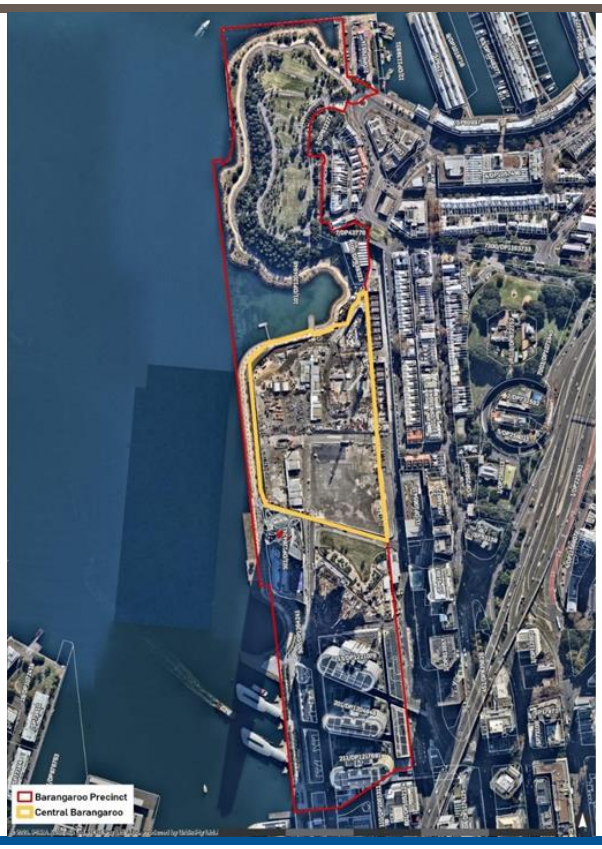
# Central Barangaroo Stage 1 Early Works

## Geotechnical Impact Assessment Report: State Significant Development Application: Central Barangaroo Early Works - Hickson Road Interface

Aqualand B Development Holding Pty Ltd (Aqualand)




**Reference: SYDGE287887AK**

2 June 2022

# CENTRAL BARANGAROO STAGE 1 EARLY WORKS

## State Significant Development Application: Central Barangaroo Early Works - Hickson Road Interface

**Report reference number: SYDGE287887AK**

2 June 2022

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# EXECUTIVE SUMMARY[1]

This Geotechnical Engineering Impact Assessment of the Central Barangaroo Stage 1 Early works on the site and surrounding properties including the Barangaroo Metro, has been prepared by Tetra Tech Coffey Pty Ltd to accompany a State significant development application (SSDA) for the proposed Hickson Road interface early works located in the eastern portion of the Central Barangaroo site (site).

This report has been prepared to address the geotechnical impact of the proposed early works on the Barangaroo Metro. The report has also been prepared to address the relevant conditions of the approved Barangaroo Concept Plan (MP06_0162) and the Secretary's Environmental Assessment Requirements (SEARs) issued for SSD-39587022 on 14 April 2022.

This report concludes that the proposed early works stage 1 involving the installation of 153m of shoring piles is not likely to have adverse impacts on properties surrounding the site.  Impacts on the Barangaroo Metro were also assessed in accordance with the Sydney Metro Underground Corridor Protection Technical guidelines.

[1] This executive summary must be read in the context of the full report and the attached limitations.

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# ACRONYMS/ABBREVIATIONS

| Acronyms/Abbreviations | Definition |
|---|---|
| AHD | Australian height datum |
| BCA | Building Code of Australia |
| Council | City of Sydney Council |
| DPE | NSW Department of Planning and Environment |
| SEARs | NSW Secretary's Environmental Assessment Requirements |
| SSD | State significant development |
| SSDA | State significant development application |
| LEP | Local Environmental Plan<br>Sydney Local Environmental Plan 2012 |
| DCP | Development control Plan<br>Sydney Development Control Plan 2012 |
| CC | Construction Certificate |
| CBD | Central Business District |
| MHWS | Mean High-Water Spring |
| MLWS | Mean Low-Water Spring |

# 1. INTRODUCTION

This Geotechnical Engineering Impact Assessment of the Central Barangaroo Stage 1 Early works on the site and the Barangaroo Metro has been prepared by Tetra Tech Coffey Pty Ltd to accompany a State significant development application (SSDA) for the proposed Hickson Road interface early works located in the eastern portion of the Central Barangaroo site (site).

This report has been prepared to assess the impact of the installation of approximately 153m of shoring piles along the Hickson Road boundary. 132m shoring piles is parallel to the Hickson Road boundary and 21m perpendicular to the boundary.

As summarised in the table 1.0 below, this report has also been prepared to address the relevant conditions of the approved Barangaroo Concept Plan (MP06_0162) and the Secretary's Environmental Assessment Requirements (SEARs) issued for SSD-39587022 on 14 April 2022.

**Table 1: SEARs Requirements**

| Item | Description of Requirement |
|---|---|
| 7 | Geotechnical Assessment |
| 15 | Report demonstrating compliance with the Sydney Metro Underground Corridor Protection Guidelines |

# 2. SITE CONTEXT

## 2.1 SITE DESCRIPTION

The site is located at Central Barangaroo, within the broader Barangaroo Precinct. The Barangaroo precinct comprises a total land holding of approximately 22ha and is located on the north-western edge of the Sydney CBD within the City of Sydney Local Government Area (LGA). Barangaroo runs north-south between Hickson Road and the western foreshore of Sydney Harbour, connecting the north-west edge of the city's business centre with the historic and cultural precincts of Millers Point and Walsh Bay.

This SSDA relates exclusively to works on the Central Barangaroo site, which is legally described as Lot 52 DP 1213772. Specifically, the proposed early works relate to a portion of the site along the eastern property boundary adjacent Hickson Road.

The Central Barangaroo site comprises approximately 5.2 hectares of land within the Barangaroo Precinct. The site forms an irregular shaped land parcel in between Barangaroo South and Barangaroo Reserve.

The location of the site in the surrounding context is illustrated in Figure 1.0.

The site is currently occupied by temporary structures for water treatment during the construction of Barangaroo South, and more generally, as a vehicle storage and construction site. It features a large concrete hardstand area / construction site that is occupied by temporary structures for site preparation works, machinery, materials, and vehicle parking for site workers. Hoarding is currently erected around the Central Barangaroo site.


**Figure 1: Site Aerial (source Urbis)**

# 3. PROJECT BACKGROUND

## 3.1 APPROVED BARNGAROO CONCEPT PLAN MP06_0162

The Concept Plan for Barangaroo (MP 06_0162) was approved in February 2007 by the then Minister for Planning under Part 3A of the EP&A Act.

The Concept Plan approval granted consent for the renewal of a 22ha precinct (formerly known as East Darling Harbour) as a new harbour precinct of Sydney, providing an extension to the Sydney CBD and a significant new public headland park.

The Concept Plan has since been modified ten times. The most recent modification to the Concept Plan is MP06_0162 Modification 11 (MOD 11), which was approved on 22 October 2020.

The proposed early works under this SSDA are submitted under the current approved Concept Plan. The approved Concept Plan does not set any express parameters on the extent of excavation or early works within the site. The proposed early works will not prevent or compromise the future development of the Central Barangaroo site consistent with the approved Concept Plan.

## 3.2 MODIFCATION 9 (MOD 9) TO MP_0162

Aqualand and Infrastructure New South Wales recently prepared Modification 9 to the approved Barangaroo Concept Plan MP06_0162 (MOD 9). The application seeks amendments to the approved Barangaroo Concept Plan as it relates to Central Barangaroo. Specifically, this includes modifications to the Central Barangaroo development blocks 5, 6 and 7 with regards to building envelopes, GFA and height, as well as the street and pedestrian movement network.

MOD 9 was lodged on 8 April 2022. The proposed early works are permissible under the provisions of the approved Barangaroo Concept Plan and not reliant on MOD 9.

# 4. PROPOSED DEVELOPMENT THE SUBJECT OF THIS SSDA

The proposed SSDA will seek approval for early works associated with the future mixed-use development within Central Barangaroo (refer MP06_0162). Specifically, the works are associated with the construction of a secant pile retention wall along the Hickson Road (eastern) boundary, and include:

- Partial demolition of an existing shoring wall capping beam along Hickson Road;
- Construction of a new pile retention wall;
- Excavation of land related to the pile retention wall preparatory works;
- Localised remediation related to the pile retention wall;
- Associated Archaeological Investigations in the area of excavation and works; and
- Sydney Metro / Hickson Road interfaces – perimeter retention wall interface works, and Hickson Road public domain interface works.

# 5. FUTURE DEVELOPMENT APPLICATIONS

## 5.1 STAGE 2 EARLY WORKS

A future separate SSDA will be prepared and submitted for more extensive early works for the Central Barangaroo precinct. It is anticipated that this will relate primarily to Central Barangaroo site establishment works and bulk excavation, including:

- Establish the site and installation of temporary plant and machinery, including dewatering and bentonite slurry plant and ancillary services;
- Construction of perimeter retention diaphragm wall, including any required excavation, associated rock anchors and foundation piling;
- Associated remediation and Archaeological investigations in the area of excavation and works;
- Provision for future services;

- Associated “tie-in” works to Metro Interface Wall and the secant pile wall associated with this SSDA;
- Excavation for the provision of a future basement and associated temporary rock anchors, rock bolting and ground improvement as required for main body of the site; and
- Basement de-watering.

## 5.2 FUTURE DETAILED SSDA’S

Separate future detailed SSDAs will be prepared and submitted seeking approval for future development associated with the mixed-use development at Central Barangaroo including, basement, public domain, and above ground building works.

# 6. PROPOSED SHORING SYSTEM

The Stage 1 Early works involves the installation of approximately 153m of shoring wall. The wall will form part of the overall shoring system for the Central Barangaroo development. This early works stage 1 involves the installation for the shoring piles only and excludes any excavation in front of the shoring piles. The engineering impact assessment of the excavation and the installation of the shoring wall temporary ground anchors will be assessed at the next DA submission Stage 2 Early Works.

The early Works Stage 1 shoring system is proposed to be a 1200mm diameter (max.) pile wall founded at approximately RL -14900. The detailed design of the shoring wall will be completed prior to issue of for construction documents and the subsequent CC related to this development application. It is noted that design of the temporary anchors required during bulk excavation will be included with Early Works DA2

# 7. GEOTECHNICAL CONDITIONS

## 7.1 GEOLOGY

The NSW Seamless Geology (Department of Planning, Industry and Environment, 2020) indicates the site is underlain by anthropogenic Fill and Quaternary sediments over Triassic age Hawkesbury Sandstone. Figure 2 displays the geology of the site and its surrounds. There is a Jurassic age dolerite dyke (Pittman LIV dyke) also located immediately to the south of Central Barangaroo site, Reference to (D.J. Och, Offler, Zwingmann, Braybrooke, & Graham, 2009) shows the Luna Park Fault near the north-western corner of the harbour foreshore area.

