RAIL RISK MANAGEMENT PLAN

90 -102 REGENT STREET REDFERN, SYDNEY NSW

February 2021

Site:	90-102 Regent Street Redfern, Sydney NSW
Developer:	Wee Hur Capital Pte Limited
Builder:	TBA
Report Ref:	GKA REG 001
Date:	25 February 2021

Email: admin@gkamanagement.com.au
Phone: +61 2 9440 4409

Proprietary Information Statement

This Rail Risk Management Plan has been prepared by Wee Hur (Australia) Pte Ltd (Wee Hur) to satisfy Sydney Metro conditions of approval under the State Environmental Planning Policy (Infrastructure) 2007.

The document has been produced to identify and manage the rail safety risks that are likely to arise from the excavation and construction activities at the development site 90-102 Regent Street Redfern Sydney NSW, adjacent to and over the Sydney Metro City & Southwest.

Authorisation and Revision History

Authorisation Record

Role	Name	Organisation	Signature	Date
Approved by:	George Kruk	GKA Management		25.02.21

Document Control

Revision	Date of Approval	Summary of Change

Issue Record

Copy No	Name	Position	Company	Date
1	Aliza Teo	Assistant Development Manager	Wee Hur	25.02.21

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TABLE OF CONTENTS

1.0 Executive Summary

The purpose of this Rail Risk Management Plan (RRMP) is to set out the process employed to manage safety risks that are likely to arise from the demolition, excavation, construction and maintenance activities at the development site 90-102 Regent Street Redfern Sydney NSW, adjacent to and over the Sydney Metro City & Southwest rail tunnels.

The risk management process follows the requirements documented in AS/NZ 31000:2009 Risk management – Principles and guidelines which are mirrored in TfNSW risk procedures and risk standard. The analysis, evaluation and treatment of risks was also undertaken in accordance with criteria documented in the TfNSW risk procedures and risk standard.

A variety of sources have been utilised to gather information for the compilation of the RRMP including engineering reports produced for the project. A total of five events (5) events resulting in six (6) hazards arising from eighteen (18) possible causes have been identified. The hazards are typical in nature to those that may arise from this type of works. Safety controls have been documented for all identified hazards. Additional controls may be added after consultation with Sydney Metro.

After the application of safety controls all risks were assessed as being within a broadly acceptable region and reduced so far as is reasonably practical.

The RRMP addresses those risks that may arise from work activities associated with the development. The RRMP does not specifically address other risks, such as project risks, unless they have been specifically identified as flowing from the works or associated monitoring activities.

A separate Impact Assessment Report & Monitoring Plan (GKA RED 002) (IAR&MP) will be produced for works after consultation with Sydney Metro defines the nature and extent of safety controls required for the project. The RRMP must be read in conjunction with the IAR&MP, which references the engineering assessments undertaken for the works, proposed monitoring regimes and reporting protocols.

2.0 Project Background

The project has been classified as a State Significant Development (SSD 10382). The project consists of a 18 storey mixed use student accommodation building. The site is located at 90-102 Regent Street Redfern Sydney NSW (Lots 1-3 Section 2 in DP 3954, Lot 1 in DP 184335 and SP 57425).

The building will consist of:

- A total of 408 student accommodation beds;
- Ground floor retail premises;
- Indoor and outdoor communal spaces;
- Bicycle spaces;
- Hard and soft landscaping within the outdoor communal terraces; and
- Public domain improvements.

The Sydney Metro City & Southwest twin rail tunnels run underneath the site. The tunnels are approximately 7m in diameter and have a segmental concrete lining typical of this type of structure.

An overlay of the project site and Sydney Metro rail tunnels is shown in Figure 2-1. A cross through the site is shown in Figure 2-2.

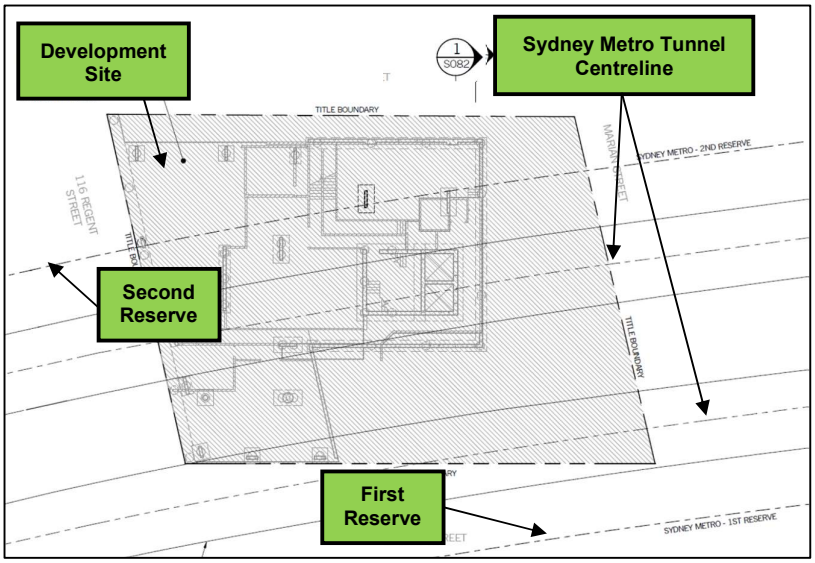

Figure 2-1 Sydney Metro Property Overlay

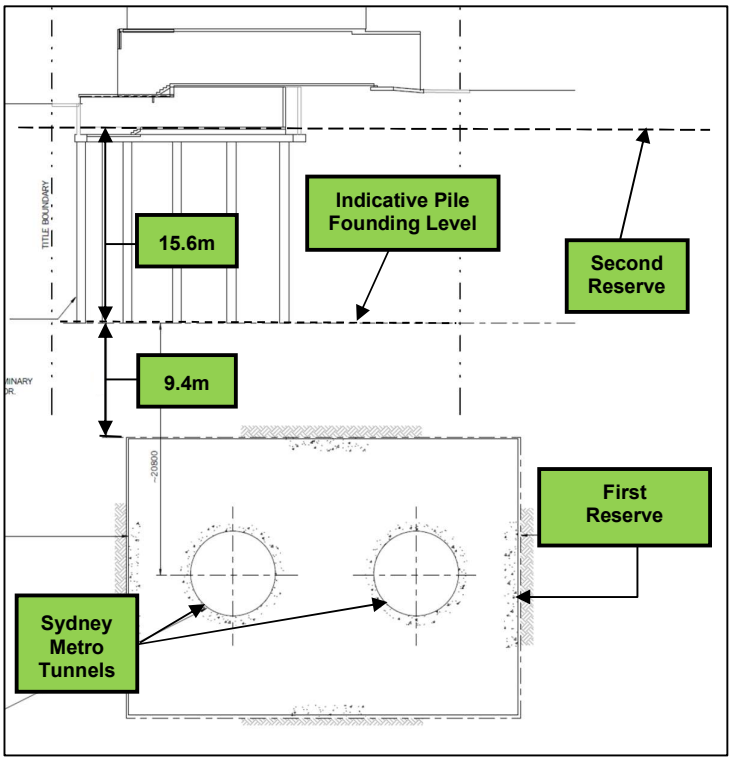

Figure 2-2 Section 1 Cross Section

The site is bounded by Marian Street to the north, Regent Street to the east, a two storey building and service station to the south and William Lane to the west. An 18 storey building is currently under construction on the western side of William Lane.

