerite has been described as of high strength and slightly to highly fractured.

In the following instances, the interface between various natural soil types has been difficult to distinguish:

- Between fill material and natural marine sediments given the similar material type.
- Between the changes from slope deposits to the underlying Dolerite bedrock given the weathering of the slope deposits, which consist of fine to coarse cobbles and boulders similar to the Dolerite.

Due to the relatively shallow depth to bedrock in the northern portion of the Site, natural soils are likely to be encountered during shallow intrusive works (i.e. < 2.0 m bgl) in the general northern and north western portion of the Site, such as the Escarpment, Audit Area 4 East, and northern portions of the Promenade and Underground Carpark area.

It is noted that due to the increasing depth of fill material across the Site from north to south, it is unlikely that natural soils will be encountered during shallow subsurface works (i.e. < 2.0 m bgl) in the general southern portion of the Site.

2.5.3 Hydrogeology

The River Derwent is located approximately 280 m southeast of the Site boundary and Sullivans Cove is located approximately 170 m south west of the Site boundary.

Based on investigations completed to date, the Site is underlain by a single aquifer unit extending to greater than 25.0 m bgl (the maximum depth assessed). Groundwater has generally been encountered in fill material in the central, southern and eastern portions of the Site, extending into the underlying natural material including marine deposits, slope deposits and fractured Dolerite.

Observations from intrusive investigations have not identified any consistent confining layers between the fill material, natural sediments or the fractured Dolerite to indicate that the lithology's are hydraulically separated. This is supported by similar standing water levels (SWLs) reported for nested groundwater wells screened within different portions of the aquifer, which may indicate that the shallow and deeper portions are likely to be hydraulically connected.

SWLs across the Site at the time of the AECOM groundwater investigation undertaken in February 2018 ranged from approximately 1.3 m bgl and 5.9 m bgl.

Groundwater is inferred to have southeast and southerly components of flow. This indicates that groundwater flows toward the River Derwent and Sullivans Cove, respectively.

Other subsurface structures such as sewer mains (understood to be at a depth of approximately 4.0 m bgl), stormwater pipes, former fuel transfer lines and former sea walls are likely to cause localised variations in groundwater flow direction.

3.0 On-Site Contamination

3.1 Chemicals of Potential Concern

Based on the known Site history, **Table 6** below presents a summary of the Chemicals of Potential Concern (CoPC) that may be present based on known historical activities or uncovered during investigation of the Site.

Table 6 Chemicals of Potential Concern Summary

Area	Historical Land Uses	Chemicals of Potential Concern
Goods Shed and Yard	• Freight storage and handling. • Vehicle Maintenance. • Fuel Storage and Handling.	• TPHs, BTEXN, PAHs and phenolic compounds associated with historical fuel storage and transfer activities. • Chlorinated solvents associated with vehicle maintenance activities.
The Escarpment	• Locomotive refuelling comprising fuel storage and transfer facilities. • Railway maintenance workshop. • Rail corridor and fuel transfer infrastructure historically located within the area. • Concrete batching plant.	• TPHs, BTEXN, PAHs and phenolic compounds associated with historical fuel storage and transfer activities. • Chlorinated solvents associated with locomotive maintenance activities and the storage of hazardous materials. • Heavy metals, chlorinated solvents and hydrocarbons associated with workshop and maintenance areas. • Phosphorus and sulphur associated with locomotive washing. • ACM sourced from historical structures (i.e. cladding). • Hydrocarbons associated with the truck wash. • Heavy metals, chlorinated solvents and hydrocarbons sourced from the historical incineration of paint/ solvents
The Promenade and Underground Carpark	• Locomotive refuelling comprising fuel storage and transfer facilities. • Locomotive maintenance. • Freight storage and handling.	• TPHs, BTEXN, PAHs and phenolic compounds associated with historical fuel (diesel) storage and transfer activities. • Chlorinated solvents associated with locomotive maintenance activities. • Heavy metals, asbestos and PAHs sourced from materials used to backfill Roundhouse structures.
The Precinct North	• Freight storage and handling.	• TPHs, BTEXN, PAHs and phenolic compounds associated with historical fuel (diesel) storage and transfer activities. • Chlorinated solvents associated with locomotive maintenance activities.
The Precinct South	• Freight storage and handling.	• TPHs, BTEXN, PAHs, phenolic compounds, and lead associated with historical fuel storage and transfer

Area	Historical Land Uses	Chemicals of Potential Concern
		activities undertaken adjacent to the Site's eastern boundary.
The Gateway	• Former Hobart Gasworks. • Locomotive refuelling comprising fuel storage and transfer facilities. • Railway maintenance workshop.	• TPHs, PAHs, BTEXN and phenols sourced from coal tar and tar oils, or from historical fuel storage and transfer activities. • Heavy metals, chlorinated solvents and hydrocarbons associated with workshop and maintenance areas. • Phosphorus and sulphur associated with locomotive washing. • ACM sourced from historical structures (i.e. cladding). • Chlorinated solvents associated with locomotive maintenance activities and the storage of hazardous materials. • Complex cyanides, free cyanides and metals sourced from spent oxides. • TPHs, PAHs and metals sourced from coke, coke breeze, ash and clinker residues. • TPHs and BTEX associated with light and drip oils. • Phenols, nitrates, sulphates, sulphides, ammonia and PAHs sourced from ammoniacal recovery wastes.
Audit Area 4 East	• Rail corridor and fuel transfer infrastructure historically located within the area.	• TPHs, BTEXN, PAHs and phenolic compounds associated with historical fuel storage and transfer activities.

Notes: TPHs – total petroleum hydrocarbons; PAHs – polycyclic aromatic hydrocarbons; BTEXN – benzene, toluene, ethylbenzene, xylene, naphthalene; ACM – asbestos containing material; VOC – volatile organic compounds; SVOC – semi VOC.

Appendix C contains areas specific fact sheets which provide more detailed information on CoPC in each area of the Site which has had a CUTEP submission to the Environmental Auditor. The following areas have fact sheets prepared:

- The Goods Shed and Yard
- The Escarpment (Audit Area 4 West)
- The Promenade and Underground Carpark
- The Precinct North.

The remaining areas of the Site (the Gateway, the Precinct South, and Audit Area 4 East) will have factsheets prepared and added to this SEMP as investigation and remediation of these areas are completed.

3.2 Identified Soil Impacts

3.2.1 Fill Material

Shallow soil across the majority of the Site consists of fill material used for land reclamation or construction during the Site's history.

Soil samples collected during the investigation of the Site have been assessed against adopted Tier 1 Criteria for the following uses:

- Maintenance of Modified/Highly Modified Ecosystems
- Human Health
  - Low and Medium/High Density Residential
  - Recreation/Open Space
  - Commercial Industrial
  - Shallow Trench Worker
- Buildings and Structures
- Aesthetics

The following CoPC have been detected in excess of one or more of the adopted Tier 1 criteria in soil samples collected from the Site:

- TRH)– C_6–C_{16}, C_{10}-C_{40}
- Benzene, naphthalene
- PAHs – benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenz(a,h)anthracene, Indeno(1,2,3-cd)pyrene, Sum of PAHs
- Metals – arsenic, cadmium, chromium, copper, lead, nickel, zinc

Further information on exceedances of the adopted Tier 1 Criteria for areas of the Site where a CUTEP submission has been made can be found in **Appendix C**. Although exceedances of the Tier 1 criteria are present in these areas, they may be managed by implementation of the safety and environmental control measures in this SEMP.

Tasmanian EPA Information Bulletin No. 105, *Classification and Management of Contaminated Soil for Disposal* (IB105) (EPA, 2018) provides guidance with regard to the classification of contaminated soil for disposal purposes. Total contaminant concentrations of the following compounds were reported in excess of the maximum total concentration for soils to be classified as *Contaminated Soil (Level 3)* during investigation completed between 2015 and 2020:

- TPH C_{10}-C_{36} fraction.
- Total PAHs
- Benzo(a)pyrene
- Lead

Further to the above, additional compounds to those listed above have been reported in excess of the *Fill Material (Level 1)* and/or *Low Level Contaminated Soil (Level 2)* criteria within the fill material on Site.

3.2.2 Natural Soil

The AECOM soil investigations undertaken between 2015 and 2020 identified a combination of copper, lead, nickel, zinc and TRH at concentrations in excess of the adopted Tier 1 screening criteria for the assessment of risk to human health and ecological receptors in natural soils at select locations.

3.2.3 Areas of Notable Impact

As part of the Environmental Audit process for sub areas of the Site, the following areas of notable impact to soil have been identified:

Table 7 Soil Impacts - Areas of Notable Impact

Area	CoPC	Description
The Promenade and Underground Carpark	Lead	Areas of lead-impacted soil which may present a risk to future Intrusive Maintenance Workers (i.e. workers installing or maintained subsurface conduits) are present in the Promenade and Underground Carpark Area, generally at a depth of >2 m bgl.
The Promenade and Underground Carpark	Asbestos	Isolated fragments of Asbestos Containing Material (ACM) have been uncovered in fill in this area. Anecdotal evidence indicated that trenches and service pits associated with the former Roundhouse which was present in this area may have been backfilled with building rubble including ACM, although investigation to date has not uncovered any.
The Escarpment	Lead	Lead-impacted soil which may present a risk to future Intrusive Maintenance Workers (i.e. workers installing or maintained subsurface conduits) is present in the exclusion zone surrounding a telecommunications cable in this area.
The Precinct North	Lead	Lead impacted soil which may present a risk to future Intrusive Maintenance Workers is present: • On the eastern site boundary • In the soil surrounding the Main Hobart Sewer line
The Precinct North	Petroleum Hydrocarbons	Hydrocarbon impacted soil which may present a risk to future Intrusive Commercial Workers is present on the eastern site boundary.
The Precinct South	Lead	Lead-impacted soil which may present a risk to future Intrusive Maintenance Workers (i.e. workers installing or maintained subsurface conduits) is present on the boundary with the Precinct North. Impacts do not extend into the Precinct North at depths <2 m bgl, following remediation in 2020.
The Gateway	Coal Tar	Coal tar, associated with the historic Hobart Gasworks, has been detected in soil in the south and southwest sections of the of the Gateway area
Audit Area 4 East	Asbestos	Fragments of corrugated roofing materials between 5 and 300 mm in size were detected within an embankment within Audit Area 4 East, adjacent to the boundary with the Escarpment.

These areas are shown on **Figure F5**. Further detail on the location and extent of these impacts, and management controls required for safe future works in the vicinity of these impacts, can be found in the area fact sheets in **Appendix C**, and should be consulted for prior to subsurface works in these areas.

3.3 Identified Groundwater Impacts

Groundwater Monitoring Events (GMEs) were routinely conducted for monitoring groundwater wells located on-Site between January 2015 and November 2019.

Groundwater sample analytical results have been assessed against adopted Tier 1 Criteria for the following uses:

- Drinking water

- Irrigation
- Industry
- Stock watering
- Ecosystem protection
- Recreation - Primary and Secondary Contact
- Aesthetics
- Buildings and Structures
- Vapour Intrusion – Residential and Commercial/Industrial.

The following CoPC have been detected in excess of one or more of the adopted Tier 1 criteria in soil samples collected from the Site:

- Total Dissolved Solids (TDS)
- TPH - C_{10}-C_{36},
- TRH - C_{10}-C_{40}
- Benzene, naphthalene
- PAHs – anthracene, benz(a)anthracene, benzo(k)fluoranthene, benzo(a)pyrene, chrysene, pyrene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, dibenzofuran, phenanthrene, fluoranthene, 2.4-dimethylphenol
- Metals – aluminium, arsenic, boron, cobalt, copper, iron, lead, manganese, vanadium, zinc
- Ammonia (as N), chloride, sodium, phosphorus, sulphate
- Cyanide
- E. Coli
- pH.

Further information on exceedances of the adopted Tier 1 Criteria for areas of the Site where a CUTEP submission has been made can be found in **Appendix C**. Although exceedances of the Tier 1 criteria are present in these areas, they may be managed by implementation of the safety and environmental control measures in this SEMP.

3.4 Non-Aqueous Phase Liquids

3.4.1 LNAPL

Measurable Light Non-Aqueous Phase Liquid (LNAPL) has been noted in the central and south-eastern portions of the Site, associated with LNAPL Plume A1, Plume A2 and Plume B. It is noted that LNAPL was previously detected at Plume A3 in the Precinct North area but has not been detected since 2017.

A detailed assessment of LNAPL impacts and remediation conducted at Site has been reported in the *Assessment of LNAPL Remediation End-Points* (AECOM, 2020e). This report concluded that:

- Further recovery of LNAPL is considered to be impracticable.
- The LNAPL plumes are sufficiently stable.
- Based on the current development plan for the Site, no unacceptable risks to current or future human or ecological receptors from LNAPL appears to be present, assuming that a SEMP or similar is implemented in order to minimise and manage potential risks for any interactions between groundwater, LNAPL and future Site users.

On this basis, further LNAPL remediation is not practicable or required. However, restoration of groundwater Protected Environmental Values (PEVs) is not practicable, and groundwater management will be required as discussed in **Section 4.10**.

3.4.2 DNAPL

Coal tar and gross tar impacts (dense NAPL [DNAPL]) have been identified within, and in proximity to, the former Hobart Gasworks footprint in the Gateway area.

The location of known NAPL impacts is shown on **Figure F3**.

3.5 Soil Vapour

Soil vapour monitoring events have been conducted across the Site between 2015 and 2019 at locations where concentrations of VOCs and SVOCs in soil or groundwater were in excess of the Tier 1 vapour intrusion criteria selected (as noted in **Section 3.2** and **3.3**), or in the vicinity of the LNAPL plumes (**Section 3.4**) to enable assessment of potential risks posed by soil vapour to potential future users of this area.

Assessment of potential vapour intrusion risks associated with the LNAPL plumes undertaken in *Soil Vapour and Indoor Air Investigations 2019* (AECOM, 2021b) surmised that soil vapour impacts associated with the LNAPL plumes do not present an unacceptable risk to the planned future uses of the Site.

Soil vapour investigations identified methane exists in potentially hazardous concentrations in the subsurface within the Precinct North and the Promenade and Underground Carpark Area. The risk from soil methane in the area assessed has been calculated as CS3 – Moderate Risk, as defined by *Guidelines for the Assessment and Management of Sites Impacted by Hazardous Ground Gases* (EPA NSW, 2020), and appropriate mitigation measures should be included in future building design in this area.

3.6 Asbestos

Asbestos or ACM fragments have previously been observed in the following locations at the Site:

- Isolated small ACM fragments have been observed at the surface and encountered in fill material in the Promenade and Underground Carpark, and the Escarpment areas and have been collected and removed by the Corporation or a licensed asbestos subcontractor.
- Larger ACM fragments (5 to 300 mm in size) have been encountered in the side of an embankment in Audit Area 4 East.
- Asbestos fibres were detected in piping cladding in a former fuel line which was present beneath the Precinct North and Precinct South areas. This pipeline has been removed within the Precinct North but is still present beneath the Precinct South and will require removal or further management prior to development of this area of the Site.
- Asbestos has been observed within the Goods Shed building.

An Asbestos Register has been prepared for the Site, and this register should be referred to prior to undertaking works on the Site.

In the event that potential ACM is encountered in soil during subsurface works, all activities are to cease immediately in the immediate work area. A suitably experienced environmental practitioner should be consulted to provide advice regarding the removal and management of ACM in soils prior to works re-commencing.

4.0 Management of Environmental Risks

4.1 Overview

The following sections provide details of measures to be implemented to manage potential human health risks.

This SEMP provides a framework for soil and groundwater management measures associated with subsurface works such as the excavation and/ or disposal of soil and importation of fill material, as well as the requirements and maintenance of barriers designed to mitigate direct and indirect contact with contaminated soils.

As previously noted, should any activities need to occur at the Site that are not currently covered in the SEMP, then the Site Owner/ Manager should update the SEMP to include these activities, where relevant. Alternatively, should the requirement for a more specific environmental management application be determined, a Construction Environment Management Plan (CEMP) may be required which addresses the proposed tasks and how the works shall comply with the general requirements of the SEMP. It is likely that a CEMP will be required during any future significant construction or development programs which occur on the Site.

The following is a list of appropriate legislative and regulatory guidelines that have been considered in the production of this SEMP:

- National Environment Protection Council, *National Environment Protection (Assessment of Site Contamination) Measure 1999* (as amended in May 2013) [ASC NEPM]
- Tasmanian Government *Environmental Management and Pollution Control (Waste Management) Regulations 2010*
- Tasmania EPA (2018) Information Bulletin No. 105, *Classification and Management of Contaminated Soil for Disposal* (IB105).

4.2 Preventative Exposure Measures

Preventative exposure measures provided in this SEMP can be categorised as follows:

- **Physical Barriers**: Placement/maintenance of a permanent barrier (i.e. concrete, asphalt, clean soil etc.) to mitigate unrestricted access/exposure to the underlying contamination (as described in **Section 4.6**).
- **Administrative Measures** such as:
  - Management plans/documents (such as this SEMP or a WHSP) that provide control of the activities and/or use of the areas of the Site as described in **Section 4.3**.
  - Planning controls as described in **Section 2.3** and **Section 4.4**.
  - Site inductions.
- **Personal Protective Equipment (PPE)** as described in **Section 4.5** to mitigate exposure to potentially harmful chemicals in soil and groundwater during subsurface works.

In some cases, it may be necessary to employ multiple preventative exposure measures, beyond the SEMP, that act as a contingency (or 'fail-safe'). For example, two physical barriers (e.g. concrete and plastic marker layer), or a physical barrier (concrete) combined with an administrative barrier (management plan).

4.3 Work Health and Safety Plan

It is recognised that as part of current and proposed future uses of the Site, it may be necessary to undertake intrusive works. Such activities increase the exposure to potentially impacted materials and therefore protective measures are to be adopted prior to work commencing.

Any works conducted on the Site should be undertaken in accordance with a WHSP. This WHSP should provide guidance with respect to the minimum PPE requirements where workers are likely to come into contact with potentially contaminated materials. Specific Safe Work Method Statements (SWMS) for each task to be performed should also be included in the WHSP.

ANY COMPANY/CONTRACTOR ENGAGED TO CONDUCT SUBSURFACE WORKS AND/OR EARTHWORKS ON THE SITE MUST PREPARE A SITE-SPECIFIC WHSP COVERING THEIR WORKERS AND PLANNED ACTIVITIES.

The following is an overview of WHS considerations for any works that may be undertaken, at a minimum, at the Site:

- Identification of WHS roles and responsibilities
- Evaluation of the Site hazards and the risks associated with these hazards
- Risk assessment methods and the risk control measures
- Details on work practices and restrictions, assessment of anticipated protection levels (including PPE), controls on access to the Site and decontamination
- Methodology for handing and management of soil and groundwater in accordance with **Section 4.9** and **Section 4.10** (if required)
- Detail regarding appropriate ventilation of the work area
- First aid and emergency procedures
- The notification of accidents and other matters
- Environmental monitoring protocols.