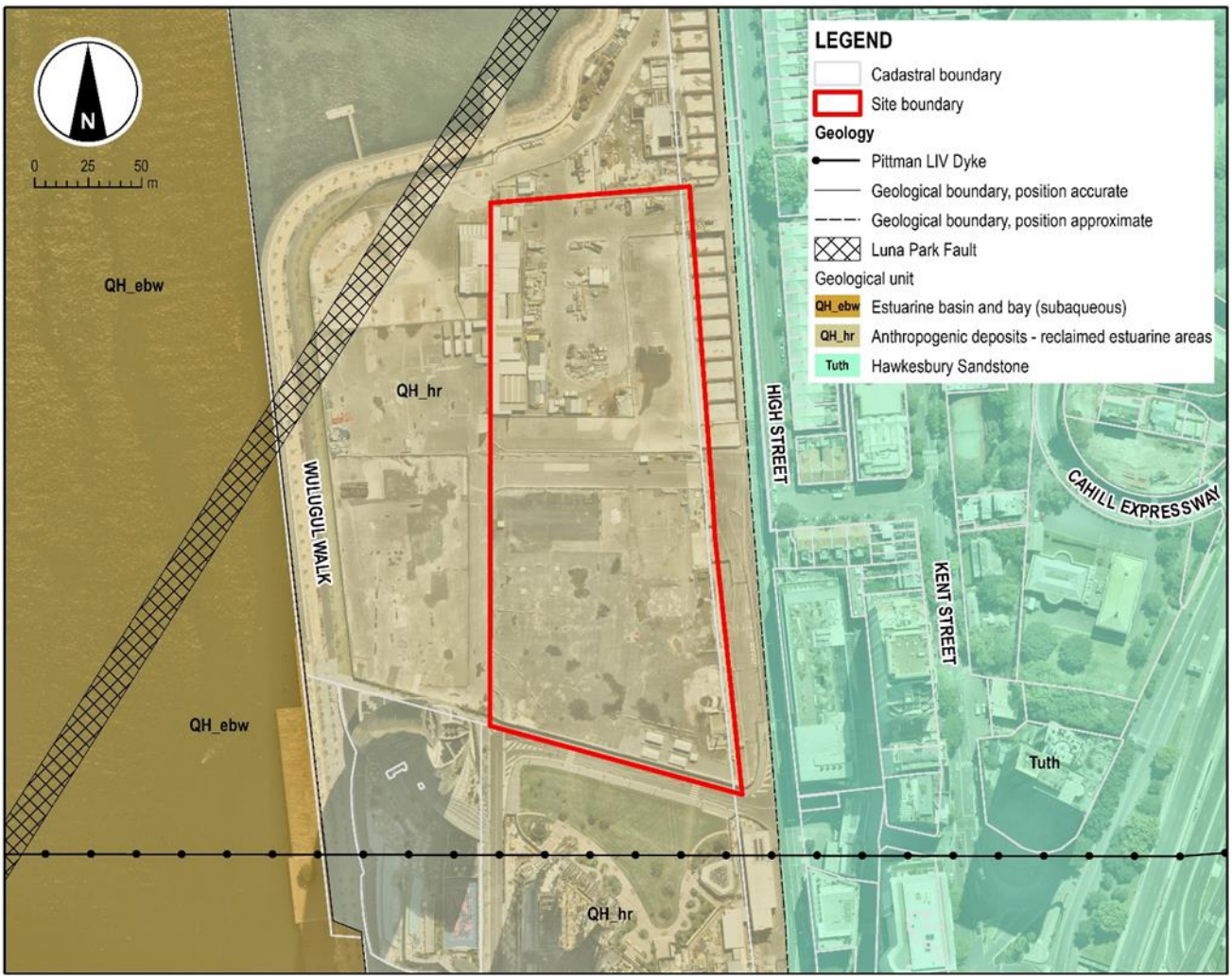


**Figure 2: Site Geology from NSW Seamless Geology and Och et al.**

### 7.1.1 Fill

Reclamation fill is highly variable in nature and thickness across the site and was placed during various phases of reclamation over the past 115 years. As a result, the fill material is heterogeneous, typically uncontrolled and cannot be easily characterised. The fill is known to contain deleterious materials, large hard inclusions such a boulders and rubble, and has a potential for near surface voids. As a result, excavations and piling through this material can be problematic at times.

### 7.1.2 Estuarine & Alluvium Deposits

Below the fill there is both recent and Quaternary alluvial and estuarine sediments occurring as pre-existing channel infills and coastal marine deposits around the pre-development Darling Harbour/Barangaroo foreshore area. The deeper Quaternary sediments are inferred to have been deposited during the last glacial period, or Pleistocene (approximately 120,000 years before present to 10,000 years before present) when sea level oscillation of between RL -20 m AHD and -120 m AHD occurred. It was during the periods of lower sea level that river systems also incised into the underlying bedrock.

In terms of sedimentary stratigraphy, the clay dominated deposits represent the broad lagoon/estuarine type environments associated with elevated sea levels, while the sand units represent higher energy fluvial deposits associated with lower sea levels.

### 7.1.3 Hawkesbury Sandstone

The Hawkesbury Sandstone is described as a fine to coarse grained quartzose sandstone deposited in 1m to 5m thick beds and lenses that exhibit either massive or sheet facies. Shale breccia lenses and bands are common at the contacts between beds, with siltstone/shale interbeds forming a minor part of the unit. In some cases, these minor shale bands weather preferentially to form softer bands.

Structurally, there are two main joint sets within the Hawkesbury Sandstone in the Sydney CBD region: one set trending north-north-east and an orthogonal set trending west-north-west. The joints are typically sub-vertical, relatively widely spaced and may not be continuous through the sandstone beds. Vertical joints often terminate in shale bands. There are a number of sub-vertical fault zones (such as the Luna Park Fault to the north of the site) and joint swarms that have been identified trending roughly north east across the Sydney CBD that can result in more closely spaced jointing and may impact on excavation stability to a greater extent than the more widely spaced joints of the main joint sets.

## 7.2 SITE HISTORY

The following excerpt from (Godden Mackay Logan, 2012) details the site's history and usage:

"The historical development of the Barangaroo [Central] site is almost entirely related to maritime industries, including wharves, shipbuilding, and associated enterprises. The development and operation of these industries had a tremendous effect on the physical form of the site, including reclamation and major changes to the shoreline.

The historical development of the broader Barangaroo site included the following phases:

- Phase 1—Aboriginal occupation
- Phase 2—Private Ownership 1788–c1870
- Phase 3—Intensive Development and Decline c1870–1901
- Phase 4—Renewal 1902–2010.

Most of the nineteenth century development within this part of the harbour was focused around the northern and southern parts of the Barangaroo precinct. Most of the Barangaroo Central site was originally located below the water line, with the natural topography of the foreshore within the Barangaroo Central site being very steep.

The area of Barangaroo Central remained largely undeveloped throughout the nineteenth century and much of the study area now comprises reclaimed land. While the northern headland and the southern portion of the Barangaroo site was extensively developed from the early nineteenth century, the central portion remained relatively undeveloped until the 1860s, owing to the steep topography of this area. Maritime industry only extended into this part of the site after this time.

By 1865, Cuthbert's shipyard had partially extended into the area of the Barangaroo Central precinct, including construction of some wharf infrastructure in this area. Dibb's wharf was constructed in this area following Cuthbert's death in 1874.

By 1870, most of the foreshore between Dawes Point and Darling Harbour had been modified by quarrying, reclamation or the construction of seawalls, and the area was almost entirely occupied by wharves, stores and commercial properties. Between 1880 and 1900, most of the wharves and other structures were demolished as part of the government resumption of the area.

Hickson Road was constructed c1912. These works included excavation of bedrock along the road alignment and major modification of the shoreline along the Barangaroo Central precinct. The foreshore within the Barangaroo Central was partially reclaimed in the early twentieth century, and a number of finger wharves

were constructed in this area c1912. By the 1950s, the finger wharves were no longer suitable for modern shipping. The areas between the wharves in the central and southern parts of the Barangaroo site were progressively infilled."

Anecdotally we understand that some of the pre-exiting timber wharves may still remain within the fill.

## 7.3 PRELIMINARY GROUND MODEL

Based on the existing site ground information presented in the Desk Top Report and Preliminary Advice by Tetra Tech Coffey dated 29 Oct 2021 reference SYDGE287887AB, the subsurface profile for the site can be summarised into six geotechnical units as outlined in Table 2 below.

**Table 2: Geotechnical Ground Model**

| Unit | Origin | Description | Inferred typical Thickness (m) |
|---|---|---|---|
| **1** | Fill | Highly variable heterogenous material, comprising gravelly sands and clayey sands with sandstone boulders and deleterious anthropogenic material including building rubble and timber | 2-18m |
| **2** | Estuarine & Alluvium Deposits | Highly variable comprising interbedded soft to very stiff clays and sandy clays, together with loose to medium dense sands and clayey sands, grey to orange mottled red-brown with shells | 2-15m |
| **3** | Residual Soil | Very stiff to hard clay and sandy clay, typically sparse across the site due to washing away from estuarine/alluvium depositional periods. | 2-4m, but of limited distribution across site |
| **4A** | Class V Sandstone | Extremely to highly weathered, very low to low strength, orange brown with clay seams | 2-3m |
| **4B** | Class IV Sandstone | Highly to moderately weathered, low to medium strength, orange-brown to grey | 2-4m |
| **4C** | Class III Sandstone | Moderately weathered to fresh, medium to high strength, orange-brown to pale grey | 4-6m |
| **4D** | Class II or Better Sandstone | Slightly weathered to fresh, high strength, pale grey | basal strata |
| **5** | Shale Breccia bands and lenses | Generally fresh, low to medium strength occurring in laterally discontinuous bands | 0.5m |

## 7.4 GROUNDAWATER

Review of previous investigations indicates that groundwater in the fill will be tidally influenced, with groundwater level measured at RL 0.65 to RL -0.61 m AHD. The Mean High-Water Spring (MHWS) level is around RL 0.62 m AHD and the Mean Low Water Spring (MLWS) level is around RL -0.7 m AHD.

A preliminary groundwater level of +1.5m AHD is recommended for the temporary short-term condition and is considered relevant to the stage 1 early works.

# 8. GEOTECHNICAL ASSESSMENT

## 8.1 STAGE 1 WORKS LOCATION

The shoring wall is located directly to the west of Hickson road and to the south of the Barangaroo Metro Station structure. The northern end of the Stage 1 shoring wall will be built adjacent to the southern extent of the Barangaroo Metro temporary soldier pile and jet grout shoring wall. Approximately 20m of the shoring wall will be located within the Barangaroo Station Metro second reserve. The Stage 1 Early Works – Sydney Metro Protection Report, prepared by TTW (dated 2 June 2022) details the technical protection guidelines used to inform the design of the piled retention wall (Attached at Appendix B). Figure 3 below illustrates the location of the pile wall with respect to the Metro station and tunnels.