The site is approximately rectangular shaped with dimensions of about 32m x 42m. The site slopes gently down towards the south west. The site is currently occupied by a number of two storey buildings with car ports off the rear of William Lane and a four storey building over a split level basement car park.

All new structural building support elements are clear of the TfNSW First Reserve protection zone and temporary anchors will not be used to restrain shoring for excavation thus ensuring the protection of rail infrastructure during construction and future operation of the development. A portion of the development will take place within the Second Reserve protection zone.

The proposed basement will require minor excavation of up to 400mm on the southern side of the site where there is an existing basement, and excavation of up to about 4m and 6m on the northern part of the site for the new basement and building core raft. The extent of excavation is shown in Figure 2-3.

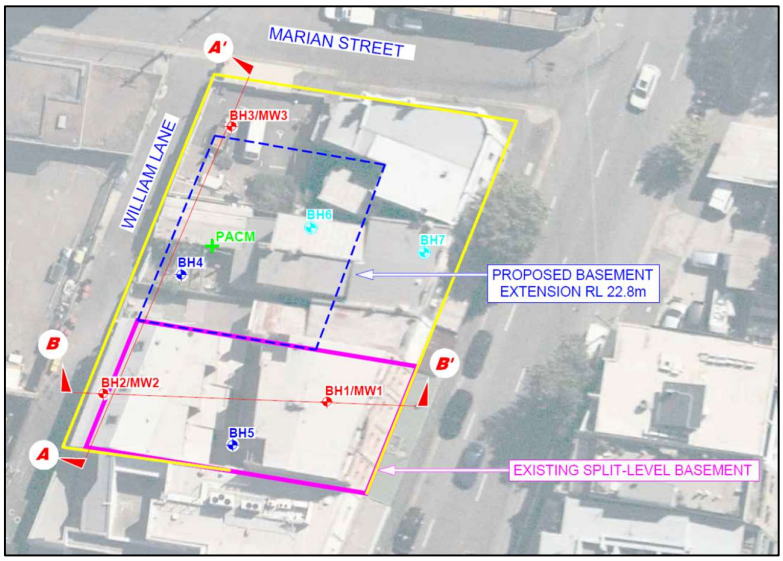

Figure 2-3 Site Excavation Details

It is understood that that the existing basement retaining walls will be re-used as the perimeter walls for the new basement and it is expected that they will be temporarily propped prior to the removal of the existing ground and basement slabs. Additional shoring walls are expected to be required where there is currently no basement. The new ground and basement slabs will provide the lateral support to the retaining walls in the long term.

Piled foundations will be constructed from either ground level or basement level under proposed columns, walls and core raft to support the superstructure loads. The piled foundations will be located within the Second Reserve protection zone with the founding level some 9.4m clear of the First Reserve protection zone. The piles will be founded within Ashfield shale. The clearances are shown in Figure 2-2.

The basement general arrangement showing the location of piles, walls and footings is shown in Figure 2-4.

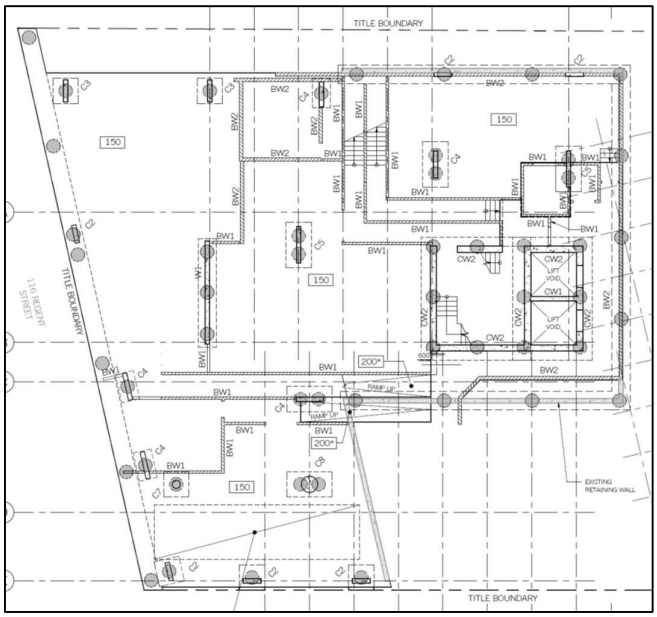

Figure 2-4 Basement General Arrangement

Finite element modelling has been undertaken based on borelog information to determine the potential impact of the excavation and piling works on the Sydney Metro rail tunnels. A vibration assessment report and electrolysis impact have also been produced.

3.0 Context

Sydney Metro is a fully automated rapid transit system. The network is controlled by the Sydney Metro agency under the umbrella of Transport for New South Wales (TfNSW). Services are operated by Metro Trains Sydney and integrated with the established Sydney Trains network.

Sydney Metro City & Southwest Line will be a 30 km section of the metro network. The project will extend the Metro North West Line from Chatswood on the North Shore, to Bankstown in the city's south-west through the Sydney central business district.

It is essential that that the structural integrity of the metro tunnels remains intact during the course of project activities generally, and throughout the life of the building. It is also essential that train operations (when commenced) continue uninterrupted.

Further, it is of paramount importance that the safety of the travelling public, Metro Trains employees, Operator's employees and project personnel (including contractors and consultants) is ensured.

At the present time the metro rail tunnels have been constructed and are being fitted out. As such the tunnels are not operational and therefore operational risks have not been considered. Also, as the existing buildings are low rise structures and the tunnel crowns are located some 35m below the ground surface, demolition risks have not been considered.

The metro tunnels are currently a construction site. As such, any access to the tunnels for the purpose of dilapidation surveys and monitoring will need to be under the authority of the Principal Contractor. The nature and extent of these activities will be discussed with Sydney Metro.

An engineering assessment has been undertaken to determine the impact on the metro tunnels due to excavation and construction activities on the site. The works within the development site are predicted to marginally affect the metro tunnels due to stress relief in the existing rock formations and the application of building loads.

At present time a contract has not been let for the demolition works and construction of the building.

4.0 Constraints

Constraints are matters (contractual, regulatory, physical or social) that define the environment and conditions under which the works must be undertaken. This project is subject to the following constraints:

- *Transport Administration Act 1988*;
- *State Environmental Planning Policy (Infrastructure) 2007*;
- *Work Health and Safety Act 2011;* and
- *Work Health and Safety Regulation 2017*.

The additional following constraints apply for work within the rail corridor:

- *Rail Safety (Adoption of National Law) Act 2012*;
- *Rail Safety (Adoption of National Law) Regulation 2018*; and
- *Principal Contractor Rules and Procedures*.

This RRMP documents safety controls that will be implemented to ensure that the impact of site activities on the Sydney Metro rail tunnels is managed in accordance with the identified constraints.

5.0 Project Management

The Sydney Metro Underground Corridor Protection Technical Guidelines (NWRLSRT-PBA-SRT-TH-REP-000008) Revision 1 dated 16 October 2017 at section 7.3 states that a risk assessment report is to be produced for the project.

