

Rail Operations Centre

Review of Environmental Factors

October 2016



Document History

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Executive Summary

Background

Sydney Trains proposes to construct the Rail Operations Centre (ROC) for and on behalf of Rail Corporation New South Wales (RailCorp) to improve management and delivery of train operations and rail services for Sydney Trains, NSW Trains and their customers (the proposal). The proposal is scheduled for completion by 2018.

Proposal objectives

The objectives of the proposal are to:

- Reduce delay times and improve confidence in rail functions
- Provide for more effective management of service disruption
- Provide for faster incident resolution and service recovery
- Foster a culture of collaboration and efficient coordination.

The proposal would be built on the corner of Wyndham Street and Mandible Street, Alexandria. The proposal forms part of the new Sydney Trains signalling, train control, communication and security system. The proposal would accommodate various rail operations infrastructure and associated workspace for Sydney Trains employees operating or supporting the ROC.

The proposal site is currently leased by Fire and Rescue New South Wales (FRNSW) and is used for FRNSW administration and emergency training activities. FRNSW owns land south of the proposal.

The proposal

The key components of the proposal are:

- The ROC is to be built across four levels, plus a plant room located on the roof
- The ROC would be operational 24 hours a day, seven days per week
- Construction and operation of the ROC building on RailCorp owned land
- Provision for a future fire station as a separate tenancy within the ground floor and first floor of the ROC building. Planning assessment and/or approval for this use and fit out would be obtained by FRNSW
- ROC stormwater management system would connect to City of Sydney's existing stormwater management system
- ROC sewerage system would connect to Sydney Water's existing sewerage system
- Construction of a car park within the ground floor of the ROC building with entry and exit via a ramp to be provided from Mandible Street, Alexandria
- A separate entry for the future fire station south of the proposal from Wyndham Street, Alexandria through a future access road. The exit will be to Mandible Street
- Upgrade of the existing southern footpath in Mandible Street and western footpath in Wyndham Street adjacent to the proposal
- Solid security barrier with closed-circuit television cameras to be provided around the perimeter of the ROC property boundary

Need for the proposal

Sydney Trains proposes to construct the ROC to improve management and delivery of train operations and rail services for Sydney Trains, NSW Trains and their customers.

The ROC vision supports the strategies of Transport for NSW, Sydney Trains, and NSW Trains, who are transforming the customer experience in line with their vision of “putting the customer at the heart of everything we do”.

Options considered

Five options were considered for the proposal:

- The do nothing ‘base case’ option would maintain the existing rail operation services decentralised across the Sydney Region in their current locations. This option would not address the strategic need and objectives of the proposal (which are set out in section 2.1).
- The remaining four options consisted of installing a building of four levels, plus a plant room in the roof level. These options used different materials externally and internally:
 - Option 1 was the DJRD architect's option that had a façade of vertical terracotta baguettes of varying depths and colour to represent the sleeper screen horizontal edge bands (tracks) between the floor levels. This option would not address the strategic needs and objectives of the proposal
 - Option 2 was the SJB architect's option that featured a roof structure including copper sheeting, primary and secondary steel trusses. This option would not address the strategic needs and objectives of the proposal
 - Option 3 was the NM architect's option that had a metal-clad scalloped façade. This option would not address the strategic needs and objectives of the proposal
 - Option 4 was the Smart Design option that was a simple, modern, flexible warehouse-like office space. This option addresses the strategic need and objectives of the proposal and is the preferred option.

Communications and stakeholder consultation

Consultation during development of the proposal has occurred with relevant stakeholders such as the City of Sydney Council, FRNSW, Sydney Water, Ausgrid, Roads and Maritime Services and NSW Environment Protection Authority. *State Environmental Planning Policy (Infrastructure) 2007* letters were sent to stakeholders including City of Sydney Council. Issues raised have been considered in the development and assessment of the proposal.

Beneficial outcomes of the proposal

The ROC would transform the customer experience of train services. It would deliver the following benefits to customers:

- Reduced delay times and improved confidence in rail – improved processes, systems and relationships between daily operational functions would result in faster identification and allocation of incidents, more effective management of service disruption, faster incident resolution and service recovery
- More accurate, timely, relevant and consistent customer information during disruption – improving the customers’ ability to make decisions about their transport options.

The ROC would deliver benefits to the rail business units including:

- Improved efficiency in incident management and resolution – providing opportunities for the daily operational role consolidation and efficiencies

- Better realising the benefits of future investments in rail capacity – the ROC would be critical to fully realising the benefits of future network efficiency and reform initiatives, strategic initiatives including network enhancements such as Sydney Metro, new rolling stock, new signalling technologies and progressive network segmentation. This enablement is driven by creation of a scalable network control function that can manage incidents effectively and adapt to changes in network demand
- Providing a new world standard operating centre and culture – the ROC would transform the way daily operations activities are managed within Sydney Trains/ NSW Trains, fostering a new culture of collaboration and efficient coordination. This is enabled by new system capabilities and enhanced by process redesign, organisational redesign and a centre built around key cultural goals.

Impacts of the proposal

A number of potential environmental impacts from the proposal have been avoided or reduced during the assessment of alternatives and development of the ROC design for the proposal and via the application of best practice environmental management and control measures.

The proposal would result in impacts during construction and operation. During construction of the proposal the potential adverse impacts would include:

- Noise and vibration, including potential night time disturbance associated with extended work hours or out of hours work
- Soil erosion and contamination impacts
- Visual impacts
- Traffic and access impacts
- Dust
- Construction plant and vehicle emissions
- Vegetation clearing.

During operation of the proposal the potential adverse impacts would include:

- Noise and vibration, including potential night time disturbance associated with the 24 hour operation
- Visual impacts
- Traffic and access impacts.

Environmental impact assessment

Detailed technical investigations were undertaken as part of this REF to identify and assess potential environmental issues as a result of the proposal, and to identify appropriate control measures to mitigate potential impacts. The main potential environmental impacts from the proposal would be related to noise and vibration (Section 5.6), soil erosion and contamination (Section 5.2 and Section 5.8 respectively), visual amenity (Section 5.9) and traffic and access (Section 5.11).

Noise and vibration

Construction noise

An assessment to determine the potential noise impacts associated with the proposal during the construction phase was undertaken. It found that the proposal would generally be undertaken during standard working hours however some works would need to be undertaken out of hours.

There would be out of hours works undertaken to minimise impacts on the road network and pedestrians during peak hours. This would primarily be for works including: installation of noise screening and installation of 'B' class hoarding around the perimeter of the proposal at Wyndham Street and Mandible Street. The timing would be dependent on the road occupancy licence issued by Roads and Maritime Services.

Noise management levels are likely to be exceeded in adjacent residential properties to the east of the proposal during most construction activities, however, these activities are only for short periods of time.

Sleep disturbance criteria is likely to be exceeded in adjacent residential properties to the east of the proposal during out of hours works. These exceedances are not likely to occur on consecutive nights.

The predicted noise levels are considered worst case and are not expected to occur for the entire construction period. As plant and equipment moves around the various work locations, the propagation distances and paths to the nearest receiver would change, thus altering noise levels at each receiver. The construction of the proposal would be expected to take up to eighteen months. These exceedances are only likely to occur for short periods of time, as the noise source would generally be contained within the building.

Operational noise

The proposal has the potential to cause noise impacts during operation. The proposal would operate on a 24 hour 7 day a week basis, with the exception of the café, which will primarily be open during daytime hours. The main source of noise emissions would be from plant and equipment associated with ventilation and air conditioning plant, and from emergency power generating plant. These items would be located within plant rooms and on the roof of the proposal.

The nearest and "most impacted" potentially affected residential receivers are the multi-storey buildings located to the east, opposite Wyndham Street. The remaining residential or educational receivers are more distant from the proposal and would not be impacted.

The operational noise assessment determined that if the control measures were implemented, noise emissions from the proposal would comply with the guidelines presented in the NSW Industrial Noise Policy (EPA, 2000) and would not produce unacceptable adverse impacts.

Vibration impacts

Vibration sources from the proposal would be limited to air conditioning, ventilation and power generating plant during operation of the proposal. These sources would be supported on vibration isolating mounts to control vibration within the subject building. Consequently, no perceptible vibration will be transmitted to other properties.

Soil erosion and contamination

The proposal has the potential to impact negatively on soils due to the following activities:

- Excavations, which may lead to erosion and sediment mobilisation

- Earthworks, which have the potential to result in soil erosion and exposure of contaminated soils, acid sulfate soils and asbestos containing material
- There is the potential for incorrect storage and handling of hazardous materials resulting in spills or leaks during construction of the proposal that could cause contamination of soils to occur.

Given the proposal characteristics and the size of the proposal area, it is anticipated that soil and contamination risks are short term and can be effectively managed through the implementation of the control measures in Section 7.17.

Visual

The proposal would result in some visual impacts during construction and would also result in a change in the visual environment of the site during operation.

Visual impacts during construction

During construction, the potential visual impacts would include:

- Presence of plant and equipment on site
- Temporary construction compounds
- Temporary stockpiles
- Light spill from security lighting and any night works.

Surrounding businesses and residents may experience a reduction in visual amenity, however these impacts would be restricted to the construction period and all disturbed areas would be restored to pre-existing condition or better post construction.

During construction some night works would be required. There would also be road closures which may need to be undertaken out of hours to prevent impacting on the road network. The timing would be dependent on the road occupancy licence issued by Roads and Maritime Services. As such night lighting may impact neighbouring properties, however this would be temporary and limited to periods where night works are required.

Visual impact during operation

During operation it is anticipated that the site would be in use continuously through the night and day and therefore lighting would be required for security purposes. External security lighting would be installed in a manner which minimises light spill to areas beyond the site boundary.

The completed building would be four storeys high and therefore has the potential to impact surrounding properties during the operational phase. Given the size of the building there is the potential for overshadowing to surrounding properties during operation. This is worst case during winter as detailed in Section 7.1.

Traffic and access

Construction traffic and access

There would be short term disruption to traffic during construction of the proposal. Temporary increases in traffic are likely to occur from construction and worker vehicles. Activities such as concrete pours are expected to generate the most traffic movements to/from the proposal during construction. Additional traffic volumes would be generated from the delivery of plant/equipment as well as the arrival and departure of employees/contractors. It is expected that about 10 per cent of the generated traffic movements would occur during the peak hour periods. However this would be temporary and limited to the concrete pours. These impacts would be effectively managed through the implementation of the control measures in Section 7.1.

It is estimated that up to 18 vehicle movements per peak hour period or 50 vehicle movements per day would be generated by the construction activities. This number of generated construction movements may be revised depending on the scheduling of works and staging. These impacts would be effectively managed through the implementation of the control measures in Section 7.1.

The operational traffic impact assessment determined that there would overall be a marginal increase in traffic volumes on the adjacent road network as a result of the proposal. By comparing with and without proposal scenarios it is evident that background traffic growth for the local area would impact the road network more than traffic volumes associated with the proposal.

The operational traffic impact assessment also determined that due to safety and network operational reasons, site access/egress for the proposal would be in a forward direction only via the driveway adjoining Mandible Street. This access would require the existing on-street parking on the southern side of Mandible Street (about 40 metres or six car spaces) to be replaced with no parking signs. This requires approval from the City of Sydney.

Control measures

Control measures detailed in this Review of Environmental Factors (Section 7) would minimise the potential adverse impacts of the proposal.

Conclusion

Sydney Trains has determined the proposal is permissible without development consent under *State Environmental Planning Policy (Infrastructure) 2007*. Accordingly, Sydney Trains has carried out an environmental assessment for the proposal under Part 5 of the *Environmental Planning and Assessment Act 1979*.