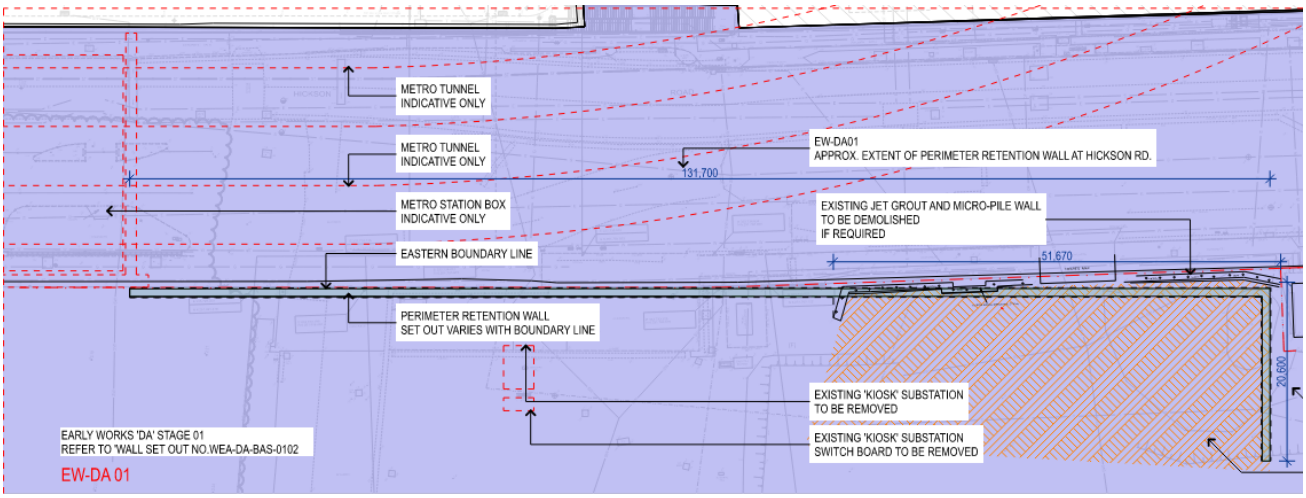


**Figure 3: Early works Stage 1 - Perimeter Retention Wall Plan (source Webber).**

## 8.2 STAGE 1 WORKS METRO INTERFACE

The interface between the proposed stage 1 pile retaining wall and the Metro Station was considered during the design of the station with the following detail constructed to facilitate the connection. The design of the Metro Station piled wall (by Metron) therefore considered the future tie-in of the proposed Central Barangaroo piled retention wall, via the construction of a jet-grout ground improvement zone to facilitate the connection, as shown in figure 4. Coordination with Sydney Metro and design certification will continue through detailed design and delivery of the Stage 1 Early works package, in accordance with published Sydney Metro Technical Guidelines.

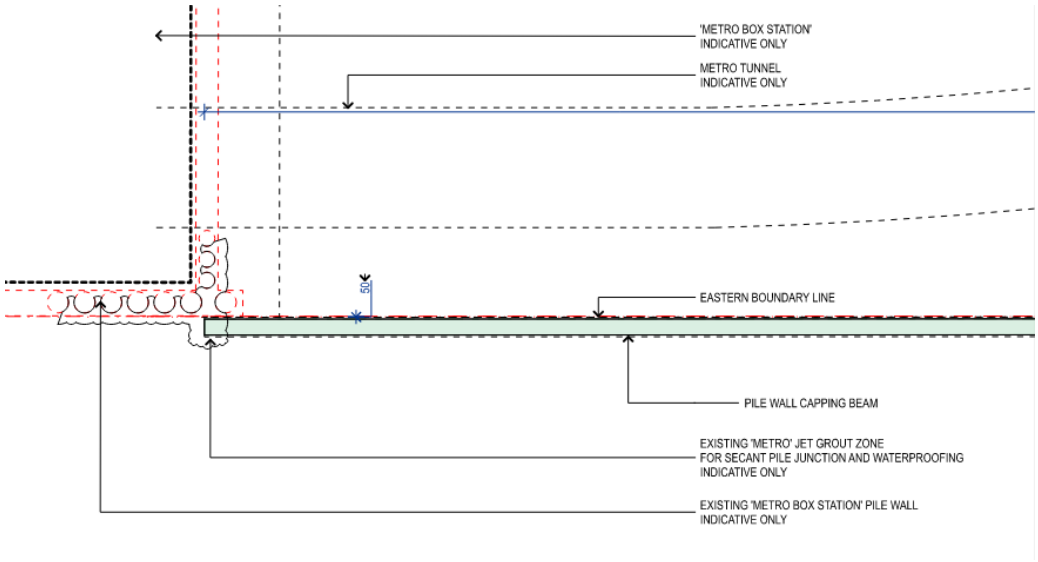


**Figure 4: Metro Station / Stage 1 Works Interface (source Webber).**

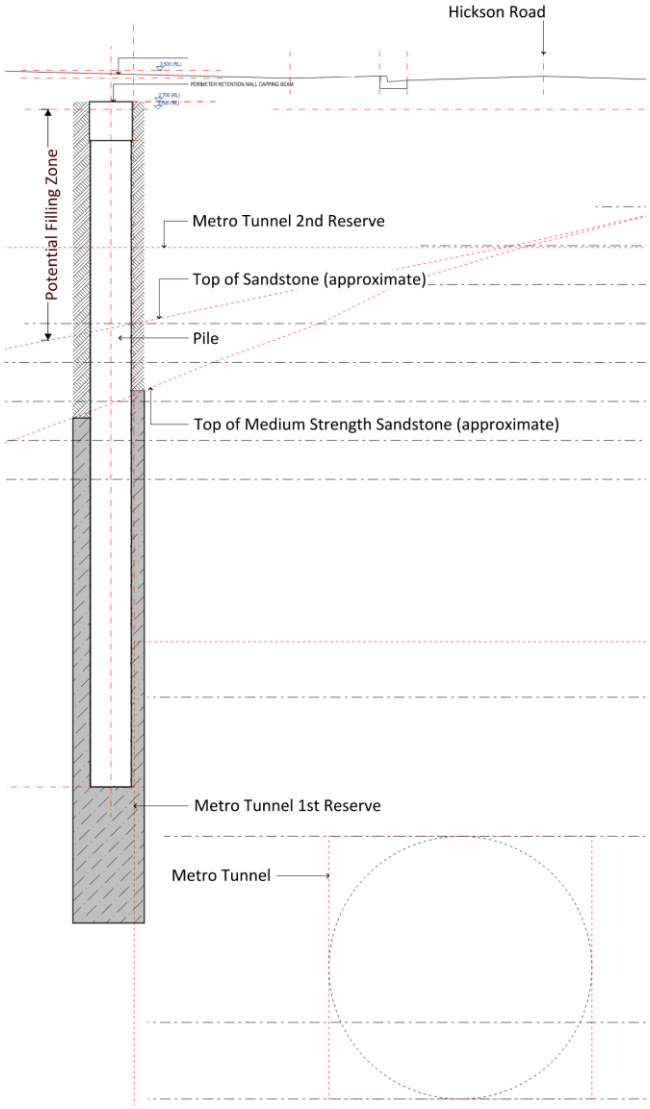


**Figure 5: Metro Station / Stage 1 Works Elevation (source Webber).**

## 8.3 STAGE 1 WORKS IMPACT

### 8.3.1 Pile Excavation

The stage 1 works involves the installation of piles adjacent to Hickson road and the Metro Station Structure where they are located within the Metro second reserve. Pile installation requires temporary excavation and subsequent backfilling with steel reinforced concrete.

The potential impact of this process would be instability or collapse of the pile excavation within the fill and / or estuarine / alluvial deposits. Excavation instability has the potential to change the in-situ ground conditions immediately adjacent to Hickson Road and the Metro Station. The Metro tunnels are surrounded by medium strength bedrock or better and hence there is no likely risk of pile excavation instability considered for the tunnels.

The pile excavation instability risk will be mitigated by the use of positive ground support mechanisms until the pile bore has been backfilled with concrete. A suitable pile shoring method may involve temporary steel casings installed into the top of the sandstone bedrock. Alternative shoring methods proposed by pile installation contractors should be assessed as being adequate prior to commencing the Stage 1 Early Works.

### 8.3.2 Groundwater

The use of temporary casing or other suitable ground support techniques will minimise the amount of ground water extracted during pile construction. There are no other planned excavation activities below the groundwater table as part of the Stage 1 Early Works and hence there are no envisaged impact on the standing groundwater table at the site or the Metro Station.

# 9. CONCLUSION

Provided good industry practice construction techniques are employed, the installation of the retaining wall piles is not likely to have adverse geotechnical impact on the site, adjoining properties, or the Barangaroo Metro Station and tunnels.

# APPENDIX A: LIMITATIONS

# IMPORTANT INFORMATION ABOUT YOUR TETRA TECH COFFEY REPORT

As a client of Tetra Tech Coffey you should know that site subsurface conditions cause more construction problems than any other factor. These notes have been prepared by Tetra Tech Coffey to help you interpret and understand the limitations of your report.

## Your report is based on project specific criteria

Your report has been developed on the basis of your unique project specific requirements as understood by Tetra Tech Coffey and applies only to the site investigated. Project criteria typically include the general nature of the project; its size and configuration; the location of any structures on the site; other site improvements; the presence of underground utilities; and the additional risk imposed by scope-of-service limitations imposed by the client. Your report should not be used if there are any changes to the project without first asking Tetra Tech Coffey to assess how factors that changed subsequent to the date of the report affect the report's recommendations. Tetra Tech Coffey cannot accept responsibility for problems that may occur due to changed factors if they are not consulted.

## Subsurface conditions can change

Subsurface conditions are created by natural processes and the activity of man. For example, water levels can vary with time, fill may be placed on a site and pollutants may migrate with time. Because a report is based on conditions which existed at the time of subsurface exploration, decisions should not be based on a report whose adequacy may have been affected by time. Consult Tetra Tech Coffey to be advised how time may have impacted on the project.

## Interpretation of factual data

Site assessment identifies actual subsurface conditions only at those points where samples are taken and when they are taken. Data derived from literature and external data source review, sampling and subsequent laboratory testing are interpreted by geologists, engineers or scientists to provide an opinion about overall site conditions, their likely impact on the proposed development and recommended actions. Actual conditions may differ from those inferred to exist, because no professional, no matter how qualified, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than assumed based on the facts obtained. Nothing can be done to change the actual site conditions which exist, but steps can be taken to reduce the impact of unexpected conditions. For this reason, owners should retain the services of Tetra Tech Coffey through the development stage, to identify variances, conduct additional tests if required, and recommend solutions to problems encountered on site.