Wee Hur is the developer of the site. The primary rail safety objectives identified by Wee Hur are:

- establish and implement a robust safety management system;
- ensure the safety of the travelling public, metro employees, contractor personnel and project personnel;
- minimise impact on metro infrastructure; and
- allow rail operations to continue without interruption when commenced.

Sydney Metro is viewed as the client in relation to rail infrastructure integrity and operations. To the extent that the public will rely on Sydney Metro to provide a safe and reliable train passenger service, they are also considered to be a stakeholder in ensuring the continuing integrity and safety of the rail infrastructure and operations through the implementation of this RRMP.

Wee Hur has engaged a number of consultants who are subject matter experts in their relevant field to provide project management services, evaluate site conditions and to document monitoring criteria in order to ensure rail safety and integrity are maintained. Consultants engaged for rail related aspects of the project as of 25 February 2021 include:

- GKA Management (GKA) to facilitate the development of the IAR&MP and RRMP;
- AJ + C to provide architectural services;
- Webber Design to provide structural services;
- Douglas Partners to conduct geotechnical investigations and assessments;
- Lockley Land Title Solutions to undertake survey;
- Acoustic Logic Consultancy Pty Ltd to provide advice on acoustic matters and monitoring of vibration; and
- Cathodic Protection Services to provide advice on electrolysis matters.

Consultants have produced reports that document the expected impact from excavation and construction works on the rail tunnels and potential future impact from electrolysis when the metro line becomes operational.

Monitoring plans will be finalised after discussions with Sydney Metro. All consultant reports and monitoring plans have been or will be submitted to Sydney Metro. Requirements documented in consultant reports and monitoring plans will be incorporated into the IAR&MP and are referenced in the RRMP risk assessment.

Inspection and test plans will be developed by the building contractor based on the associated work methodologies and used to provide a link between planning, contractual requirements, verification activities and records.

Various Work Method Statements will be produced by the building contractor and its subcontractors, and personnel will be inducted into the content to ensure that documented risk controls are captured and implemented. Copies of Work Method Statements that relate to activities with potential to impact on infrastructure or operations will be provided to Sydney Metro as they are developed, if requested.

Individual contractors will produce their own Safe Work Method Statements (SWMSs) as required by clause 299 of the WHS Regulation 2017 (Regulation). Personnel will be inducted into the content of the SWMS(s) applicable to their work activity by a safety delegate appointed by the company that produced the SWMS.

The Builder will be appointed as principal contractor and will review contractor SWMSs as required by clause 302 of the Regulation to ensure (among other things) that the SWMSs address specific hazards identified in the Rail Safety Project Hazard Log (PHL).

Access to the metro tunnels (if required) for the conduct of dilapidation surveys, monitoring activities and servicing of monitoring equipment will be by arrangement with the Sydney Metro and its principal contractor.

All personnel working on site will be inducted to the site. The induction will include general awareness of the rail tunnels and relevant hazards identified in the Rail Safety PHL.

6.0 Risk Management Process

The following documents have been referenced in conjunction with the risk management process:

- AS/NZ ISO 31000:2009 Risk management – Principles and guidelines (**Risk Standard**);
- AS/NZ 4801:2001 Occupational health and safety management systems – Specification with guidance for use (**OHS Standard**);
- Sydney Metro Underground Corridor Protection Technical Guidelines (NWRLSRT-PBA-SRT-TH-REP-000008);
- TfNSW Airspace Developments (T HR CI 12075 ST);
- TfNSW System Safety Standard for New or Altered Assets (T MU MD 20001 ST);
- SafeWork Australia Safe Design of Structures Code of Practice;
- TfNSW Quantified Safety Risk Assessment (T MU MD 20003 GU);
- TfNSW Risk Criteria for Use by Organisations Providing Engineering Services (T MU MD 20002 ST); and
- TfNSW Enterprise Risk Management (TERM) Standard (30-ST-164).

This risk management process follows the process documented in the AS/NZ Risk Standard which is mirrored in the TfNSW risk procedures and risk standard. The linkage between the elements of the risk management process is documented in the Risk Standard as shown in Figure 6-1.

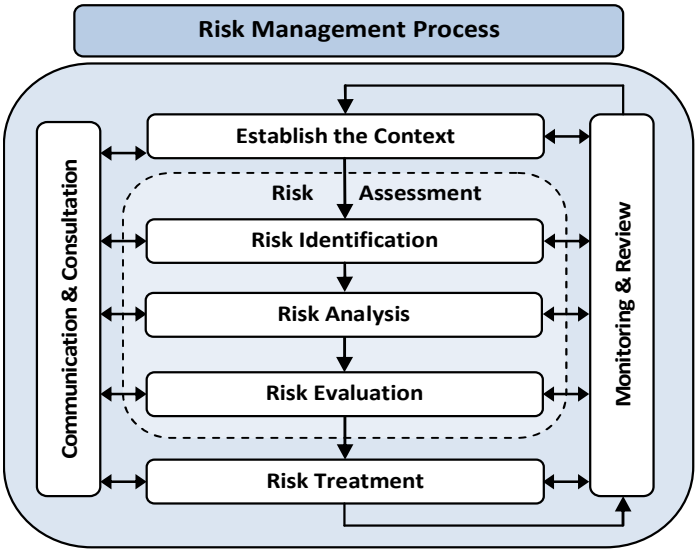

Figure 6-1 Risk Management Process Overview

The risk management process includes the following elements:

➢ **Communication and consultation**

Communicate and consult with internal and external stakeholders as appropriate at each stage of the risk management process and concerning the process as a whole.

- **Establishment of context**

  Establish the external, internal and risk management context in which the process will take place. Document criteria against which risk will be evaluated and define the structure of the analysis.

- **Identification of risks**

  Identify where, when, why and how events could prevent, degrade, delay or enhance the achievement of objectives.

- **Analysis of risks**

  Identify and evaluate existing controls. Determine consequences and likelihood and hence the level of risk. Consider the range of potential consequences and how these could occur as part of the analysis.

- **Evaluation of risks**

  Compare estimated levels of risk against the pre-established criteria and consider the balance between potential benefits and adverse outcomes. Make decisions about the extent and nature of treatments required and about priorities based on this comparison.

- **Treatment of risks**

  Develop and implement specific cost-effective strategies and action plans for increasing potential benefits and reducing potential costs.

- **Monitoring and review**

  Monitor risks and the effectiveness of treatment during all steps of the risk management process and ensure changing circumstances do not alter priorities.

7.0 Main Rail Safety Events and Hazards

The AS/NZ Risk Standard defines an event as an *"occurrence or change of a particular set of circumstances"*.

The AS/NZ OHS Standard defines a hazard as *"a source or situation with a potential for harm in terms of human injury or ill-health, damage to property, damage to the environment, or a combination of these"*.

Main events and hazards (together with associated causes) have been documented in the Rail Safety PHL. The purpose of the log is to ensure that all safety risks identified through the course of the project are documented and controlled.