This Review of Environmental Factors finds that the proposal as described in Chapter 2 of this REF is unlikely to have a significant impact on the environment and therefore an environmental impact statement (EIS) under Part 5.1 of the NSW *Environmental Planning and Assessment Act 1979* is not required.

The REF has examined and taken into account to the fullest possible extent all matters affecting or likely to affect the environment by reason of the proposed activity. The proposal as described in the REF best meets the proposal objectives. Control measures proposed as detailed in this REF would minimise expected impacts that are considered to be minor. The proposal would improve the rail operations of the Sydney Trains network by making it more centralised. The proposal is therefore considered justified.

Abbreviations and Definitions

Abbreviation	
AADT	Annual Average Daily Traffic
ACM	Asbestos containing material
AEP	Annual exceedance probability
AHD	Above Height Datum
AHIMS	Aboriginal Heritage Information Management System
AONE	Assessment of Operational Noise Emissions
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
AS/NZS	Australian/New Zealand Standard
ASS	Acid sulfate soil
ASSMP	Acid Sulfate Soil Management Plan
AQI	Air Quality Index
bgl	Below Ground Level
CCIA	Climate Change Impact Assessment
CCTV	Closed-circuit Television
CE	Critically Endangered
CEMP	Construction environmental management plan
CLM Act	<i>NSW Contaminated Land Management Act 1997</i>
CSEP	Community and Stakeholder Engagement Plan
dB	Decibel
dB(A)	A-weighted Decibel
DECC	Former NSW Department of Environment and Climate Change
EMS	Environmental Management System
EPA	NSW Environment Protection Authority
EP&A Act	<i>NSW Environmental Planning and Assessment Act 1979</i>
EP&A Regulation	<i>NSW Environmental Planning and Assessment Regulation 2000</i>
EPBC Act	<i>Commonwealth Environment Protection and Biodiversity Conservation Act 1999</i>
EPL	Environment Protection Licence
ESCP	Erosion and sediment control plan
ESD	Ecologically Sustainable Development
FL	Finished Level
FM Act	<i>NSW Fisheries Management Act, 1994</i>
FRNSW	Fire and Rescue New South Wales
FSR	Floor space ratio
FtS	Fluorotelomer sulfonate
GHG	Greenhouse gas emissions
ha	Hectare
Heritage Act	<i>NSW Heritage Act 1977</i>
HML	Higher Mass Limit

Abbreviation	
HVAC	Heating, ventilation and air conditioning
Hz	Hertz
ICNG	<i>Interim Construction Noise Guidelines</i> published by the former NSW Department of Environment and Climate Change (now NSW Office of Environment and Heritage)
ISEPP	<i>NSW State Environmental Planning Policy (Infrastructure) 2007</i>
LEP	Local Environmental Plan
LGA	Local Government Area
LOS	Level of Service
m²	Square metres
m³	Cubic metres
m/s	Metres per second
mm/s	Millimetres per second
MNES	Matters of National Environmental Significance
MR	Main Road
MSDS	Material safety data sheet
NCAs	Noise catchment areas
NEPM	National Environment Protection Measures
NPW Act	<i>NSW National Parks and Wildlife Act 1974</i>
NS	No Status
NV Act	<i>NSW Native Vegetation Act 2003</i>
OEH	Office of Environment and Heritage NSW
PFC	Perfluorinated chemicals
PMF	Probable maximum flood
POEO Act	<i>NSW Protection of the Environment Operations Act 1997</i>
RailCorp	Rail Corporation New South Wales
RAP	Remediation Action Plan
RAV	Restricted Access Vehicle
REF	Review of Environmental Factors
RBL	Rating Background Level
RL	Reduced Level
ROC	Rail Operations Centre
SAC	Site Assessment Criteria
SEIFA	Socio-Economic Indexes for Areas
SEPP	State Environmental Planning Policy
TCE	Trichloroethene
TfNSW	Transport for New South Wales
TPA	Total potential acidity
TSC Act	<i>NSW Threatened Species Conservation Act, 1995</i>
TTIA	Traffic and Transport Impact Assessment

Term	Definition
Annual exceedance probability	This is the chance of a flood of a given or larger size occurring in any one year, usually expressed as a percentage. One per cent AEP flood is about equal to one in one hundred year average recurrent interval (ARI) flood event (or simply one hundred year flood). It has a one per cent chance to occur in a given year.
Asbestos containing material	Any material or object that contains asbestos.
Local Environment Plan	A local government level environmental planning instrument.
Noise catchment area	The grouping of sensitive land uses for residential, commercial and school premises with the potential to be affected by the construction activities.
Probable maximum flood	This is an extreme flood that could conceivably occur at a particular location, generally estimated from the probable maximum precipitation. Generally it is not physically or economically possible to provide complete protection against this event.
State Environmental Planning Policy	A State level environmental planning instrument.

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1 Introduction

1.1 Introduction

Sydney Trains proposes to construct the Rail Operations Centre (ROC) for and on behalf of Rail Corporation New South Wales (RailCorp) to improve the management and delivery of train operations and rail services for Sydney Trains, NSW Trains and their customers.

The ROC vision supports the strategies of Transport for NSW (TfNSW), RailCorp, Sydney Trains, and NSW Trains, who want to transform the customer experience in line with their vision of “putting the customer at the heart of everything we do.”

Better coordination, communication, and management would be achieved through the ROC centralisation of services and resources to integrate teams and transform the processes, systems and communications of the functions focused on managing the daily operational activities. This integration would include computer based signalling locations, train control, security, customer information, fleet management, asset monitoring and incident response functions.

The ROC would deliver consistent, accurate, timely and up to date information to customers about delays and improve processes and systems allowing faster incident resolution and service recovery. It would provide the operational management of the Sydney Trains network with a highly coordinated customer focus and would support the realisation of benefits from future initiatives including major infrastructure programs, the Rail Futures Strategy and future business model changes.

This REF has been undertaken to assess the environmental risks and impacts associated with the ROC (the proposal).

1.2 Proposal location

The proposal site is located at 8 Mandible Street, Alexandria, NSW, outside of the rail corridor. There are three access points to the site via Mandible Street, Wyndham Street and Bourke Road.

The proposal is located within the following two Lots:

- Lot 701 in Deposited Plan DP 713555 – 177 to 187 Wyndham Street
- Lot 2 DP 552864 – 8 to 10 Mandible Street.

Figure 1 shows the location of the proposal. The area is urban with vegetation restricted to selected street tree plantings along Mandible Street, Wyndham Street and Bourke Road. There is an ephemeral tributary of Sheas Creek running underground to the south west of the site. There is an open stormwater drain on the south east corner of the FRNSW property which drains to Alexandra Canal.

The site is relatively flat with an elevation of about ten metres Australian Height Datum (AHD). The site currently contains asphalt and concrete on-grade car parking and hardstand areas for parking of vehicles associated with an existing fire station. A concrete retaining wall extends along the Mandible Street boundary that is up to one metre high.

The area surrounding the proposal is largely commercial and industrial, however there are some high density residential towers along Wyndham Street to the north west of the proposal. The proposal site is zoned as ‘B7 Business Park’ under the City of Sydney Council Local Environment Plan (LEP) 2012, and is surrounded by ‘mixed use’ and ‘general

industrial' zones. The FRNSW site is located south of the proposal. Green Square Station is less than two hundred metres south east of the proposal site and Waterloo Public School is one hundred and sixty-five metres to the east.

Figure 1 outlines the proposal site in the context of the surrounding network.

1.3 Purpose of REF

This REF has been prepared by Aurecon for Sydney Trains, for and on behalf of RailCorp. The purpose of the REF is to:

- Describe the proposal
- Document the likely impacts of the proposal on the environment and community
- Detail control measures to be implemented
- Consider whether the proposal is likely to significantly affect the environment.

As explained in Section 3.1, for the purposes of these works, Sydney Trains, for and on behalf of RailCorp, is both the proponent and the determining authority for this REF under Part 5 of the EP&A Act.

The proposed works and associated environmental impacts have been described in the context of clause 228 of the NSW Environmental Planning and Assessment Regulation 2000 (EP&A Regulation), the *Threatened Species Conservation Act 1995* (TSC Act), the *Fisheries Management Act 1994* (FM Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). In doing so the REF helps to fulfil the requirements of Section 111 of the EP&A Act that Sydney Trains examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the activity.

The statutory framework surrounding the REF is discussed in more detail in Section 3.

The findings of the REF would be considered when assessing:

- Whether the proposal is likely to have a significant impact on the environment and therefore whether it is necessary for an environmental impact statement to be prepared and approval to be sought from the Minister for Planning and Infrastructure under Part 5.1 of the EP&A Act
- Whether the proposal is likely to have a significant impact on threatened species as defined by the TSC Act and/or FM Act, in Section 5A of the EP&A Act and therefore whether it is necessary for a Species Impact Statement to be prepared
- Whether the proposal will or is likely to significantly impact a matter of national environmental significance or Commonwealth land and therefore whether it is necessary to make a referral to the Australian Government Department of the Environment for a decision by the Commonwealth Minister for the Environment on whether assessment and approval is required under the EPBC Act.
- Whether to proceed with the ROC.

2 The Proposal

2.1 Need and objectives of the proposal

Sydney Trains proposes to construct the ROC to improve management and delivery of train operations and rail services for Sydney Trains, NSW Trains and their customers.

The ROC vision supports the strategies of TfNSW, RailCorp, Sydney Trains, and NSW Trains, who are transforming the customer experience in line with their vision of “putting the customer at the heart of everything we do”.

Better coordination, communication, and management would be achieved through the ROC, which would co-locate teams and transform the processes, systems, and communications of the functions focused on managing daily operational activities.

This transformation is expected to deliver consistent, accurate, timely and up to date information to customers about delays and improve processes and systems allowing faster incident resolution and service recovery. It would provide the operational management of the Sydney Trains network with a highly coordinated customer focus and would support the realisation of benefits from future initiatives including major infrastructure programs, the Rail Futures Strategy, and future business model changes.

Specific objectives of the ROC are to:

- Reduce delay times and improve confidence in rail functions
- Provide more effective management of service disruption
- Provide faster incident resolution and service recovery
- Foster a culture of collaboration and efficient coordination.

The ROC would transform the customer experience of train services. It would deliver the following benefits to customers:

- Reduced delay times and improved confidence in rail – improved processes, systems and relationships between daily operational functions would result in faster identification and allocation of incidents, more effective management of service disruption, faster incident resolution and service recovery
- More accurate, timely, relevant and consistent customer information during disruption – improving the customers’ ability to make decisions about their transport options.

The ROC would also deliver benefits to the rail business units including:

- Improved efficiency in incident management and resolution – providing opportunities for the daily operational role consolidation and efficiencies
- Better realising the benefits of future investments in rail capacity – the ROC would be critical to fully realising the benefits of future network efficiency and reform initiatives, strategic initiatives including network enhancements such as Sydney Metro, new rolling stock, new signalling technologies and progressive network segmentation. This enablement is driven by creation of a scalable network control function that can manage incidents effectively and adapt to changes in network demand
- Providing a new world standard operating centre and culture – the ROC would transform the way daily operations activities are managed within Sydney Trains/ NSW Trains, fostering a new culture of collaboration and efficient coordination. This is enabled by new system capabilities and enhanced by process redesign, organisational redesign and a centre built around key cultural goals.

2.2 Description of proposal

Sydney Trains have selected a site of about 4,097m² in Alexandria on the intersection of Wyndham and Mandible Streets. The site is currently occupied by Fire and Rescue NSW.