## Your report will only give preliminary recommendations

Your report is based on the assumption that the site conditions as revealed through selective point sampling are indicative of actual conditions throughout an area. This assumption cannot be substantiated until project implementation has commenced and therefore your report recommendations can only be regarded as preliminary. Only Tetra Tech Coffey, who prepared the report, is fully familiar with the background information needed to assess whether or not the report's recommendations are valid and whether or not changes should be considered as the project develops. If another party undertakes the implementation of the recommendations of this report there is a risk that the report will be misinterpreted and Tetra Tech Coffey cannot be held responsible for such misinterpretation.

## Your report is prepared for specific purposes and persons

To avoid misuse of the information contained in your report it is recommended that you confer with Tetra Tech Coffey before passing your report on to another party who may not be familiar with the background and the purpose of the report. Your report should not be applied to any project other than that originally specified at the time the report was issued.

## Interpretation by other design professionals

Costly problems can occur when other design professionals develop their plans based on misinterpretations of a report. To help avoid misinterpretations, retain Tetra Tech Coffey to work with other project design professionals who are affected by the report. Have Tetra Tech Coffey explain the report implications to design professionals affected by them and then review plans and specifications produced to see how they incorporate the report findings.

## Data should not be separated from the report

The report as a whole presents the findings of the site assessment and the report should not be copied in part or altered in any way. Logs, figures, drawings, etc. are customarily included in our reports and are developed by scientists, engineers or geologists based on their interpretation of field logs (assembled by field personnel) and laboratory evaluation of field samples. These logs etc. should not under any circumstances be redrawn for inclusion in other documents or separated from the report in any way.

## Geoenvironmental concerns are not at issue

Your report is not likely to relate any findings, conclusions, or recommendations about the potential for hazardous materials existing at the site unless specifically required to do so by the client. Specialist equipment, techniques, and personnel are used to perform a geoenvironmental assessment. Contamination can create major health, safety and environmental risks. If you have no information about the potential for your site to be contaminated or create an environmental hazard, you are advised to contact Tetra Tech Coffey for information relating to geoenvironmental issues.

## Rely on Tetra Tech Coffey for additional assistance

Tetra Tech Coffey is familiar with a variety of techniques and approaches that can be used to help reduce risks for all parties to a project, from design to construction. It is common that not all approaches will be necessarily dealt with in your site assessment report due to concepts proposed at that time. As the project progresses through design towards construction, speak with Tetra Tech Coffey to develop alternative approaches to problems that may be of genuine benefit both in time and cost.

## Responsibility

Reporting relies on interpretation of factual information based on judgement and opinion and has a level of uncertainty attached to it, which is far less exact than the design disciplines. This has often resulted in claims being lodged against consultants, which are unfounded. To help prevent this problem, a number of clauses have been developed for use in contracts, reports and other documents. Responsibility clauses do not transfer appropriate liabilities from Tetra Tech Coffey to other parties but are included to identify where Tetra Tech Coffey's responsibilities begin and end. Their use is intended to help all parties involved to recognise their individual responsibilities. Read all documents from Tetra Tech Coffey closely and do not hesitate to ask any questions you may have.

# APPENDIX B: TTW SYDNEY METRO PROTECTION REPORT

TTW Structural Civil Traffic Façade

# Central Barangaroo Stage 1 Early Works

## Sydney Metro Protection Report

**Prepared for:**

**Aqualand B Development Holding Pty Ltd (Aqualand)** / 2 June 2022

211757

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Your Partner in Engineering

## Contents

| Reference | Description |
|---|---|
| AHD | Australian height datum |
| BCA | Building Code of Australia |
| Council | City of Sydney Council |
| DPE | NSW Department of Planning and Environment |
| SEARs | NSW Secretary's Environmental Assessment Requirements |
| SSD | State significant development |
| SSDA | State significant development application |
| LEP | Local Environmental Plan<br>Sydney Local Environmental Plan 2012 |
| DCP | Development Control Plan<br>Sydney Development Control Plan 2012 |

# 1.0 Executive Summary

This Engineering Impact Assessment of the Central Barangaroo Stage 1 Early works on the Sydney Metro has been prepared by TTW (NSW) Pty Ltd to accompany a State significant development application (**SSDA**) for the proposed Hickson Road interface early works located in the eastern portion of the Central Barangaroo site (**site**).

This report has been prepared for to address the relevant condition. The report has also been prepared to address the relevant conditions of the approved Barangaroo Concept Plan (**MP06_0162**) and the Secretary's Environmental Assessment Requirements (**SEARs**) issued for SSD-39587022 on 14 April 2022.

This report concludes that the proposed early works stage 1 involving the installation of 153m of shoring piles will not result in any adverse impacts on the Barangaroo Metro as assessed in accordance with the Sydney Metro Underground Corridor Protection Technical guidelines.

The Engineering Impact Assessment for the basement excavation of Barangaroo Central will be included in a future development application and prepared in accordance with the Sydney Metro Underground Corridor Protection Technical Guidelines and the Barangaroo Station Protection Guidelines.

It is noted that ongoing detailed design coordination of the proposed development at Central Barangaroo is subject to the Metro Interface agreement, between the Central Barangaroo Developer, INSW and Sydney Metro. This involves regular engagement between the parties on matters of design and delivery

# 2.0 Introduction

This Engineering Impact Assessment of the Central Barangaroo Stage 1 Early works on the Sydney Metro report has been prepared by TTW (NSW) Pty Ltd to accompany a State significant development application (**SSDA**) for the proposed Hickson Road interface early works located in the eastern portion of the Central Barangaroo site (**site**).

This report has been prepared to assess the impact of the installation of approximately 153m of shoring piles along the Hickson Road boundary. 132m shoring piles is parallel to the Hickson Road boundary and 21m perpendicular to the boundary.

Table 1 SEARs requirements

| Item | Description of Requirement | Report Reference |
|---|---|---|
| 15 | Report demonstrating compliance with the Sydney Metro Underground Corridor Protection Technical Guidelines | 5.0 & 7.0 – 10.0 |

As summarised in the tables 1.0 below, this report has also been prepared to address the relevant conditions of the approved Barangaroo Concept Plan (**MP06_0162**) and the Secretary's Environmental Assessment Requirements (**SEARs**) issued for SSD-39587022 on 14 April 2022.

# 3.0 Site Context

## 3.1 Site Description

The site is located at Central Barangaroo, within the broader Barangaroo Precinct. The Barangaroo precinct comprises a total land holding of approximately 22ha and is located on the north-western edge of the Sydney CBD within the City of Sydney Local Government Area (**LGA**). Barangaroo runs north-south between Hickson Road and the western foreshore of Sydney Harbour, connecting the north-west edge of the city's business centre with the historic and cultural precincts of Millers Point and Walsh Bay.

This SSDA relates exclusively to works on the Central Barangaroo site, which is legally described as Lot 52 DP 1213772. Specifically, the proposed early works relate to a portion of the site along the eastern property boundary adjacent Hickson Road.

The Central Barangaroo site comprises approximately 5.2 hectares of land within the Barangaroo Precinct. The site forms an irregular shaped land parcel in between Barangaroo South and Barangaroo Reserve.

The location of the site in the surrounding context is illustrated in Figure 2.0.

The site is currently occupied by temporary structures for water treatment during the construction of Barangaroo South, and more generally, as a vehicle storage and construction site. It features a large concrete hardstand area / construction site that is occupied by temporary structures for site preparation works, machinery, materials and vehicle parking for site workers. Hoarding is currently erected around the Central Barangaroo site.


Figure 1.0 – Site Aerial

# 4.0 Project Background

## 4.1 Approved Barangaroo Concept Plan MP06_0162

The Concept Plan for Barangaroo (MP 06_0162) was approved in February 2007 by the then Minister for Planning under Part 3A of the EP&A Act.

The Concept Plan approval granted consent for the renewal of a 22ha precinct (formerly known as East Darling Harbour) as a new harbour precinct of Sydney, providing an extension to the Sydney CBD and a significant new public headland park.

The Concept Plan has since been modified ten times. The most recent modification to the Concept Plan is MP06_0162 Modification 11 (**MOD 11**), which was approved on 22 October 2020.

The proposed early works under this SSDA are submitted under the current approved Concept Plan. The approved Concept Plan does not set any express parameters on the extent of excavation or early works within the site. The proposed early works will not prevent or compromise the future development of the Central Barangaroo site consistent with the approved Concept Plan.

## 4.2 Modification 9 (MOD 9) to MP06_0162

Aqualand and Infrastructure New South Wales recently prepared Modification 9 to the approved Barangaroo Concept Plan MP06_0162 (**MOD 9**). The application seeks amendments to the approved Barangaroo Concept Plan as it relates to Central Barangaroo. Specifically, this includes modifications to the Central Barangaroo development blocks 5, 6 and 7 with regards to building envelopes, GFA and height, as well as the street and pedestrian movement network.

MOD 9 was lodged on 8 April 2022. The proposed early works are permissible under the provisions of the approved Barangaroo Concept Plan and not reliant on MOD 9.

# 5.0 Proposed Development The Subject of This SSDA

The proposed SSDA will seek approval for early works associated with the future mixed-use development within Central Barangaroo (refer MP06_0162). Specifically, the works are associated with the construction of a secant pile retention wall along the Hickson Road (eastern) boundary, and include:

- Partial demolition of an existing shoring wall capping beam along Hickson Road;
- Construction of a new secant pile retention wall or equivalent;
- Excavation of land related to the secant pile retention wall;
- Localised remediation related to the secant pile retention wall;
- Associated Archaeological Investigations in the area of excavation and works; and
- Sydney Metro / Hickson Road interfaces – perimeter retention wall interface works, and Hickson Road public domain interface works.

# 6.0 Future Development Applications

## 6.1 Stage 2 Early Works

A future separate SSDA will be prepared and submitted for more extensive early works for the Central Barangaroo precinct. It is anticipated that this will relate primarily to Central Barangaroo site establishment works and bulk excavation, including:

- Establish the site and installation of temporary plant and machinery, including dewatering and bentonite slurry plant and ancillary services;

- Construction of perimeter retention diaphragm wall, including any required excavation and associated rock anchors;
- Associated remediation and Archaeological investigations in the area of excavation and works;
- Provision for future services;
- Associated “tie-in” works to Metro Interface Wall and the secant pile wall associated with this SSDA; and
- Excavation for the provision of a future basement and associated temporary rock anchors, rock bolting and ground improvement;
- Site dewatering.