The Rail Safety PHL:

- documents events that give rise to hazards;
- identifies potential hazards in relation to those events;
- identifies causes associated with individual hazards;
- documents an assessment of risk;
- documents risk controls; and
- identifies responsible parties.

Rail safety events and associated primary hazards identified for this project are documented in Table 1.

Table 1 Rail Safety Events and Primary Hazards

Event	Hazard
Installation of vibration monitoring equipment	Operational failure of monitoring equipment
Dilapidation survey	Plant working in metro tunnel
	Construction materials on metro tunnel floor
Excavation and / or piling on site	Ground deformation
	Vibration
Construction of building	Ground deformation
Stray electrical traction currents emanating from the metro tunnels	Premature corrosion of building structural elements and services

A total of five (5) events resulting in six hazard (6) hazards arising from eighteen (18) possible causes have been identified. The hazards are typical in nature to those that may arise from this type of works. Safety controls have been documented for all identified hazards. Additional controls may be added after consultation with Sydney Metro.

As the project progresses additional rail safety hazards may be identified. These additional hazards will be added to the Rail Safety PHL. The Builder will monitor the Rail Safety PHL during the course of excavation and construction activities. Individual hazards will be monitored as they progress to final closure at project completion.

8.0 Rail Safety Risk Tolerability

The AS/NZ Risk Standard defines risk as *"the effect of uncertainty on objectives".* Risk is the combination of the frequency, or probability, and the consequence of a specified hazardous event. Risk management in the context of the RRMP is the culture, processes and structures that are directed towards the effective management of negative safety impact.

Clause 36 of the WHS Regulation 2017 documents a hierarchy of risk control measures where it is not possible to eliminate risk, namely:

- substituting (wholly or partly) the hazard giving rise to the risk with something that gives rise to a lesser risk;
- isolating the hazard from any person exposed to it;
- implementing engineering controls;
- implementing administrative controls; and
- suitable personal protective equipment.

A legislative obligation is contained within both the Work Health and Safety Act 2011 and the NSW Rail Safety (Adoption of National Law) Act 2012 (RSA) to manage safety risk, So Far As Is Reasonably practicable (SFAIRP). The RSA imposes an obligation on rail organisations and associated industry participants to ensure the safety of their railway operations.

Section 5.1 of the TfNSW Quantified Safety Risk Assessment states in part:

In practice, the application of SFAIRP requires a judgement to be made while following a risk management approach of the safety risks of an activity against the resources needed to eliminate or reduce those safety risks in terms of time, cost, or effort. No hard and fast legal definition exists of what is required to reduce risks SFAIRP and so the test of 'reasonably practicable' is applied.

The SFAIRP approach puts the onus on the duty holder to determine whether the costs or business impacts of additional measures to control the risk (over and above those risk controls already in place) would be grossly disproportionate to the risk reduction benefit that they would achieve.

SFAIRP duties of care do not require safety at any cost. The level of safety the duty holder must provide hinges on what is 'reasonably practicable' given the situation and context. There are three main methods for assessing reasonably practicable, namely:

- comparison with good practice;
- expert judgement; and
- through cost benefit analysis.

9.0 Risk Assessment

The TfNSW Risk Criteria for Use by Organisations Providing Engineering Services references a table of Risk Assessment Consequences Criteria (Table 1), a table of Risk Assessment Likelihood Criteria (Table 2) and a Risk Matrix Likelihood and Consequence (Table 3) which have been included at Appendix A of the RRMP. By assigning criteria to particular risks, the resulting risk ranking can be derived from the risk matrix.

The rail safety risks associated with project activities are deemed to be indirect safety risks from the perspective of Sydney Metro in that the risks can be influenced, but not fully controlled. TfNSW Risk Criteria for Use by Organisations Providing Engineering Services documents risk tolerances and responses which have been replicated in Table 2.

Table 2 Risk Tolerances and Responses

Risk rating	Response	Risk frequency
Very High 'A'	Very high risks are generally intolerable and should be avoided except in extraordinary circumstances. An alternate solution shall be found and all necessary steps shall be taken to reduce the risk below this level without delay.	Monthly update of the risk register by the risk owner.

Risk rating	Response	Risk frequency
High 'B'	High risks are undesirable. They can only be tolerated if it is not reasonably practicable to reduce the risk further. High risks are considered to be on the verge of being unacceptable and must be given immediate priority.	Monthly update of the risk register by the risk owner.
Medium 'C'	Medium risks are generally tolerable if it is not reasonably practicable to reduce risk further. Additional treatment measures should be sought if significant benefit can be demonstrated and / or there is an additional treatment measure available which is recognised as good practice in other like environments.	Two monthly update of risk register by the risk owner
Low 'D'	Low risks are considered to be broadly acceptable. If options for further risks reduction exist and costs are proportionate to the benefit, then implementation of such measure should be considered.	Quarterly update of the risk register by the risk owner

The risks associated with causes for associated hazards have been classified and documented in the Rail Safety PHL using the consequence and likelihood risk tables and the risk matrix evaluation table included at Appendix A of the RRMP. A copy of the Rail Safety PHL is included at Appendix B of the RRMP.

A summary of the initial risk ranking documented in the Rail Safety PHL is shown in Table 3.

Table 3 Initial Safety Risk Ranking Summary

	Risk Classification			
	A	**B**	**C**	**D**
Risk Summary (20)	0	0	0	20

In accordance with the target actions documented in Table 2 the activities were reviewed to determine if the risk could be reduced further and whether all reasonable and practicable controls had been considered and / or applied.

The hierarchy of control principle was applied to all identified hazards and associated risks. There were no additional controls identified. Risk reviews will be undertaken by the Builder as a minimum on a quarterly basis (as required for Low range risks) or at such other frequency as is required by the inclusion of additional higher risk classifications.

In summary, the works do not introduce any unmanaged risks. The risks that are introduced are located within the Low range. Further, through the implementation of controls that comply with industry standards and good practice risks have been managed SFAIRP.

10.0 Issues Register

As a risk eventuates it becomes an issue that needs to be managed. The means of managing issues will be through the Issues Register. A copy of the Issues Register is included at Appendix C of the RRMP.

11.0 Response to Risk Control Strategies

Various risk controls have been documented in the Rail Safety PHL. Resources (materials and personnel) will be allocated by the Builder at relevant stages of the works so that the nominated safety controls can be implemented.

The Rail Safety PHL includes an Action schedule. The schedule documents actions with regard to individual matters that need to be addressed, nominates a timeframe for implementation, identifies the action owner and documents the status.

12.0 Risk Monitoring Strategy

The day to day management of hazards and risks will be through project meetings. Separate project meetings will be held with Sydney Metro as requested.

Should an intervention limit be exceeded meetings will be held with Sydney Metro to review the current risk controls and determine whether any additional risk controls need to be implemented.

In the event of a stop work intervention limit being exceeded it may be appropriate to hold a specific risk workshop to address the circumstances giving rise to the stop work intervention limit being breached.

13.0 Surveillance and Review

As a minimum quarterly reviews will be undertaken of the Rail Safety PHL by the Builder. In addition reviews will be undertaken when:

- a warning or stop work limit is breached;
- there is evidence the risk assessment is no longer valid;
- events indicate the assessment of risk may not have been adequate; and
- significant changes are proposed in the work to be carried out.