Appropriate WHS measures should be established by the contractors for personnel involved in subsurface works at the Site. The levels of protection and the procedures specified in this section are related to contamination issues only and do not represent a WHSP for the Site.

The ultimate responsibility and authority for the health and safety of the individual rests with the individual themselves and their colleagues. Each worker is responsible for exercising utmost care and good judgment in protecting his or her own health and safety and that of fellow workers. It is the responsibility of Site owners and those working on Site to bring any observed potentially unsafe condition or situations to the attention of any worker or contractor. Should workers find themselves in a potentially hazardous situation, they should immediately discontinue the hazardous procedure and take effective corrective or preventative action.

All incidents and/or near misses pertaining to works carried out on Site should be reported immediately to the owner or occupier of the area of the Site in which they occur.

4.4 Planning Controls

Development of the Site as described in **Section 2.3** is intended under the following restrictions:

- Development of an area will not proceed without an area-specific Contaminated Land Audit Report issued by an Environmental Auditor approved under Section 37 of the *Macquarie Point Development Act 2012*. Modifications in Site uses or development (i.e. planning for residential uses in an open space area) will require approval by a Contaminated Land Auditor.
- The Site surface will be covered with either hardstand and/or an engineered break layer, as specified in **Section 4.6** of this SEMP, which shall be implemented to provide a framework for ongoing maintenance and management of the Site during future use.
- Prior to commencement of building-related works within the Goods Shed, or any other structures within the Goods Shed and Yard area, a suitably qualified occupational hygienist should be consulted to confirm the nature and extent of ACM in the work area (if any), and to provide advice regarding the removal and management of ACM.

- The existing hardstand and flooring of the Goods Shed (including the slab, raised platform areas, crawl spaces and hard coverings etc.) remains *in situ*. In the event that the existing hardstand is partly or wholly removed, and/or changes to the configuration and/or penetrations are made, where the hardstand was placed directly above soils (e.g. slab on-grade), hardstand is to be reinstated to at least the minimum specification noted in **Section 4.6**.
- No ground floor residential uses will be included in developments in the Promenade and Underground Carpark, and Precinct North areas. Residential uses may be allowed on the first floor and above.
- The design of the Underground Carpark in the Promenade and Underground Carpark area should consist of the following:
    - A single level carpark excavated to a depth of 2.5 to 3.5 m bgl. The base of the carpark should be located approximately 1.5 m above groundwater.
    - The carpark roof should be located between 0.5 to 1 m above the current surface area, with an open ventilation space present surrounding the structure.
    - Any conduits or services which run beside or beneath the carpark at a depth of >2 m bgl should be installed in protective shrouds or in trenches/corridors of clean fill and no contact with soil beneath the carpark (i.e. for maintenance works) is expected as part of future carpark usage.
    - The Underground Carpark should be ventilated in accordance with ventilated in accordance with Building Code of Australia (BCA) requirements to deal with exhaust fumes.

  Final carpark design will be determined by a Site developer. Any significant changes to the proposed design should be reviewed by a qualified environmental practitioner and approved by an Contaminated Land Auditor and will require update of this SEMP.
- The potential exists for methane migration into buildings or structures in the Promenade and Unground Carpark and Precinct North areas during development. *Soil Vapour and Indoor Air Investigations 2019* (AECOM, 2021b) assessed the risk from soil methane as Characteristic Situation 3 – Moderate Risk (CS3), as defined by *Guidelines for the Assessment and Management of Sites Impacted by Hazardous Ground Gases* (EPA NSW, 2020). Based on this rating, and the proposed future development of the area (Arts/Institutional) a minimum gas protection guidance value of 3 should be incorporated into the future development.

It is noted that if the proposed Underground Carpark is ventilated in accordance with BCA requirements to deal with exhaust fumes, it should also provide sufficient protection from methane infiltration as per EPA NSW, 2020. If the Underground Carpark is not designed and constructed to BCA standards, methane protection measures should be advised by a qualified environmental practitioner and approved by a Contaminated Land Auditor.

4.5 Personal Protection Equipment

It is the responsibility of the contractor carrying out the works on-Site to develop SWMS for works to be undertaken, including the relevant PPE to be worn by the Site workers. This SWMS should be approved by the owner or occupier of the area of Site where works are occurring. The typical minimal level of PPE required for subsurface works includes:

- Neck to toe high visibility clothing
- Hard hat when working with plant equipment (i.e. excavator or similar)
- Protective gloves (Note: Impervious gloves are to be worn if there is potential for contact with potentially contaminated soil and/or groundwater. Gloves should be checked regularly for wear and tear and replaced when necessary).
- Steel-toed boots
- Safety glasses
- Other appropriate PPE as directed by the worker's Site Safety representative. This may include:

- Disposable coveralls
- Dust masks

A first-aid kit, with eye wash bottle and manual should also be available in the work area.

4.6 Physical Barriers

The following is to be considered with regard to the management of potential human health risks at the Site:

- The Site surface should be maintained with hardstand or an earthen cap to prevent direct human access to soil. In the event that the existing hardstand is partly or wholly removed, and/or changes to the configuration and/or penetrations are made, the following would be required:
  - Further assessment to evaluate potential impact to future users.
  - Reinstatement of hardstand, or placement of an earthen cap.

  It is noted that confirmation of the design of all proposed hardstand or earthen cap areas (i.e. thickness and material type) with a Contaminated Land Auditor is required prior to placement.
- In the event that the existing hardstand is partly or wholly removed, and/or changes to the configuration and/or penetrations are made, the following minimum design barrier shall be installed, unless otherwise agreed to with a Contaminated Land Auditor. Note that consideration will need to be given to the intended use of the hardstand area during the design process to ensure the hardstand is suitable for the anticipated loads (e.g. light or heavy vehicles):
  - *Layer 1*: Orange mesh para-webbing (or similar) placed as an indicator barrier over exposed soils to alert Site users/ maintenance workers.
  - *Layer 2*: Sub-grade/ base material (minimum 0.2 m) certified as 'Fill Material' in accordance with Tasmanian EPA Bulletin 105 and be geotechnically suitable.
  - *Layer 3*: Surface covering such as concrete or asphalt at a thickness suitable for the intended use (e.g. light or heavy vehicles). Asphalt shall be a minimum 30 mm thickness to allow for longevity of the barrier.
- Landscaped areas and gardens should be established in above ground planter boxes on hardstand and not directly over exposed soil. In the event that gardens are proposed in-ground, the following barrier system shall be installed:
  - *Layer 1*: Orange mesh para-webbing (or similar) placed as an indicator barrier over exposed soils to alert Site users.
  - *Layer 2*: Earthen cover (minimum 0.5 m) certified as 'Fill Material' in accordance with Tasmanian EPA Bulletin 105.
  - *Layer 3*: Surface coverage (comprising shallow rooted vegetation).

  Allowance may be made for the establishment of deep rooted vegetation; however, the barrier thickness may need to be increased, or the design modified. In-ground garden designs should be confirmed with a Contaminated Land Auditor.

Modifications of the land use and/or the configuration of the Site surface may result in a potential human health risk due to exposure to contamination in the subsurface. This includes (but is not limited to) the following:

- Construction of new buildings.
- Modification of existing buildings.
- Any subsurface excavation works.
- Modification of the existing surface profile (specifically with respect to excavation and/or levelling of soil).
- Modification of the existing surface coverings (e.g. replacing a concrete area with turf).

The Site surface is presently covered with a mixture of concrete, asphalt, and imported clean VENM in areas where remediation has occurred in.

Section 4.9 provides further guidance with respect to conducting excavation works on the Site. It is critical that in the event that the existing physical barriers are modified or removed during any future works, then they must be reinstated to a minimum of the same standard/quality that exists at that location currently.

In the event that variation from the barrier requirements within this SEMP are required, the suitability of the proposed barriers should be confirmed with a Contaminated Land Auditor prior to implementation.

4.7 Chemical Exposure

The following compounds have been identified as CoPC in soils and groundwater that may pose a potential human health risk:

- Heavy metals
- PAHs
- TRHs
- Benzene
- ACM.

A summary of the potential symptoms of exposure is provided in **Appendix D**. Potential exposure to these CoPC should be managed through the implementation of measures provided in a Site-specific WHSP (refer **Section 4.3**).

4.8 Unexpected Finds

In the event that unexpected finds are encountered during intrusive works which have the potential to cause harm to human health or the environment, works shall cease and the area isolated. The Site owner or occupier should then immediately be informed.

An unexpected find may include (but not be limited to):

- ACM (see **Section 3.6**)
- UST
- Redundant pipework and abandoned services (as discussed in **Section 2.4**)
- Historic artifacts (Aboriginal and European) (see **Section 4.8.1**).
- Former gasworks infrastructure.

The material should be appropriately assessed by an experienced environmental or health and safety practitioner (depending on what the material is) and disposed/treated in a suitable manner with consideration to the guidance outlined in **Section 4.9**. Historic or artifact finds should be managed as described in **Section 4.8.1**

It should be noted that during previous Site investigations, redundant pipes and other abandoned services have been encountered which are not on any records and the origin and purpose of which remains unknown. There remains further potential for unidentified pipes to be discovered during subsurface works. Underground service location surveys are to be completed prior to the commencement of subsurface works and due caution taken as part of any excavation.

Further to the above, if subsurface works are to be undertaken within the Gateway area, or in proximity to the former Hobart Gasworks, reference is made to recommendations provided in Workplace Standards Tasmania *Safety Alert No. 1 September 2010* with regard to working near historical gas infrastructure.

4.8.1 Protocol for Management of Unanticipated Archaeological Discoveries

The potential exists for unexpected Aboriginal and European artifacts to exist in Site soil. Portions of the Escarpment, Gateway and Promenade and Underground Carpark areas have been identified as a Place of Archaeological Significance in the *Sullivans Cove Planning Scheme.*

The following outlines the protocol for managing Unanticipated Historic (European) Archaeological Discoveries. Separate legislative and procedural requirements exist for Aboriginal heritage and these are documented in the Unanticipated Discovery Plan (attached as **Appendix H**).

Archaeological investigations have taken place at Macquarie Point since 2008 through a series of test and controlled excavations, principally at the western end of the site. These works assist in understanding subsurface archaeological conditions and the potential of certain locations within Macquarie Point to contain archaeological features. Based on these insights, some inferred judgments have been made on:

- The potential, or likelihood for particular areas to contain subsurface archaeology; and
- The likely significance of such features or deposits.

Figure 2 shows the inferred areas archaeological sensitivity of the Site based on works completed to date.

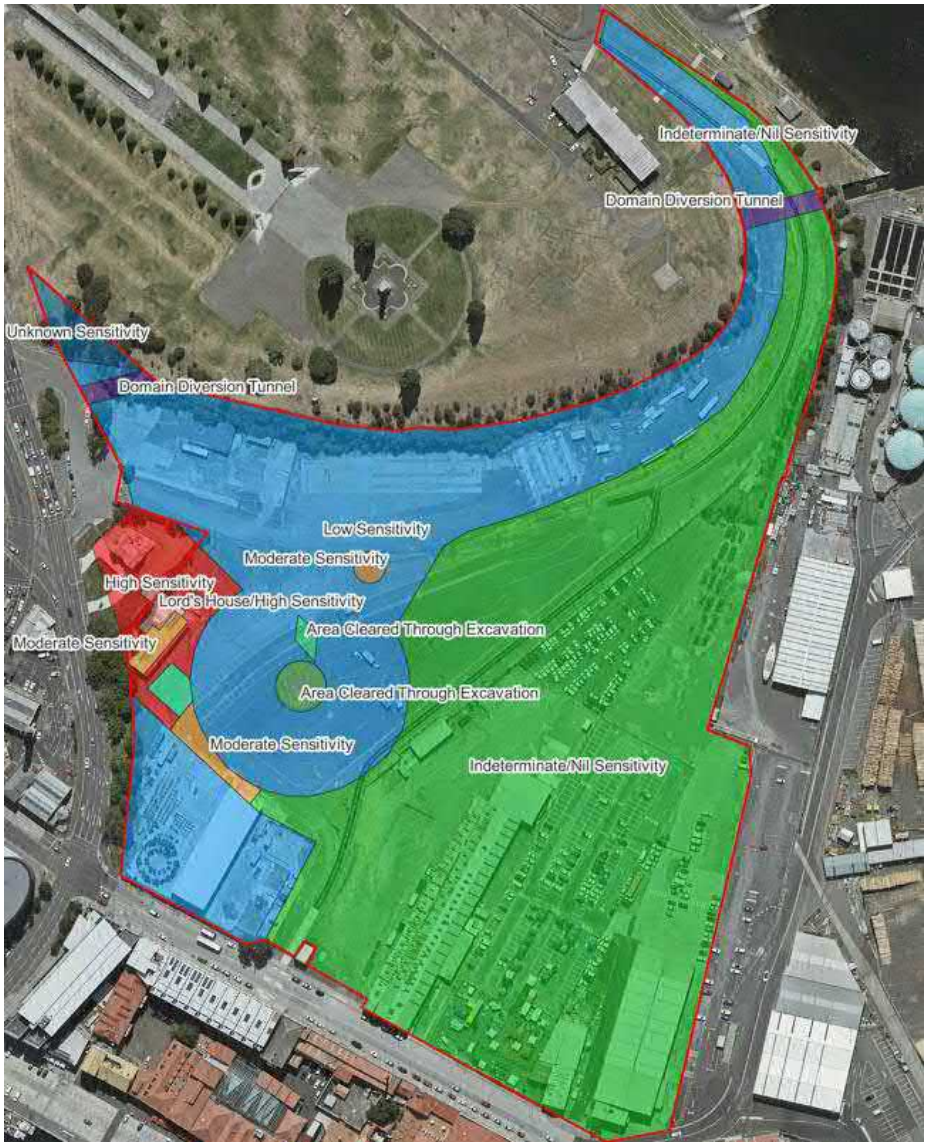

Figure 2 Areas of Inferred Archaeological Sensitivity

However, it is highly likely that unanticipated archaeology will be encountered during excavation works because of the diversity and widespread nature of past development on the site and the limited insights available from historical research and excavations.

To account for such finds, project specifications for works must consider the potential for dealing with unanticipated discoveries. The Sullivans Cove Planning Scheme 1997 includes specific requirement as part of its requirements for Archaeological Sensitivity Reports, terming such protocols a 'watching brief'.

Features may include but not be limited to the exposure of handmade clay bricks or sandstone blocks forming walls or surfaces, or artefacts such as fragments of ceramic, bottle glass, bone, shell or other items. Where such material is found, or where doubt exists, excavations within the area should cease pending attendance on site and receipt of advice from a qualified archaeologist, at which point, depending on the findings, it may also be necessary to involve Hobart City Council in discussions.

What if any further archaeological management is required will depend on the significance of the discovery. This will largely be a question of its thematic context; its potential to provide new and important information; and its condition. Management may vary from no further action, to recording of exposed features, to further archaeological monitoring, testing or controlled excavation in accordance with Parts 4 to 8 of the Tasmanian Heritage Council's *Practice Note 2: Managing Historical Archaeological Significance in the Works Application Process.*

4.9 Soil Management Plan

The management of soils at the Site must have regards to the provision of both the *Environmental Management and Pollution Control Act 1994* and IB105.

4.9.1 Excavated Material

In the event soil needs to be excavated, excavated materials shall be stockpiled in a designated area and must be labelled as contaminated, until the material is reinstated to the excavation which it was removed from, or the contamination status is assessed by sampling and analysis of the stockpiled material for the purpose of off-Site disposal (refer to **Section 4.9.3**). Exclusion zones or barriers should be maintained around excavations to prevent access by unauthorised people who may fall into excavations or come into contact with the soil.

The stockpiling area is to be on hardstand or high-density polyethylene (HDPE) sheeting. Stockpiles should be appropriately managed to prevent the loss of suspect soils as dust (via wind erosion), or stormwater runoff.

This may involve:

- Covering, or spraying the stockpiles to keep the soil damp to mitigate wind erosion.
- Construction of silt fences and other measures to capture and prevent runoff from the area.
- Establishment of exclusion zones or barriers to prevent access and contact with soil by unauthorised people.

Stockpiling for an extended period of time should be avoided in order to mitigate potential environmental impacts such as dust and odour generation, and stormwater and sediment run off.

Soils with potentially high levels of contamination encountered during excavation work must be separated and stockpiled from other non-odorous, visibly clean soils, and assessed by a suitably experienced environmental practitioner. Soils which should be separated in this way may be identified by one or more of the following attributes:

- Containing coke, ash, coal tar, ACM fragments, or other visually evident contamination
- Highly odorous (i.e. putrescible, aromatic or hydrocarbon odours)
- Visibly stained (i.e. hydrocarbon staining or other)
- Soil which appears to have been in contact with groundwater
- Soil excavated from the areas of notable soil impacts as noted in **Section 3.2.3**.

Records of excavated soil and stockpile movements, including, but limited to, the location of materials excavated, quantities, descriptions of materials encountered, laboratory test certificates, disposal location, and tip dockets, should be maintained by the Site owner or occupier.

4.9.2 Dust Management

This section is applicable to works associated with subsurface excavation and soil movement. It is expected that normal operation of the Site, or intended future uses, will not require the implementation of dust and odour controls.

The following measures that can be undertaken to assist with mitigating issues associated with dust and odours should be considered when planning soil excavation or movement on the Site:

- Minimise movement of vehicles on exposed surface areas
- Minimise excavation and movement of soils
- Dampen down vehicle tracks with water
- Trucks transporting soil around and off-Site should have their loads covered with tarpaulins (or similar) to prevent the emission of dust and/or odour
- Dampen down exposed soil in excavations, or in stockpiles, to minimise dust generation
- Dampen down exposed soil, stockpile, or loads, with an environmentally appropriate odour suppressant solution
- Avoid excavating soil on windy days, due to the increased likelihood of dust and odour generation and transport
- Cover exposed soil (i.e. stockpiles) with netting, matting or plastic sheeting if necessary, to minimise generation of dust and odours.

4.9.3 Characterisation for On-Site Reuse/ Off-Site Disposal

Due to the heterogeneous nature of fill material at the Site, it is recommended that excavated materials be stockpiled (or stored within a skip/drums) and appropriately characterised for on-Site re-use or off-Site disposal by a suitable qualified environmental practitioner on a case by case basis.

It is noted that in accordance with IB105, on-Site remediation, treatment and/or re-use is the preferred approach to the management of contaminated soil.

A recommended approach for characterising excavated materials is provided in the following sections.