The preliminary engineering impact assessment engineering impact of the excavation works will be submitted in the Stage 2 Early Works DA which will include:

- changes in stress distribution within the ground around the Barangaroo Station and tunnels.
- changes in water table
- predicted ground movements
- excavation methodology
- temporary ground anchor details
- risk analysis
- continued engagement with Sydney Metro regarding the design of the proposed systems will inform the extent of information required in the future development application.

### 6.2 Future Detailed SSDAs

Separate future detailed SSDAs will be prepared and submitted seeking approval for future development associated with the mixed-use development at Central Barangaroo including, basement, public domain and above ground building works.

## 7.0 Proposed Shoring System

The Stage 1 Early works involves the installation of approximately 153m of shoring wall (Fig 2.0, 3.0 & 4.0). The wall will form part of the overall shoring system for the Central Barangaroo development. This early works stage 1 involves the installation for the shoring piles only and excludes any excavation from behind the shoring piles. The engineering impact assessment of the excavation of the basement and the installation of the shoring wall temporary ground anchors will be assessed at the next DA submission Stage 2 Early Works.

The early Works Stage 1 shoring system is proposed to be a 1200mm dia (max.) secant pile wall founded at approximately RL -14900. The detailed design of the shoring wall will be completed prior to the issue of for construction documents and the subsequent CC related to this development application. It is noted that design of the temporary anchors required during bulk excavation will be included with Early Works DA2.

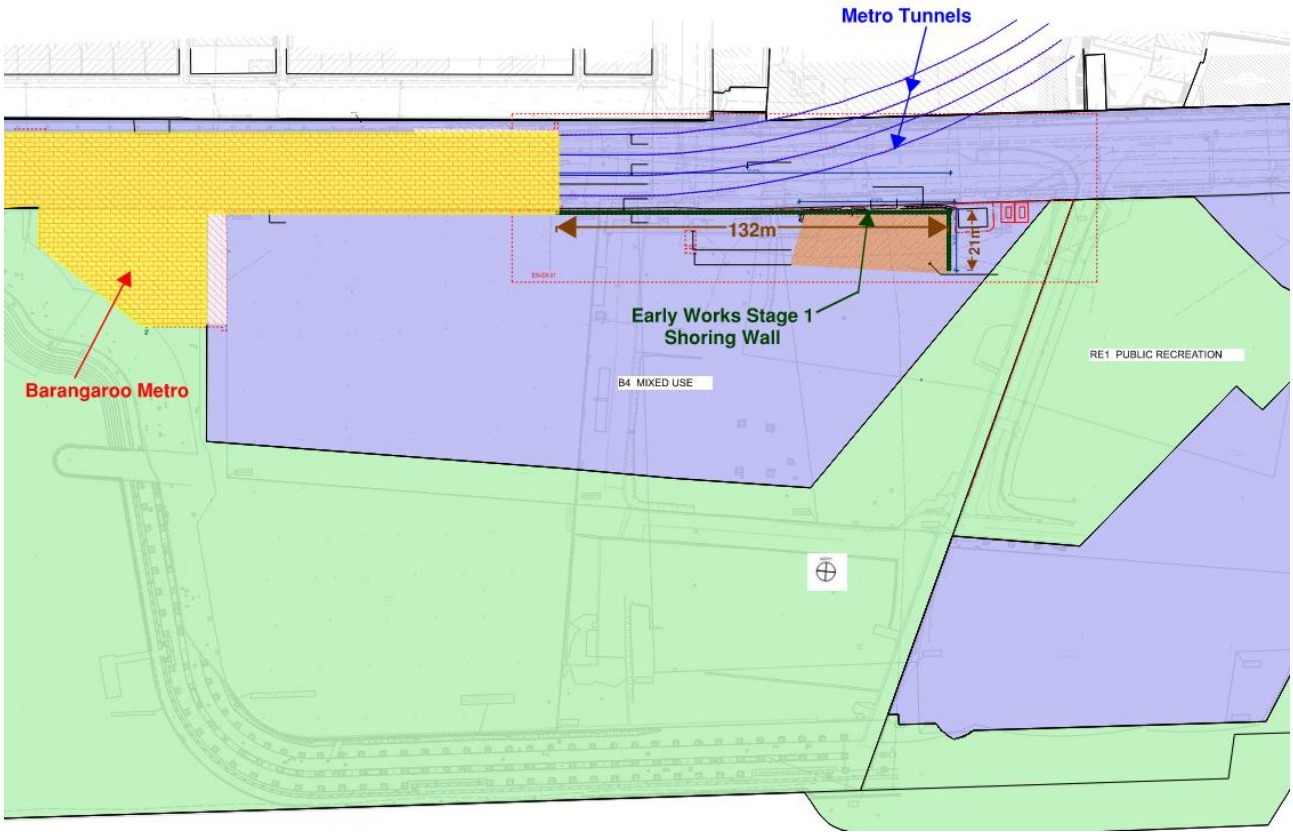



Figure 2.0 – Extent of Early Works Stage 1 Shoring

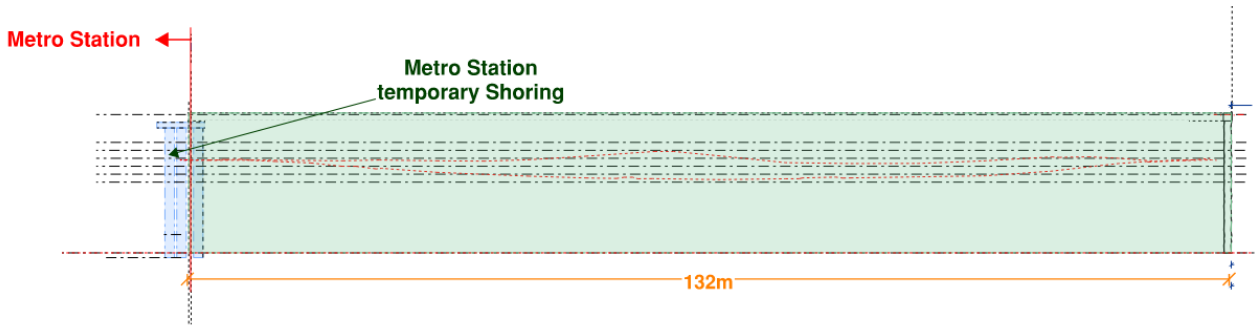



Figure 3.0 - Elevation of Shoring Wall Along Hickson Road

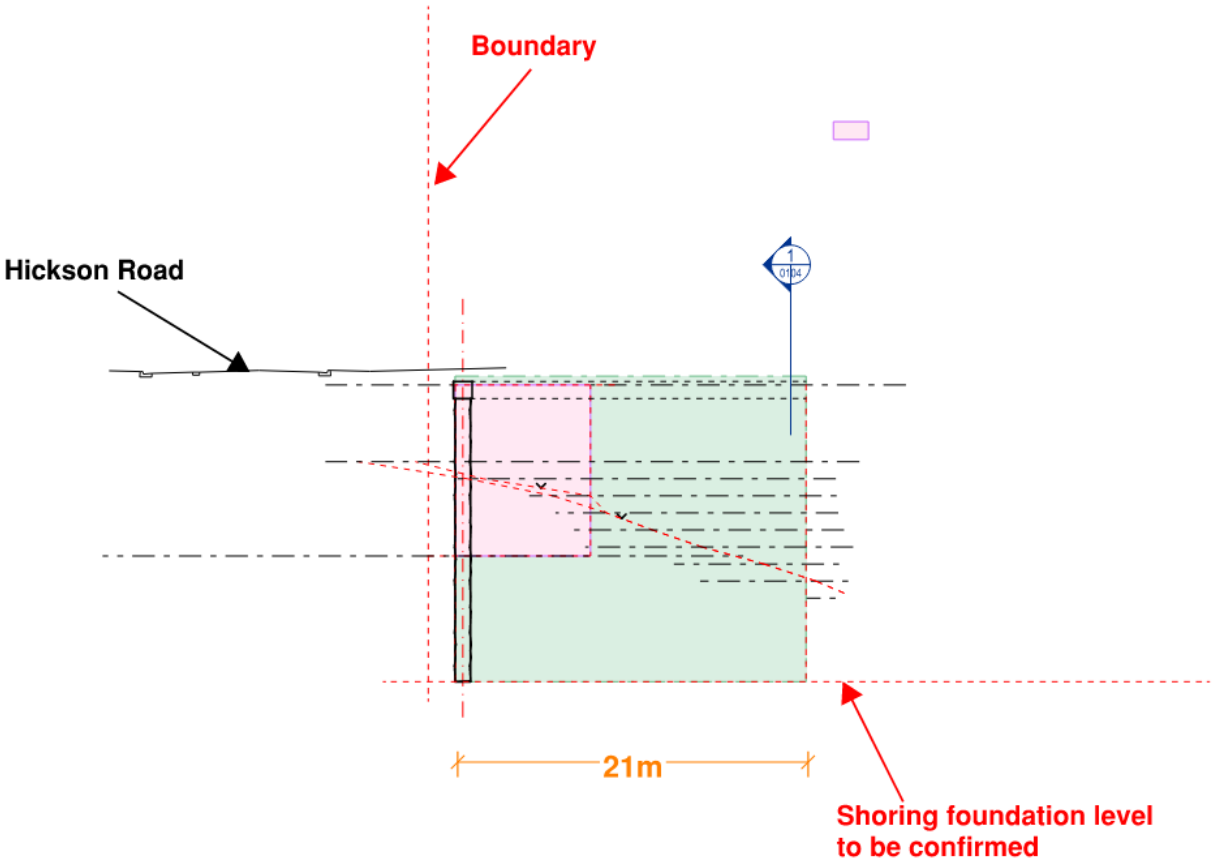



Figure 4.0 - Elevation of Shoring Wall Perpendicular to Hickson Road

## 8.0 Sydney Metro

The shoring wall is located directly to the south of the Barangaroo Station structure and the northern end of the Stage 1 shoring wall will be built adjacent to the southern extent of the Sydney Metro temporary soldier pile and jet grout shoring wall. Approximately 20m of the shoring wall will be located within Barangaroo Station Metro second reserve.