Activities on site will be continuously monitored by the Builder to ensure that documented procedures are being followed, risk controls maintained and action plans implemented.

Periodic surveillance / audit will be undertaken by the Builder (or delegate) to independently confirm compliance with risk controls on site and separately the overall effective implementation of the RRMP.

14.0 References

Legislation

1. Rail Safety (Adoption of National Law) Act 2012

2. Rail Safety (Adoption of National Law) Regulation 2018
3. Work Health and Safety Act 2011
4. Work Health and Safety Regulation 2017
5. State Environmental Planning Policy (Infrastructure) 2007

Standards and Guides

1. AS/NZ ISO 31000:2009 Risk management – Principles and guidelines
2. AS/NZ 4801:2001 Occupational health and safety management systems – Specification with guidance for use
3. Sydney Metro Underground Corridor Protection Technical Guidelines (NWRLSRT-PBA-SRT-TH-REP-000008)
4. TfNSW Airspace Developments (T HR CI 12075 ST)
5. TfNSW System Safety Standard for New or Altered Assets (T MU MD 20001 ST)
6. SafeWork Australia Safe Design of Structures Code of Practice
7. TfNSW Quantified Safety Risk Assessment (T MU MD 20003 GU)
8. TfNSW Risk Criteria for Use by Organisations Providing Engineering Services (T MU MD 20002 ST)
9. TfNSW Enterprise Risk Management (TERM) Standard (30-ST-164)

Project Documentation

1. Douglas Partners Report of Geotechnical Investigation Rev. 1 30 September 2020
2. Douglas Partners Preliminary Numerical Modelling and Impact Assessment Rev. 0 23 February 2021
3. Acoustic Logic Metro Tunnel Vibration Monitoring Plan Rev. 1 dated 24 February 2021
4. Cathodic Protection Services Residential Tower Development 90-102 Regent Street Redfern dated 21 October 2020

Appendix A

Transport for New South Wales
Risk Criteria Tables and Risk Matrix Table

Table 1 – Risk assessment consequence criteria

Rating / description	C6 Insignificant	C5 Minor	C4 Moderate	C3 Major	C2 Major	C1 Catastrophic
Safety	• Incident and/or injury/illness to staff/customer/community, not requiring first aid or medical treatment • No lost time	• Injury or illness to staff/customer/ community, requiring first aid or medical treatment (non-hospitalisation) • No lost time post medical treatment • Single event	• Minor injuries or illnesses to staff/customer/community, requiring professional medical treatment (that is, doctor, nurse, and paramedic) or hospitalisation resulting in lost time • Injuries to customer/community requiring hospitalisation	• 1 to 10 serious injuries or illnesses to staff/customer/community, as defined under section 36 of the *Work Health and Safety Act 2011* (WHS Act) resulting in hospitalisation, lost time and/or potential permanent impairment • Multiple injuries to customer/community requiring hospitalisation • Single event and/or multiple locations • Coordinated emergency response required	• Single fatality and/or 10 to 20 serious injuries or illnesses to staff/customer/ community, as defined under section 36 of the WHS Act (resulting in hospitalisation, lost time and/or potential permanent impairment • Could impact safety across the network • Coordinated emergency response required	• Multiple fatalities and/or more than 20 serious injuries or illnesses to staff/customer/community, as defined under section 36 of the WHS Act resulting in hospitalisation, lost time and/or potential permanent impairment. (permanent disabilities/chronic diseases) • Transport unable to assure community and network safety • Coordinated emergency response required

Rating / description	C6 Insignificant	C5 Minor	C4 Moderate	C3 Major	C2 Major	C1 Catastrophic
Everyday service delivery (customer satisfaction)	• Isolated written complaints • No impact to overall customer satisfaction index or customer ratings (core customer satisfactions drivers) • Typical levels of complaints per 100000 boardings benchmark	• Uninterrupted complaints at an increased volume for more than three months, resulting in a material increase in the rate of customer complaints for the transport mode or service (but less than 33% of the normal background level), increased ministerial and potentially ombudsman complaints • No impact to the overall customer satisfaction index • Relatively small reduction (<5%) in the satisfaction level on one of the core drivers of customer satisfaction for no more than a year	• Continuous complaints at an increased volume for more than a year, and/or an increase in the rate of customer complaints for the transport mode or service of >33% of the normal background level (per 100000 boardings), increased ministerial and ombudsman complaints and some media coverage • Reduction in the overall customer satisfaction index for one transport mode by no more than 2% • relatively small reduction (<5%) in the satisfaction level in two or three core drivers of customer satisfaction • Relatively small reduction (<5%) in the satisfaction level in two or three core drivers of customer satisfaction	• A substantial and sustained uplift in the rate of customer complaints (per 100000 boardings) with a backlog that can be cleared within 30 days, depending on resources. Repeat complaints associated with a failure to respond in a timely manner, increased ministerial and Ombudsman complaints, along with intensified media coverage *Note: Major changes in services tend to generate customer complaints such as NorthWest Bus Service changes in July 2019. In some instances this may present a risk while in others it may represent an adjustment period for customers.* • Reduction in the overall customer satisfaction index for any transport mode by no more than 2% and can be recovered within 12 months • Small reduction (<5%) in the satisfaction level for more than three core drivers of customer satisfaction or more than 5% on any one driver	• Increased customer complaints for up to six months, with normal background rates for the transport mode or service increasing by a factor of three or more, and a persistent backlog in responses – allowing for typical seasonal variation in complaints volume throughout the year • Backlog of complaints not readily cleared within 30 days, and repeat complaints associated with delayed responses to complaints • Increased ministerial and Ombudsman complaints, accompanied by persistently negative media coverage • The overall customer satisfaction index for one major transport mode only dropping by 3% or more and can be recovered within 12 months • Larger reduction (5% or more) in the satisfaction level for more than three core drivers of customer satisfaction or more than 10% on any one driver	• A prolonged increase in customer complaints for greater than six months, with normal background rates for the transport mode or service increasing by a factor of 10 or more, and a persistent backlog in responses - allowing for typical seasonal variation in complaints volume throughout the year • Substantial backlog of complaints • Ministerial and Ombudsman complaints • Persistent media and political scrutiny • A prolonged material reduction in overall customer satisfaction across the board (5% or more) for one or more major transport modes • A prolonged reduction (10% or more) in the satisfaction levels of the core drivers of customer satisfaction on more than one transport mode