The proposed ROC building would have a floor area of about 15,160m² set across four levels (including a mezzanine level) plus a plant room located on the roof, spread vertically over 31.2 metres. The proposed building would house network operations, office accommodation and a control room. The ROC is expected to include computer based signalling locations, train control, security, customer information, fleet management, asset monitoring and incident response functions. The main frontage of the building would be on Wyndham Street which would house the main lobby of the building. Vehicle access would be via the Mandible Street frontage. There would be security fencing with closed-circuit television cameras (CCTV) around the perimeter of the property boundary. The footprint of the proposal is shown in Figure 2 to Figure 5.

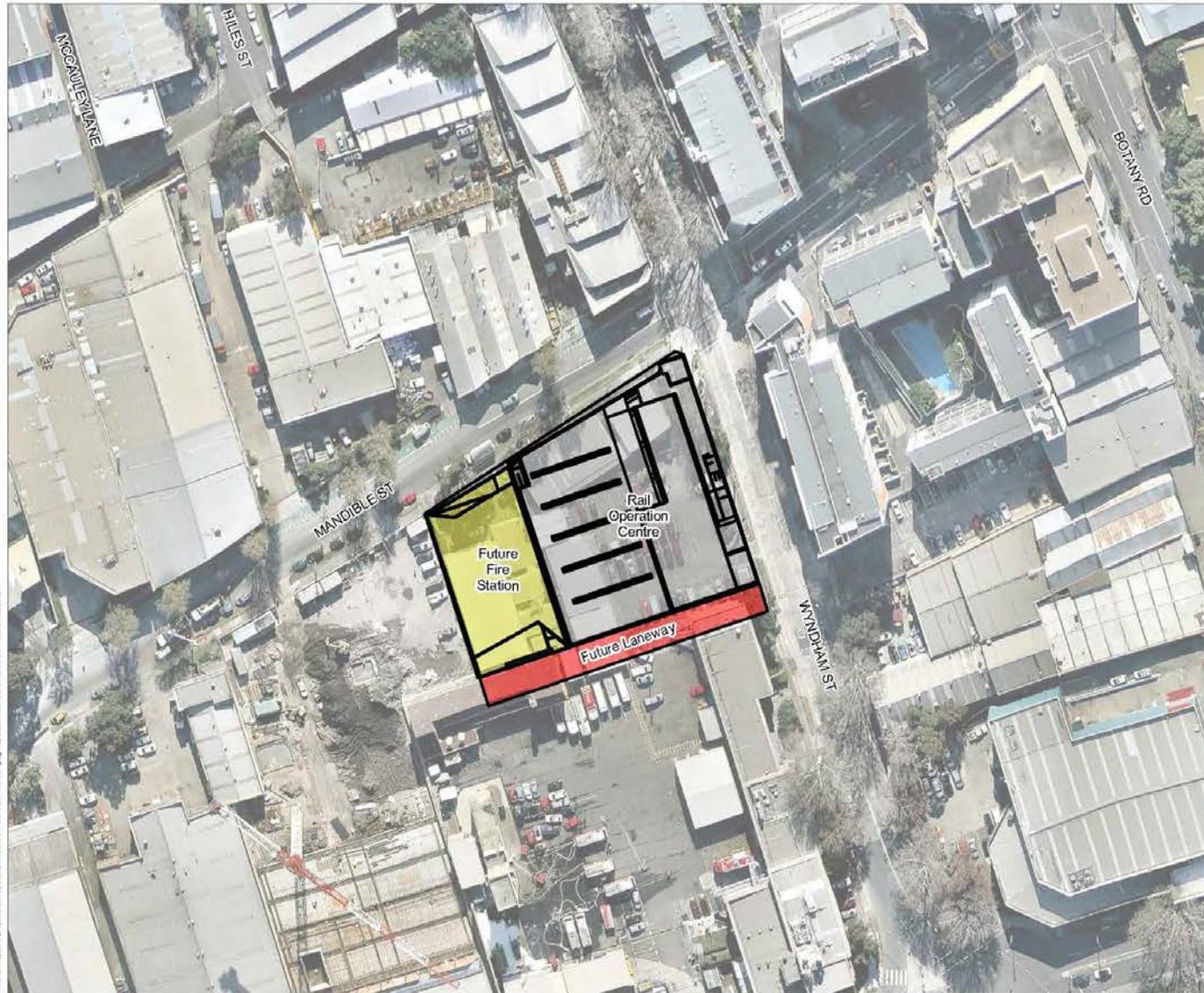
The key components of the ROC proposal are:

- The ROC is to be built across four levels, plus a plant room located on the roof
- The ROC would be operational 24 hours a day, seven days per week
- Construction and operation of the ROC building on RailCorp owned land
- Provision for a future fire station as a separate tenancy within the ground floor and first floor of the ROC building. Planning assessment and/or approval for this use and fit out would be obtained by FRNSW
- ROC stormwater management system would connect to the City of Sydney's existing stormwater management system
- ROC sewerage system would connect to Sydney Water's existing sewerage system
- Construction of a car park within the ground floor of the ROC building with entry and exit via a ramp to be provided from Mandible Street, Alexandria to the ground floor
- A separate entry for the future fire station south of the proposal from Wyndham Street, Alexandria through a future access road. The exit will be from Mandible Street
- Upgrade of existing southern footpath in Mandible Street and western footpath in Wyndham Street adjacent to the proposal
- Solid security barrier with CCTV to be provided around the perimeter of the ROC property boundary.

The key features of each level of the ROC building are provided in Table 1.

Table 1 Key features for each level of the proposed ROC building

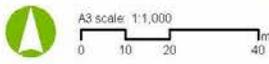
Level	Features
Ground	<p>The ground level comprises the entry area, main lobby and café area. The ground floor accommodates a total of 54 car parking spaces and various control and storage rooms. There is space for a future fire station.</p> <p>The mezzanine includes bicycle parking and end of journey facilities.</p>
Level 1	<p>Level 1 houses the main generic office spaces as well as a kitchenette, meeting rooms and amenities.</p>
Level 2	<p>Level 2 is the support and services floor, comprising additional office space, computer & UPS rooms, meeting rooms and amenities.</p>
Level 3	<p>Level 3 holds the control room and additional informal break out area..</p>
Level 4	<p>Level 4 is a mezzanine level. It houses support functions to the control room, visitor's areas and a gym and amenities.</p>
Roof	<p>The roof level houses a plant room.</p>



P:\GIS\road\3\proposals\Rail Operations Centre\ROC_Non_Visual_02_Proposal.rvt Date: 06/09/18 Author: rsm/ra