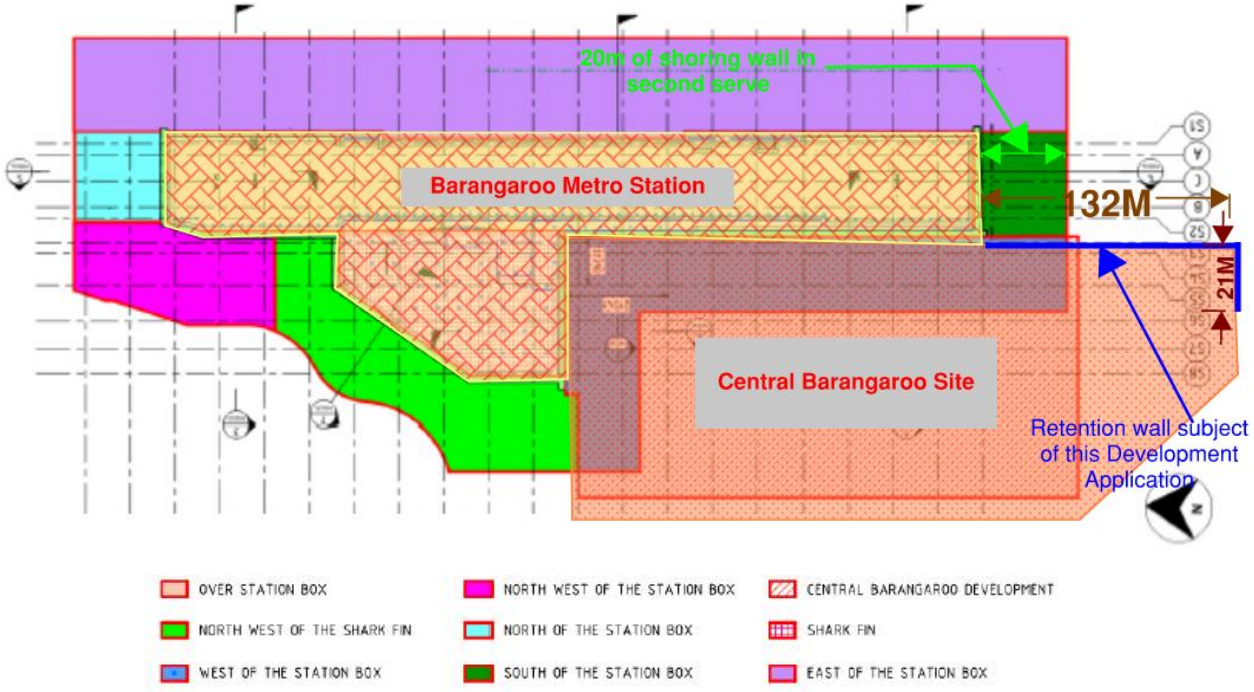



Figure 5.0 – Specific Reserve Zones

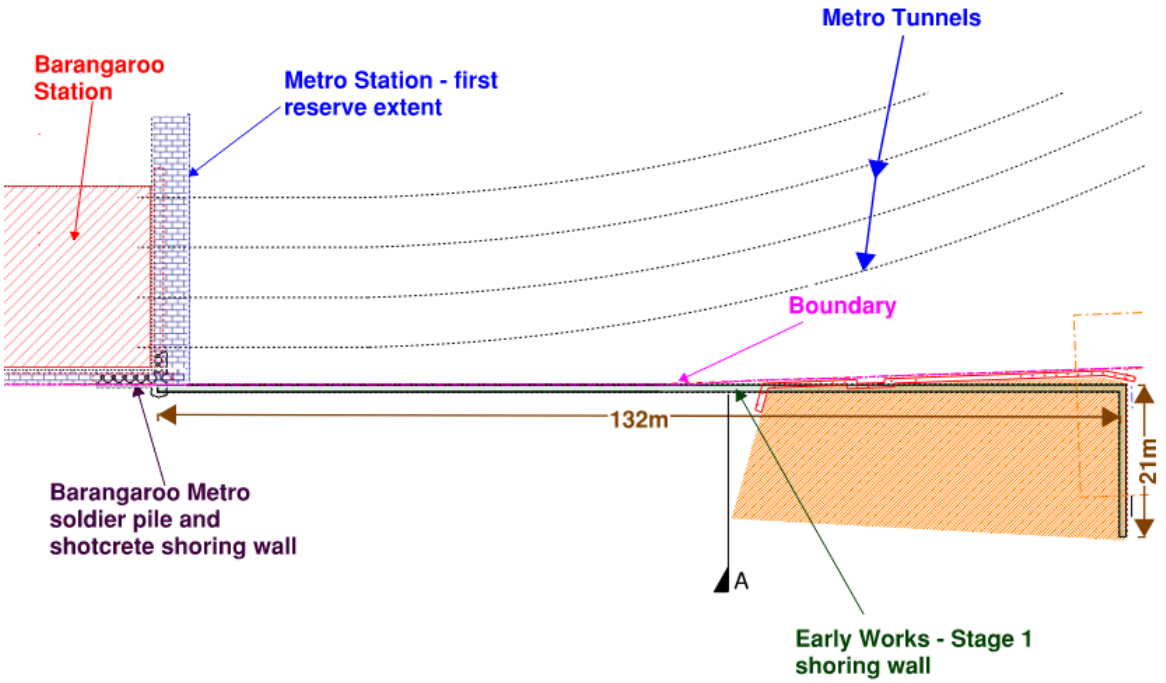



Figure 6.0 – Stage 1 Shoring Wall

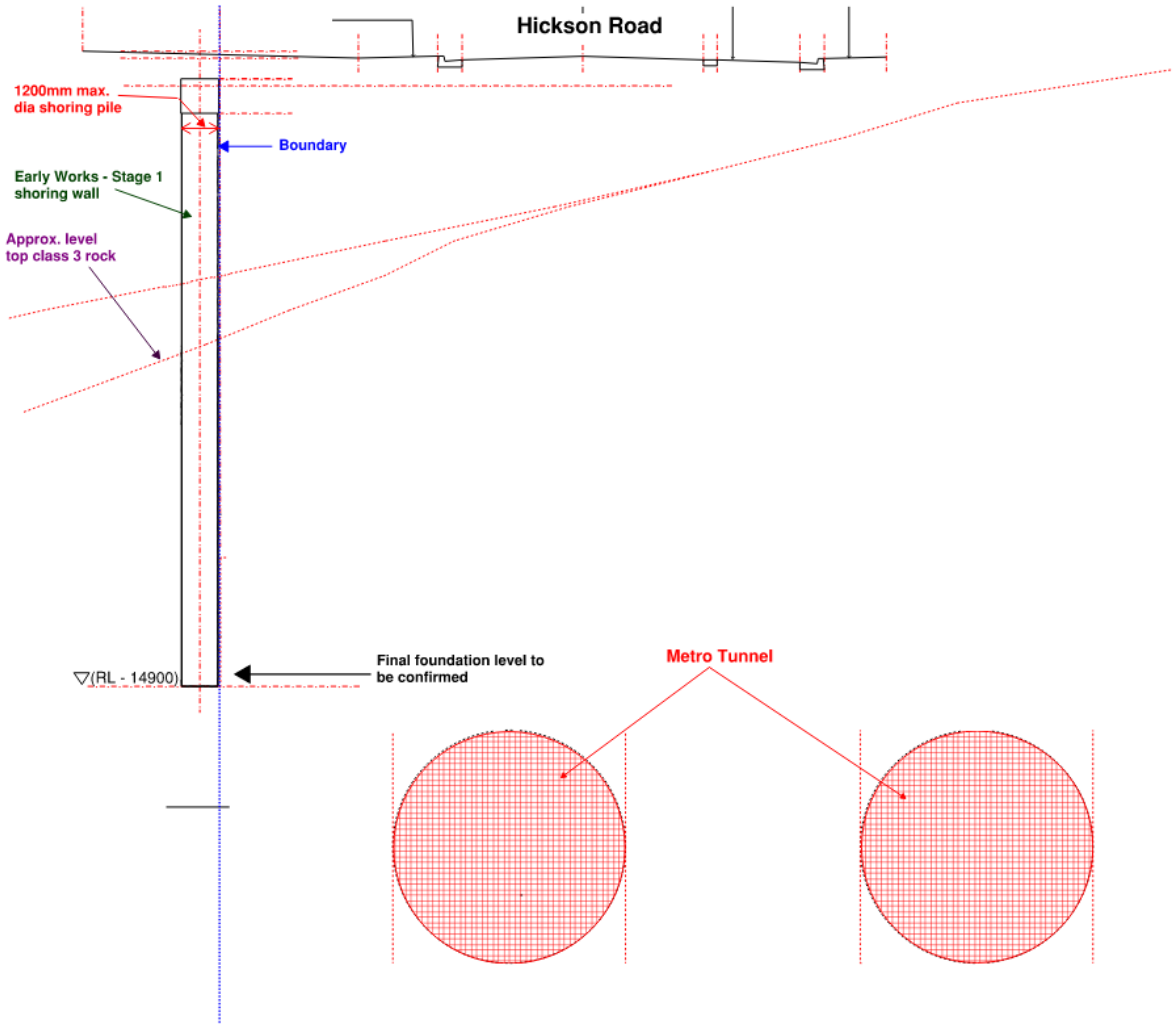



Figure 7.0 – Section A Section

Refer plans and sections by Webber (Appendix A) which locate the early works stage 1 shoring wall in relation to the Barangaroo station and southern tunnels.

## 9.0 Geotechnical Conditions

Please refer to geotechnical report by Tetra Tech Coffey report no. SYDGE287887AL dated 23 May 2022for details of the soil and rock stratum.

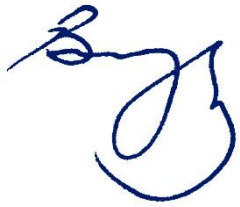
# 10.0 Compliance with the Sydney Metro Underground Protection Technical Guidelines

The Stage 1 Early Works includes the installation of the piled retention wall only. The excavation of the material behind the wall and the installation of the temporary ground anchors will form part of the Stage 2 Early Works scope.

The piled retention wall is proposed to be installed using a temporary casing to ensure no loss of surrounding ground material during installation. The installation of the secant pile will not cause any adverse effects on the Barangaroo Station or tunnels.

Prepared by

**TTW (NSW) PTY LTD**



**BARRY YOUNG**
Director

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## Appendix A

# Plans and Sections Prepared by Webber

**EARLY WORKS NOTES:**

EXISTING ELECTRICAL CABLES TO BE TERMINATED.

EXISTING STORM WATER LINE TO BE RELOCATED.

EXISTING STREET LIGHT POSTS TO BE RELOCATED OR PROTECTED.

EXISTING COMMS. PITS TO BE PROTECTED.

EXISTING 'HV' EL. CABLES TO BE PROTECTED.