4.9.3.1 On-Site Reuse

To assess the suitability for excavated materials to be re-used on Site, it is recommended that soil data be screened against the interim Remediation Criteria (RC) developed by AECOM (refer AECOM, 2016) and listed in **Appendix G**. The interim RC considers that the Site will be mostly covered with hardstand, with opportunities for direct access to future Site users within areas of landscaping considered likely to be minimal and more likely to result in contact with imported materials rather than current Site soils. This land use scenario is also considered to be applicable for the proposed interim Retail and Commercial uses at the Site.

In addition to the consideration of contaminant concentrations in soils, material exhibiting aesthetic impacts such as discolouration (i.e. stained from spills), odours, or wastes should not be reused on-Site unless managed by placement of an impervious barrier (i.e. placement of physical hardstand).

Where existing soil data for the subject material is not available, material should be sampled at a rate of 1 sample per 25 m^3 (or three samples as a minimum) and analysed for:

- Heavy Metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, vanadium, and zinc)
- TPH
- BTEX
- PAH

- Cyanide
- Phenolic compounds.

If it is suspected that other contaminants may be present (e.g. asbestos), these should also be included in the analytical suite.

Where compounds are reported below the interim RC, soils may be reused on-Site and covered with an impervious barrier (i.e. placement of physical hardstand). In cases where compounds are reported above the interim RC, an appraisal as to whether the material is suitable for on-Site reuse (with consideration to the implementation of additional management controls) should be undertaken by an appropriately experienced environmental practitioner.

4.9.3.2 Off-Site Disposal

If off-Site disposal of excavated material is planned, stockpiles or waste in soil drums must be sampled and analysed for waste characterisation purposes prior to removal from Site in accordance with IB105.

Material should be sampled at a rate of 1 sample per 25 m^3 (or three samples as a minimum) and analysed for compounds listed on Table 2 of IB105. Alternative sampling suites and/or density may be accepted by EPA and waste disposal facilities, but any change from the sample suites and sample density should be determined by a suitably qualified environmental practitioner.

Table 8 below provides an overview of soil disposal options with reference to IB105.

Table 8 IB105 – Waste Classification Summary

EPA Classification	Disposal/ Treatment Options	Requirements
Level 4 (Contaminated Soil for Remediation)	• On-Site remediation • Off-Site remediation • Storage pending availability of treatment	• No direct disposal to landfill • EPA Environmental Approval and transport certificates must be used • Vehicles must hold EPA permit (unless exemption issued)
Level 3 (Contaminated Soil)	• On-Site remediation • Off-Site remediation • Licensed landfill	• Disposal to licensed facility • EPA Environmental Approval and transport certificate system must be used • Vehicles must hold EPA permit (unless exemption issued)
Level 2 (Low Level Contaminated Soil)	• On-Site remediation • Off-Site remediation • Licensed landfill	• Disposal to licensed landfill • EPA Environmental Approval and transport certificate system must be used • Vehicles must hold EPA permit (unless exemption issued)
Level 1 (Fill Material)	• Unrestricted	• Disposal should not adversely impact the environment or human health

A Waste Management Plan (as detailed in Section 5.2 of IB105) must be prepared and submitted to EPA for approval for disposal of any material which is classified as *Level 2 (Low Level Contaminated Soil)* or above.

Soils and excavated materials classified as *Level 4 (Contaminated Soil for Remediation)* must be remediated (either on-Site or off-Site) and are unable to be disposed directly to landfill without treatment.

4.9.4 Imported Material

Any materials imported to the Site for use as fill will be required to meet the environmental and geotechnical requirements specified for the particular end use. Material should comply with the requirements for reuse as defined in IB105 and should be assessed and below the site specific RC as defined in **Appendix G**.

Compaction of backfill should be applied such that the reinstated areas will not settle.

4.9.5 Surface Reinstatement

Where hardstand has been removed to facilitate excavation activities, it is recommended that the surface be reinstated with like materials (i.e. concrete with concrete), or with a physical barrier which fulfils the requirements described in **Section 4.6**.

4.10 Groundwater Management Plan

Depth to groundwater across the Site has ranged from approximately 1 to 6 m bgl. The average depth to groundwater beneath the Site is 1.5 m bgl.

The potential exists for groundwater to be encountered during subsurface works that extend to 1.0 m bgl and beyond beneath the Site. Groundwater may also be encountered at shallower depths at select locations.

Groundwater which ponds in open excavations which needs to be removed for logistical considerations should be removed by a licensed waste contractor, or alternatively treated and disposed to sewer under a Site-specific Trade Waste Agreement (subject to regulatory approval).

4.10.1 Groundwater Monitoring Wells

Where possible, excavations should avoid damage to groundwater monitoring wells. The integrity of groundwater monitoring wells should be maintained to facilitate potential future groundwater monitoring events. The locations of groundwater monitoring wells are provided in **Figure F4a** in the **Figures** section.

4.11 Noise Control

This section is applicable to works associated with subsurface excavation and soil movement. It is expected that normal operation of the Site, or intended future uses, will not require the implementation of noise controls.

Works with heavy plant or other equipment which is has the potential to cause noise above background levels should be conducted in accordance with the *Construction Noise Management Plan* (CNMP), attached as **Appendix F**.

5.0 Implementation

The SEMP is an active document, which needs to be considered by all parties/stakeholders planning to undertake intrusive work at the Site. Any parties carrying out intrusive works at the Site shall satisfy themselves that suitable safety and environmental controls have been implemented as part of their proposed works program.

Should any activities by the Site owner or occupier, or with their consent, need to occur on the Site that is not currently covered in the SEMP, then the SEMP should be updated to include these activities. Alternatively, as stated in **Section 4.1**, a CEMP may be required which specifically addresses the proposed tasks and how the works shall comply with the general requirements of the SEMP.

5.1 Site Inspection

Visual inspections of the Site should be undertaken by the Site owner or occupier (or nominated representative) annually to assess the surface condition of the Site. Where excavations have taken place, and excavations have been backfilled, the surface is to be reinstated with an impervious barrier (i.e. placement of physical hardstand).

If significant works are undertaken, or breaches or damages to surface protections are detected, inspection of the affected area should be undertaken at the time of works, and at the completion of modifications of the area, or repairs to damaged surface coverings.

Where this has not been undertaken, corrective actions will be required to reduce the risk to an acceptable level to such an extent that it no longer presents an unacceptable risk to human health or the environment.

A register of the completion of visual inspections and documentation associated with works completed subsequent to inspections identifying the need for corrective actions should be maintained by the Site owner or occupier.

The register of inspections should include (but not be limited to) the following:

- Time and date of the inspection and/or incident
- Details of any visual indications of changes to surface conditions at the Site
- Details regarding the cause (suspected or known) of the breach
- Details and documentation associated with works undertaken in the reinstatement of surface condition
- Details of any systems or procedures implemented to prevent similar breaches or deteriorations in the future.

5.2 Incident Management

All environmental incidents should be recorded, and if an incident or potential incident is likely to cause significant impacts to people or the environment, the Site owner or occupier should be immediately notified.

Environmental incidents, accidents or mishaps include:

- An accident (actual environmental impact)
- A near miss (‘near miss’ where no environmental impact occurred)
- A dangerous occurrence (event posing a risk to the environment or damage of property).

Records shall be kept by the Site owner or occupier of any environmental incidents, hazardous situations, unusual events and the corrective action taken. A representative of the Site owner or occupier should investigate the cause of any emergency so that necessary changes in work practices can be made to prevent the incident recurring.

5.3 Corrective Actions

In the event that Site conditions result in an accidental or unintentional risk to human health or the environment without implementation of appropriate exposure minimisation measures, isolation of the affected area should be undertaken and steps taken by the most suitable and effective means to prevent exposure to Site personnel.

Following this, the SEMP should undergo a review of all procedures to minimise the potential for future exposure of impacted material. Corrective actions should be completed in a manner and timing as directed by the Site owner or occupier.

Following the incident or accident, a documented review of the incident should be undertaken by the Site owner or occupier (or their nominated representative). The review should be tasked with identifying the cause of the incident and providing recommendations on alternative procedures or systems to be implemented at the Site and/or within the SEMP to prevent/minimise the likelihood of the incident reoccurring.

5.4 Document Revision

A review of the SEMP should be undertaken every three years, or earlier if significant changes in the use or conditions of the Site occur, by the Site owner or occupier (with input from specialist professionals where required), and should consider:

- Any non-compliances with the SEMP that have not been rectified
- Means of improving environmental compliance
- Legislation or guidelines that impact any part of the SEMP
- Proposed changes in the way the areas of the Site are used or any changes in the surrounding land use which may impact upon exposure pathways.

The SEMP should be updated as necessary, based on the results of reviews of the SEMP.

5.5 Record Keeping

The Site owner or occupier will be responsible for keeping documents relating to the implementation of the SEMP, including (but not limited to):

- The outcomes of additional soil assessments or modifications in the future Site uses.
- A SEMP maintenance register (including superseded versions of the SEMP, Site inspection documents, permits and correspondence between, and training records of, people who have been inducted onto the SEMP.
- Documentation of the following:
    - Materials tracking and disposal
    - Unexpected finds
    - Environmental incidents which occur on Site.

6.0 References

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Tasmanian Environment Protection Authority, 2018. *Information Bulletin No. 105 (IB105), Classification and Management of Contaminated Soil For Disposal*

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Tasmanian Government *Environmental Protection Policy (Noise) 2009*

Tasmanian Government *Environmental Management and Pollution Control (Miscellaneous Noise) Regulations 2016*

Tasmanian Government (2012) *Macquarie Point Development Corporation Act* (Updated on 2 December 2020)

Victorian State Government (2017) *Environment Protection Act 2017*

Appendix A

Figures

List of Figures

PROJECT ID 60321835
CREATED BY PK
LAST MODIFIED PK 11 Oct 2021

AECOM
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N

DATUM GDA 1994, PROJECTION MGA ZONE 55

0 25 50 100

metres

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Legend

- Assessment Area
- Site Boundary

ASSESSMENT AREA BOUNDARY

Macquarie Point Development Corporations

Site Environment Management Plan

Macquarie Point, Hobart, TAS

Figure

F1

Map Document: (\\aumel1fp001.au.aecomnet.com\Projects\603X\60321835\4. Tech work area\4.99 GIS\02_Maps\2021\10\SEMP\F1_Assessment_Area_Boundary.mxd)

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CREATED BY PK
LAST MODIFIED PK 11 Oct 2021

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DATUM GDA 1994, PROJECTION MGA ZONE 55

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metres

1:1,675 (when printed at A3)

Legend

- Assessment Area
- Site Boundary
- Underground Carpark Footprint
- Building Parcels

Land Use

- Art and Institutional Area
- Open Space Area
- Mixed Use Area
- Access Link
- Transport/Vehicle Areas

SITE LAYOUT

Macquarie Point Development Corporations

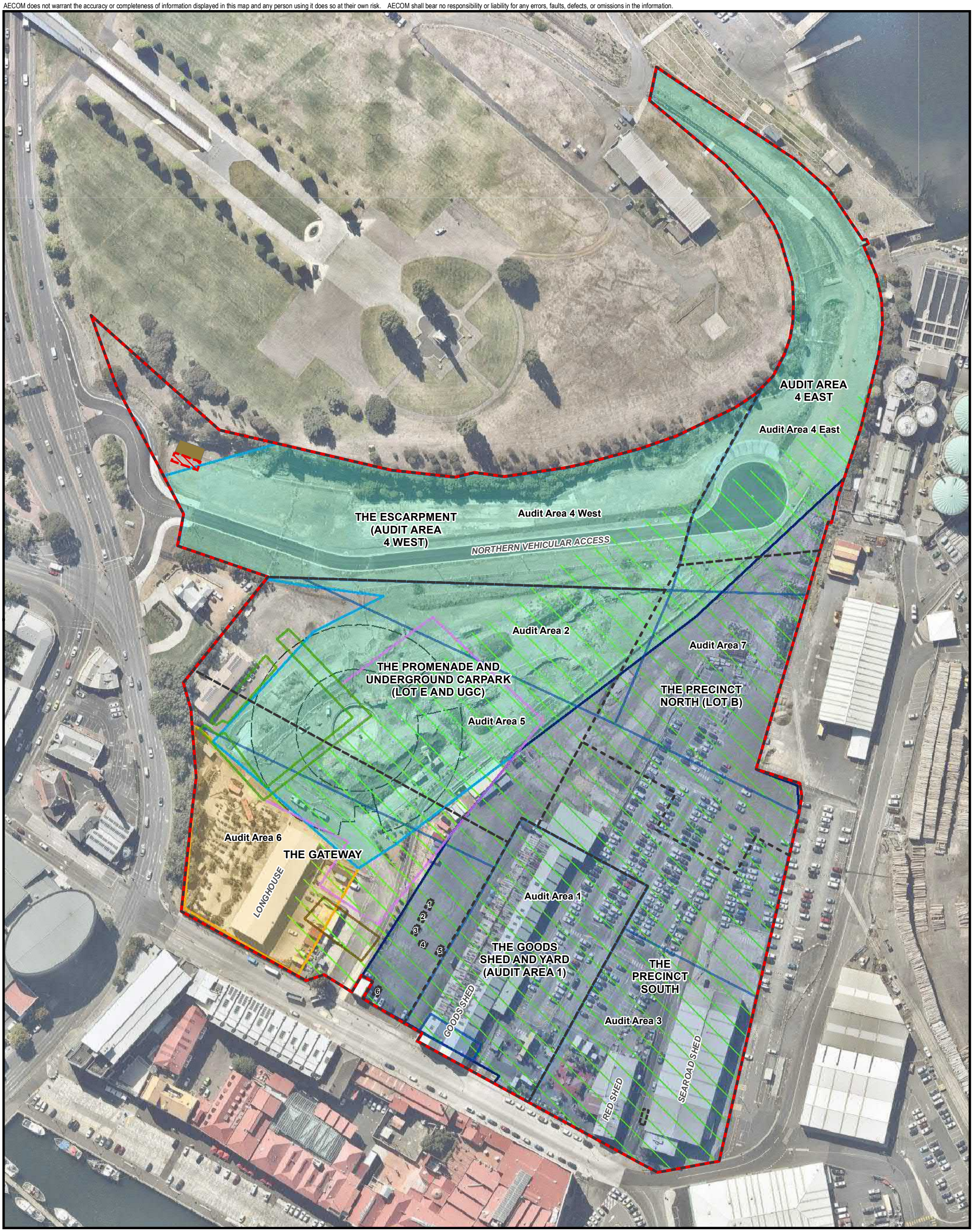
Site Environment Management Plan

Macquarie Point, Hobart, TAS

Figure
F2

Map Document: (\\aumel1fp001.au.aecomnet.com\Projects\603X\60321835\4. Tech work area\4.99 GIS\02_Maps\2021\10\SEMP\F2_Site_Layout.mxd)

A3 size



PROJECT ID 60321835
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LAST MODIFIED PK 13 Oct 2021

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metres

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Legend

- Assessment Area
- Site Boundary
- Underground Carpark Footprint
- Building Parcels
- Former Audit Area Boundary
- Reclaimed Land
- Freight Handling
- Rail Yards
- Gas Works
- Drill Yards
- Former Hobart Rivulet
- Sanitary Depot
- Septic Tanks
- Slaughter House and Yards
- Historic Infrastructure
- Truck Wash/ Settling Pits
- Potential Petroleum Storage Tanks
- Previous UST Location

HISTORIC SITE USES AND AUDIT AREAS

Macquarie Point Development Corporations

Site Environment Management Plan

Macquarie Point, Hobart, TAS

Figure
F3

Map Document: (\\aumel1fp001.au.aecomnet.com\Projects\603X\60321835\4. Tech work area\4.99 GIS\02_Maps\2021\10\SEMP\F3_Historic_Siteuses_Audit_Areas.mxd)

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PROJECT ID 60321835
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LAST MODIFIED PK 20 Oct 2021

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DATUM GDA 1994, PROJECTION MGA ZONE 55

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metres

1:1,675 (when printed at A3)

Legend

- Groundwater Well
- Vapour Probes
- Assessment Area
- Site Boundary
- Underground Carpark Footprint
- Building Parcels

Land Use

- Art and Institutional Area
- Open Space Area
- Mixed Use Area
- Access Link
- Transport/Vehicle Areas

ASSESSMENT LOCATIONS- GROUNDWATER AND SOIL VAPOUR

Macquarie Point Development Corporations

Site Environment Management Plan

Macquarie Point, Hobart, TAS

Figure
F4a

Map Document: (\\aumel1fp001.au.aecomnet.com\Projects\603X\60321835\4. Tech work area\4.99 GIS\02_Maps\2021\10\SEMP\F4a_Assessment_locations_GW_SV.mxd)

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CREATED BY PK
LAST MODIFIED PK 20 Oct 2021

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DATUM GDA 1994, PROJECTION MGA ZONE 55
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metres
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Legend

- Geotechnical Borehole
- Soil Bores/Test Pits
- Test Pit (Roundhouse Investigation)
- Trench (Roundhouse Investigation)
- Assessment Area
- Site Boundary
- Underground Carpark Footprint
- Building Parcels

Land Use

- Art and Institutional Area
- Open Space Area
- Mixed Use Area
- Access Link
- Transport/Vehicle Areas

ASSESSMENT LOCATIONS - SOIL

Macquarie Point Development Corporations

Site Environment Management Plan

Macquarie Point, Hobart, TAS

Figure
F4b

Map Document: (\\aumel1fp001.au.aecomnet.com\Projects\603X\60321835\4. Tech work area\4.99 GIS\02_Maps\2021\10\SEMP\F4b_Assessment_locations_Soil.mxd)

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CREATED BY PK
LAST MODIFIED PK 13 Oct 2021

AECOM
www.aecom.com

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DATUM GDA 1994, PROJECTION MGA ZONE 55

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metres

1:1,675 (when printed at A3)

Legend

- Assessment Area
- Site Boundary
- Sea Wall
- Stormwater pipeline
- Sewer (Main Hobart Pipeline)
- Former Sewer pipeline
- TasGas pipeline
- Pipeline (Unknown)
- Tar pipeline
- Naval oil pipeline
- Water pipeline
- Diesel Pipeline (Remaining)
- Diesel Pipeline (Removed)
- Oil Line (Remaining)
- Oil Line (Removed)
- Fuel Line (Remaining)
- Fuel Line (Removed)
- Northern Refuelling Line (Removed)
- Telecommunication Cables
- Lead impacted soil on Site boundary
- Petroleum impacted soil on Site boundary
- Potential Buried ACM
- Previous UST Location
- Sewer Exclusion Zone
- Telecommunications Exclusion Zone
- Remediation Excavation Extent
- Inferred Extent of LNAPL Plume
- Inferred Extent of Tar and Gross Tar Impact
- Historical Inferred Extent of LNAPL Plume

SUBSURFACE FEATURES

Macquarie Point Development Corporations

Site Environment Management Plan

Macquarie Point, Hobart, TAS

Figure
F5

Map Document: (\\aumel1fp001.au.aecomnet.com\Projects\603X\60321835\4. Tech work area\4.99 GIS\02_Maps\2021\10\SEMP\F5_Subsurface_Features.mxd)

A3 size

Appendix B

Induction Register

SEMP Induction Form

Date	Name	Company	Position/ Responsibility	Contact No.	Signature

Appendix C

Area Specific Contamination Summaries

Goods Shed and Yard Contamination Summary

Historical activities undertaken within The Goods Shed and Yard area have resulted in the presence of residual soil and groundwater contamination. Multiple phases of soil, groundwater and soil vapour investigations have been undertaken to assess the nature and extent of contamination.