Rating / description	C6 Insignificant	C5 Minor	C4 Moderate	C3 Major	C2 Major	C1 Catastrophic
Everyday service delivery	• Antisocial behaviour on service or resulting in minor delays • Minor traffic incident resulting in minor delays • Passenger(s) unable to disembark due to technical asset failure for more than five minutes • Business as usual (BAU) service delays	• BAU cancelations of service due to various causes including asset failure • Partial or full closure of a line/route/run or incidents resulting in minor to moderate delays such as track failure • Access and operation compromised (for example, closed entry and exits) for >30 minutes	• Police operation on a transport asset (for example, threat, suspicious package, security incident, civil unrest) • Incident requiring investigation by statutory authorities (WorkSafe, EPA, ONRSR/OTSI, NSW Police Force)	• Police operation on a transport asset (for example, threat, suspicious package, security incident, civil unrest) resulting in a significant delay for a prolonged period of time and likely to attract significant media attention such as no services during peak periods • Incidents resulting in a significant detrimental impact to a transport mode or multiple transport modes for a prolonged period of time in excess of an hour, or likely to attract significant media attention such as derailment, overcrowding at stations, significant delays or no services during peak periods, injury to school children, multiple injuries, person overboard, fire on a service • Evacuation or unplanned closure, caused by flood, fire, smoke, or hazardous substance spill, and suspicious substance	• Serious injury or fatality to member of staff • Fatality on a service or asset/station/ interchange (not self-harm)	• Multiple injuries or fatality due to asset failure/derailment or significant ongoing threat
Financial sustainability	• Capital expenditure (capex), above P50 capital budget of <$10 million • Non-infrastructure capex of <$100K • Operating expenditure (opex) (including accounting adjustments) of <$1 million • Revenue (including fines, penalties, compensation and so on) <$100K	• Capex (above P50 capital budget) of $10 million to $25 million • Non-infrastructure capex of $100K to $1 million • Opex (including accounting adjustments) of $1 million to $10 million • Revenue (including fines, penalties, compensation and so on) of $100K to $1 million	• Capex (above P50 capital budget) of $25 million to $50 million • Non-infrastructure capex of $1 million to $5 million • Opex (including accounting adjustments) of $10 million to $25 million • Revenue (including fines, penalties, compensation and so on) of $1 million to $5 million	• Capex (above P50 capital budget) of $50 million to $150 million • Non-infrastructure capex of $5 million to $25 million • Opex (including accounting adjustments) of $25 million to $75 million • Revenue (including fines, penalties, compensation) of $5 million to $25 million	• Capex (above P50 capital budget) of $150 million to $250 million • Non-infrastructure capex of $25 million to $50 million • Opex (including accounting adjustments) of $75 million to $150 million • Revenue (including fines, penalties, compensation and so on) of $25 million to $50 million	• Capex (above P50 capital budget) of >$250 million • Non-infrastructure capex of >$50 million • Opex (including accounting adjustments) of >$150 million • Revenue (including fines, penalties, compensation and so on) of >$50 million

Rating / description	C6 Insignificant	C5 Minor	C4 Moderate	C3 Major	C2 Major	C1 Catastrophic
Reputation and integrity	• Single negative article in local media • Limited social media commentary • Goodwill, confidence and trust retained • Confined to the branch • Local council may want to discuss	• Series of negative articles in local media (district / electorate based adverse media) • Some social media commentary • Confidence remains - minor loss of goodwill • Confined to branch but requiring notification to division • Council requires written explanation • Recoverable with little effort or cost. Some continuing scrutiny/attention	• Extended local media coverage with some broader regional media coverage • Extended negative social media coverage • Confidence and trust of stakeholders dented (recoverable at modest cost within existing budget and resources) • Division formal response needed to State - government/regulator	• State media coverage, short term negative national media coverage • Widespread social media coverage • Confidence/trust impaired • Project/activity credibility under question • TfNSW and/or Minister's office requires update	• Sustained negative State media coverage • Regular 'talk-back' programs questioning credibility and capability • Confidence and trust are severely damaged • Widespread negative social media coverage • Regular updates demanded by the Minister • Stakeholders withdraw their support recoverable at considerable cost, time and staff effort	• Sustained, high profile media attention at national level • Material change in the public perception of the agency • Extensive negative social media coverage • Confidence and trust non-existing. Government forced to reverse decision • Stakeholders are actively campaigning against the organisation
People	• Little employee interest/impact • Confidence and trust of employees retained • Confined to small number of people <5 • No performance impairment • Little or no impact on workload, employee numbers, work/life balance • No cultural impact • No noticeable excess stress or excessive absenteeism of key staff during/after workload peaks • Union activity/correspondence without staff pickup	• Impacts employees at a specific location and/or of a specific discipline (for example, accountants) (<50) • Employees concerned as to their wellbeing and future • Employees frustrated but still willing to proactively contribute to meeting objectives • Isolated incidence of excess stress or excessive absenteeism of key staff during/after workload peaks • Unions are being called upon to take up employee cause • industrial relations tension is high	• Impacts large numbers of employees (<500) • Employee's wellbeing and future is at risk • Employees frustrated and are largely only 'doing what needs to be done' • Culture and morale dropping • People are actively looking to leave • Noticeable incidence of excess stress or excessive absenteeism of key staff during/after workload peaks • Pockets of staff support for union agitation	• Majority of employees potentially impacted (50%). • Employee morale is low • Employees not willing to proactively engage – lack of commitment • Key people are actively looking to leave • Widespread staff support for union agitation • Widespread incidence of excess stress or excessive absenteeism of key staff	• All employees potentially impacted • Employee morale is poor • Employees not willing to proactively engage • Key people are leaving, workforce turnover rates increase (loss of IP) • Unions action – work to rule, stop work, short time but significant action • Stress and other work related injuries/health issues increasing • High incidence of excessive absenteeism of staff	• Employee brand significantly impaired • All employees potentially impacted • No confidence and trust of employees • Transport wide dissatisfaction – bad, dysfunctional morale • Performance significantly impaired – little or no immediate sign of improvement • High staff turnover – poor corporate culture • Doubling of workload, stress levels dangerously high • Long-term (months) of ongoing rolling industrial action which significantly impacts on service delivery