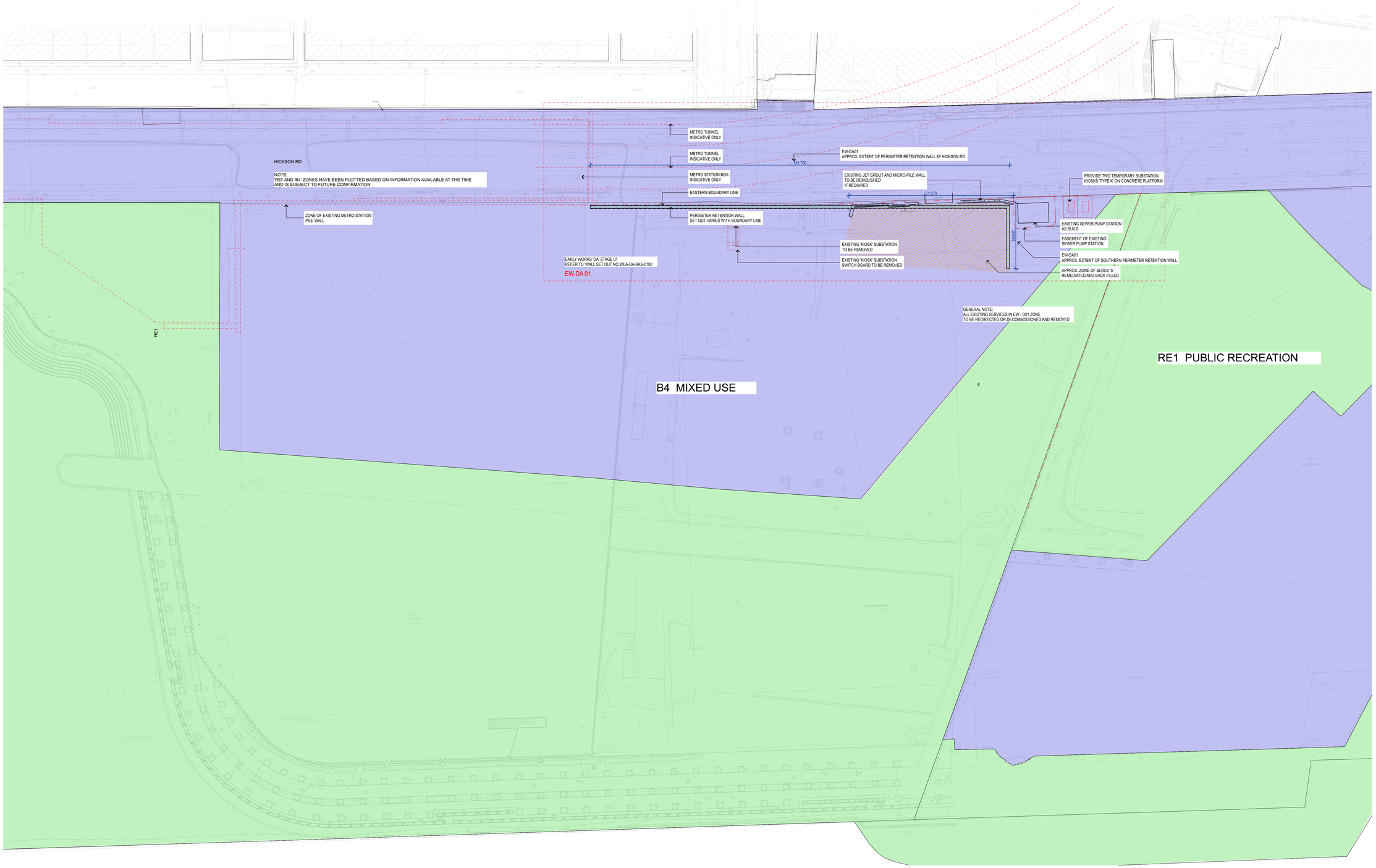
EXISTING STORM WATER LINE TO BE PROTECTED.

EXISTING STORM WATER LINE.

EXISTING ELECTRICAL CABLES.

EXISTING COMMS. LINE.

BOUNDARY LINE.

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| REV | DATE | DESCRIPTION |
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| J | 6/5/22 | ISSUED FOR APPROVAL |
| I | 22/3/22 | ADDITIONAL INFORMATION |
| H | 3/3/22 | ADDITIONAL NOTES AND UPDATES |
| G | 1/3/22 | ADDITIONAL NOTES |
| F | 24/2/22 | ADDITIONAL INFORMATION |
| E | 23/2/22 | ISSUED FOR INFORMATION AND REVIEW |
| D | 3/2/22 | REVISED SECANT PILES |
| C | 28/1/22 | ISSUED FOR URBIS SCOPE |
| B | 25/1/22 | ISSUED FOR URBIS SCOPE |
| A | 15/12/21 | PRELIMINARY ISSUE |

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PROJECT

**CENTRAL BARANGAROO**
**39 Hickson Road**
**Sydney, NSW, 2000**

TITLE

**DA01 - SITE PLAN**

ISSUED STATUS

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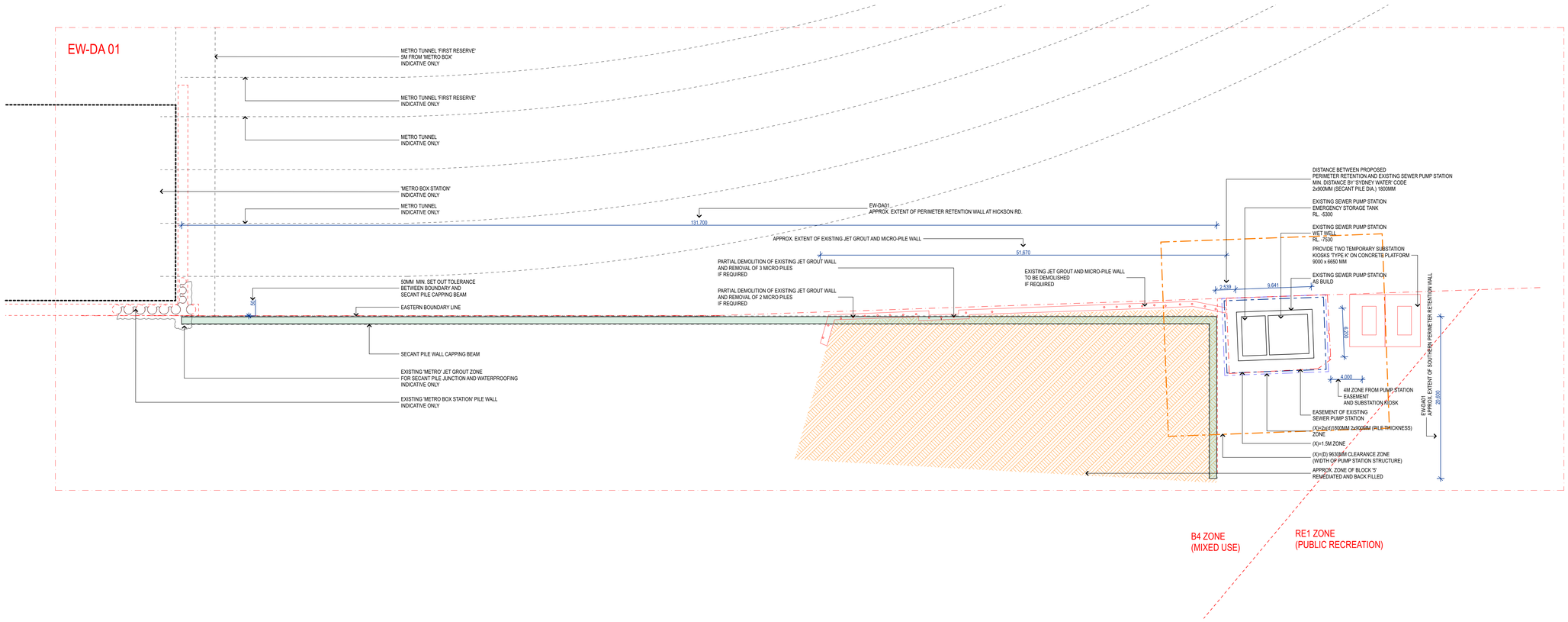


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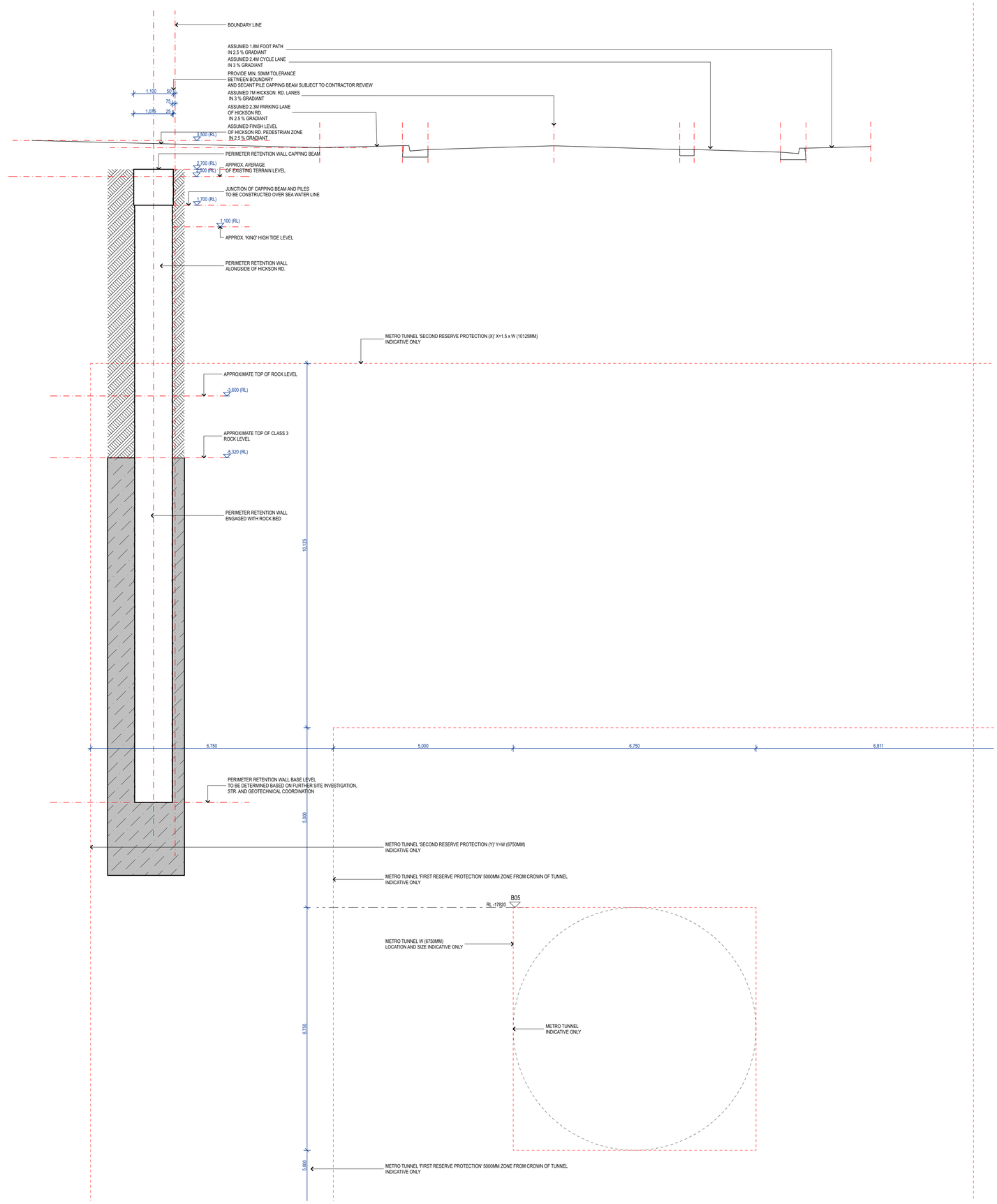