The following sections provide an overview of identified soil and groundwater impacts in this area. It is noted that no remediation of this area has been required in order to fulfil the future development plans, and this has been validated and approved by the Contaminated Land Auditor in *Contaminated Land Audit Report – Macquarie Point Development Project – Audit Area 1* (Coffey, 2019).

Identified Soil Impacts

Fill has been identified beneath the Goods Shed and Yard area from the surface to depths of 7 – 10 m below ground level (bgl). Field observations indicated that fill material is heterogeneous comprising silts, sands with dolerite gravels and cobbles with occasional rubble, glass, metal fragments, coal, coke and ash. A slight hydrocarbon odour was noted at two sampling locations (BH36 and MW127), and a slight hydrocarbon sheen was also noted during the drilling of the soil bore for groundwater well MW127.

The field observations and the presence of Chemicals of Potential Concern (CoPC) above the adopted soil investigation (Tier 1) criteria are likely to have occurred as a result of the placement of fill material associated with the former Hobart Gasworks, or potentially from impacted fill material imported to the site for land reclamation.

Concentrations of Polycyclic Aromatic Hydrocarbons (PAHs), Total Petroleum Hydrocarbons (TPH) / Total Recoverable Hydrocarbons (TRH) and select metals were reported in soil above the adopted Tier 1 criteria for the following Protected Environmental Values (PEVs):

- Residential, Recreation/ Open Space or Commercial/ Industrial Land Uses
- Maintenance of Modified and Highly Modified Ecosystems.

Table 1 below provides a range of concentrations of CoPC (or general CoPC groups) identified within the Goods Shed and Yard area that have been reported above the adopted Tier 1 criteria.

Table 1 Summary of Soil Analytical Results

CoPC	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)
Lead	<5	1,640
Nickel	<2	77
Copper	<5	248
Zinc	6	2,820
TRH (C_{10}-C_{40})	<50	10,500
Benzene	<0.1	0.8
Total PAHs	<0.5	2,310

Identified Groundwater Impacts

Groundwater Monitoring Events (GMEs) have been routinely conducted for wells located within the Goods Shed and Yard area since January 2015.

Over this timeframe, groundwater samples have had concentrations reported of a combination of arsenic, cobalt, iron, manganese, zinc, ammonia, sodium, chloride, TDS and sulphate, above the adopted Tier 1 assessment criteria for groundwater PEVs.

Table 2 below provides a range of CoPC concentrations (or general CoPC groups) identified within The Goods Shed and Yard area that have been reported above the adopted Tier 1 criteria.

Table 2 Summary of Groundwater Analytical Results

CoPC	Minimum Concentration (mg/L)	Maximum Concentration (mg/L)
Arsenic	<0.001	0.021
Cobalt	<0.001	0.012
Iron	0.46	34
Manganese	0.004	2.48
Zinc	<0.005	0.23
Ammonia	<0.001	26
Total Dissolved Solids (TDS)	38	3,650
Sodium	<1	930
Chloride	3	4,400
Sulphate	<1	930

Asbestos

Whilst asbestos has not been identified in soil during previous environmental investigations, there is potential that Asbestos Containing Material (ACM) may be encountered during intrusive works or require management as part of building refurbishment activities within the Goods Shed and Yard area.

Asbestos has been noted within the Goods Shed building.

The Escarpment (Audit Area 4 West) and Audit Area 4 East Contamination Summary

Historical activities undertaken within the Escarpment and the Audit Area 4 East areas have resulted in residual soil and groundwater contamination. Multiple phases of soil and groundwater investigations have been undertaken to assess the nature and extent of contamination.

The following sections provide an overview of identified soil and groundwater impacts at these areas of the Site. It is noted that remediation of soil impacts in the Escarpment area was conducted in late 2019 and early 2020 as reported in *Audit Area 4 – Remediation Validation* (AECOM, 2020b).

Validation and Contaminated Land Auditor approval of this remediation has been received in *Contaminated Land Audit Report – Macquarie Point Development Project – Audit Area 4 West* (Coffey, 2020), and no further Remediation is anticipated for the proposed future development of the Escarpment. However, further remediation and Auditor approval is required for Audit Area 4 East prior to future development.

Identified Soil Impacts

In the Escarpment and Audit Area 4 East areas, fill material consists of crushed stone/ballast, silt and clayey gravels with occasional rubble, brick and wood fragments.

Concentrations of Polycyclic Aromatic Hydrocarbons (PAHs), Total Petroleum Hydrocarbons (TPH) / Total Recoverable Hydrocarbons (TRH) and select metals were reported in soil above the adopted Tier 1 criteria for the following Protected Environmental Values (PEVs):

- Residential, Recreation/ Open Space or Commercial/ Industrial Land Uses
- Maintenance of Modified and Highly Modified Ecosystems.

Error! Reference source not found. below provides the range of concentrations of Chemicals of Potential Concern (CoPC) (or general CoPC groups) identified within the Escarpment and Audit Area 4 East areas that have been reported above the adopted Tier 1 investigation criteria.

Table 1 Summary of Soil Analytical Results

CoPC	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)
Lead	<5	1,070
Nickel	3	62
Arsenic	<5	552
Copper	12	828
Zinc	16	1,220
TPH (C_{16}-C_{34})	<100	4,170
TPH (C_{10}-C_{16})	<50	5,680
TPH (C_{10}-C_{16}) (minus Naphthalene)	<50	5,670
TPH (C_6-C_{10}) (less BTEX[1])	<10	53
Benzo(a)pyrene	<0.5	46.4
Total PAHs	<0.5	464

CoPC	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)
Naphthalene	<0.5	17
Dibenz(a,h)anthracene	<0.5	7.1
Indeno(1,2,3-c,d)pyrene	<0.5	24.3

Note: 1. BTEX – benzene, toluene, ethylbenzene and xylenes

Lead Impacted Soil in Telecommunications Cable Exclusion Zone (the Escarpment)

During remediation works in the Escarpment, a lead concentration of 1,600 mg/kg was reported in soil validation sample CB-EX-41, collected from the boundary of the 2 m buffer zone surrounding the major telecommunications cable in the former Concrete Batching Plant area of the Escarpment. The location of the lead detection is shown on **Plate 1** below.

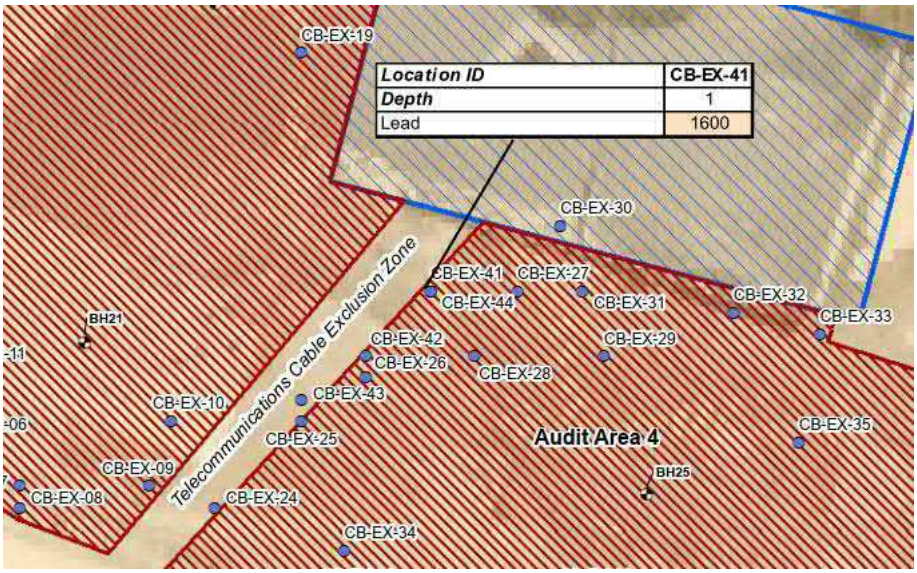

Plate 1 Location of lead in soil detection in telecommunication cable exclusion zone

Due to the risk of damage to the cable from excavations in this area, the asset owner (Telstra) did not give approval for excavation of soil in the exclusion zone. The impact was assessed as localised and not typical of the material in the exclusion zone in the Remediation Validation report (AECOM, 2020b), and soil present within the exclusion zone has been isolated from clean fill using a 200 µm plastic liner (shown on **Plate 2** below).

Plate 2 Liner on the Western Boundary of the Telecommunications Cable

Future works in this area should consider the potential for lead impacts to be present if this soil is to be disturbed.

Asbestos in Audit Area 4 East

On 9 July 2020, contractors (Pitt & Sherry Pty Ltd) working for the Macquarie Point Development Corporation detected fragments of Asbestos Containing Material (ACM) in the embankment within Audit Area 4 East adjacent to the boundary with the Escarpment. The following was noted with regard to these fragments:

- The ACM encountered consisted of fragments of corrugated roofing material between 5 to 300 mm in size.
- ACM was typically encountered 400 – 600 mm below the ground surface.

All encountered ACM and surrounding soil were removed when encountered and the area was assessed by an occupational hygienist to be free of visual ACM. The hygienist indicated that the number of ACM fragments present appeared to increase in the northwest of the area cleared and may be present in the adjacent embankment in that direction.

The location where ACM was detected, and the potential area to the northwest, has been added to the Site Asbestos Register, and both areas are shown on **Plate 3** below.

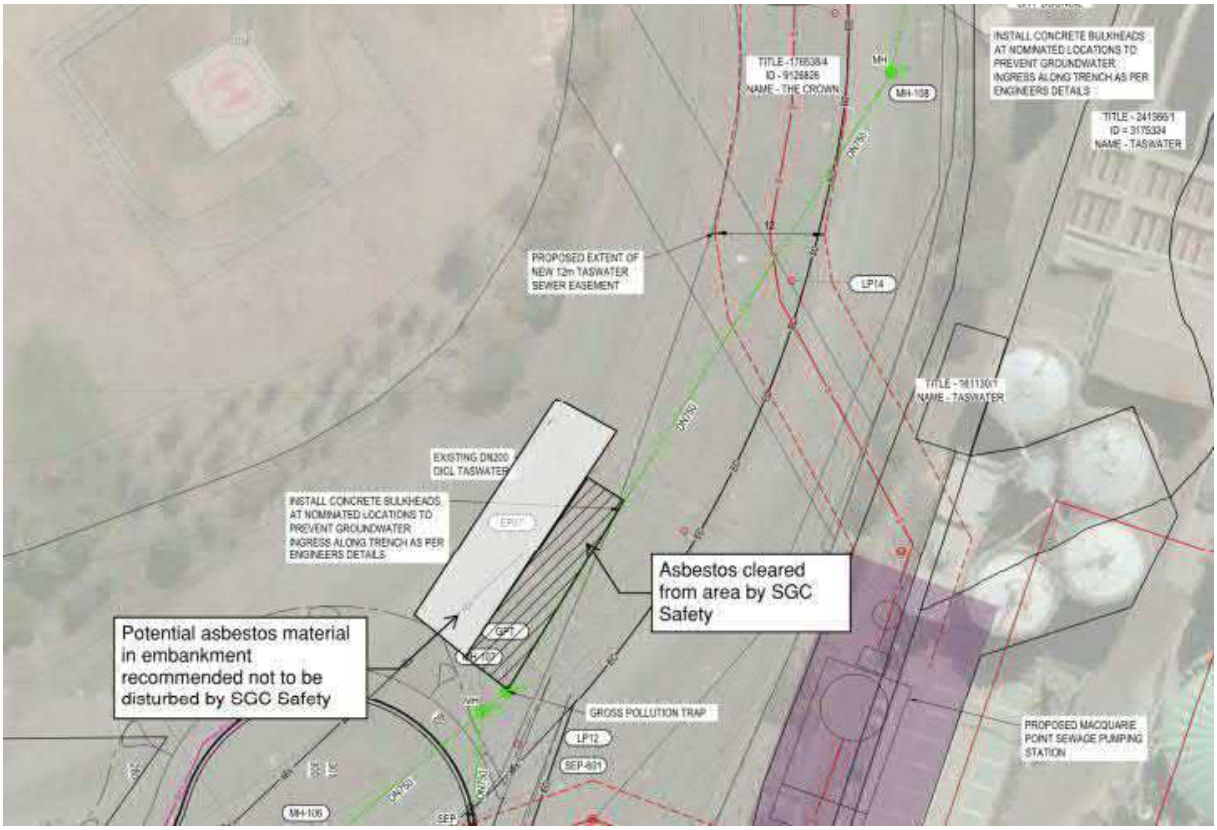

Plate 3 Audit Area 4 East - Area of ACM Encountered

Identified Groundwater Impacts

Groundwater Monitoring Events (GMEs) have been routinely conducted for wells located within these areas since February 2015.

Over this timeframe, groundwater samples have reported concentrations of a combination of aluminium, iron, manganese, arsenic, boron, copper, vanadium, zinc, phosphorus, ammonia, total dissolved solids (TDS), chloride, sodium, BTEXN, TRH and PAHs above the adopted Tier 1 assessment criteria for select groundwater PEVs.

Error! Reference source not found. below provides a range of CoPC concentrations (or general CoPC groups) identified within the Escarpment and Audit Area 4 East that have been reported above the adopted Tier 1 criteria.

Table 2 Summary of Groundwater Analytical Results

CoPC	Minimum Concentration (mg/L)	Maximum Concentration (mg/L)
Aluminium (Filtered)	1.38	1.38
Iron (Filtered)	<0.05	6.22
Manganese (Filtered)	<0.001	5.1
Arsenic (Filtered)	0.001	0.019
Copper (Filtered)	<0.001	0.03
Vanadium (Filtered)	<0.01	0.18

CoPC	Minimum Concentration (mg/L)	Maximum Concentration (mg/L)
Zinc (Filtered)	<0.005	0.143
Phosphorus	1.2	1.2
Ammonia as N	<0.01	3.84
Total Dissolved Solids (TDS)	460	9010
Chloride	10	8890
Sodium	30	6300
Benzene	<0.001	0.003
Naphthalene	<0.001	0.332
Dibenzofuran	<0.005	0.015
pH (pH units)	7.21	11.1
TPH C10 - C36 (Sum of total)	<0.05	1.57
TPH >C10 - C40 (Sum of total)	<0.1	1.55
TPH >C_{10}-C_{16} minus Naphthalene (F2)	<0.05	1.59
Anthracene	<0.001	0.007
Fluoranthene	<0.001	0.007
Phenanthrene	<0.001	0.035

The Promenade and Underground Carpark Contamination Summary

Historical activities undertaken within the Promenade and Underground Carpark area have resulted in the presence of residual contamination within soil and groundwater. Multiple phases of soil, groundwater, light non-aqueous phase liquid (LNAPL) and soil vapour investigations have been undertaken to assess the nature and extent of contamination. The following sections provide an overview of identified soil, groundwater, LNAPL and soil vapour impacts at the Promenade and Underground Carpark area.

Soil, groundwater and LNAPL remediation works have been undertaken in or adjacent to this area, as discussed in the *Remediation Validation Report – Audit Areas 2 and 7 and Pipeline Removal* (AECOM, 2021d) and the *Goods Shed Remediation Validation Report* (AECOM, 2021e). The *Assessment of LNAPL Remediation End-Points* (AECOM, 2021b) report contains a detailed assessment LNAPL remediation conducted.

It is noted that completion of remediation in this area for the proposed future development has been accepted by the Contaminated Land Auditor in *Contaminated Land Audit Report – Macquarie Point Development Project – Lot E and Underground Carpark* (Coffey, 2021).

Identified Soil Impacts

Within the Promenade and Underground Carpark area and the surrounding buffer zone, fill material typically consisted of sand and gravel with occasional anthropogenic material including coal, coke, slag, ceramics, glass, metal fragments, wire, timber/wood, bone, rubber and general building rubble including brick, concrete and pipes.

Concentrations of a combination of Chemicals of Potential Concern (CoPC) including Polycyclic Aromatic Hydrocarbons (PAHs) [naphthalene, benzo(a)pyrene, benz(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, sum of PAHs], Total Recoverable Hydrocarbons (TRHs) [TRH >C_{10}-C_{16}, TRH >C_{16}-C_{34}, TRH >C_{34}-C_{40}, aliphatic TRH >C_{10}-C_{12}, aromatic TRH >C_{10}-C_{12}, aliphatic TRH >C_{12}-C_{16}, aromatic TRH >C_{12}-C_{16}, TRH C_6-C_{10} (minus BTEX) (F1), TRH >C_{10}-C_{16} (minus Naphthalene) (F2)] and metals (arsenic, cadmium, chromium, copper, lead, nickel, zinc) in soil were reported above the adopted Tier 1 criteria for the following Protected Environmental Values (PEVs) and Site Derived Remediation Criteria (RC):

- Human Health – Direct Contact – Residential (low, and medium/high density), Recreation/ Open Space, and Commercial/ Industrial land uses.
- Human Health – Vapour Intrusion – Residential and Commercial/ Industrial land uses.
- Maintenance of Modified and Highly Modified Ecosystems.
- Aesthetics.
- Remediation Criteria – Residential (slab-on-grade with unknown construction or multi-storey building, low rise slab-on-grade, and building with basement), Commercial (slab-on-grade with unknown construction or multi-storey building, and working within a basement) and Maintenance Workers.

Table 1 below provides the range of CoPC concentrations (or general CoPC groups) identified within the Promenade and Underground Carpark area that have been reported above the adopted Tier 1 criteria and Site Derived RC.