Source: Neatmap, Aurecon, RailCorp



Job No: 287572
Projection: MGA Zone 55

Rail Operations Centre **Review of Environmental Factors**

FIGURE 2: The proposal plan view



Figure 3 The ROC proposal north-easterly view

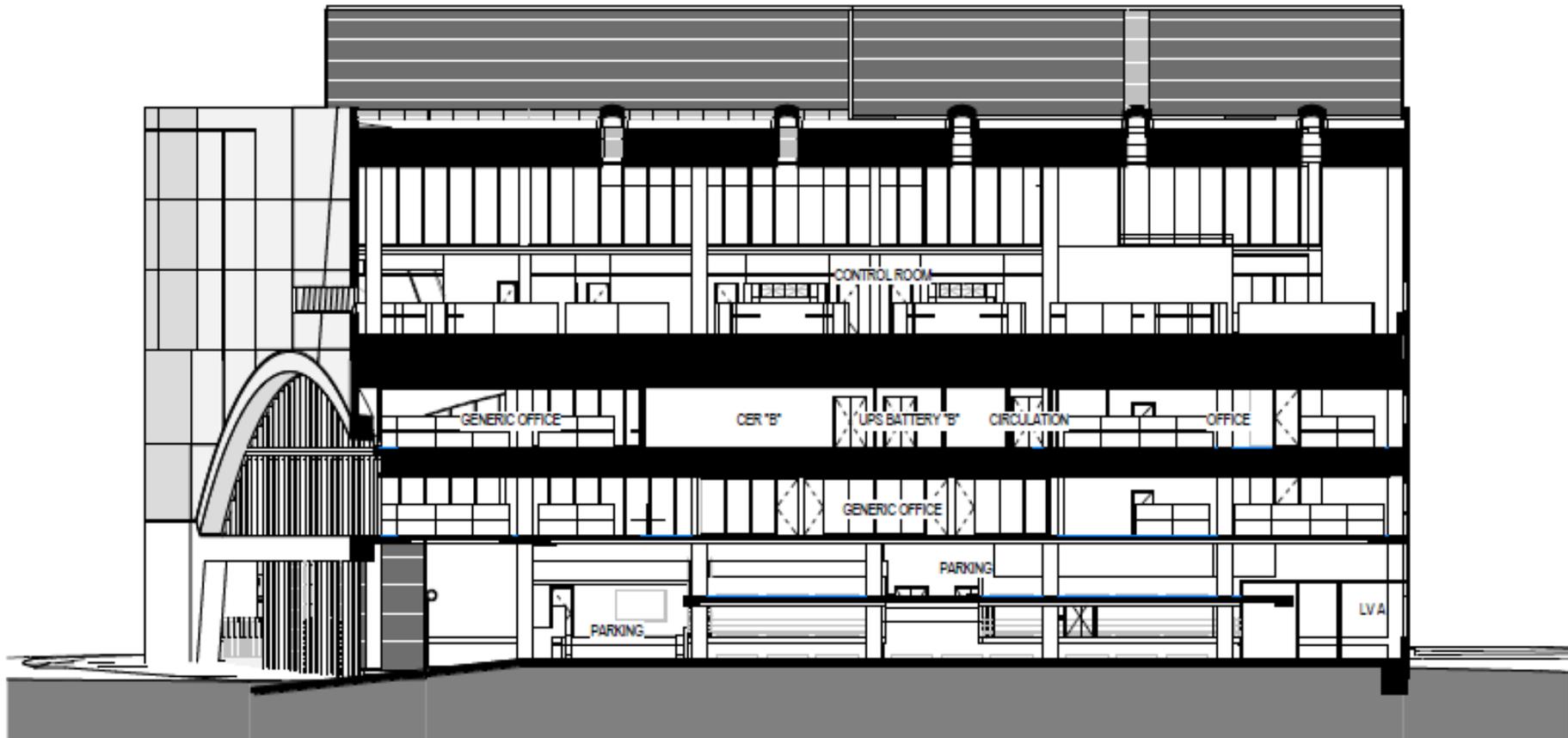


Figure 4 Westerly elevation section of the proposal

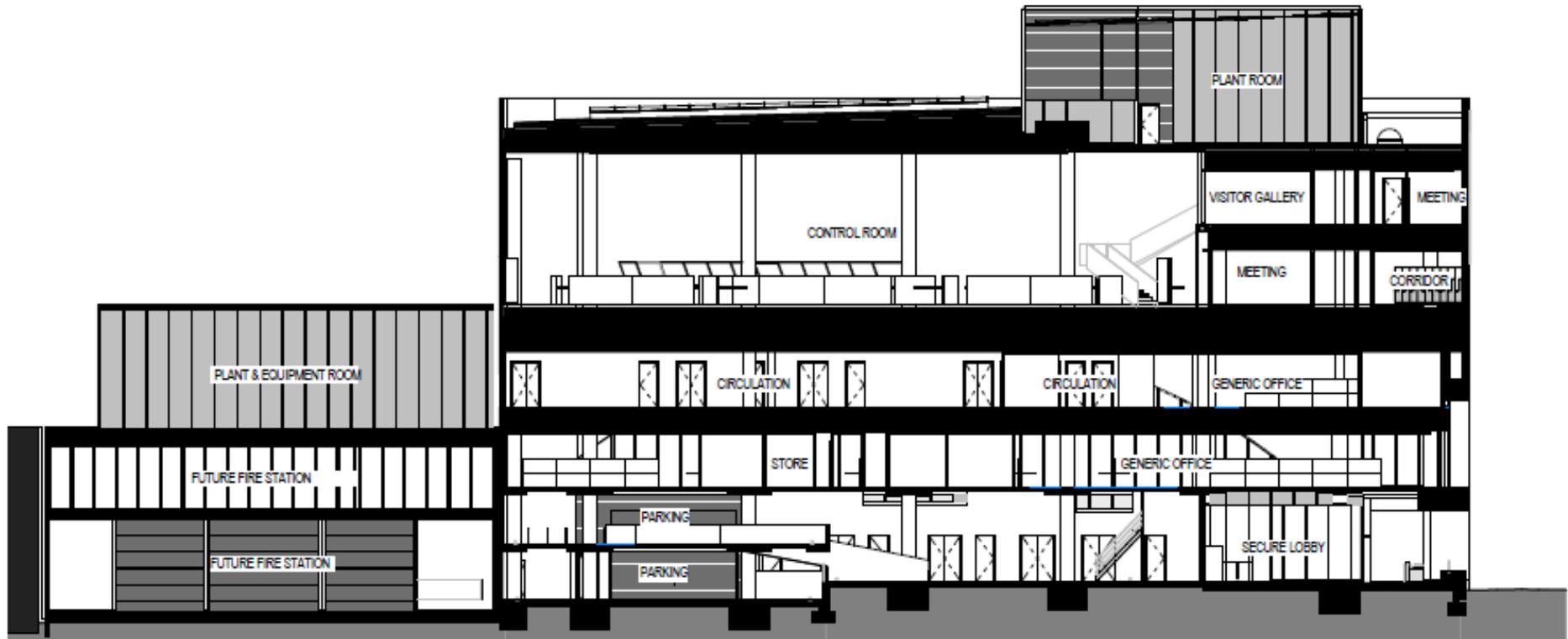


Figure 5 Southerly elevation section of the proposal

2.3 Construction methodology

It is anticipated that the main construction activities would be carried out in the following sequence, with the following indicative time frames:

- Stage 1: Install site facilities and clearing (about three months)
- Stage 2: New building (about one year)
- Stage 3: Commissioning (about three months).

An indicative outline of the work which is anticipated to be carried out in each stage is provided in sections 2.4 - 2.6 below.

2.3.1 Program

The program in Table 2 is indicative of the program dependent on the approval of the works. The construction of the proposal would be expected to take up to eighteen months.

Table 2 Indicative ROC program

Activity	Quarter 1	Quarter 2	Quarter 3	Quarter 4	Quarter 5	Quarter 6
Stage 1 Install site compounds and clearing						
Stage 2 New building						
Stage 3 Commissioning						

2.3.2 Construction working hours

The recommended standard construction working hours are as follows:

- Monday to Friday 7am to 6pm
- Saturday 8am to 1pm
- No work on Sundays or Public Holidays.

Any out of hours work would be undertaken according to the Sydney Trains environmental management system for out of hours works and would include road closures for installation of noise screening and installation of 'B' class hoarding around the perimeter of the ROC proposal at Wyndham Street and Mandible Street.

Potential interruptions to traffic movements on road sections near or at capacity, particularly during the peak periods where proposed construction activities (such as but not limited to lane closures) may impact, may have the potential to impact the throughput of traffic, consequently causing significant delays. There would be road closures for: installation of noise screening and installation of 'B' class hoarding around the perimeter of the ROC proposal at Wyndham Street and Mandible Street. These works may need to be undertaken out of hours to prevent impacting on the road network. The timing would be dependent on the road occupancy licence issued by Roads and Maritime.

Any construction works to be undertaken outside standard construction hours, would be undertaken in accordance with the Sydney Trains environmental management system.

2.3.3 Parking

About five car parking spaces would be required for construction staff parking and these would be provided in a leased office near the proposal.

2.3.4 Construction plant

Table 3 outlines the typical construction vehicles and equipment that would be required to construct the proposal at each stage. The proposal would typically require one of each item of plant listed in Table 3.

Table 3 The proposal construction plant and equipment

Construction stage	Activity	Plant and equipment
Stage 1 Install site compounds and clearing	Establish laydown and storage area, install site amenities, install site signage, demolish asphalt, decommission or disconnect existing services, install on site detention tank.	Truck Water truck Excavator Dozer Chainsaw Pipe cutting equipment Wet saw cutting machine Jack hammer Air compressor Mobile crane
Stage 2 New building	In ground services, formwork, traffic management, concrete placement, scaffolding, structural steel and roofing, façade, fit out, external works	Compactor Concrete truck Concrete pump and boom Tower crane Crawler crane Hand tools Dozer Truck Excavator Wet saw cutting machine Jack hammer Air compressor
Stage 3 Commissioning	Commissioning phase of the ROC	Truck Mobile crane

2.4 Stage 1 Install site compounds and clearing

2.4.1 Establishment of fenced laydown and storage area

A laydown/storage area would be located in the space for the future fire station (refer to Figure 4 and Figure 5) to stockpile materials and store equipment. The area would also be used for the delivery of materials and for temporary onsite parking for construction vehicles (refer to Figure 2).

Site access

Pedestrian and vehicle access to the proposal area would be primarily through the existing access point in Wyndham Street on the eastern side of the proposal (refer to Figure 13). Mandible Street would be used to access the western portion of the proposal during the construction of the space for the future Fire Station (refer to Figure 4 and Figure 5). To connect to existing services there would be a need to use the existing Mandible Street access on the northern side of the proposal. An additional security gated entrance on Wyndham Street (on the eastern side) would also be used temporarily during the stage 1 works. Existing fencing along the perimeter of Mandible Street (on the northern side), Wyndham Street and Bourke Road would be retained and used to prevent unauthorised access to the site.

2.4.2 Establishment of temporary site amenities

A site office would be established in a nearby rented office space. An additional temporary site office and toilet would be installed at the eastern end of the proposal over the new building near the Wyndham Street entrance. The future Fire Station space to be located within the proposal would be located on the western side of the proposal and would be used as temporary storage space during all stages of construction.

2.4.3 Install site signage

Standard Sydney Trains construction information signage would be installed near the Mandible Street entrance and Wyndham Street entrance of the proposal. Signage information would include the constructions hours, duration of works and incident and information contacts and phone numbers.

2.4.4 Decommission or disconnect existing services

There are a number of utility assets located under the existing asphalt surface within the proposal area that would require decommissioning or disconnection. These include:

- Stormwater pits and pipes
- Water and sewer pipes
- Communication cables
- Electricity cables.

Existing sewer and water main connections no longer required that are adjacent to Mandible Street in Lot 701 DP 713555 and Lot 2 DP 552864 would be capped and decommissioned according to Sydney Water requirements.

An Ausgrid 132kV critical cable runs through the eastern portion of Lot 701 DP713555 and Lot 2 DP552864.

Generally services would be decommissioned by disconnecting the services within existing pits.

2.4.5 Install on site detention tank

One on site detention tank that holds about 63m³ would be installed on the western perimeter of the proposal area to capture rain water from the roof once the proposal is built. This would be connected to a new pit in an existing City of Sydney stormwater pipe in Mandible Street.

2.5 Stage 2 New building

2.5.1 In ground services

Once services are installed and trenches backfilled, there would be rolling compaction and regrading of the surface. In-ground hydraulic services would be pressure tested as required. Refer to Figure 6 for the utilities.

2.5.2 Formwork

A perimeter scaffold and screens as appropriate would be erected around the building to provide edge protection during the structure phase and provide access for the installation of the façade. The formwork would be extended to the inside face of the scaffold to close any penetrations whereby a person or material could fall.

2.5.3 Traffic management

During works, traffic control management would direct vehicular and pedestrian traffic around the construction zone to ensure the safety of emergency response teams, Sydney Trains employees, construction workers including subcontractors visiting the site, and the general public.

2.5.4 Concrete placement

Concrete in-situ placement would be used to develop each slab on site. Concrete trucks would enter the site from Mandible Road. All concrete placement would be through the use of a boom and fixed line concrete pumps. This would assist with the concrete placement to vertical elements such as the lifts and stair core. Logistical plans for each concrete pour would be developed to allow the efficient docking of concrete trucks. Efficient placement of concrete would be necessary to ensure that concrete pours are maintained within standard working hours.

2.5.5 Scaffolding

A modular scaffold system would be erected around the perimeter of the building progressively as edge protection to allow the structure and facade installation activities to take place. The scaffold would generally be five boards wide. This provides sufficient access for personnel movements and façade components along the scaffold.

Stair access would be provided to the scaffolds in a combination of alloy stairs, and stretcher stairs. The location and type of each stair would be carefully considered to ensure they provide the best access points for personnel movements, materials handling and safety.

All perimeter scaffolds would be wrapped with chainwire and shade cloth to provide total encapsulation of the worksite. The shade cloth would include the Sydney Trains logo.

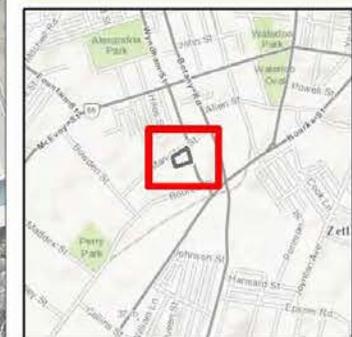


Legend

- New hydrant and sprinkler test drain sump
- New stormwater pits
- Existing stormwater pits
- New fire water
- New stormwater pipe
- Existing gas pipe
- New gas connection
- The proposal
- Cadastre



Extent map



Source: Nearamap, Aurecon, RailCorp



Job No: 247572
Project: MOA Zone 55

The perimeter scaffold would remain in place until the façade is completed and would be progressively stripped and the scaffold tie locations filled.

2.5.6 Structural steel and roofing

The major structural elements (substructure framework) would be erected with the tower crane supplemented by a small crawler crane that operates from the fourth floor within the proposed control room.

Roofing would commence immediately after installation of the structural steel to provide a weather proof environment for all the fit out works of the proposal to be undertaken by the different trades.

2.5.7 Façade

Once the substructure framework has been installed, the rain screen and cladding would be installed. The window systems would be installed immediately after the substructure framing is completed.

The cladding and louvres to the plant rooms would be erected once the major plant has been installed. Cladding to these areas would be essential to the progression of the services installation.

Scaffolds would be stripped as sections of the façade are completed and cleaned.

2.5.8 Fit out

Services within the building

As the formwork is removed and the back propping is in place, partitions would be set-out on the concrete floor and the services installation would commence. As the areas are stripped and cleared of formwork, the partitions would be set out on the concrete slabs to set out the services locations.

A first pass of aerial services would be installed in each floor, following the structure steel works. Mechanical ductwork ends would be wrapped in plastic to protect dust migration into the ducts during construction.

Partitions

Once the first pass of aerial services has been installed, framing of the full height of the internal partitions (wall framing and sheeting) would be installed, with focus on the wet areas.

The partition installation would follow the structural steel works. There would also be acoustic detailing and fire rating works.

As the partition studwork is erected any plywood blocking required for future fixings would be installed. The first sheet of plasterboard would be fixed to the partitions to enable the services installation to progress. These works would be followed with services including: hydraulics, electrical and communications. Upon verification that all services have been installed and tested, the walls would be sheeted with the second sheet of plasterboard, once again paying particular attention to acoustic detailing and wall sealing.

Once the walls have been sheeted, the ceilings and accessible floor areas would be progressed. If in-floor services are to be reticulated in floor areas, the access floor pedestal grid would be set-out. This allows services to follow, avoiding clashes. Once the services have been installed in the floor space, the floor area would be progressively cleaned. The ceiling services would follow a similar installation sequence.

A detailed inspection and clean as deemed necessary, of services including acoustic and fire rating details would be completed prior to the closing up of ceilings or floors.