Rating / description	C6 Insignificant	C5 Minor	C4 Moderate	C3 Major	C2 Major	C1 Catastrophic
Project delivery	• Insignificant delay (one to two days) • No reduction in functionality/scope • No discernible impact, benefit realisation may have a slight decrease but largely intact • No time delay with initiative or project but will incur a slight decrease in the benefits realised • <2 month project delay	• Insignificant delay (one to two days) • No reduction in functionality/scope • No discernible impact • Benefit realisation partially impaired but still adds value and economically sound • No public impacts • Two to three months project delay	• Minor delay (<1% to max of one week) • <1% reduction in functionality/scope • Benefit realisation partially impaired but still adds value and economically sound • No public impacts • Three to six months project delay	• Major delay (<10% to max of five months) • <10% reduction in functionality/scope • Cost/benefit analysis may not have supported the program to go ahead • Publicly announced portion/milestone missed or final completion date missed with demonstrable mitigating external circumstances • Six to nine months project delay	• Severe delay (<15% to max of 9 months) • <15% reduction in functionality/scope • Cost/benefit analysis would not justify program • Publicly announced portion/milestone missed or final completion date missed on critical path project • Nine to twelve months project delay	• Total blow out in time (>9 months or >15%). • >15% reduction in functionality/scope • Will probably require a major project in the foreseeable future to either rectify or complete the results of this project • Publicly announced portion/ milestone significantly missed or final completion date significantly missed on critical path project • >12 months project delay • Failure to realise benefits of the initiative
Regulations and compliance	• Low-level/technical non-compliance with legal and/or regulatory requirement or duty by individuals or TfNSW-not reportable • Minor noncompliance to a low impact contract clause – little or no interest by either party to pursue or rectify	• Noncompliance with whole or significant aspects of government policy not reportable but requiring internal activity to put in place • Formal investigation and/or formal notification to regulator • Minor breach of contract by either party rectified through local management discussion	• Noncompliance with key government policy - reportable and/or explanation required – need to put in place as soon as possible • Noncompliance – key obligation • Formal notification to regulator • Agency on notice • Breach of contract by either party rectified at branch level management discussion • Small fine and no disruption to services	• Technical noncompliance with a minor government policy - not reportable • Low level noncompliance • Technical nonconformance • Minor noncompliance to a low impact contract clause – little or no interest by either party to pursue or rectify • Substantial fine and no disruption to services	• Noncompliance with high profile, outward facing government policy or ministerial decree - immediately reportable to government body such as Treasury and action to put in place required immediately (high priority) • Continuous breach resulting in prohibition notices • Breach of significant, key aspects of contract by either party leading to lodgement (threat) to sue and recompense at severe financial levels • Cessation of contract may occur • Large fines as a result of noncompliance • Licence or accreditation restricted or conditional affecting ability to operate	• Noncompliance with high profile government policy or ministerial decree - immediately reportable to ministerial level requiring actions to put in place immediately (high priority) and progress to be reported to the minister on an agreed and appropriate schedule • Litigation and potentially imprisonment • Loss of operating licenses • Continued breach cannot be tolerated • Major contract breach by either party leading to significant litigation and financial costs • Total breakdown and cessation of contract • Criminal prosecution as a result of noncompliance
Environment	• No appreciable changes to environment	• Change from existing conditions that can be rectified immediately (<1 day) with available resources	• Short-term (<1 year) and/or well-contained environmental impact • Minor remedial actions probably required	• Short to medium term (between 1 year and <5 years) environmental impact • Considerable remedial actions probably required	• Medium-term (>5 years) environmental impact • Extensive remedial actions probably required	• Long-term (>10 years) large-scale environmental impact • Extensive and ongoing remedial actions probably required

Table 2 – Risk assessment – likelihood criteria

Rating / description	L6 Almost unprecedented	L5 Very unlikely	L4 Unlikely	L3 Likely	L2 Very likely	L1 Almost certain
Qualitative expectation	• Not expected to ever occur during time of activity or project • Very little or no real chance of this risk occurring • History shows that this risk hardly ever happens, if at all	• Not expected to occur during the time of activity or project • Only an unusual chance of this risk occurring • History shows that this risk rarely happens, usually under unusual circumstances	• More likely not to occur than occur during time of activity or project • Chance of this risk occurring but not very often • History shows that this risk does happen but not very frequently	• More likely to occur than not occur during time of activity or project • Chance of this risk occurring in the current period • History shows that the risk has occurred on a number of occasions	• Expected to occur occasionally during time of activity or project • Good chance of this risk occurring • History shows that the risk occurs unacceptably too often	• Expected to occur frequently during time of activity or project • Very strong chance of this risk occurring • History shows that it is something that occurs frequently
Quantitative frequency	• Risk event will occur at least once every 50 years • Less than 2% probability of risk/event occurring within the next 12 months	• Risk event will occur at least once every 25 years • Greater than 2% and up to 4% probability of risk/event occurring within the next 12 months	• Risk event will occur at least once every 10 years • Greater than 4% and up to 10% probability of risk/event occurring within the next 12 months	• Risk event will occur once every year • Greater than 10% and up to 50% probability of risk/event occurring within the next 12 months	• Risk event will occur between 2 times and 10 times per year • Greater than 50% and up to 80% probability of risk/event occurring within the next 12 months	• Risk event will occur more than 10 times every year • Greater than 80% probability of risk/event occurring within the next 12 months

Table 3 – Risk matrix – Likelihood and consequence

			Consequence					
	Description		Insignificant C6	Minor C5	Moderate C4	Major C3	Severe C2	Catastrophic C1
Likelihood	Almost certain	L1	D	C	B	A	A	A
	Very likely	L2	D	C	B	B	A	A
	Likely	L3	D	C	C	B	B	A
	Unlikely	L4	D	D	C	C	B	B
	Very unlikely	L5	D	D	D	C	C	B
	Almost unprecedented	L6	D	D	D	D	C	C

Appendix B

Rail Safety Project Hazard Log

90 - 102 Regent Street Redfern
Rail Safety Project Hazard Log: Construction Adjacent to Sydney Metro City & Southwest

TfNSW Safety Risk Ranking

Issue date: 25/02/21
Review date:

Risk Identification: Ref.	Main Event (By ActivityPhase)	Hazard	Impact / Consequence	Cause	Risk Owner	Control Strategy: Existing Controls	Risk Control Owner	Risk Assessment: Likelihood	Consequence	Risk Rating	Exposed Group: Public	Sydney Metro	Employee	Builder	Environment	Additional Risk Treatment and Response to Control Strategy (A - Generally intolerable; B - Undesirable; C - Tolerable; D - Broadly acceptable)	Residual Risk: Likelihood	Consequence	Risk	Task Owner	Notes and Comments	Action: Action Ref.	Action Statement	Timeframe	Status	Action Owner
1	Installation of vibration monitoring equipment	Operational failure of monitoring equipment	Excessive vibration undetected.	Power cable cut or power supply interrupted	Builder	Battery backup for vibration monitoring equipment. Daily remote access check on equipment. Slow or stop excavation and / or piling work until fault is rectified.	Acoustic Logic	L4	C5	D				√							The Acoustic Logic Metro Tunnel Vibration Monitoring Plan Rev. 1 dated 24 February 2021 nominates surface monitoring and installation of monitoring wells over each tunnel.					
				Monitoring equipment struck by construction equipment	Builder	Equipment fenced off on site. Location of equipment included in site induction. Condition of equipment included in daily site inspection. Communication protocol with acoustic engineer. Slow or stop excavation and / or piling until equipment is replaced.	Builder	L4	C5	D				√							The Acoustic Logic Metro Tunnel Vibration Monitoring Plan Rev. 1 dated 24 February 2021 nominates surface monitoring and installation of monitoring wells over each tunnel.					
				Vandalism or theft of monitoring equipment	Builder	Site secured from public access. Security patrols. Condition of equipment included in daily site inspection.	Builder	L4	C5	D	√			√							The Acoustic Logic Metro Tunnel Vibration Monitoring Plan Rev. 1 dated 24 February 2021 nominates surface monitoring and installation of monitoring wells over each tunnel.					
2	Dilapidation survey	Plant working in metro tunnel	First aid or medical treatment injury	Survey team member struck by plant	Builder	Operate under metro tunnel contractor safety management plan and incident response plan. Develop safe work method statements approved by metro tunnel contractor. Use pre-approved elevating work platforms operated by metro tunnel contractor. Site induction by metro tunnel contractor provided to survey team. Personal protective equipment worn by survey team personnel personnel.	Metro Contractor	L4	C5	D		√	√	√							Metro tunnels are currently being fitted out so access will need to be under the authority of the Principal Contractor. Risk can be eliminated if Sydney Metro does not require a dilapidation survey.					
		Construction materials on metro tunnel floor	First aid or medical treatment injury	Survey team member slips, trips or falls	Builder	Operate under metro tunnel contractor safety management plan and incident response plan. Develop safe work method statements approved by metro tunnel contractor. Site induction by metro tunnel contractor provided to survey team. Personal protective equipment worn by survey team personnel personnel.	Metro Contractor	L4	C5	D		√	√	√							Metro tunnels are currently being fitted out so access will need to be under the authority of the Principal Contractor. Risk can be eliminated if Sydney Metro does not require a dilapidation survey.					
3	Excavation and / or piling on site	Ground deformation	Damage to metro tunnel lining	Inadequate geotechnical modelling	Developer	Geotechnical model established from borehole data. Building loads provided by structural engineer. Engineering assessment of movement determined using finite element modelling.	Douglas Partners	L4	C5	D		√		√							Douglas Partners Report of Geotechnical Investigation Rev. 1 30 September 2020.. Douglas Partners Preliminary Numerial Modelling and Impact Assessment Rev. 0 23 February 2021					
				Poor ground conditions	Builder	Ground conditions established from borehole data. Ground conditions monitored against predicted during excavation and piling. Piles terminated 9.4m above first protection reserve enabling extension of pile lengths.	Builder	L4	C5	D		√		√												
				Design error	Developer	Foundation system designed by experienced and qualified engineers. Competency review process for project team selection. Design subject to quality assurance and safety in design procedures.	Webber Design	L4	C5	D		√		√							Quality assurance implemented for design in accordance with clause 7.3 ISO 9001 Quality Management Systems - Requirements. Design activities have been controlled by detailed procedures. The design process includes independent design review and verification.					
				Construction methodology inadequate or not followed.	Builder	Full time supervision. Plant selected to minimise vibration impact. Vibration warning and stop work monitoring limits established for the works. Vibration warning and stop work monitoring alerts sent by SMS text to nominated personnel by equipment on site. Alarm activated on site to stop work. Construction quality assurance processes.	Builder	L4	C5	D		√		√												
				Monitoring system does not capture relevant vibrations	Builder	Vibration consultant reviews construction 4 week look ahead programme. Monitoring equipment relocated as work progresses in different areas of the site.	Acoustic Logic	L4	C5	D		√		√												
				Construction personnel not suitably qualified and experienced	Builder	Personnel inducted into documented work methods and induction records produced. Worker competency assessed. Full time site supervisor on site. Surveillance of work activities undertaken to ensure documented work methods are being followed and appropriate records generated.	Builder	L4	C5	D		√		√												
				Watertightness of the lining through joints is compromised as consequence of gasket decompression and/or damage	Builder	Geotechnical model established from borehole data. Building loads provided by structural engineer. Engineering assessment of movement determined using finite element modelling. Movement below maximum limits of 10mm and differential movement of 0.5%. Pre and post construction dilapidation inspection. Inspection and Test Plan verifies controls are being followed. Monitoring regime to be agreed with Sydney Metro..	Douglas Partners Builder	L4	C5	D		√		√							Douglas Partners Preliminary Numerial Modelling and Impact Assessment Rev. 0 23 February 2021 predicts movement of < 1mm during excavation and piling. Sydney Metro Underground Corridor Protection Technical Guidelines (Ref. NWRLSRT-PBA-STR-TU-REP-00008, Rev 1) (Guidelines) permit a 10mm movement in any direction. The report also predicts a maximum total differential displacement in the tunnel liners is < 1mm and < 0.01% as a consequence of excavation and piling. The Guidelines permit total differential movement of 10 mm or 0.05% (whichever is less) in any plane. Metro tunnels are currently being fitted out so access will need to be under the authority of the Principal Contractor. Sydney Metro will consulted on the nature and extent of monitoring that may be required.					
				Boreholes drilled into first protection zone	Builder	Set out of pile locations by surveyor. Controlled set of design drawings. Pile rig drilling depths set.	Builder	L4	C5	D		√		√												
				Movement of metro tunnels not kept within prescribed limits	Builder	Monitoring regime to be agreed with Sydney Metro.	Builder	L4	C5	D		√		√							Metro tunnels are currently being fitted out so access will need to be under the authority of the Principal Contractor. Sydney Metro will consulted on the nature and extent of monitoring that may be required.					
				Site investigation data does not reflect in-situ material	Builder	Excavation and piling done in stages. Face mapping of material as excavation progresses. Review of borehole material. Confirmation that founding material for foundations and piles is adequate. Rerun finite element model if required.	Builder Douglas Partners	L4	C5	D		√		√												
		Vibration	Damage to metro tunnel lining	Incorrect stop work limit.	Acoustic Logic	Warning limit established prior to stop work limit. Stop work limit reduced from maximum permitted limit.	Acoustic Logic	L4	C6	D		√		√							The Acoustic Logic Metro Tunnel Vibration Monitoring Plan Rev. 1 dated 24 February 2021 nominates a warning trigger level of 12.5 mm/s peak paricle velocity and a stop work limit of 15 mm/s peak particle velocity. Sydney Metro Underground Corridor Protection Technical Guidelines (Ref. NWRLSRT-PBA-STR-TU-REP-00008 permit a maximum vibration of 20mm/sec.					
				Selection of inappropriate plant and equipment.	Builder	Equipment selected to keep vibration within specified limits. The metro tunnel lining consists of pre-cast concrete segments that are not sensitive to minor vibration impacts.	Builder	L4	C6	D		√		√												
4	Construction of building	Ground deformation	Damage to metro tunnel lining	Watertightness of the lining through joints is compromised as consequence of gasket decompression and/or damage	Builder	Geotechnical model established from borehole data. Building loads provided by structural engineer. Engineering assessment of movement determined using finite element modelling. Movement below maximum permitted limits of 10mm and differential movement of 0.5%.. Pre and post construction dilapidation surveys. Monitoring regime to be agreed with Sydney Metro.	Douglas Partners Builder	L4	C5	D		√		√							Douglas Partners Preliminary Numerial Modelling and Impact Assessment Rev. 0 23 February 2021 predicts movement of 3mm with the application of full building load. Sydney Metro Underground Corridor Protection Technical Guidelines (Ref. NWRLSRT-PBA-STR-TU-REP-00008, Rev 1) (Guidelines) permits a 10mm movement in any direction. The report also predicts a maximum total differential displacement in the tunnel liners is about 1 mm and 0.02% as consequence of the application of building load. The Guidelines permit total differential movement of 10 mm or 0.05% (whichever is less) in any plane.					
5	Stray electrical traction currents emanating from the metro tunnels	Premature corrosion of building structural elements and services	Partial collapse of building or failure of services	Electrolysis	Builder	Desktop review of potential impact undertaken. Controls identified for building structural elements and services Concrete of minimum specified strenght used. Specified incoming services isolated at boundary. Waterproof membrane installed.	Cathodic Protection Services Builder	L4	C5	D	√	√									Cathodic Protection Services Residential Tower Development 90-102 Regent Street Redfern dated 21 October 2020.					

Appendix C

Issues Register

Issues Register

REF NO	ISSUE	ACTION PLAN	FORECAST DATE	ACTUAL DATE	RESPONSIBLE PERSON	COMMENTS	CLOSE OUT RECORD