Table 1 Summary of Soil Analytical Results

CoPC	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)
Arsenic	<2	576
Cadmium	<0.4	29
Chromium	<2	314
Copper	<5	2,280
Lead	<5	20,100
Nickel	3	86
Zinc	8	55,70
TRH >C10-C16	<50	15,500
TRH >C16-C34	<100	15,500
TRH >C34-C40	<100	2,920
Aliphatic TRH >C10-C12	<10	504
Aromatic TRH >C10-C12	<10	114
Aliphatic TRH >C12-C16	<10	2,790
Aromatic TRH >C12-C16	<10	1,170
TRH C6-C10 (minus BTEX) (F1)	<10	114
TRH >C10-C16 (minus Naphthalene) (F2)	<50	15,500
Naphthalene	<0.5	39.7
Benzo(a)pyrene	<0.05	156
Benz(a)anthracene	<0.5	157
Benzo(b)fluoranthene	0.9	4.6
Benzo(k)fluoranthene	<0.5	64.7
Dibenz(a,h)anthracene	<0.5	20
Indeno(1,2,3-cd)pyrene	<0.5	66.2
Sum of PAHs	<0.5	1,810

Shallow Lead Impacted Soil

The presence of shallow lead-impacted soil has been identified at some locations within the Promenade and Underground Carpark area at depths <2.0 m below ground level (bgl), with some isolated impacts also noted at depths >2.0 m bgl. As a result, there is potential for Intrusive Maintenance workers within the Promenade and Underground Carpark area to come in contact with these soils. Two sample locations – SV12 (soil at 1.0 m bgl) and UC07 (soil at 2.0 m bgl) reported exceedances of the Maintenance Workers Site Derived RC by greater than 250%. However, based on

the overall statistical assessment of shallow lead impacts in this area conducted against the Maintenance Workers Site Derived RC, remediation of these impacts is not considered as required (AECOM, 2021b). It is further noted that these locations will be excavated and removed as part of the Underground Carpark installation.

In the event that construction of the Underground Carpark takes place, any services or conduits that will be installed within soil at a depth of >2.0 m bgl (i.e. below or in deeper soil next to the Underground Carpark) must be installed in protective shrouds or in trenches/corridors of clean fill to prevent contact with Site soil.

Maintenance Workers should use appropriate PPE (i.e. dust masks and gloves) to reduce potential exposure to lead in soil. Soil management requirements are discussed in the main body of the SEMP.

Asbestos

Anecdotal information indicates that pits and service trenches in the southern portion of the Promenade and Underground Carpark area were backfilled with building rubble including asbestos. No bulk asbestos or Asbestos Containing Material (ACM) has been encountered in investigations to date, however minor ACM has been encountered as seven isolated fragments. Under current and proposed future development, while the Site is maintained with hardstand or an engineered break, potential ACM within the soil does not have a complete source-pathway-receptor linkage to Site users. However, the potential for ACM to be present should be considered in future works which may disturb soil in this area and managed as discussed in the Site Environment Management Plan (SEMP).

Identified Groundwater Impacts

Groundwater Monitoring Events (GMEs) have been routinely conducted for monitoring groundwater wells located within the Promenade and Underground Carpark area since January 2015.

Since 2015, groundwater samples have reported concentrations of a combination of CoPC including total dissolved solids (TDS), metals (arsenic, copper, iron, lead, manganese, zinc), inorganics (ammonia, sodium, boron), TRH [TRH C_{10}-C_{36} fraction (sum), TRH >C_{10}-C_{40} fraction (sum), TRH C_{10}-C_{16} fraction (sum) (minus naphthalene)] and PAHs [naphthalene, benz(a)anthracene, benzo(a)pyrene, anthracene, phenanthrene, fluoranthene] above the following adopted Tier 1 assessment criteria for groundwater PEVs and Site Derived RC:

- Drinking water (health and aesthetics)
- Recreation (primary and secondary contact)
- Maintenance of Ecosystems (90% ecosystem protection level)
- Irrigation
- Vapour Intrusion (from groundwater)
- Remediation Criteria – Residential (unknown construction or multi-storey building)

Table 2 below provides a range of CoPC concentrations (or general CoPC groups) identified within the Promenade and Underground Carpark area that have been reported above the adopted Tier 1 criteria and Site Derived RC.

Table 2 Summary of Groundwater Analytical Results

CoPC	Minimum Concentration (mg/L)	Maximum Concentration (mg/L)
Total Dissolved Solids	40	5,420
Arsenic	<0.001	0.032
Copper	<0.001	0.011
Iron	<0.05	6.72

CoPC	Minimum Concentration (mg/L)	Maximum Concentration (mg/L)
Lead	<0.001	0.017
Manganese	0.002	5.47
Zinc	<0.001	0.063
Ammonia (as N)	<0.01	8.43
Sodium	3.7	363
Boron	<0.05	0.78
TRH C10-C36 fraction (sum)	<0.050	4.05
TRH >C10-C40 fraction (sum)	<0.100	3.95
TRH C10-C16 fraction (minus naphthalene) [F2]	<0.050	2.01
Naphthalene	<0.001	0.0015
Benz(a)anthracene	<0.001	0.0014
Benzo(a)pyrene	<0.0005	0.0011
Anthracene	<0.001	0.0054
Phenanthrene	<0.001	0.016
Fluoranthene	<0.001	0.0069

Identified LNAPL Impacts

Environmental investigations completed on the Site to date have historically identified three Light Non-Aqueous Phase Liquid (LNAPL) plumes in or adjacent to the Promenade and Underground Carpark area, referred to as LNAPL Plume A1, LNAPL Plume A2 and LNAPL Plume A3.

The LNAPL in these plumes is understood to comprise predominantly diesel fuel, as well as fuel oils associated with diesel engine operation (e.g. lubricants, engine oils). The probable source of LNAPL is historic locomotive refuelling activities during operation the Roundhouse Refuelling Area.

Measurable LNAPL has been noted in the Promenade and Underground Carpark area ranging in thickness from 0.001 cm at MW138 and MW139 (located within the extent of LNAPL Plume A2) to 29.1 cm at MW137 (located within LNAPL Plume A1). Measurable LNAPL has not been identified at Plume A3, within the Precinct North to the east, since July 2017 and is not considered to be a key ongoing contaminant source at the Site.

A detailed assessment of LNAPL impacts and remediation conducted at the Site has been reported in the *Assessment of LNAPL Remediation End-Points* (AECOM, 2020e). This report concluded that:

- Further recovery of LNAPL is considered to be impractical.
- The LNAPL plumes are sufficiently stable.
- Based on the current development plan for the Site, no unacceptable risks to current or future human or ecological receptors from LNAPL appears to be present, assuming that a SEMP or similar is implemented in order to minimise and manage potential risks for any interactions between groundwater, LNAPL and future Site users.

On this basis, further LNAPL remediation is not practicable or required. However, restoration of groundwater PEVs is not practicable, and groundwater management will be required as discussed in the main body of the SEMP.

Identified Soil Vapour Impacts

Soil vapour monitoring events have been conducted across the Site between 2015 and 2019, including at soil vapour wells within and immediately adjacent to the Promenade and Underground Carpark area, at locations where concentrations of Volatile Organic Compounds (VOCs) and Semi-VOCs (SVOCs) in soil or groundwater were in excess of the Tier 1 vapour intrusion criteria selected, or in the vicinity of the LNAPL plumes to enable assessment of potential risks posed by soil vapour to potential future users of this area.

Assessment of potential vapour intrusion risks associated with the LNAPL plumes undertaken in *Soil Vapour and Indoor Air Investigations 2019* (AECOM, 2021b) surmised that soil vapour impacts associated with the LNAPL plumes do not present an unacceptable risk to the planned future uses of the Promenade and Underground Carpark area.

Soil vapour investigations identified that methane exists in potentially hazardous concentrations in the subsurface within the Promenade and Underground Carpark area (at SV12, SV27S and SV27D) as well as the surrounding area (at SV14 and SV16). The risk from soil methane in the area assessed has been calculated as CS2 – Low Risk, as defined by *Guidelines for the Assessment and Management of Sites Impacted by Hazardous Ground Gases* (EPA NSW, 2020), and appropriate mitigation measures should be included in future building design in this area.

It is noted that if the Underground Carpark is ventilated in accordance with Building Code of Australia (BCA) requirements to deal with exhaust fumes, it should also provide sufficient protection from methane infiltration as per EPA NSW, 2020. If the Underground Carpark is not designed and constructed to BCA standards, methane protection measures should be advised by a qualified environmental practitioner and approved by a Contaminated Land Auditor.

The Precinct North Contamination Summary

Historical activities undertaken within the Precinct North area have resulted in the presence of residual contamination within soil and groundwater. Multiple phases of soil, groundwater, light non-aqueous phase liquid (LNAPL) and soil vapour investigations have been undertaken to assess the nature and extent of contamination. The following sections provide an overview of identified soil, groundwater, LNAPL and soil vapour impacts at the Precinct North area.

Soil, groundwater and LNAPL remediation works have been undertaken in or adjacent to this area, as discussed in the *Remediation Validation Report – Audit Areas 2 and 7 and Pipeline Removal* (AECOM, 2021d) and the *Goods Shed Remediation Validation Report* (AECOM, 2021e). The *Assessment of LNAPL Remediation End-Points* (AECOM, 2021b) report contains a detailed assessment LNAPL remediation conducted.

A submission has been made to the Contaminated Land Auditor for completion of remediation of this area for the proposed future development. Approval from the Contaminated Land Auditor is pending and this Site Environment Management Plan (SEMP) will be updated once received.

Identified Soil Impacts

Subsurface investigations have identified that the Precinct North area is underlain by fill material extending up to 8.2 m below ground level (bgl). Fill material is described as silty sand with dolerite gravels and cobbles with a range of anthropogenic materials including rubble, glass and metal fragments, coal, coke, ash, brick, rubber, timber, wires and fabric. Following remediation and soil excavation in 2020 (AECOM, 2021d), portions of the Precinct North area have been backfilled with fill material and crushed dolerite sourced from either other sections of the Site or imported Virgin Excavated Natural Material (VENM).

Underlying the fill material is natural sands, clays, gravels and dolerite bedrock.

During historic land reclamation activities undertaken across the broader Site, sea walls were constructed consisting of a combination of timber and stone. A sea wall is understood to run approximately parallel to the eastern boundary of the Precinct North area.

Concentrations of a combination of Chemicals of Potential Concern (CoPC) including Polycyclic Aromatic Hydrocarbons [PAHs] (benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, 7,12-dimethylbenz(a)anthracene, indeno(1,2,3-cd)pyrene, Sum of PAHs), Total Recoverable Hydrocarbons [TRH] (aliphatic C_{10}-C_{12}, aliphatic C_{12}-C_{16}, aromatic C_{10}-C_{12}, aromatic C_{12}-C_{16}, C_6-C_{10}, C_{10}-C_{16}, C_{16}-C_{34}, C_{34}-C_{40}), naphthalene, and heavy metals (arsenic, copper, lead, nickel, zinc) in soil were reported above the adopted Tier 1 criteria for the following Protected Environmental Values (PEVs) and Site Derived Remediation Criteria (RC):

- Human Health – Direct Contact – Residential (low, and medium/high density), Recreation/ Open Space, and Commercial/ Industrial land uses.
- Human Health – Vapour Intrusion – Residential and Commercial/ Industrial land uses.
- Maintenance of Modified and Highly Modified Ecosystems.
- Aesthetics.
- Remediation Criteria – Residential (slab-on-grade with unknown construction or multi-storey building, low rise slab-on-grade, and building with basement), Commercial (slab-on-grade with unknown construction or multi-storey building, and working within a basement) and Maintenance Workers.
- Remediation Criteria - Potential Future Residential, Commercial/Light Industrial Workers or Intrusive Maintenance Workers

Table 1 below provides the range of CoPC concentrations (or general CoPC groups) identified within the Precinct North area that have been reported above the adopted Tier 1 criteria and Site Derived RC.

Table 1 Summary of Soil Analytical Results

CoPC	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)
Arsenic	<2	184
Copper	<5	1,800
Lead	<5	1,340
Nickel	3	68
Zinc	8	10,200
TRH C_6-C_{10} (minus BTEX[1])	<10	152
TRH >C_{10}-C_{16} (minus Naphthalene)	<50	17,995
TRH >C_{10}-C_{16}	<50	18,000
TRH >C_{16}-C_{34}	<100	16,000
TRH >C_{34}-C_{40}	<100	3,310
Aliphatic TRH >C_{10}-C_{12}	<50	1,420
Aromatic TRH >C_{10}-C_{12}	<50	140
Aliphatic TRH >C_{12}-C_{16}	<50	6,590
Aromatic TRH >C_{12}-C_{16}	<50	2,540
Naphthalene	<0.5	184
Benzo(a)pyrene	<0.5	141
Benz(a)anthracene	<0.5	148
Benzo(b)fluoranthene	2.1	128
Benzo(k)fluoranthene	<0.5	68.9
Chrysene	<0.5	140
Dibenz(a,h)anthracene	<0.5	18.7
7,12-dimethylbenz(a)anthracene	<0.5	3.8
Indeno(1,2,3-cd)pyrene	<0.5	59.2
Sum of PAHs	<0.5	2,330

Note: 1. BTEX – benzene, toluene, ethylbenzene and xylenes

Boundary Impacts

Soil samples collected at seven locations on the eastern boundary of the Precinct North area reported exceedances of Site Derived RC for proposed future uses:

- Two locations (OL-EX-288/1.5 and OL-EX-59/0.9) reported exceedances of the RC for Future Commercial Workers for Total Petroleum Hydrocarbons (TPH) C_{10}-C_{16} (minus Naphthalene).

- Five locations (OL-EX-75/0.5, OL-EX77/1.0, OL-EX-79/0.2, OL-EX-293/1.15, OL-EX-294/1.05) reported exceedances of the RC for Future Intrusive Maintenance Workers for lead.

These samples do not represent an unacceptable risk for future uses of the area as the impacted areas are limited and delineated by samples within 5 m from within the excavation boundary or base, and impacted soils which had the potential to extend onto the Site were excavated and removed during remediation works in 2020 (AECOM, 2021d). These areas should be considered when conducting works along the Site boundary in these areas.

Hobart Main Sewer Soils

During remediation works in 2020 (AECOM, 2021d), excavation of impacted soils was limited by the presence of the Main Hobart Pipeline, a sewer line which runs through the Precinct North area. The owner of the sewer, TasWater, required an exclusion zone for excavation which did not allow excavation to depths of greater than 1 m below ground level (bgl) within 3 m of the sewer location.

Soil was excavated to a depth of 1 m bgl in this exclusion zone. However, lead concentrations in excess of the RC for Future Intrusive Maintenance Workers for lead were detected in the soil within the exclusion zone and should be considered and appropriate controls put in place for future works in this area.

Precinct South Boundary

Lead concentrations in excess of the RC for Future Intrusive Maintenance Workers for lead were detected in the soil along the boundary between the Precinct North and Precinct South areas of the Site.

Soil was excavated to a depth of >2 m bgl on the Precinct North side of the boundary and lead in soil is not considered to present an unacceptable risk for development of the Precinct North. Further remediation or assessment of impacts in the Precinct South is required prior to development of that area of the Site.

Identified Groundwater Impacts

Groundwater Monitoring Events (GMEs) have been routinely conducted for monitoring groundwater wells located within the Precinct North area since January 2015.

Since 2015, groundwater samples have reported concentrations of a combination of CoPC including: total dissolved solids (TDS), metals (arsenic, boron, copper, iron, lead, manganese, zinc), inorganics (ammonia, chloride, cyanide, sodium), TRH (C_{10}-C_{16}, C_{10}-C_{36}, C_{10}-C_{40}), PAHs (naphthalene, benz(a)anthracene, benzo(a)pyrene, anthracene, phenanthrene, fluoranthene, 2,4-dimethylphenol, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, pyrene) and E. Coli above the following adopted Tier 1 assessment criteria for groundwater PEVs and Site Derived RC:

- Drinking water (health and aesthetics)
- Recreation (primary and secondary contact)
- Maintenance of Ecosystems (90% ecosystem protection level)
- Irrigation
- Buildings and Structures
- Vapour Intrusion (from groundwater)
- Remediation Criteria – Residential (unknown construction or multi-storey building)

Table 2 below provides a range of CoPC concentrations (or general CoPC groups) identified within the Precinct North area that have been reported above the adopted Tier 1 criteria and Site Derived RC.

Table 2 Summary of Groundwater Analytical Results

CoPC	Minimum Concentration (mg/L)	Maximum Concentration (mg/L)
Total Dissolved Solids	240	1,690
Arsenic	<0.001	0.009
Boron	0.2	0.69
Copper	<0.001	0.011
Iron	15.5 (one sample only)	
Lead	<0.001	0.013
Manganese	0.026	2.46
Zinc	<0.005	0.134
Ammonia (as N)	<0.01	22.1
Chloride	11	664
Cyanide	<0.004	0.29
Sodium	8	547
TRH C10-C36 fraction (sum)	<0.05	12.6
TRH >C10-C40 fraction (sum)	<0.1	12.2
TRH C10-C16 fraction (minus naphthalene)	<0.1	6.19
Naphthalene	<0.005	0.232
Benz(a)anthracene	<0.001	0.095
Benzo(a)pyrene	<0.001	0.0985
Anthracene	<0.001	0.142
Phenanthrene	<0.001	0.317
Fluoranthene	<0.001	0.254
2,4-Dimethylphenol	<0.001	0.0062
Benzo(k)fluoranthene	<0.001	0.0346
Chrysene	<0.001	0.0974
Dibenz(a,h)anthracene	<0.001	0.0114
Indeno(1,2,3-cd)pyrene	<0.001	0.0434
Pyrene	<0.001	0.228

LNAPL

Environmental investigations completed on the Site to date have historically identified three LNAPL plumes in or up groundwater gradient of the Precinct North area, referred to as LNAPL Plume A1, LNAPL Plume A2 and LNAPL Plume A3.

Measurable LNAPL has been noted up groundwater gradient of the Precinct North area (in the Promenade and Underground Carpark area) ranging in thickness from 0.001 cm at MW138 and MW139 (located within the extent of LNAPL Plume A2) to 29.1 cm at MW137 (located within LNAPL Plume A1). Measurable LNAPL has not been identified at Plume A3, within the Precinct North since July 2017 and is not considered to be a key ongoing contamination source at the Site.

A detailed assessment of LNAPL impacts and remediation conducted at the Site has been reported in the *Assessment of LNAPL Remediation End-Points* (AECOM, 2020e). This report concluded that:

- Further recovery of LNAPL is considered to be impractical.
- The LNAPL plumes are sufficiently stable.
- Based on the current development plan for the Site, no unacceptable risks to current or future human or ecological receptors from LNAPL appears to be present, assuming that a Site Environment Management Plan (SEMP) or similar is implemented in order to minimise and manage potential risks for any interactions between groundwater, LNAPL and future Site users.

On this basis, further LNAPL remediation is not practicable or required. However, restoration of groundwater PEVs is not practicable, and groundwater management will be required as discussed in the main body of the SEMP.

Identified Soil Vapour Impacts

Soil vapour monitoring events have been conducted across the Site between 2015 and 2019, including at soil vapour wells within and immediately adjacent to the Precinct North area, at locations where concentrations of Volatile Organic Compounds (VOCs) and Semi-VOCs (SVOCs) in soil or groundwater were in excess of the Tier 1 vapour intrusion criteria selected, or in the vicinity of the LNAPL plumes to enable assessment of potential risks posed by soil vapour to potential future users of this area.

Assessment of potential vapour intrusion risks associated with the LNAPL plumes undertaken in *Soil Vapour and Indoor Air Investigations 2019* (AECOM, 2021b) surmised that soil vapour impacts associated with the LNAPL plumes do not present an unacceptable risk to the planned future uses of the Precinct North area.