Once the ceiling has been lined, set and sanded, the services would be cut out in preparation for painting and services fit out. Floor boxes would be installed for future workstations.

Wet areas

Contemporary toilet partitioning system constructed with lining would be installed. Plywood blocking would be installed within the metal stud work and ceiling grid for mounted items such as basins, guard rails and shower curtains. Fit out of services would occur once the wall and floor finishes are completed.

Floor finishes

A floor topping exercise would be applied to the concrete floors. The floor finishes would be applied progressively, focusing firstly on areas where a longer fit out duration is required. As areas are completed, protection would be applied to the floors.

Plant Rooms

Reinforced concrete hobs/plinths would be provided for all major plant. The plinths/hobs would be waterproofed prior to the placement of the plant. Once the plantrooms have been fit out the remainder of the waterproofing would be completed.

Fit out

Services installation would follow the initial paint of the ceilings and walls. Once the services have been installed, ceilings and wall finishes would be touched up.

Dust covers would remain on the smoke detectors, until final commissioning and fire tests are completed.

Fixed Furniture and Equipment

Fixed furniture and equipment would be installed manually throughout the building.

2.5.9 External works

Soft landscaping works would be undertaken once all the building works are completed.

The works would be staged to ensure access is maintained to the main entry and other critical points.

Upon completion of the external works surrounding the new main building, the perimeter fences would be removed.

2.6 Stage 3 Commissioning

This stage of works would consist of demobilisation of temporary construction plant, equipment and temporary site amenities. All debris and dust would be removed from the building. All the perimeter scaffolding would be dismantled.

There would also be testing and commissioning undertaken of all services at all locations.

2.7 Alternatives considered

2.7.1 The 'do nothing' option

The 'do nothing' option involves not undertaking the proposal. Under this option rail operations would continue to be run consistent with the current system. This would mean the benefits and objectives listed in Section 2.1 would not be realised. This option is not considered acceptable as it would result in continual delays for customers and ineffective management and service function for rail business units.

2.7.2 Alternative options

Four design options were investigated as shown in Figure 7. These were:

- Option 1 – The DJRD architect's option has a façade of vertical terracotta baguettes of varying depths and colour to represent the sleeper screen horizontal edge bands (tracks) between the floor levels. The structural modulation on the lower floors and the lightweight truss structure to the fourth floor provided column free control operations. The concrete barrier walls around the mezzanine room provided employees with unobstructed visual access to the operational activities (refer to Figure 7).
- Option 2 – The SJB architect's option has a feature roof structure including copper sheeting, primary and secondary steel trusses. The control room has a curved perforated copper clad façade around the third floor and fourth floor, including copper cladding to Level 3 that expand over the lower floors. The building form consists of angular shapes in the lower floors. External green spaces are included within the secure zones of the building. There are also internal gardens in the first floor that is open to the sky and the weather. The roof of the control room has a series of skylights (refer to Figure 7).
- Option 3 – The NM architect's option has a metal-clad scalloped façade. There is a large balcony and terrace in the top floor (refer to Figure 7). The building base is solid with precast concrete walls. Internally there is a combination of rectangular and arched openings. The foyer has an extruded arch reminiscent of those grand railway halls.
- Option 4 – The Smart Design architect's option is a simple, modern, flexible warehouse-like office space. The building is an inverted pyramid building supported by red brick arches on the street facades. A regular structural grid rises through the building to support a truss roof, which spans from the grid perimeter. Referencing not only the colours and natural formations characterising the Australian landscape but also the stations and bridges of the Sydney Trains network. Beneath the protective canopy of the arches there is the entrance "portico" that provides all-weather building access and on the first floor there is a broad north-facing landscaped terrace for all of the building's employees to gather. The southern length of the building is occupied by a tiered brick stair within a full height void. This spine is both artery and square as it connects each of the functions of the ROC. The stair's landings are activated by breakout spaces for meeting, reviewing and interacting, whilst the high space above floods the interior with natural light (refer to Figure 7).

The public can rise up through the full height void, via glass lifts, dignitaries or schoolchildren to view the proposal operations from a dedicated point overlooking the ROC and then descend through the remainder of the facility along the stairs. The building's main street will be populated with items salvaged from Sydney's train network operations, photographs and diagrams.

An assessment of the four design options was undertaken by Sydney Trains and Jacobs shown in Table 4.

Table 4 Assessment of options

Objectives of the proposal	Option 1 DJRD	Option 2 SJB	Option 3 NM	Option 4 Smart Design
Reduce delay times and improve confidence in rail functions	X	✓	X	✓
More effective management of service disruption	X	X	X	✓
Faster incident resolution and service recovery	X	✓	X	✓
Foster a culture of collaboration and efficient coordination	X	✓	✓	✓



DARYL JACKSON ROBIN DYKE



NEESON MURCUTT ARCHITECTS



SJB ARCHITECTS



SMART DESIGN STUDIO

Figure 7 Design options

2.7.3 Preferred option

The preferred option incorporates the following benefits:

- Addresses the strategic need and objectives of the proposal
- Responds to the urban context and public amenity
- Provides an innovative interpretation of the brief as it meets functional requirements, such as car parking
- Demonstrates character of the proposal as a piece of critical transport infrastructure
- Promotes amenity of the proposal as a modern 24/7 workplace
- Integrates ecologically sustainable design.

2.8 Justification of preferred option

Option four was chosen as the preferred option and is the subject of this REF.

The chosen option 'the proposal' was the only option that met all the objectives of the proposal (refer to Table 4).

3 Statutory requirements

3.1 State environmental planning policies

3.1.1 State Environmental Planning Policy (Infrastructure) 2007

The Infrastructure SEPP (ISEPP) aims to assist in the effective delivery of public infrastructure across the State by improving certainty and regulatory efficiency through consistent planning assessment and approvals regime for public infrastructure and services and through the clear definition of environmental assessment and approval process for public infrastructure and services facilities.

Clause 79 of the ISEPP relevantly states that development for the purposes of "rail infrastructure facilities" may be carried out by or on behalf of a "public authority" without development consent on any land.

Clause 78 of the ISEPP defines the term "*rail infrastructure facilities*" as follows:

"rail infrastructure facilities include:

- (a) *railway tracks, associated track structures, cuttings, drainage systems, fences, tunnels, ventilation shafts, emergency accessways, bridges, embankments, level crossings and roads, pedestrian and cycleway facilities, and*
- (b) *signalling, train control, communication and security systems, and*
- (c) *power supply (including overhead power supply) systems, and*
- (d) *railway stations, station platforms and areas in a station complex that commuters use to get access to the platforms, and*
- (e) *public amenities for commuters, and*
- (f) *associated public transport facilities for railway stations, and*
- (g) *maintenance, repair and stabling facilities for rolling stock, and*
- (h) *refuelling depots, garages, maintenance facilities and storage facilities that are for the purposes of a railway, and*
- (i) *railway workers' facilities, and*
- (j) *rail freight terminals, sidings and freight intermodal facilities,*

The proposal is a '*rail infrastructure facility*' because it is development for the purposes of '*signalling, train control, communication and security systems*'.

The proposal can be classified as being for the purposes of rail infrastructure facilities under the ISEPP. Both Sydney Trains and RailCorp are 'public authorities' under the ISEPP.

As the proposal is for rail infrastructure facilities and is to be carried out by Sydney Trains for and on behalf of RailCorp, it is permissible without consent under clause 79 of the ISEPP. Accordingly, it will be considered under Part 5 of the EP&A Act. Development consent from the council is not required. The requirements of Part 5 of the EP&A Act are discussed in Section 3.3.1.

Part 2 of the ISEPP contains provision for public authorities to consult with local councils and other agencies prior to the commencement of development, as described in Section 4.1.

3.1.2 Other environmental planning instruments

The section below considers the terms of relevant instruments, to the extent they may be relevant, as well as the way in which the proposal addresses those instruments.

State Environmental Planning Policy No. 14 – Coastal Wetlands

The proposal is not located within an area covered by the SEPP and therefore no further consideration of SEPP 14 is necessary.

State Environmental Planning Policy No. 19 – Bushland in Urban Areas

This SEPP protects and preserves bushland within certain urban areas, as part of the natural heritage or for recreational, educational and scientific purposes. City of Sydney local government area (LGA) is listed in Schedule 1 as an area where bushland needs to be preserved. This SEPP defines “bushland” as follows: “bushland means land on which there is vegetation which is either a remainder of the natural vegetation of the land or, if altered, is still representative of the structure and floristics of the natural vegetation.”

There is no vegetation to be removed for the proposal. Therefore, no further consideration of this SEPP is required.

State Environmental Planning Policy No. 26 – Littoral Rainforests

The proposal is not located within an area covered by this SEPP and no further consideration of SEPP 26 is required.

State Environmental Planning Policy No. 44 – Koala Habitat Protection

The proposal is not located within an area covered by this SEPP and no further consideration of SEPP 44 is required.

State Environmental Planning Policy No. 55 – Remediation of Land

SEPP 55 provides for a consistent state-wide planning approach to the remediation of contaminated land. The policy states that land must not be developed if it is unsuitable for a proposed use because it is contaminated. If the land is unsuitable, remediation must take place before the land is developed.

A contamination report has been prepared for the ROC site.

Although not related to SEPP55, any spoil removed from site would be disposed of in accordance with the EPA's Waste Classification Guidelines (EPA 2014). Any risk of accidental human contact with contaminated material would be managed through the implementation of control measures discussed in Section 5.8.

State Environmental Planning Policy No. 71 – Coastal Protection

The proposal is not located within an area covered by this SEPP and no further consideration of SEPP 71 is required.

State Environmental Planning Policy (Major Development) 2005

This SEPP identifies certain developments that are deemed major proposals. The proposal is not listed in this SEPP and no further consideration of this SEPP is required.

State Environmental Planning Policy (State and Regional Development) 2011

The proposal is not listed in the SEPP and has not been declared as State Significant Infrastructure or State Significant Development under the SEPP.

State Environmental Planning Policy (Sydney Drinking Water Catchment) 2011

The proposal is not located within the Sydney Drinking Water Catchment and as such this SEPP does not apply to the proposal.

3.2 Local environmental plans

The proposal is within the City of Sydney City Council area and is governed by Sydney Local Environment Plan 2012 (LEP 2012). The site falls within the Business Park (B7) zone identified in the City of Sydney Council Land Zoning Sheet Map 11 and 18.

The works proposed are permissible with development consent in this zone. However, under clause 78 of the ISEPP, the proposal is considered development for the purposes of rail infrastructure facilities. ISEPP allows Sydney Trains to undertake this type of development without development consent from City of Sydney Council.

For the purposes of these works, Sydney Trains is the proponent and the determining authority for the proposal and is required to prepare a REF under Part 5 of the EP&A Act. The LEP's requirements for development consent will not apply, including the requirements of the Sydney LEP identified in Table 5.

A summary of the LEP provisions and the way in which the proposal relates to them has nevertheless been included in this REF.