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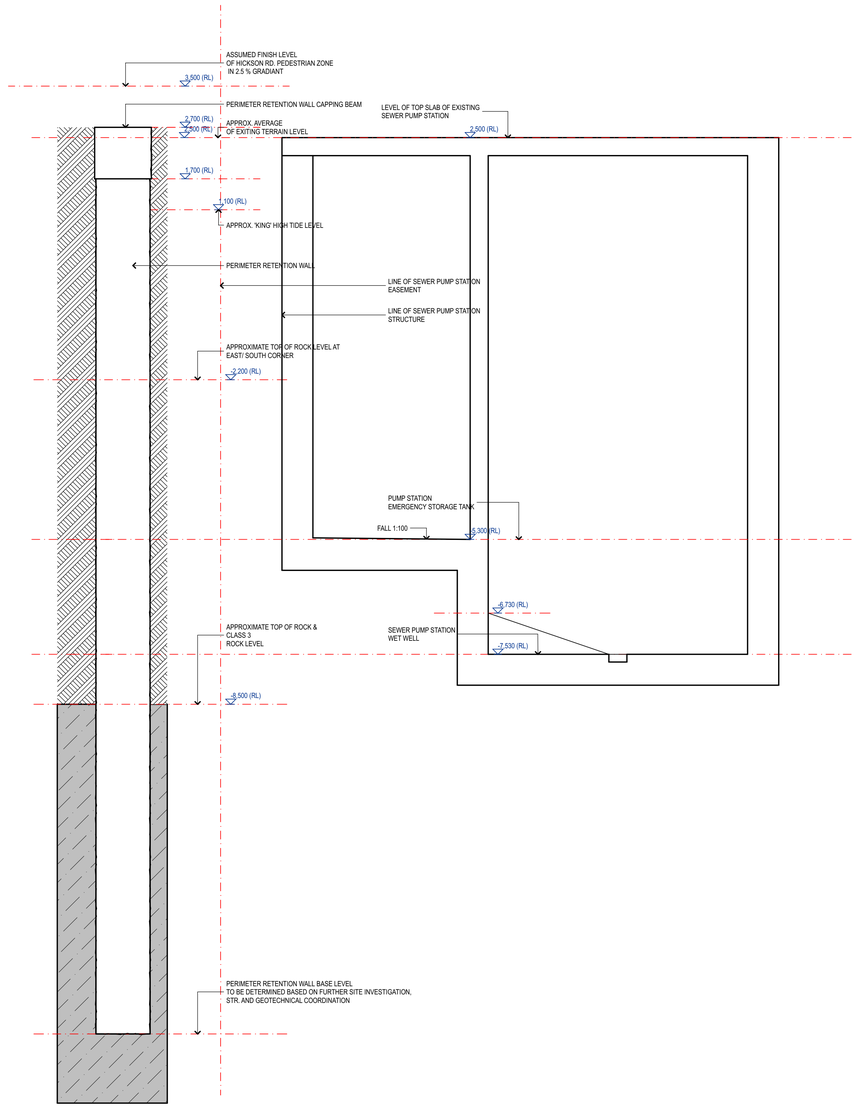


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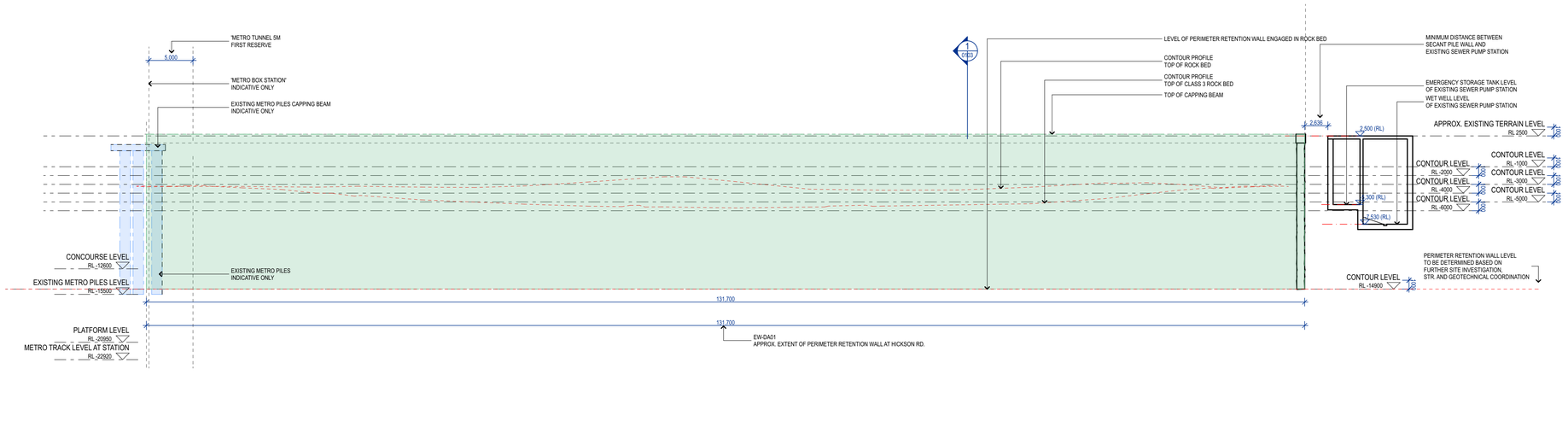


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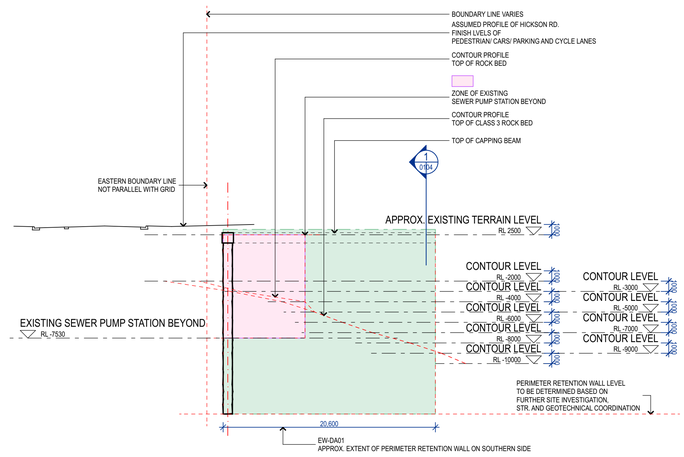


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**DA01 - SOUTHERN ELEVATION**

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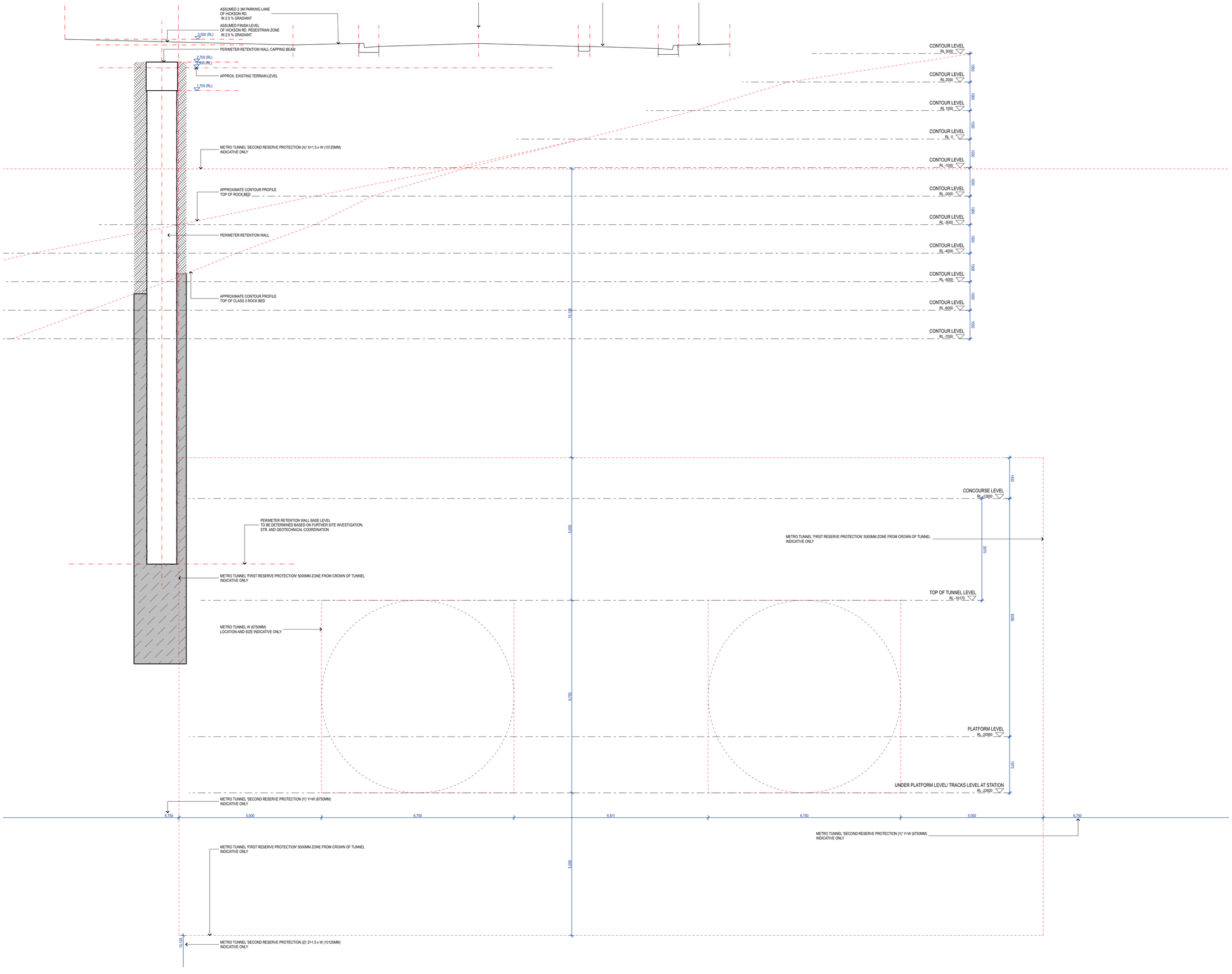


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**CENTRAL BARANGAROO**

**39 Hickson Road**
**Sydney, NSW, 2000**

TITLE

**DA01 - EASTERN METRO SECTION**

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