Soil vapour investigations identified methane exists in potentially hazardous concentrations in the subsurface within the Precinct North area (at SV14, SV16, SV17 and SV18). The risk from soil methane in the area assessed has been calculated as CS2 – Low Risk, as defined by *Guidelines for the Assessment and Management of Sites Impacted by Hazardous Ground Gases* (EPA NSW, 2020), and appropriate mitigation measures should be included in future building design in this area.

Appendix D

Summary of CoPC

Summary of Chemicals of Potential Concern

The following information has been compiled from the June 1997 National Institute of Occupational Health and Safety (NIOSH) *Pocket Guide to Chemical Hazards*, 1998 American Conference of Governmental Industrial Hygienists (ACGIH) *Guide to Occupational Exposure Values, Agency for Toxic Substances & Disease Registry* (ATSDR), the Australia Government *Asbestos Safety and Eradication Agency*, and representative material safety data sheets (MSDS).

Polycyclic Aromatic Hydrocarbons (PAHs)

PAHs are formed as a result of the incomplete burning of organic material. The most common health effects associated with PAHs are linked to its carcinogenic effects. The primary route of exposure to PAHs during this project is contact with contaminated soils which can lead to entry through ingestion, inhalation (dust) or open wounds. This necessitates the use of appropriate protective clothing and proper decontamination procedures.

Total Petroleum Hydrocarbons (TPH)

TPH is a term used to describe several hundred chemical compounds that originate from crude oil. The compounds in various TPH fractions can affect the body in different ways. Health effects include central nervous system depression, irritation of the throat, skin, eyes, and stomach, breathing difficulties, in addition to impacts on blood, immune system, liver, spleen, kidneys, developing foetus, and lungs. The primary route of exposure to TPH during this project will be through handling tar impacted material. Appropriate PPE must be worn at all times while handling TPH contaminated material.

Benzene, Toluene, Ethyl-benzene, and Xylenes (BTEX)

These chemicals are often found in products such as paints and coatings, and are constituents of petroleum products, particularly gasoline, jet fuels, kerosene. All of the BTEX chemicals can produce neurological impairment, and exposure to benzene can additionally cause haematological effects including aplastic anaemia and acute myelogenous leukemia. The primary route of exposure to BTEX during this project is the inhalation of vapours. This necessitates the use of appropriate protective clothing including respiratory equipment where necessary.

Chlorinated Solvents

Chlorinated solvents are a large family of chemical compounds that contain chlorine, for example, carbon tetrachloride, trichloroethylene (TCE), or methylene chloride. They are used for a wide variety of commercial and industrial purposes, including degreasers, cleaning solutions, paint thinners, pesticides, resins, glues, and a host of other mixing and thinning solutions. Exposures can lead to short-term or long-term health effects, depending on the manner by which they entered your body and the amount of exposure. Short-term side effects may include dizziness, fatigue, headaches, and/or skin rashes. Long-term side effects may include chronic skin problems, and/or damage to the nervous system, kidneys, or liver. Some chlorinated solvents are also known to cause cancer, in both humans and animals.

Workers can be exposed to chlorinated solvents through the absorption of solvents, through inhalation and skin contact.

Heavy Metals

Large amounts of heavy metals may cause acute or chronic toxicity (poisoning). Heavy metal toxicity can result in damaged or reduced mental and central nervous function, lower energy levels, and damage to blood composition, lungs, kidneys, liver, and other vital organs. Heavy metals may enter the human body through ingestion, inhalation, or absorption through the skin. Appropriate protective equipment must be worn and proper decontamination procedures must be adhered to.

Total Dissolved Solids (TDS)

TDS consist of inorganic salts and small amounts of organic matter that are dissolved in water. **TDS** comprise sodium, potassium, calcium, magnesium, chloride, sulfate, bicarbonate, carbonate, silica, organic matter, fluoride, iron, manganese, nitrate, nitrite and phosphates. No health effects have been associated specifically with or directly attributable to high TDS concentrations, although the health effects of individual components of TDS must be considered separately. Indirectly, high TDS water, being less palatable, might discourage consumers from drinking tap water, leading to use of potentially less healthy water (from alternative sources, natural or manufactured) and/or other less healthy drinks.

Sodium

Sodium is a natural component of water and essential to human life. The guideline value for sodium in drinking water is based on aesthetic considerations (taste threshold); while high sodium may be likely to give water a salty taste, it is unlikely to present a health concern. When consumed, sodium is readily absorbed by the body. It is present in all body tissues and fluids and its concentration is maintained by the kidney. High concentrations give rise to the sensation of thirst. Excessive sodium intake, usually via diet, can aggravate chronic congestive heart failure and increase blood pressure. Reduced sodium intake can reduce the blood pressure of some individuals with hypertension.

Asbestos Containing Material (ACM)

Asbestos is a naturally occurring mineral fibre which is strong, flexible, and can insulate from heat and electricity. Because of these properties, historically asbestos has been commonly used in the construction of homes and buildings and is understood to have been used in roofing material as bonded asbestos at Macquarie Point. It can be encountered as friable (generally crumbling material with potential to generate fibres) or non-friable (bonded). Asbestos is a known carcinogen and exposure to asbestos fibres can lead to a number of diseases, including pleural disease, asbestosis, lung cancers, and mesothelioma. In the event that potential asbestos containing material (ACM) is encountered in soils during intrusive works, all activities are to cease immediately in the work area. A suitably experienced occupational hygienist should be consulted to provide advice regarding the removal and management of ACM in soils prior to works re-commencing.

Appendix E

Materials Tracking

Materials Tracking Register

Name / Representative	
Company /Organisation	
Description of Works	
Page No. of	

Table 1 Materials Tracking Register

Date	Origin[1]	Approximate Volume (m^3)	Sampled (Y/N)	Destination[2]	Notes / Comments[3]

Notes: 1. Include a description of the location where the soil was excavated and a grid location (where possible); 2. This may be off-Site disposal, placement in stockpile, re-use on the Site. Provide a description of the location where soils are to be re-used and/or stored, and a grid location (where possible); 3. Include soil type, any odours or other indicators of contamination and sampling undertaken; 4. Table provided above is an example of a soil materials tracking register for simple earthworks. Large scale earthworks may require a different tracking system; 5. The completed form should be returned to the Site Manager (or delegate) and retained on file for reference.

Appendix F

Construction Noise Management Plan

Construction Noise Management Plan (CNMP) Preparation

Purpose of this document

The Macquarie Point Development Corporation ("Corporation") requires Contractors to prepare and follow a project-specific Construction Management Plan (CMP) as part of their project set-up. A CMP addresses matters such as community liaison & communication protocols, traffic management, and management of environmental issues including dust, stormwater run-off, and noise.

The Corporation is aware of the potential for noise to trigger complaints of nuisance and the Corporation's policy is that construction activities should be carried out in such a way to prevent or minimise off site noise nuisance. The Corporation therefore requires Contractors to prepare a Construction Noise Management Plan (CNMP) as part of the CMP. The CNMP shall be in accordance with the NSW *Interim Construction Noise Guideline* (see section "Guideline to be followed") and is to be approved by the Corporation.

This document sets out the Corporation's requirements regarding key components of the CNMP.

Background

Work to develop the Macquarie Point Precinct requires construction activities to be undertaken on land owned, operated, or managed by the Corporation, either through the Corporation's own actions or through work on land parcels by third party developers. Such activities have the potential to create off-site noise nuisance.

Examples of noise generating activities include:

- operation of stationary equipment such as jackhammers, concrete saws, and power tools;
- excavation, demolition, and foundation work, including piling and drilling;
- building maintenance and repair work; and
- operation of mobile plant and equipment such as excavators, cranes, and heavy vehicles.

Nuisance caused by construction work noise can be exacerbated for any of several reasons.

i) The noise was not expected and people do not know how long it will last.

ii) The noise happens outside normal day time hours or at a noise sensitive time of day. For example, heavy vehicle activity before 7am, or when someone is participating in a zoom teleconference.

iii) The noise has intrusive characteristics such as impulsiveness, tonalities, or low frequency noise.

iv) The noise is causing nuisance and yet mitigation measures are clearly not in place or not being applied properly. For example, a concrete saw is being used but moveable acoustic barriers have not been placed to reduce its noise impact. People are more tolerant of nuisance if they can see mitigation efforts are being made.

Guideline to be followed

Tasmania's *Environmental Management and Pollution Control (Noise) Regulations 2016* specify prohibited hours of use for various common noise sources including equipment on building and demolition sites. However, these regulations are not intended to apply to comstruction activities on the scale associated with development of the Macquarie Point Precinct, which require a Construction Noise Management Plan.

Tasmanian authorities have not produced state-specific guidelines for preparing a CNMP, but the Resource Management and Planning Appeals Tribunal has identified the NSW *Interim Construction Noise Guideline* (NSW Dept. of Environment and Climate Change, July 2009) as Best Practice. The Corporation requires the CNMP to be prepared in accordance with this guideline.

In 2020, the EPA NSW released a new *Draft Construction Noise Guideline* for public consultation, but its key aspects are essentially the same as the 2009 guideline.

Support documents are:

- *AS 2436-2010 Guide to noise & vibration control on construction sites*. This provides sound levels for various civil works equipment and activities to facilitate estimation of noise levels off site, and outlines noise mitigation measures.
- *AS/NZS 2107:2016 Acoustics - Recommended design sound levels & reverberation times for building interiors*. It is sometimes necessary to establish the link between noise levels outside and inside a building and AS/NZS 2107 lists recommended internal noise levels for residences, offices, and so on.

Specialist support

The Corporation has engaged noise specialists familiar with construction noise who have helped to prepare this document. Noise levels in the vicinity of the Precinct are accurately known. The Corporation operates a permanent on-site noise monitoring station near the Longhouse and noise levels measured by this station are available in real-time through the web-based Noise Cloud service. TasPorts has made available the results of noise level surveys across the Port of Hobart, including in the vicinity of Evans Street and Hunter Street.

The CNMP should be prepared by an appropriately qualified noise specialist familiar with the NSW *Interim Construction Noise Guideline* and able to provide guidance on noise mitigation measures. The specialist should be available throughout the construction works project to address any problems that arise and to review the noise level monitoring data.

However, the Contractor has the principal day-to-day responsibility for managing noise by following the CNMP and to this end the Contractor's Project Manager and Works Supervisor will be required to be able to predict and measure noise levels from construction works activities, ensure that noise mitigation measures are properly applied, and monitor noise levels (see the worked example, below).

Communications

Communication protocols and a community liaison strategy are important components of a CNMP. The responsible people are usually the Contractor's Project Manager and Works Supervisor, under guidance and direction from the Corporation.

Developing an email distribution list is essential. It is used to advise residents and businesses of the next week's schedule of activities, flagging noisy periods so people can plan accordingly.

Stakeholders in the vicinity of the Macquarie Point Precinct include (this list is not exhaustive):

- MPDC tenants.
- The IXL complex between Evans and Hunter Streets hosts businesses, shops, and the Henry Jones Hotel.
- The Zero Davey Apartments, the Sullivans Cove Apartments and the IXL Apartments on Evans Street.
- Residents in the Glebe.
- Premises located on Hunter Street including the University's School of Creative Arts and Media, Marine and Safety Tasmania, and the MACq 01 apartments. Some premises have line of sight to the Precinct.
- Noise sensitive premises a little further away including the Woolstore and the Hotel Grand Chancellor.

Stakeholders will be provided with the contact details of the Contractor's Project Manager and Works Supervisor, so they can bring any problems to their attention instead of complaining to the Council, the EPA, or the Corporation.

Working hours

Under any contracts with construction companies, the Corporation stipulates that construction activities shall only occur between the following hours, as recommended by the NSW *Interim Construction Noise Guideline*.

- Monday to Friday: 7:00am to 6:00pm
- Saturday: 8:00am to 1:00pm
- No work on Sundays or public holidays

Work outside these hours requires strong justification and must be approved by the Corporation. Noise level management targets for any work outside the above hours will be more stringent, as per the guideline, and approval by the Corporation will likely have conditions such as requiring the Contractor to undertake negotiations with potentially affected residents and businesses.

Noise level management targets

The NSW *Interim Construction Noise Guideline* requires construction noise level management targets to be set. For residences this is based on the Rating Background Level (RBL) and the methodology to calculate the RBL for a given time of day (day/evening/night) is given in the appendix of the *NSW Industrial Noise Policy* (2000) and involves deploying a noise logger to measure L_{90} noise levels. This work has already been done by the noise specialists engaged by the Corporation.

It is expected that if construction noise levels are satisfactory at two off-site locations then noise levels elsewhere off-site should also be satisfactory. A noise level management target also applies to on-site tenants.

- The Glebe. The nearest residences in the Glebe have elevated line of sight to the Macquarie Point Precinct and are located just over 600m from the part of the Precinct that is closest to the Glebe.

  For work during the standard working hours the RBL at the residence that is nearest to the Precinct is fairly steady and approximately 50 dBA. This residence has direct line of sight to the Precinct and the reason the RBL is fairly steady is because it is significantly influenced by Brooker highway traffic noise.

  The NSW *Interim Construction Noise Guideline* specifies a noise level management target for residences of RBL + 10 dB, but the Corporation recognises that a more stringent noise level management target of 55 dBA is appropriate, using a 15 minute averaging period.

- Evans Street. Residential and visitor accommodation apartments are located on the south side of Evans Street in the first 100m from Davey Street. The Zero Davey Apartments, the Sullivans Cove Apartments and the IXL Apartments all have elevated line of sight to the Precinct.

  Between 7am to 8am the south side of Evans Street is considered to be residential in nature. Background (L_{90}) noise levels rise rapidly during this period as traffic builds on Davey Street, and are naturally higher for apartments closer to Davey Street. The RBL for this hour is estimated to be 52 dBA, using data from the Corporation's noise monitor near the Longhouse, so the noise level management target is 52 + 10 = 62 dBA (15 min).

  For the rest of the working day (8am to 6pm) the south side of Evans Street can be treated as commercial in nature since visitor accommodation premises are not particularly noise sensitive during the day. The noise level management target set by the NSW *Interim Construction Noise Guideline* for commercial premises is 70 dBA (15 min).

- On-site tenants. Tenants of the Corporation, and the Corporation's own premises, are commercial in nature so a noise level management target of 70 dBA (15 min) is appropriate.

Alert noise level

Construction noise levels above the background noise levels are audible, so marginal compliance with the noise level management target may be tolerated by the community, but it would not be surprising to receive some complaints, especially if the noise has intrusive characteristics. Therefore if construction noise levels reach an alert noise level, the works supervisor must review the situation to ensure mitigation measures are in place. An appropriate alert noise level is the noise level management target but using a five minute averaging period instead of 15 minutes.

Predicting and mitigating noise levels: a worked example

The CNMP should predict approximate noise levels associated with each project stage and set out mitigation measures and management strategies if the noise levels are above the noise level management targets.

However, noise level predictions will necessarily need to be refined as the project proceeds and details of upcoming activities come into focus. Estimating noise levels is straightforward and the project manager and works supervisor should know how to do it. The Contractor should not need to rely on a noise specialist for day-to-day noise level predictions.

In brief, noise levels at the nearest residences can be calculated from either the sound power of a noise source, or its sound pressure at a specified distance.

- The sound power level (L_W) of a noise source is measured in Watts or alternatively in decibels with a reference level of 10 pW (i.e. 10^{-12} W). It is the intrinsic strength of the noise source and it does not depend on distance.

- The sound pressure level (L_P) of a noise source is measured in Pascals or alternatively in decibels with a reference level of 20 µPa (i.e. 20 x 10^{-6} Pa). It is what we actually hear, and it depends on the distance from the noise source.

- *AS 2436-2010 Guide to noise & vibration control on construction sites* provides typical values of L_W and L_P at 10m for a various civil works activities and equipment, but it is better to use values specific to the activities and equipment being used if they are available. L_W and/or L_P values are usually provided in the equipment specifications and are inscribed on the information plate of bulldozers, excavators, generators and so on. Alternatively, the L_P values can be measured and the L_W values deduced from them.

- *AS 2436-2010* and the NSW *Interim Construction Noise Guideline* both provide worked examples of how to use this information and the distance from the noise source(s) to the nearest residences to calculate the total L_p noise levels at the nearest residences. It is usually sufficient to consider only the two or three strongest noise sources.

<u>Worked example.</u>

Two jackhammers and a concrete saw will be working in the late morning at a location 25m from the noise monitoring station, 60m from the apartments on Evans Street, and 650m from the nearest Glebe residence.

The jackhammer types are not known so the default typical noise levels given in AS2436 are used, namely a sound power level of 121 dBA re 1pw. The concrete saw's noise levels have been measured and it has a sound power level of 125 dBA re 1pW.

The total sound power is $L_W = 10 \log_{10} (10^{121/10} + 10^{121/10} + 10^{125/10}) = 127.5$ dBA re 1pW.

For sound spreading over flat hard ground, the sound power (L_W) and sound pressure (L_P) at a distance R (m) from the source are related by:

$$L_W = L_P + 10 \log_{10}(2 \pi R^2)$$

$$= L_P + 20 \log_{10}(R) + 8$$

So, the total sound pressure levels (dBA re 20 µPa) are predicted to be:

Monitoring station	$L_P = 127.5 - 20 \log_{10}(25) - 8$	≈ 92 dBA at 25m
Apartments	$L_P = 127.5 - 20 \log_{10}(60) - 8$	= 84 dBA at 60m
Glebe	$L_P = 127.5 - 20 \log_{10}(650) - 8$	= 63 dBA at 650m

Note that sound pressure levels at distances R_1 and R_2 from a noise source are related:

$$L_P \text{ at } R_2 = L_P \text{ at } R_1 - 20 \log_{10}(R_2 / R_1)$$

For example, consider the above sound pressure levels at the apartments and at the Glebe:

$$84 \text{ dBA at } 60\text{m} - 20 \log_{10}(650/60) = 84 - 21 = 63 \text{ dBA at } 650\text{m}$$

The NSW *Interim Construction Noise Guideline* lists noise sources that have intrusive noise characteristics and jackhammers and concrete saws are both on the list. The guideline requires a penalty adjustment of 5 dB to be added to the predicted noise levels, so the revised predictions are:

Monitoring station	$L_P \approx 92$ dBA at 25m
Apartments	$L_P = 84 + 5 = 89$ dBA at 60m
Glebe	$L_P = 63 + 5 = 68$ dBA at 650m

Note that the penalty does not apply to the sound pressure level predicted at the monitoring station. The predictions say that in the absence of noise mitigation measures, the two jackhammers and the concrete saw will produce noise levels (including the 5 dB penalty) of 89 dBA at the Evans Street apartments and 68 dBA at the Glebe. These predicted noise levels are 19 dB over the 70 dBA noise level target for the Evans Street apartments and 13 dB over the 55 dBA noise level target for the Glebe.