Table 5 Sydney Local Environment Plan 2012 requirements

LEP Part/Clause	Comment	Comparison with ROC
<p>Part 2 – Land use Zone B7 – Business Park (1) Objectives of zone:</p> <ul style="list-style-type: none"> • To provide a range of office and light industrial uses. • To encourage employment opportunities. • To enable other land uses that provide facilities or services to meet the day to day needs of workers in the area. • To ensure uses support the viability of nearby centres. <p>(2) Permitted without consent: Nil</p> <p>(3) Permitted with consent: Agricultural produce industries; Child care centres; Food and drink premises; Garden centres; Hardware and building supplies; Horticulture; Hotel or motel accommodation; Kiosks; Light industries; Markets; Neighbourhood shops; Office premises; Passenger transport facilities; Plant nurseries; Respite day care centres; Roads; Shops; Warehouse or distribution centres; Any other development not specified in item 2 or 4.</p> <p>The Sydney Local Environment Plan 2012 Dictionary defines Office premises as below: Office premises means a building or place used for the purpose of administrative, clerical, technical, professional or similar activities that do not include dealing with members of the public at the building or place on a direct and regular basis, except where such dealing is a minor activity (by appointment) that is ancillary to the main purpose for which the building or place is used.</p>	<p>The proposal is development for the purposes of rail infrastructure facilities under the ISEPP. Accordingly, the permissibility provisions of LEP 2012 do not apply.</p>	<p>N/A</p>
<p>Part 4: Clause 4.3 – Height of buildings Clause 4.3(2) of Part 4 of the LEP states that the height of a building on any land is not to exceed the maximum height shown for the land on the Height of Buildings Map.</p>	<p>The maximum allowable height of buildings map for the proposal is 35 metres, as shown on City of Sydney Council LEP Sheet HOB_010.</p> <p>The proposal is proposed to reach a height of 31.2 metres, inclusive of roof level plant infrastructure.</p>	<p>Consistent</p>

LEP Part/Clause	Comment	Comparison with ROC
<p>Part 4: Clause 4.4 – Floor Space Ratio</p> <p>Clause 4.4(2) of Part 4 of the LEP states that the maximum floor space ratio (FSR) for a building is not to exceed the FSR shown for the land on the FSR Map, as detailed below:</p> <ul style="list-style-type: none"> • The floor space ratio of buildings on a site is the ratio of the gross floor area of all buildings within the site to the site area. • Gross floor area means the sum of the floor area of each floor of a building measured from the internal face of external walls, or from the internal face of walls separating the building from any other building, measured at a height of 1.4 metres above the floor, and includes: <ul style="list-style-type: none"> (a) the area of a mezzanine, and (b) habitable rooms in a basement or an attic, and (c) any shop, auditorium, cinema, and the like, in a basement or attic, <p>but excludes:</p> <ul style="list-style-type: none"> (d) any area for common vertical circulation, such as lifts and stairs, and (e) any basement: <ul style="list-style-type: none"> (i) storage, and (ii) vehicular access, loading areas, garbage and services, and (f) plant rooms, lift towers and other areas used exclusively for mechanical services or ducting, and (g) car parking to meet any requirements of the consent authority (including access to that car parking), and (h) any space used for the loading or unloading of goods (including access to it), and (i) terraces and balconies with outer walls less than 1.4 metres high, and (j) voids above a floor at the level of a storey or storey above. 	<p>The maximum FSR for the proposal is 2:1, as shown on City of Sydney Council LEP Sheet FSR_010.</p> <p>The proposal currently has a FSR of 2.48:1.</p>	<p>The gross floor area is 9,994.9m² and the FSR is 2.48:1. The maximum FSR has been exceeded as it includes plant rooms etc. The FSR will be further refined during detailed design. The FSR for the proposal would be close to the maximum FSR of about 2:1.</p>

LEP Part/Clause	Comment	Comparison with ROC
<p>Clause 5.3 – Development near zone boundaries</p> <p>The adjoining zone of the proposal is classified as Mixed Use (B4). The objectives of this zone is:</p> <ul style="list-style-type: none"> • To provide a mixture of compatible land uses. • To integrate suitable business, office, residential, retail and other development in accessible locations so as to maximise public transport patronage and encourage walking and cycling. <p>To ensure uses support the viability of centres.</p>	<p>The intent of this clause is to provide flexibility where the investigation of a site and its surroundings reveals that a use allowed on the other side of a zone boundary would enable a more logical and appropriate development of the site and be compatible with the planning objectives and land uses for the adjoining zone.</p> <p>The proposal is sympathetic and aligned with the intent of the adjoining zone and therefore is considered to be compliant.</p>	<p>Consistent</p>
<p>Part 5: Clause 5.10 – Heritage Conservation</p> <p>Clause 5.10 of Part 5 of the LEP sets out the requirements for the consideration of potential impacts on heritage items and conservation areas.</p>	<p>The proposal is not located within a conservation area and does not contain listed heritage items.</p>	<p>Consistent</p>
<p>Part 7: Clause 7.15 – Flood Planning</p> <p>(3) Development consent must not be granted to development on land to which this clause applies unless the consent authority is satisfied that the development:</p> <p>(a) is compatible with the flood hazard of the land, and</p> <p>(b) is not likely to significantly adversely affect flood behaviour resulting in detrimental increases in the potential flood affectation of other development or properties, and</p> <p>(c) incorporates appropriate measures to manage risk to life from flood, and is not likely to significantly adversely affect the environment or cause avoidable erosion, siltation, destruction of riparian vegetation or a reduction in the stability of river banks or watercourses, and is not likely to result in unsustainable social and economic costs to the community as a consequence of flooding.</p>	<p>Adopted design/flood levels in the proposal:</p> <ul style="list-style-type: none"> • Lobby – RL 11.20m above the PMF flood level • Electrical rooms and access road from Mandible Street – RL 10.2m above the PMF flood level • Fire Station – RL 9.25m above the AEP flood level <p>As per the ROC flood assessment report (refer to Appendix D) the flood planning levels for the main ROC building have been set at RL=11.2 metre and 10.2 metre which are above the PMF flood along Wyndham St and Mandible St. These levels are consistent with Council's floodplain management requirements.</p>	<p>The Future Fire Station flood planning level at RL=9.25 metre does not comply with Council's flood plain management and is lower than the PMF (probably maximum flood). The flood planning level adopted for the Fire Station is the one per cent AEP plus 500 millimetres. Access or entry during a flood event is restricted by both Mandible Street and Wyndham Streets as the roads were previously designed to be lower than the one per cent AEP storm event.</p>

3.3 NSW State legislation

3.3.1 *Environment Planning and Assessment Act 1979*

In NSW, the EP&A Act and the EP&A Regulation regulate the majority of planning and environmental impact assessment requirements. Under Section 111 of the EP&A Act, Sydney Trains is required to examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of its activities.

Clause 228 of the EP&A Regulation identifies factors to be considered by Sydney Trains in order to assess the likely impacts of the proposal on the natural and built environment in producing the REF. Clause 228 factors are considered in Section 6.1.

3.3.2 *Other relevant state legislation*

Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) is the primary piece of legislation which aims to protect, restore and enhance the quality of the environment in NSW. It is administered by the NSW Environment Protection Authority (EPA) and provides a mechanism for licensing of certain activities that have the potential to cause environmental harm (Scheduled Activities) listed under Schedule 1.

Railway system activities are listed as Scheduled Activity under clause 33 of Schedule 1. However, this clause does not apply to the Rail Operations Centre. Therefore, the proposal is not a Scheduled Activity within the meaning of the POEO Act and would not require an EPL. Sydney Trains holds an EPL (number 12208) for the carrying out of Railway Systems Activities. NSW EPA have advised that as Sydney Trains is a public authority, the EPA would be the appropriate regulatory authority under the POEO Act for the activity (Refer to Table 10).

Electricity Supply Act 1995

The *Electricity Supply Act 1995 and Electricity Supply (General) Regulation 2001* set out certain notification and procedural requirements in relation to excavation. Section 63Z provides:

(1) A person must not commence to carry out excavation work to which this section applies, or authorise such excavation work to be commenced, unless the person has first:

(a) contacted the designated information provider and requested information as to the location and type of any underground electricity power lines in the vicinity of the proposed work, and

(b) complied with any reasonable procedures of the designated information provider as to the manner of contacting the designated information provider and the information to be provided by the person in connection with the person's request for information, and

(c) allowed a reasonable period for the requested information to be provided.

Clause 104B of the *Electricity Supply (General) Regulation 2001* provides:

(1) Work of the following kind that is carried out within the distribution district of a distribution network service provider is excavation work to which section 63Z of the Act applies.

(b) excavation that is, or is carried out in connection with, an activity within the meaning of Part 5 of the Environment Planning and Assessment Act 1979.

Consultation with the relevant service provider would occur in accordance with these provisions.

Contaminated Land Management Act 1997 (CLM Act)

The CLM Act establishes requirements and a process for reporting contamination of land which meets prescribed criteria, and for investigating and remediating land where the EPA decides whether the contamination is significant enough to warrant regulation. It applies to contamination which occurred before or after its commencement.

Sydney Trains must consider contamination caused by past activities (including rail activities) and potential contamination from spills and leaks in developing and managing land. Potential impacts from contamination are discussed in Section 5.8.

A contamination report has been prepared for the proposal (refer to Appendix A).

Although not regulated by the CLM Act, any spoil removed from site would be disposed of in accordance with the EPA's Waste Classification Guidelines (2014). Any risk of accidental human contact with contaminated material would be managed through the implementation of control measures discussed in Section 5.8.

Heritage Act 1977

The *Heritage Act 1977* (Heritage Act) aims to protect and preserve items of non-Aboriginal heritage significance. The Heritage Act provides for the protection of items of local, regional and State heritage significance. It establishes a list of State Heritage Items and outlines processes for approval of development which may impact items of non-Aboriginal heritage significance.

Section 57(1) of the Heritage Act lists the types of activities/works that require approval from the Heritage Council when working on/in an item/place listed on the State Heritage Register. An application for an exemption can also be made under some circumstances.

Approval from the Heritage Council is also required under Section 139 of the *Heritage Act* prior to the disturbance or excavation of land if a proposal would, or is likely to result in, a relic being discovered, exposed, moved, damaged or destroyed.

Section 170 also requires Government agencies to maintain registers of heritage places and items which they own or occupy, and to manage those places and items.

No items listed on the NSW State Heritage Register or any Government Agency s170 Heritage Register would be impacted by the proposal.

National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974* (NPW Act) provides for the care, control and management of all national parks, historic sites, nature reserves, reserves, Aboriginal areas and state game reserves. The NP&W Act outlines approval requirements for works in the vicinity of indigenous archaeological sites and provides for the protection of flora and fauna.

The excavating, moving or exhibiting of Aboriginal objects requires a permit under Section 90 of the NPW Act. The harming or desecrating of Aboriginal objects or places is an offence under Section 86 of the NPW Act. Under Section 90, an Aboriginal heritage impact permit may be issued in relation to a specified Aboriginal object, Aboriginal place, land, activity or person or specified types or classes of Aboriginal objects, Aboriginal places, land, activities or people.

An Aboriginal Heritage Information Management System (AHIMS) search was conducted on 3 December 2015 (OEH, 2015) for the proposal which included a two hundred metre search buffer. No Aboriginal sites or places were declared in or near the proposal. In addition, the highly disturbed nature of the proposal means that it is highly unlikely that there are any such objects or places, unless they are unknown and are beneath the surface of the sites.

Therefore, Section 90 of the NPW Act does not apply unless Aboriginal heritage items are

unearthed during construction. Should any Aboriginal heritage items be found all work would stop on site and an Aboriginal Heritage Consultant would be contacted.

All native birds, reptiles, amphibians and mammals, except the dingo, are protected in NSW under the NPW Act. The harming of protected fauna is prohibited under the NPW Act; however, an exemption applies in relation to activities that are essential to the carrying out of an activity to which Part 5 of the EP&A Act applies and where the Determining Authority (ie. in this case, Sydney Trains on behalf of RailCorp, as the public authority carrying out the proposal) has complied with the provisions of Part 5 of the EP&A Act.

The proposal is not expected to impact upon native fauna. The potential impacts to native fauna are assessed in Section 5.5.

Roads Act 1993

The NSW *Roads Act 1993* is administered by either the Roads and Maritime, local government or the Land and Property Management Authority. Roads and Maritime has jurisdiction over major roads, whilst local government has jurisdiction over minor roads, and the Department of Primary Industries – Land, over Crown roads.