An appropriate noise mitigation and management strategy would be:

i) Consider not using all the equipment at the same time. For example, using the two jackhammers but not the concrete saw will reduce the noise levels by 3.5 dB.

ii) Place moveable acoustic barriers around the equipment (see next section). Standard barriers typically reduce noise by 12-15 dB and heavy duty barriers typically reduce noise by up to 25 dB. However, the Glebe residences and the apartments on Evans Street are elevated so the barriers need to be placed as close to the equipment as is safely possible in order to break the line of sight.

iii) Advise the community of the upcoming work and warn that even with mitigation measures in place the noise levels will be near the noise level management targets.

iv) At the start of the work, use a sound level meter to confirm that the noise levels (i.e. sound pressure levels) are acceptable, by measuring noise levels at a distance of, say, 10m from the equipment in the direction of (a) Evans Street and (b) the Glebe. Then use the above distance adjustment to predict the noise levels at the Evans Street apartments and the Glebe residences.

Mitigation measures

The above worked example shows that noise mitigation measures will be necessary for many construction activities to meet the noise level management targets.

There are several ways in which construction noise levels can be reduced or made more acceptable.

- Avoid scheduling noisy activities early in the day. Construction work usually starts at 7am, when many people are still sleeping or just getting up and the low background noise levels at this time of day mean construction work noise is more audible.

- Use quieter equipment.
  Example 1. Use a small roller instead of large roller to compact soil, with smaller lifts and a few more passes to achieve the required compaction.

  Example 2. Noise levels and issues such as tonalities vary greatly for different makes of equipment such as generators and compressors. It is important to review noise specifications before deciding on what equipment to bring on site.

- Use moveable sound absorbing barriers within the construction site to mitigate noise from equipment such as concrete saws and jack hammers. These should be placed close to the noise source.

Placing sound absorbing barriers on the site boundary will not be very effective because the residences in the Glebe and the apartments on Evans Street have elevated line of sight to the Precinct. Sound absorbing barriers placed close to noise sources will be more effective than perimeter barriers and Contractors are expected to have a sufficient number of moveable sound absorbing barriers available on site to provide satisfactory mitigation of construction activity noise. As per the worked example in the previous section, some should be heavy duty barriers able to achieve better noise reduction performance than standard barriers, especially low frequency noise.

Figure 1 Typical sound absorbing barriers mounted on a temporary fence at a project in Hobart. These barriers are each 2m high and 1.3m wide and they can achieve 12-15 dB noise reduction when placed near a noise source such as a jackhammer. A heavy duty version of the barriers is also available that can achieve much better performance, especially regarding low frequency noise. There are other similar products on the market.

The Contractor may need to apply mitigation measures other than moveable sound absorbing barriers. Here are some examples, three of them from Tasmania.

Figure 2 Top left. A 550 kVA generator inside a shipping container lined with acoustic material. Two high performance acoustic louvres provided ventilation, and on top is a custom-designed muffler.

Top right. An excavator with a rock breaker head operating behind shipping containers that reduced noise levels at a residence on the other side of the road.

Bottom right. Two compressors operating behind an acoustic barrier, with "bus-shelter" barriers over their air outlet plenums and custom-designed mufflers.

Bottom left. Using a jack hammer inside a purpose-built sound absorbing barrier.

Reversing beepers are a frequent cause of noise complaints. Mitigation options are:

i) Change to a broad-band reversing beeper instead of a beeper that produces a single tone at 1 kHz.

ii) Change to a smart beeper that only sounds if there is an object behind the reversing vehicle.

iii) Operate the reversing vehicle in a safe area in which either no-one is allowed, or someone is guiding the reversing vehicle, so the beeper can be safely switched off.

Monitoring noise levels and construction activity

The Corporation operates a real time noise monitor on site for continuous measurement of noise levels in the vicinity of Evans Street. However the Precinct is a large site and measurements of noise levels from a given activity should be made close enough to the noise source that its noise is at least 5 dB above the background noise. Noise levels in Evans Street and the Glebe can then be predicted using the distance adjustment equation given in the worked example.

Figure 3. The Corporation's noise monitoring station in the south part of the Precinct near Evans Street.

Contractors are required to have their own on-site noise measuring equipment. A sound level meter is essential, and operation of a real time noise monitoring station is recommended to help manage noise from major construction work. In addition to assisting the management of noise, a noise monitoring station allows the Contractor to independently record noise levels and investigate any complaints of noise nuisance. In addition, when people become sufficiently irritated to complain about noise nuisance they may exaggerate the extent of the nuisance, but if they know a noise monitoring station is operating then they tend to make more accurate statements.

The Corporation has a number of security cameras across site that can monitor construction activities, however the Contractor may need to install additional cameras to help in determining the source of any noise nuisance.

Appendix G

Site Specific Remediation Criteria

Site Specific Remediation Criteria

In order to assess risks and inform potential remediation works required to allow development of the Macquarie Point Site (the Site) in accordance with the Site *Masterplan* (Macquarie Point *Strategic Framework and Masterplan 2015 – 2030*), AECOM prepared *Derivation of Remediation Criteria* (AECOM, 2016) to develop Site specific Remediation Criteria (RC) for soil and groundwater which are protective of human health under the potential future land use conditions at the Site stated in the Masterplan.

The following human receptors were considered in this assessment based on the proposed future land uses:

- Residents of a High Density Development (slab-on-grade buildings and buildings with a communal basement car park)
- Recreational Open Space Users
- Users of a Multi-Storey Car Park
- Commercial/Light Industrial Workers (slab-on-grade buildings and working within a basement car park)
- Outdoor maintenance Workers (including excavation to depths of up to 1 metre below ground level).

Information about proposed Site layout, uses and building design can be used to refine the RC to be more Site-specific and reduce conservatism where appropriate based on any changes to the Masterplan or Site uses in future. Any changes to RC should be prepared by a qualified environmental professional, and if changes allow higher concentrations of Chemicals of Potential Concern (CoPC) to remain on Site, be reviewed and endorsed by a Contaminated Land Auditor.

Assumptions

The following key assumptions have been made when deriving the RC and should be noted as limitations when applying the RC:

- NAPL impacts at the Site have be remediated to the extent practicable and therefore risks associated with exposure to NAPL and volatile contaminants derived from NAPL were not considered in the derivation of the RC. NAPL is known to remain in some areas of Macquarie Point (refer to **Section 3.4** and **Section 4.10** of the main body of the SEMP). Where NAPL has been remediated to the extent practicable in areas of Macquarie Point which have received Contaminated Land Auditor endorsement (refer to **Section 1.6**), the relevant Contaminated Land Audit Report should be referred to for any specific management requirements for residual NAPL.
- An engineered break layer will be present at the ground surface to mitigate potential for future Site users (with the exception of maintenance workers) to have direct contact with soils. The engineered break layer will be required to meet ASC NEPM 2013 HIL/HSL relevant to the future land use.
- Use of any future basements is limited to car parking. If basements are constructed for other purposes, a risk assessment specific to the intended use should be conducted.
- Where basements are associated with future residential or commercial buildings, it is assumed that these will be communal areas for multiple properties, for example, as part of a strata scheme that is managed by a body corporate. Private basements will therefore not be associated with individual residences.
- Where there is access to a basement car park, it is assumed that any groundwater seepage collects in floor drains and a physical barrier is present, and therefore, it is unlikely that groundwater will be directly contacted by basement users, with the exception of maintenance workers. It is assumed that individual tenants will not be involved in the maintenance of any associated services, including drainage pumps or sumps.

- Adjacent off-Site land uses include open space, commercial/industrial and residential areas. As these potential land uses have been considered on-Site, the derived RC are considered to also be protective of potential exposures to off-Site receptors (e.g. via groundwater migration beyond the Site boundary).
- Workers involved in Site remediation/redevelopment works are not included in this assessment. It is considered that potential exposures to these workers can effectively be mitigated through the implementation of an appropriate Construction Environment Management Plan.

Soil

Table 1 below provides a summary of Site specific RC (reported to two significant figures) for soil concentrations which are considered to be protective of human health for proposed future uses.

Table 1 Site Specific Land Use RC for Soil (mg/kg)

Chemical	Potential Future Residents (slab-on-grade with unknown construction or multi-storey building) #	Potential Future Residents (low rise slab-on-grade)	Potential Future Residents (building with a basement car park)	Potential Future Commercial (slab-on-grade with unknown construction or multi-storey building) #	Potential Future Commercial/ Light Industrial Workers (slab-on-grade)	Potential Future Commercial/ Light Industrial Workers (Working within a basement car park)	Potential Future Recreational Open Space Users	Potential Future Maintenance Workers
Lead	-	-	-	-	-	-	-	620
Benzo(a)pyrene	-	-	-	-	-	-	-	110
Naphthalene	2.7	13	20	12	160	97	>Sat	38,000
Benzene	0.5	0.5 *	0.5 *	3	3 *	3 *	360	170
Toluene	160	200	290	950	2500	1400	>Sat	660,000
Ethylbenzene	57	57 *	24	340	340 *	110	>Sat	290,000
Xylenes (total)	40	67	93	240	830	430	>Sat	530,000
TPH C6-C8 (Aliphatic)	54	94	120	310	>Sat	570	>Sat	1,000,000
TPH >C8-C10 (Aliphatic)	88	88 *	28	510	510 *	130	>Sat	270,000
TPH >C8-C10 (Aromatic)	12	27	36	67	340	170	>Sat	110,000
TPH >C10-C12 (Aliphatic)	51	140	>Sat	300	>Sat	>Sat	>Sat	270,000
TPH >C10-C12 (Aromatic)	25	130	170	140	>Sat	770	>Sat	110,000

Chemical	Potential Future Residents (slab-on-grade with unknown construction or multi-storey building) #	Potential Future Residents (low rise slab-on-grade)	Potential Future Residents (building with a basement car park)	Potential Future Commercial (slab-on-grade with unknown construction or multi-storey building) #	Potential Future Commercial/ Light Industrial Workers (slab-on-grade)	Potential Future Commercial/ Light Industrial Workers (Working within a basement car park)	Potential Future Recreational Open Space Users	Potential Future Maintenance Workers
TPH >C12-C16 (Aliphatic)	330	>Sat	>Sat	1700	>Sat	>Sat	>Sat	270,000
TPH >C12-C16 (Aromatic)	110	>Sat	>Sat	510	>Sat	>Sat	>Sat	110,000
TPH >C16-C21 (Aliphatic)	-	-	-	-	-	-	-	1,000,000
TPH >C16-C21 (Aromatic)	-	-	-	-	-	-	-	65,000
TPH >C21-C34 (Aliphatic)	-	-	-	-	-	-	-	1,000,000
TPH >C21-C34 (Aromatic)	-	-	-	-	-	-	-	65,000
TPH >C34-C40 (Aliphatic)	-	-	-	-	-	-	-	1,000,000
TPH >C34-C40 (Aromatic)	-	-	-	-	-	-	-	65,000

*Notes: # Source = CRC CARE (2011) Appendix F, * Where the soil criteria derived using the infinite source model were more conservative than the CRC CARE (2011) screening values based on a finite source model, the CRC CARE (2011) values are proposed for adoption. >sat – greater than saturation concentrations of this CoPC*

Groundwater

Table 2 below provides a summary of Site specific RC (reported to two significant figures) for groundwater concentrations which are considered to be protective of human health for proposed future uses.

Table 2 Site Specific Land Use RC for groundwater (mg/kg)

Chemical	Potential Future Residents (slab-on-grade with unknown construction or multi-storey building) #	Potential Future Residents (low rise slab-on-grade)	Potential Future Residents (building with a basement car park)	Potential Future Commercial (slab-on-grade with unknown construction or multi-storey building) #	Potential Future Commercial/ Light Industrial Workers (slab-on-grade)	Potential Future Commercial/Light Industrial Workers (Working within a basement car park)	Potential Future Recreational Open Space Users	Potential Future Maintenance Workers
Benzo(a)pyrene	-	-	-	-	-	0.05	-	-
Naphthalene	2	3	7	12	28	6	>Sol	>Sol
Benzene	0.8	0.8	6	5	9	5	>Sol	>Sol
Toluene	950	>Sol	>Sol	>Sol	>Sol	5,500	>Sol	>Sol
Ethylbenzene	250	250 *	>Sol	>Sol	>Sol	1,600	>Sol	>Sol
Xylenes (total)	180	>Sol	>Sol	>Sol	>Sol	2,800	>Sol	>Sol
TPH C6-C8 (Aliphatic)	21	>Sol	>Sol	>Sol	>Sol	16,000	>Sol	>Sol
TPH >C8-C10 (Aliphatic)	0.6	>Sol	>Sol	4	>Sol	79	>Sol	>Sol
TPH >C8-C10 (Aromatic)	30	30 *	>Sol	190	>Sol	360	>Sol	>Sol
TPH >C10-C12 (Aliphatic)	0.8	>Sol	>Sol	5	>Sol	40	>Sol	>Sol
TPH >C10-C12 (Aromatic)	38	>Sol	>Sol	>Sol	>Sol	190	>Sol	>Sol
TPH >C12-C16 (Aliphatic)	1	>Sol	>Sol	6	>Sol	67	>Sol	>Sol
TPH >C12-C16 (Aromatic)	72	>Sol	>Sol	>Sol	>Sol	160	>Sol	>Sol

Chemical	Potential Future Residents (slab-on-grade with unknown construction or multi-storey building) #	Potential Future Residents (low rise slab-on-grade)	Potential Future Residents (building with a basement car park)	Potential Future Commercial (slab-on-grade with unknown construction or multi-storey building) #	Potential Future Commercial/ Light Industrial Workers (slab-on-grade)	Potential Future Commercial/Light Industrial Workers (Working within a basement car park)	Potential Future Recreational Open Space Users	Potential Future Maintenance Workers
TPH >C16-C21 (Aliphatic)	-	-	-	-	-	3,300	-	-
TPH >C16-C21 (Aromatic)	-	-	-	-	-	94	-	-
TPH >C21-C34 (Aliphatic)	-	-	-	-	-	3,300	-	-
TPH >C21-C34 (Aromatic)	-	-	-	-	-	39	-	-
TPH >C34-C40 (Aliphatic)	-	-	-	-	-	3,300	-	-
TPH >C34-C40 (Aromatic)	-	-	-	-	-	39	-	-
Dimethylphenol, 2,4-	-	-	-	-	-	1,300	-	-
Methylphenol-2 (cresol, o-)	-	-	-	-	-	4,300	-	-
Methylphenol-3 (cresol, m-)	-	-	-	-	-	4,200	-	-
Methylphenol-4 (cresol, p-)	-	-	-	-	-	4,300	-	-
Aniline	-	-	-	-	-	890	-	-
Dibenzofuran	-	-	-	-	-	8	-	-
Styrene	96	99	>Sol	>Sol	>Sol	160	>Sol	>Sol

*Notes: # Source = CRC CARE (2011) Appendix F, * Where the soil criteria derived using the infinite source model were more conservative than the CRC CARE (2011) screening values based on a finite source model, the CRC CARE (2011) values are proposed for adoption, >sol – greater than the solubility concentration of this CoPC*

Appendix H

Unexpected Discovery Plan - Aboriginal Artifacts and Relics

Unanticipated Discovery Plan

Procedure for the management of unanticipated discoveries of Aboriginal relics in Tasmania

For the management of unanticipated discoveries of Aboriginal relics in accordance with the *Aboriginal Heritage Act 1975* and the *Coroners Act 1995*. The Unanticipated Discovery Plan is in two sections.

Discovery of Aboriginal Relics other than Skeletal Material

Step 1:
Any person who believes they have uncovered Aboriginal relics should notify all employees or contractors working in the immediate area that all earth disturbance works must cease immediately.

Step 2:
A temporary 'no-go' or buffer zone of at least 10m x 10m should be implemented to protect the suspected Aboriginal relics, where practicable. No unauthorised entry or works will be allowed within this 'no-go' zone until the suspected Aboriginal relics have been assessed by a consulting archaeologist, Aboriginal Heritage Officer or Aboriginal Heritage Tasmania staff member.

Step 3:
Contact Aboriginal Heritage Tasmania on **1300 487 045** as soon as possible and inform them of the discovery. Documentation of the find should be emailed to **aboriginal@heritage.tas.gov.au** as soon as possible. Aboriginal Heritage Tasmania will then provide further advice in accordance with the *Aboriginal Heritage Act 1975*.

Discovery of Skeletal Material

Step 1:
Call the Police immediately. Under no circumstances should the suspected skeletal material be touched or disturbed. The area should be managed as a crime scene. It is a criminal offence to interfere with a crime scene.

Step 2:
Any person who believes they have uncovered skeletal material should notify all employees or contractors working in the immediate area that all earth disturbance works cease immediately.

Step 3:
A temporary 'no-go' or buffer zone of at least 50m x 50m should be implemented to protect the suspected skeletal material, where practicable. No unauthorised entry or works will be allowed within this 'no-go' zone until the suspected skeletal remains have been assessed by the Police and/or Coroner.

Step 4:
If it is suspected that the skeletal material is Aboriginal, Aboriginal Heritage Tasmania should be notified.

Step 5:
Should the skeletal material be determined to be Aboriginal, the Coroner will contact the Aboriginal organisation approved by the Attorney-General, as per the *Coroners Act 1995*.

Aboriginal Heritage Tasmania
Department of Primary Industries, Parks, Water and Environment

Tasmanian Government

Guide to Aboriginal site types

Stone Artefact Scatters

A stone artefact is any stone or rock fractured or modified by Aboriginal people to produce cutting, scraping or grinding implements. Stone artefacts are indicative of past Aboriginal living spaces, trade and movement throughout Tasmania. Aboriginal people used hornfels, chalcedony, spongelite, quartzite, chert and silcrete depending on stone quality and availability. Stone artefacts are typically recorded as being 'isolated' (single stone artefact) or as an 'artefact scatter' (multiple stone artefacts).

Shell Middens

Middens are distinct concentrations of discarded shell that have accumulated as a result of past Aboriginal camping and food processing activities. These sites are usually found near waterways and coastal areas, and range in size from large mounds to small scatters. Tasmanian Aboriginal middens commonly contain fragments of mature edible shellfish such as abalone, oyster, mussel, warrener and limpet, however they can also contain stone tools, animal bone and charcoal.

Rockshelters

An occupied rockshelter is a cave or overhang that contains evidence of past Aboriginal use and occupation, such as stone tools, middens and hearths, and in some cases, rock markings. Rockshelters are usually found in geological formations that are naturally prone to weathering, such as limestone, dolerite and sandstone

Quarries

An Aboriginal quarry is a place where stone or ochre has been extracted from a natural source by Aboriginal people. Quarries can be recognised by evidence of human manipulation such as battering of an outcrop, stone fracturing debris or ochre pits left behind from processing the raw material. Stone and ochre quarries can vary in terms of size, quality and the frequency of use.

Rock Marking

Rock marking is the term used in Tasmania to define markings on rocks which are the result of Aboriginal practices. Rock markings come in two forms; engraving and painting. Engravings are made by removing the surface of a rock through pecking, abrading or grinding, whilst paintings are made by adding pigment or ochre to the surface of a rock.

Burials

Aboriginal burial sites are highly sensitive and may be found in a variety of places, including sand dunes, shell middens and rock shelters. Despite few records of pre-contact practices, cremation appears to have been more common than burial. Family members carried bones or ashes of recently deceased relatives. The Aboriginal community has fought long campaigns for the return of the remains of ancestral Aboriginal people.

Further information on Aboriginal Heritage is available from:

Aboriginal Heritage Tasmania
Natural and Cultural Heritage Division
Department of Primary Industries, Parks, Water and Environment
GPO Box 44 Hobart TAS 7001

Telephone: **1300 487 045**
Email: **aboriginal@heritage.tas.gov.au**
Web: **www.aboriginalheritage.tas.gov.au**

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30 January 2025

Our ref: 754-MELEN225720.1-L01

Macquarie Point Development Corporation
via email: greg@macpoint.com

Attention: Greg Cooper

Dear Greg

Environmental Auditor Opinion - Remediation Approach

1. INTRODUCTION AND OBJECTIVE

Mr David Lam of Tetra Tech Coffey is the Environmental Auditor for the Macquarie Point Development Project (the Site) appointed by Macquarie Point Development Corporation (the Corporation). Mr Lam is acting in an independent role and was engaged in 2015 to oversee the environmental remediation and validation of the Site. Environmental assessment and remediation including development and implementation of a remediation strategy is being undertaken by AECOM Australia Pty Ltd (AECOM).

The objective of this letter is to provide the Environmental Auditor's opinion on the adopted approach to assessment and remediation of the land and groundwater at the Site, to deliver a site that is suitable for the proposed use: multipurpose stadium (with nearby basement carpark) with surrounding mixed use, including open space, as depicted in the Mac Point Precinct Plan (https://www.macpoint.com/precinctplan). The Regatta Point part of the precinct includes medium to high density residential use.

We prepared this letter at the request of MPDC, in response to comments and queries raised by the Tasmanian Planning Commission (TPC) and Environment Protection Authority (EPA) Tasmania.

The Environmental Auditor cannot provide a definitive statement regarding what the environmental audit will later find, because that would compromise the Environmental Auditor's independence in writing the final environmental audit report. Further, no other party can state definitively what the audit will later find. It is however considered reasonable for the Environmental Auditor to note (in general terms) the overall appropriateness of the approach being adopted.

This letter should not be considered any form of guarantee or warranty regarding the final condition of the Site or future findings of Site assessment, remediation or management by others, or the Environmental Auditor's reasonable response to those findings, under relevant guidance.

2. THE ENVIRONMENTAL AUDIT SYSTEM

In the absence of an environmental audit system in Tasmania, the Victorian environmental audit system was adopted to provide a framework for assessment and sign-off on the suitability of land for proposed use. For the Macquarie Point Site, this approach was formalised by an amendment to the Macquarie Point Development Corporation Act 2012 (in 2015), and by registration of the Environmental Auditor on the EPA Tasmania Register of Interstate Contaminated Land Auditors. The environmental audit system considers the human health and ecological impacts or risks that may be presented by land and groundwater.

The Environmental Auditor completing audits at the Site to date under the (Victorian) guidelines has undertaken the following key steps (among other things).

- Notified EPA Tasmania of the audit, referring to the Environmental Auditor's place on the Register of Interstate Contaminated Land Auditors.
- Reviewed the Site's known history (including the surrounding area), and other relevant background information.
- Reviewed and commented on reports and other documents prepared by the environmental site assessor (including documents describing work plans, assessment, and derivation of criteria).
- Conducted site visits and attended meetings.
- Assessed the environmental condition of soil, groundwater and soil vapour at the Site, using all available information.
- Assessed potential risks to human health and the environment relevant to the potential land use/s.
- Consulted with the audit client and MPDC, to discuss intentions for the Site.
- Consulted with EPA with respect to the audit process and the determination of 'Clean Up To the Extent Practicable' (CUTEP) using EPA Victoria guidance.
- Prepared Contaminated Land Audit Reports (including Site Suitability Statements).

When the environmental auditing of the Site commenced, the Environment Protection Act 1970 (EP Act 1970) was in place, in Victoria. The EP Act 1970 defined the environmental audit process. Although the EP Act 1970 was repealed and replaced by the Environment Protection Act 2017 (the EP Act 2017), at 1 July 2021, transitional arrangements allowed audits commenced under the EP Act 1970 to continue under that framework, with no defined end-point specified for continuing under that system. The relevant parts of the EP Act 1970 continue - as if not repealed - for audits commenced before 1 July 2021, under Section 478 of the EP Act 2017.

Environmental audits (consisting of a Contaminated Land Audit Report and a Site Suitability Statement) have been completed for four of the seven sub-areas originally forming the Site. To maintain continuity with the environmental auditing already completed, it was decided to continue the environmental auditing under the EP Act 1970 framework, per the mechanism in Section 478 of the EP Act 2017.

Currently, the Macquarie Point Development Project is in the process of adding land at Regatta Point (at the eastern end of the Site) into the project. Although the Royal Engineers Building and Yards, at the western end of the Site, are in the Precinct Plan, we understand no steps have yet been taken to add this area to the project. The land at Regatta Point has an industrial use history, while the Royal Engineers Building and Yards has not been subject to industrial activity.

Whether the additional land at Regatta Point will be audited under the EP Act 1970 or under the EP Act 2017 has not been determined, although a Preliminary Site Investigation (PSI) and Sampling and Analytical Quality Plan (SAQP) for this area have been prepared. A 'whole-of-site' consolidated audit report is proposed to be completed following the auditing of the currently remaining three sub-areas of the Site and the approach to be adopted for the additional land areas (regarding using either the EP Act 1970 or EP Act 2017) will also apply for the whole-of-site environmental audit. Regardless of the legislative framework adopted, the systems are

similar in objective and process and are considered by the Environmental Auditor to not require significant changes to the Site remediation strategy.

3. ROLE OF THE ENVIRONMENTAL AUDITOR

As indicated above, the Corporation has engaged Mr David Lam of Tetra Tech Coffey to undertake the environmental auditing of the Site. The role of the Environmental Auditor in this instance is to provide confidence / assurance to the Corporation and other relevant Project stakeholders that the environmental assessment, remediation and validation required has been completed to a level compliant with relevant standards.

The Environmental Auditor has been involved during the iterative process of environmental assessment and development and implementation of the remediation strategy. This has informed the completed Contaminated Land Audits and associated Suitability Statements. We note that the suitability of the Site for proposed uses has been subject to requirements for ongoing management of residual contamination, because total clean up of all contamination is not practicable for the Site. Ongoing management of residual contamination has been specified under a Site Environment Management Plan, Macquarie Point Development Project (AECOM, 2021 – 'SEMP'). Site Suitability Statements completed to date have required the SEMP to be implemented, and for any changes to the SEMP to be prepared by a suitably qualified professional and verified as acceptable by an Environmental Auditor. The SEMP is currently being updated.

An important aspect to understand regarding remediation versus management of contamination is that an environmental audit should only be completed where further 'remediation' is not required. This may be determined either because there is no contamination that could compromise the proposed use, or because contamination remaining will not affect the proposed use, and can be managed if retained. In the latter case, further removal of contaminated soil may be conducted at a later stage (such as during construction), but would be considered 'incidental', rather than necessary before audit completion.

4. PROJECT DETAILS

4.1 PROPOSED USE OF THE SITE

The Macquarie Point Strategic Framework and Masterplan 2015-2030 (the Masterplan) (MPDC, 2015) outlined a range of mixed uses for the overall Site, including:

- Hotel
- Public use
- Residential
- Retail (incl. Tourism & Hospitality)
- Commercial (incl. Office & Research)

The Mac Point Precinct Plan (the Precinct Plan) (MPDC, 2023) outlines a different range of uses including a multipurpose stadium, with a range of mixed uses in surrounding areas. As noted, an additional area at Regatta Point is being added to the Site. The area of the Royal Engineers Building and Yards is included in the Precinct Plan[1]). The proposed mixed use will consist largely of commercial or open space, although an underground carpark is proposed (at the northeast of the stadium) along with medium to high density residential use (proposed at Regatta Point). The clean up that has been conducted, and the requirements for

[1] The Royal Engineers Building and Yards is included in the Precinct Plan but there is no process underway to add the area to the Site, so it is not currently envisaged to be included in the environmental auditing work.

management of residual contamination in the SEMP have previously been based on the original development based on the 2015 Masterplan.

The multipurpose stadium and surrounding mixed uses would in general be considered to be consistent with uses envisaged for parts of the Site previously audited. However, some elements of the specific design for the stadium and nearby basement carpark will need to be considered for specific risk issues that may apply. If this confirms that risks are consistent with the original development scenario, auditing for the changed development scenario should be straightforward. For example, barrier layers in the playing field area, and basement depth for the nearby basement carpark need to be considered for potential differences in risk profile compared to allowances made to date. As design of the stadium and surrounds may change the remediation process, associated audits may also need to be amended with addenda (if necessary).

4.2 ENVIRONMENTAL AUDITING COMPETED

The remediation and validation of the Site has been progressing in a staged approach and the Site Suitability Reports / Statements have also been issued progressively for four sub-areas of the Site as follows:

- **Contaminated Land Audit Report - Macquarie Point Development Project - Audit Area 1**, dated 5 June 2019.[2]
- **Contaminated Land Audit Report - Macquarie Point Development Project - Audit Area 4 West**, dated 24 September 2020.[3]
- **Contaminated Land Audit Report - Macquarie Point Development Project – Lot E and Underground Carpark**, dated 23 July 2021.[4]
- **Contaminated Land Audit Report - Macquarie Point Development Project – Lot B**, dated 22 November 2021.[5]

The Site Suitability Statements consider the environmental suitability of the Site with respect to soil, groundwater and vapour. Each of the four Site Suitability Reports reflect the proposed use of each sub-area at the time of preparation. The proposed use of each sub-area at the time of the audit is outlined in each report. Since these reports were issued (2019 to 2021), proposed uses of the Site have changed. A review will be required to confirm whether or not the previous considerations of risk are applicable to all design details that may apply to the changed development scenarios.

Currently there are three sub-areas in various stages of assessment / remediation / validation, with preparation of Site Suitability Reports / Statements pending, as listed below:

- The Gateway (south west portion)
- The Precinct South (south east portion)
- Audit Area 4 East (north east portion)

As an overview, the contamination remaining on the Site generally (rather than specific to any one sub-area) includes:

- Contaminants in soils, predominantly consisting of hydrocarbons (including polycyclic aromatic hydrocarbons (PAHs)), metals and localised possible asbestos.
- Vapour impacts by hydrocarbons and methane.
- Groundwater impacts by hydrocarbons and metals (the hydrocarbon impacts including localised residual LNAPL, and dissolved PAHs)

[2] This sub-area of the Site is now referred to as The Goods Shed and Yard.
[3] This sub-area of the Site is now referred to as The Escarpment.
[4] This sub-area of the Site is now referred to as The Promenade and Underground Carpark.
[5] This sub-area of the Site is now referred to as The Precinct North.

The remaining impacts have been assessed for the previous envisaged development, and have been considered able to be managed under the SEMP that has been developed for the Site. The process required for the different development scenario is to consider whether there are any additional risks, and whether these remain manageable. For example, a proposed basement carpark is now understood to be significantly deeper than the previously envisaged underground carpark. The management of contaminated groundwater and vapour ingress therefore needs to be reconsidered. As well, residual impacts in groundwater have previously been considered not to pose an unacceptable risk to the receiving environment of Sullivans Cove / Derwent Estuary, based on monitoring/observation of discharge areas, and the expectation that the previous envisaged development / construction would not change flow paths materially. The potential for the newly proposed deep basement carpark to affect the receiving environment in a more adverse way needs to be considered. The assessment will depend on proposed details of design and construction. It is possible that some elements of the new proposal will reduce risks - a larger / deeper excavation envelope may cause additional residual contaminant mass to be physically removed. The results of these and any other necessary risk considerations cannot be pre-empted at this time, but there are not yet any known obstacles to a Site Suitability Statement being able to eventually be issued. Whether this requires additional remediation of residual impacts, or any changes in the documented approach to management of the residual contamination remains to be seen.

Document review

The Environmental Auditor has reviewed assessment reports for soil, groundwater and vapour along with remediation and validation reports for multiple sub-areas of the Site.

Also:

- Data Gap Assessments (DGAs)
- Sampling and Analytical Quality Plans (SAQPs)
- Remediation Work Plans (RWPs)
- LNAPL Remediation aspects.
- Remediation Pilot Trials, Remediation Bench Scale,
- Assessment of Off-Site Ecological Impacts (so including surface waters nearby the Site (Sullivans Cove and the Derwent Estuary.
- Site Environment Management Plan (SEMP)

The Environmental Auditor has also reviewed the characterisation of imported backfill (VENM) as well as characterisation of soil excavated and stockpiled at the Site for on-site reuse or off-site disposal.

4.3 OTHER MATTERS

Environmental Auditor review of current key documents

The Environmental Auditor is currently reviewing the following two key documents prepared by AECOM:

- **Site Remediation Strategy Update 2024**, dated 17 June 2024 (**SRS Update 2024**)
- **Site Environment Management Plan**, dated 18 December 2024 (**SEMP 2024**)

The **SRS Update 2024** was prepared to review the changed proposed use of the Site from that in the Masterplan to the current proposed use for the multipurpose stadium. Further, the SRS Update 2024 has been prepared to assess the extent of required modifications or additional works required to address the contamination of land and groundwater at the Site and manage any residual risks to human and ecological receptors both on and off Site during construction activities and extending into the on-going future users and maintenance workers.

The **SEMP 2024** is an update of earlier iterations of the SEMP and has been adapted to address management requirements in sub-areas of the Site as they have been progressively completed, and for the Site as a whole. The management measures and actions in the SEMP are closely tied to the specific proposed uses of sub areas and based on derivation of relevant remediation criteria for each use. The SEMP is required to be implemented under Site Suitability Statements issued to date, and will remain a requirement in future environmental audits. The SEMP includes elements such as:

- prevention of use/contact with groundwater (other than for remediation or monitoring),
- constructed barriers to prevent contact by Site users with residual soil contamination (this would also prevent surface erosion of contaminated soil and consequent impacts to stormwater),
- clean soil conduits for services to reduce maintenance worker risk, and
- vapour mitigation where appropriate.

Depending on the results of assessment of any changes to risks for the new development proposal, some details of the SEMP may need to be amended (by a suitably qualified professional, and the changes verified by an Environmental Auditor), to allow a Site Suitability Statement to be issued for the new development.

Implications of Proposed Basement Carpark

The proposed basement carpark abutting the northeast edge of the stadium is understood to be likely to extend several metres below the water table.

Basements below the water table level have not previously been considered in derivation of remediation criteria and in the scope of management plans. Basement construction will require careful consideration and management of potential for ingress of contaminated/saline groundwater and associated odours or vapours, both in the construction and post-construction phase. This includes consideration of potential residual Non Aqueous Phase Liquids (NAPLs) in basement areas, or where NAPL could migrate to a basement (currently the proposed basement carpark does not appear to intersect a known residual LNAPL plume). For example, basement tanking or pressure relief by drainage – if undertaken – requires different consideration than is needed for vapour mitigation systems where there is unsaturated soil below the lowest basement level. It is understood that tanking is envisaged, but the Environmental Auditor has not yet seen proposed details of design.

Groundwater

The condition of groundwater is an important aspect of environmental audits. It is necessary to demonstrate that clean up of groundwater contamination has occurred to the extent practicable, and that the residual contamination does not pose unacceptable impacts which cannot be managed (such as impacts to receiving surface waters). This ‘Clean Up To the Extent Practicable’ (CUTEP) status had been considered to apply for completed audits, but will need to be reconsidered in the context of changes to the developed Site. Issues to be considered include the possible changed groundwater regime from deeper structures/basements, and sewer realignment works. The effects of residual NAPL in some areas will need to be considered in the context of the changed development scenario – for example possible ingress.

Adopted Criteria

The applicability of the adopted criteria for the remediation and management of the Site will need to be re-confirmed for the different development scenario now proposed. Because the criteria have been based on a wide range of envisaged development scenarios, they are likely to remain acceptable, however a complete reconsideration of the conceptual site model for the Site (and the applicability of the criteria as developed) needs to be checked off.

Services

An aspect of the management of risks from residual contamination is the limitation of potential exposure to maintenance workers through the use of dedicated service conduits which may allow isolation from direct contact with residual contaminants in soils.

5. REMEDIATION STRATEGY

The Site remediation strategy, broadly, adopts a process of assessing contamination and remediating contamination that poses unacceptable risks to the proposed development to the extent practicable. Only where residual contamination (that is not practicable to remove) is able to be managed, an environmental audit (with 'Site Suitability Statement' will be sought). Where residual contamination cannot be practicably managed by controls able to be specified by the environmental audit, the proposed land use cannot be achieved. In that instance, either the land use would need to be reconsidered, or the extent of remediation that has been considered to have been practicable may need to be re-visited.

Although the details of assessment and remediation/management vary, the above overall approach applies to soil, groundwater (including NAPL impacts) and vapours.

6. ENVIRONMENTAL AUDITOR OPINION OF PROPOSED REMEDIATION AND MANAGEMENT

As noted, no Environmental Auditor can reasonably pre-empt/predict exact findings of future environmental auditing. To do so would introduce an intractable conflict for the Environmental Auditor in their final evaluation of Site suitability.

However, the Environmental Auditor can advise the following.

- The overall approach and process to remediation and management is reasonable.
- Full Site remediation, assessment and auditing has not been completed, and in particular has not been completed for the changed development scenario.
- At this time, there is no obvious impediment to the Site being able to be remediated, and residual contamination managed, in a way that allows the proposed development to occur.
    - It is possible that this interpretation may change based on new information or assessments to be completed.
    - Specific requirements in terms of remediation extents, investigations to support the conceptual site model, and associated timelines and costs that may be required to finalise environmental auditing cannot be pre-empted and are not the responsibility of the Environmental Auditor.

The environmental audits (and final site-wide audit) will relate only to environmental contamination aspects of the Project. Geotechnical and other aspects of the proposed use of the Site are excluded.

7. CLOSURE

We hope this letter adequately clarifies the Environmental Auditor's position with respect to the proposed approach for remediation of the Site to allow the proposed multipurpose stadium and mixed use.

Please contact Mr David Lam if clarification of any matter is required.

Regards

David Lam
Senior Principal Environmental Consultant/Environmental Auditor