Under Section 138 of the *Roads Act 1993*, a person must not “erect a structure or carry out work in, on or over a public road, or dig up or disturb the surface of a public road...” other than with the consent of the appropriate roads authority. However, clause 5(1) in Schedule 2 of the Act states that public authorities do not require consent for works on unclassified roads.

There will be works undertaken on the driveways and footpaths of both Mandible Street and Wyndham Street adjacent to the proposal. The stormwater management system would connect to the City of Sydney’s existing stormwater management system. There will be digging works within Mandible Street for the installation of the stormwater pipe requiring road closures.

Mandible Street, Alexandria is a local road which is owned and maintained by the City of Sydney Council. As such notification to Roads and Maritime is not required for the proposal. A Section 138 Application will be required for consent of works and structures within the road reserve of Mandible Street.

Wyndham Street is a regional road which has been classified under the *Roads Act 1993* and is therefore managed by Roads and Maritime. As such, consultation with Roads and Maritime has been undertaken for the proposal. A Section 138 Application will be required for consent of works & structures within the road reserve of Wyndham Street.

Threatened Species Conservation Act 1995

The *Threatened Species Conservation Act 1995* (TSC Act) is administered by the NSW Office of Environment and Heritage (OEH) and aims to conserve biological diversity by protecting and encouraging the conservation of threatened species, populations and ecological communities and their critical habitats.

A NSW Wildlife Atlas search for threatened species was conducted on 3 December 2015 within a ten kilometre radius (OEH, 2015). The search identified the closest threatened species located about 500 metres from the proposal, and as such, would not be affected by the proposal.

Although threatened species do occur within a five kilometre radius of the proposal, due to the disturbed nature of the site being primarily cleared there is no suitable habitat for any of the threatened species, and therefore the activity described in the REF would not significantly affect any threatened species, populations or ecological communities or their habitats. Therefore, a species impact statement is not required.

Native Vegetation Act 2003

The *Native Vegetation Act 2003* (NV Act) manages the clearing of native vegetation in NSW. Section 25(g) of the NV Act provides that any clearing under 0.1 ha is permissible without consent under Part 5 of the EP&A Act and does not require approval under the Act. Given that the proposal would be determined under Part 5, approval under the NV Act is not required.

Sydney Water Act 1994

Sydney Water Act 1994 Section 78 requires Sydney Water to be notified when a proposal can affect the delivery of its services. The *Sydney Water Act 1994* Section 73 specifies when a Section 73, Compliance Certificate is required when connecting to Sydney Water assets. However the proposal does need to connect to Sydney Water’s existing sewer and water pipes in Mandible Street and as such the proposal does require a Section 73 Compliance Certificate.

An application for a Section 73 Compliance Certificate would be submitted to Sydney Water for approval.

3.4 Commonwealth legislation

3.4.1 Environment Protection and Biodiversity Conservation Act 1999

Matters of National Environmental Significance (MNES) are protected under the EPBC Act and Sydney Trains must not take an action that has, would have or is likely to have a significant impact on any of the matters of MNES without approval from the Commonwealth Minister for the Environment. An action is a proposal or project, a development, an undertaking, an activity or a series of activities, or an alteration of any of these things.

A search of the EPBC Protected Matters Search Tool database was undertaken for the proposal area on 31 August 2016 (refer to Appendix B). The results of the search within a 500 metre radius are presented in Table 6.

Table 6 Matters of National Environmental Significance search results

MNES	Identified in search (500 metre radius)
World Heritage Properties	None
National Heritage Places	None
Wetlands of International Significance	None
Great Barrier Reef Marine Park	None
Commonwealth Marine Areas	None
Threatened Ecological Communities	1
Threatened Species	20
Migratory Species	13

All EPBC species were classified as unlikely or very unlikely to occur in the region (refer to Section 5.5) It is therefore unlikely that the development would significantly effect MNES and so no approval is required.

3.4.2 Other relevant commonwealth legislation

No other Commonwealth legislation is applicable to the proposal.

3.5 Ecologically sustainable development

Ecologically sustainable development (ESD) entails using, conserving and enhancing the community's environmental resources in a manner that sustains and improves ecological processes, and hence the quality of life, for present and future generations.

Section 5(2)(e) of the *Transport Administration Act 1988* states that an objective of Sydney Trains is that where its activities affect the environment, it must conduct its operations in compliance with the principles of ESD contained in Section 6(2) of the *Protection of the Environment Administration Act 1991*.

Section 6(2) of the *Protection of the Environment Administration Act 1991* requires compliance with the following four principles of ESD, where an activity affects the environment.

1. **The precautionary principle:** For example, if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.
2. **Inter-generational equity: The present generation should** ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations.
3. **Conservation of biological diversity and ecological integrity** should be a fundamental consideration of the decision to undertake the activity.
4. **Improved valuation, pricing and incentive mechanisms:** For example, the users of goods and services should pay prices that include the use of natural resources and assets and the ultimate disposal of any waste generated by the provision of that good or service, and that environmental goals, having been established, should be pursued in the most cost effective way.

Sydney Trains is committed to ensuring that its proposals are consistent with the principles of ecologically sustainable development. The principles of ESD have therefore been an integral consideration in the proposal. Table 7 outlines the how the principles of ESD have been applied to the proposal.

Table 7 Principles of ecologically sustainable development applied to the proposal

ESD principle	Application to the proposal
Precautionary principle	The proposal poses a minimal risk of serious or irreversible environmental damage. Measures to reduce adverse impacts as far as practicable have been identified within this REF.
Intergenerational equity	The proposal is expected to contribute towards regional strategic benefits for future generations by ensuring safer and more effective transport throughout the greater Sydney region.
Conservation of biological diversity and ecological integrity	This REF includes an assessment of the clause 228 EP&A Regulation factors (refer to Section 6.1) that broadly consider biological diversity and ecological integrity of the proposal area. Control measures recommended within this REF would reduce the loss of biodiversity.
Improved valuation and pricing of environmental resources	This REF has identified control measures for areas that may result in an adverse impact. The implementation of these control measures would result in an economic cost to the NSW Government. Likewise the proposal has been designed with consideration to the Transport for NSW Sustainable Design Guidelines Version 3 (TfNSW, 2013), which has identified measures to minimise long term costs, such as costs associated with energy consumption (refer to Appendix C).

3.6 Licences, approvals and permits

The proposal does not constitute "*railway systems activities*", and therefore no environment protection licence is required. However, NSW EPA have advised that because Sydney Trains is a public authority, the EPA would be the appropriate regulatory authority for other matters under the POEO Act.

Reference to Section 78 of the *Sydney Water Act 1994* requires Sydney Water to be notified when a proposal can affect the delivery of its services. Development types that do not require a Section 73 Compliance Certificate include non-habitable garages, sheds or outbuildings. The proposal would connect to Sydney Water's existing sewer and water pipes in Mandible Street and as such the proposal requires a Section 73 Compliance Certificate.

The relevant licences, approvals and permits are provided in Table 8 .

3.7 Summary of statutory requirements

Table 8 summarises the statutory requirements for the proposal.

Table 8 Statutory requirements relevant to the proposal

Aspect	Legislation	Section/Clause	Approval authority	Comment
Planning Pathway	EP&A Act	Part 5	Sydney Trains	Sydney Trains, on behalf of RailCorp, is the Proponent and Determining Authority for the proposal
	ISEPP	Division 15, clause 79	Sydney Trains	Railway Infrastructure
Compliance	<i>Sydney Water Act</i>	Section 73	Sydney Water	Connection to Sydney Water sewer and water pipes
Road occupancy licence	<i>Roads Act 1993</i>	Section 138	Roads and Maritime Services	Removal of driveway in Wyndham Street will require road closures.
Road occupancy licence	<i>Roads Act 1993</i>	Section 138	City do Sydney	Removal/installation of driveway and installation of of the stormwater pipe in Mandible Street will require road closure.

No other licences, approvals or permits would be required for the proposal.

4 Consultation

4.1 Infrastructure ISEPP consultation

The ISEPP contains provisions for public authorities such as Sydney Trains to consult with local councils and other public authorities prior to the commencement of certain types of development. Sydney Trains must take into consideration any responses received within twenty-one days after notification.

A summary of the ISEPP consultation requirements is detailed in Table 9.

Table 9 Summary of ISEPP consultation

<i>Is consultation with council or other agencies required under clauses 13-15 of the ISEPP?</i>	
Are the works likely to have a substantial impact on the stormwater management services which are provided by council?	No The proposal would connect to the City of Sydney's existing stormwater management system in Mandible Street. The proposal would not result in a substantial impact on the stormwater management services provided by City of Sydney Council. Nonetheless City of Sydney Council has been notified.
Are the works likely to generate traffic to an extent that will strain the existing road system in a local government area?	No The proposal would be confined to the existing site and would generate adverse short term traffic movement on the existing road system.
Will the works involve connection to a council owned sewerage system? If so, will this connection have a substantial impact on the capacity of the system?	No The proposal would connect to Sydney Water's existing sewerage network. A Section 73 Compliance Certificate would be obtained from Sydney Water. The proposal would not impact on sewerage services provided by City of Sydney Council.
Will the works involve connection to a council owned water supply system? If so, will this require the use of a substantial volume of water?	No The proposal would connect to Sydney Water's existing potable water supply network. A Section 73 Compliance Certificate would be obtained from Sydney Water. The proposal would not impact on potable water services provided by City of Sydney Council.
Will the works involve the installation of a temporary structure on, or the enclosing of, a public place which is under local council management or control? If so, will this cause more than a minor or inconsequential disruption to pedestrian or vehicular flow?	No The works may result in the temporary blockage of a section of footpath located on the southern side of Mandible Street and western side of Wyndham Street, Alexandria. However this would be temporary and would be confined to certain times during construction and would not result in more than a minor or inconsequential disruption to pedestrian or vehicular flow. The works would be undertaken under a Road Occupancy Licence (ROL).

Is consultation with council or other agencies required under clauses 13-15 of the ISEPP?	
Will the works involve more than a minor or inconsequential excavation of a road or adjacent footpath for which council is the roads authority and responsible for maintenance?	Yes The works would involve excavation of the road or footpath on the southern side of Mandible Street, Alexandria to connect to Sydney Water's existing sewer and water pipes. There would also be installation of the temporary fence around the perimeter of the proposal. However the works would be temporary and would be confined to out of hours during construction and would not result in more than a minor or inconsequential disruption to pedestrian or vehicular flow.
Are the works located on flood liable land? If so, will the works change flooding patterns to a more than minor extent?	Yes The proposal is within flood liable land. The ROC building would be installed above flood liable land and would not result in a change to flooding patterns in the greater study area (refer to Appendix D).
Is there a local heritage item (that is not also a state heritage item) or a heritage conservation item in the study area for the works? If yes, does a heritage assessment indicate that the potential impacts to the item/area are more than minor or inconsequential?	No The site is not listed as a heritage item under the NSW State Heritage Register or the City of Sydney LEP 2012. Additionally, no items listed on either of these registers are located within the immediate vicinity of the proposal.
Are the works adjacent to a national park, nature reserve or other area reserved under the <i>National Parks and Wildlife Act 1974</i> ?	No A search of the NSW Planning Viewer did not identify and lands reserved under the <i>National Parks and Wildlife Act 1974</i> located adjacent to the proposal.
Are the works adjacent to a declared aquatic reserve under the <i>Fisheries Management Act 1994</i> ?	No No aquatic areas declared under the <i>Fisheries Management Act 1994</i> are located adjacent to the proposal.
Are the works adjacent to a declared marine park under the <i>Marine Parks Act 1997</i> ?	No The proposal would not be located adjacent to a declared marine park under the <i>Marine Park Act 1997</i> .
Are the works in the Sydney Harbour Foreshore Area as defined by the <i>Sydney Harbour Foreshore Authority Act 1998</i> ?	No The proposal would not be undertaken within the Sydney Harbour Foreshore Area.
Do the works involve the development of a fixed or floating structure in or over navigable waters?	No The proposal would be restricted to a terrestrial setting only.
Are the works for the purpose of residential development, as educational establishment, a health services facility, a correctional facility or group home in bush fire prone land?	No The proposal would not be undertaken within brush fire prone land.

As per the ISEPP requirements the City of Sydney Council and other public authorities have been contacted via letter and have been asked to provide comments detailed in Table 10.

Sydney Trains consultation approach for the proposal is to:

- Engage with key stakeholders to understand potential issues and implement suitable mitigation measures to address these issues
- Inform community and stakeholders about proposal milestones and work that may impact on their lives, property or business
- Promptly respond to and address public enquiries and complaints.

Sydney Trains would undertake engagement activities and provide information to stakeholders through all phases of the proposal including during:

- Preparation of the REF, see Table 10
- Ongoing consultation with directly affected receivers
- Construction, if determination is made to proceed with the proposal.

4.2 Consultation during REF preparation

Consultation during the preparation of the REF involved meeting with and/or writing to key government stakeholders, nearby businesses and the community, providing information on the proposal and inviting their feedback on issues and/or assessment requirements.

The following agencies and stakeholders were contacted:

- City of Sydney Council
- Ausgrid
- FRNSW
- NSW EPA
- Sydney Water
- Roads and Maritime Services
- Member for Heffron
- Alexandria Residents Action Group
- Sydney Chamber of Commerce
- Nearby residents and businesses.

A summary of the consultation to date is provided in Table 10.

Table 10 Summary of consultation undertaken during the preparation of the REF

Consultation carried out with	Date of consultation	Summary of comments raised	Response
City of Sydney Council	Meeting held on 30 November 2015	Requested that Sydney Trains check the updated City of Sydney LEP heritage items register and flood assessment.	City of Sydney Council LEP (Schedule 5) was searched to identify any heritage items within the vicinity of the proposal and no heritage items were identified. This is detailed in Table 11. Flood assessment has been undertaken in Section 5.3 and a Flood report has been provided in Appendix D.
		City of Sydney Council requested an accredited site auditor be engaged for the proposal.	A control measure has been included for an accredited site auditor to be engaged for the proposal in Section 5.8.3.
	ISEPP letter sent on 2 March 2016	City of Sydney Council requested on 11 March 2016 the following drawings: site plan, floor plans, elevations, sections and landscape plans.	Sydney Trains issued the requested drawings electronically on 17 March 2016.
	Meeting held on 17 March 2016	City of Sydney Council raised concern about floor space ratio (FSR).	The gross floor area is 9,994.9m ² and the FSR is 2.48:1. The maximum FSR has been exceeded as it includes services etc. The FSR will be further refined during detailed design. The FSR for the proposal is expected to be close to the maximum FSR of about 2:1.
City of Sydney Council raised concern about setback.		The proposal in the Sydney Trains Asset Standard Authority RailCorp Security Standard (RSS-0004 Signalling and Control Room Facilities) is classified as 'State Critical Infrastructure' based on the functionality of the control room and supporting services. The standard requires high security perimeter fencing for critical infrastructure. Due to land size constraints, there is insufficient room to support a high security perimeter fence. It is proposed that in lieu of the high security perimeter fence, a secure building perimeter will form the outer layer of security which will be the building mass itself. The control room and supporting equipment rooms are to be constructed as secure cells within the outer layer. The proposal aligns with the permanent one metre high	

Consultation carried out with	Date of consultation	Summary of comments raised	Response
			fence on the Dangrove Building at 12-20 Mandible Street, Alexandria located adjacent to the proposal. Under these circumstances, the proposed setback is considered appropriate.
		Provide City of Sydney with masonry quality of the façade finishes of the proposal.	Sydney Trains issued the masonry quality finishes of the proposal electronically on 17 March 2016.
	ISEPP letter sent on 2 March 2016	Provide justification for the FSR exceeding the development standard be included in the REF.	Details on the FSR were provided in the response to the meeting held on 17 March 2016.
	The façade materials on the Mandible and Wyndham Street frontages should wrap around the north-western and south-eastern corners to carry through the quality of the design.	The façade material of the proposal does wrap around the north-western and south-eastern corners on the Mandible and Wyndham Street frontages. Sydney Trains is committed to maintaining the façade treatment for the proposal.	
	The pre-cast concrete panels at the north-western corner should be replaced with the terracotta or equivalent finish of the Mandible frontage.	The proposal's wrap around at the north western corner is consistent with the Dangrove Building at 12-20 Mandible Street, Alexandria located adjacent to the proposal. This consists of pre-cast concrete panels rather than terracotta or equivalent finish.	
	The setback at the north-western corner is to be integrated with the proposal and the existing Dangrove Building at 12-20 Mandible Street, Alexandria.	Justification for the setback at the north-western corner was provided in the response to the meeting held on 17 March 2016.	
	The rooftop will be visible from neighbouring buildings and so requests that plant on the roof be covered on all four sides with recessive materials and recessive colour and setback from all building edges.	Sydney Trains agree to have recessive materials and recessive colour for the plant on the roof. Louvres and chillers are below parapet level and will not be visible.	
	Existing aboveground power poles along the northern and eastern frontages of the proposal be placed underground along the northern and eastern frontages of the proposal.	The aboveground power poles along the northern frontage of the proposal would be placed underground. The aboveground power poles in the eastern frontages of the proposal will not be installed underground. This has been	

Consultation carried out with	Date of consultation	Summary of comments raised	Response
			addressed in the ROC Early Works REF.
		Relocate the services box from the footpath at the corner of Wyndham and Mandible Streets underground or incorporate into the proposal.	The relocation of the services box from the footpath at the corner of Wyndham and Mandible Streets is not part of this proposal.
		A new control measure to be listed in the REF that requires the preparation of a detailed Public Domain Plan submission in accordance with the City's Public Domain Manual during the design development.	Sydney Trains has included a new control measure that requires the preparation of a detailed Public Domain Plan submission in accordance with the City's Public Domain Manual during the design development (refer to Section 5.9.
	Meeting held 16 May 2016	City of Sydney requested revit design with PMF levels and flood assessment report.	Sydney Trains issued revit design with PMF levels and flood assessment report electronically on 20 May 2016.
	Meeting held 24 August 2016	City of Sydney requested ROC and Dangrove public domain plan for Mandible Street and Wyndham Street. City of Sydney also requested when the plan will be available for review.	Sydney Trains has engaged the same landscape architect to ensure consistency between the two public domain plans. The draft public domain plan has already been prepared and is currently being reviewed by Sydney Trains.
		City of Sydney recognised the trees on Mandible Street and Wyndham Street need to be removed due to the proximity of the building foundation and piling works. The works will be within the root zone of the existing trees and will not be stable if left in-situ.	A control measure has been included in Section 5.5 to address the offset of clearing impacts to be undertaken in accordance with Sydney Trains Biodiversity Offset Strategy.
		The communication system for the ROC will go back to Green Square Station. City of Sydney stated that Roads and Maritime Services want to upgrade the intersection at Bourke Road and this may impact on future services.	Additional consultation will be undertaken with Roads and Maritime Services. This will be undertaken during design development.
Community	Announcement in the Daily Telegraph by the Minister of the proposal on 2 March 2016	No comments received.	
FRNSW	ISEPP letter sent on	No comments received.	

Consultation carried out with	Date of consultation	Summary of comments raised	Response
	2 March 2016		
NSW EPA	ISEPP letter sent on 2 March 2016	Railway system activities are listed as Scheduled Activity under clause 33 of Schedule 1. However, this clause excludes the Rail Operations Centre. Therefore, the proposal is not a Scheduled Activity within the meaning of the POEO Act and would not require an EPL. Sydney Trains holds an EPL (number 12208) for the carrying out of Railway Systems Activities. NSW EPA have advised that as Sydney Trains is a public authority, the EPA would be the appropriate regulatory authority under the POEO Act for the activity.	Noted.
Ausgrid	ISEPP letter sent on 3 March 2016	Ausgrid 132kV critical cable runs down Mandible Street and then heads North on Wyndham Street. A dial before you dig assessment will need to be completed to confirm the location. Consultation will be necessary with Robin Luo (0437 692 416) at least two weeks prior to any proposed excavation that may be within two metres of the Ausgrid cable to discuss the proposal.	A control measure has been included to consult Ausgrid in Section 5.10.3.
Sydney Water	ISEPP letter sent on 3 March 2016	There are existing house service connections to the Sydney Water wastewater system which if used will only require NSW Fair Trading to inspect. No Section 73 application would be required if connections are made to existing house service connections.	Noted.
		There are existing water connections for the proposal. If the proposal requires new connections Sydney Trains can apply for the new connections through the Tap-in on the Sydney Water website, however Sydney Trains needs to explain that Sydney is a public authority and that the proposal is permissible under ISEPP.	Noted.

Consultation carried out with	Date of consultation	Summary of comments raised	Response
		If you require connection to the Sydney Water stormwater channel then a Section 73 application is required for an Adjustment/Deviation by a Water Servicing Coordinator.	Noted.
Roads and Maritime Services	ISEPP letter sent on 4 March 2016	An estimate of the total daily and peak hour vehicle trips generated by the proposal.	It is estimated that a total of 18 vehicle movements per peak hour period or 50 vehicle movements per day would be generated by the construction activities. This number of generated construction movements may be revised depending on the scheduling of works and staging to avoid any unnecessary congestion for the ROC site (refer to Section 5.11).
		The impact on the road network, nearby intersections, public transport services and infrastructure (existing and planned) with consideration of the cumulative impact from other approved developments in the vicinity, and the need/associated funding for upgrading or road improvement works (if required).	The operational traffic impact assessment determined that there would overall be a marginal increase in traffic volumes on the adjacent road network as a result of the proposal (refer to Section 5.11).
		The proposed access arrangements and measures to mitigate any associated impacts on road safety, transport services and traffic flows.	A construction traffic management plan is a control measure to address road safety, transport services and traffic flows (refer to Section 5.11).
		Traffic, transport and road safety impacts during construction and how these impacts will be mitigated for any associated traffic, pedestrian, cyclists, parking and public transport impacts.	A construction traffic management plan is a control measure to address any associated traffic, pedestrian, cyclists, parking and public transport impacts (refer to Section 5.11).
The community and local businesses	12 August 2016 issued project update letter	A letter was sent to around 450 local residents and businesses and key stakeholder groups on 12 August 2016 advising them of the proposal, contact details for more information and the upcoming REF public display.	Noted.
The	5 September 2016	An additional stakeholder letter was distributed to	Noted.

Consultation carried out with	Date of consultation	Summary of comments raised	Response
community and local businesses	stakeholder letter	around 450 nearby residents and businesses on 5 September 2016 advising them of vegetation maintenance as part of early work on the ROC site.	
Individual	6 September 2016 general inquiry	The City of Sydney received a public enquiry requesting if the fire training facility on Wyndham Street had been sold and whether there is a new development ready to take place on site. They also requested to see the plans, if available, of what is proposed to be developed or has been approved. No contact details were provided with the enquiry.	Responded to City of Sydney providing contact details for the ROC Program (ROC@transport.nsw.gov.au or 131 500) to pass on.
Individual	6 September 2016	Local resident requested more information about the proposed development	An email response was provided referring to the ROC project website and upcoming REF public display
The community and local businesses	18 September 2016 stakeholder letter	An additional stakeholder letter was distributed to around 450 nearby residents and businesses on 18 September 2016 advising them of further vegetation maintenance as part of early work on the ROC site.	Noted.

4.3 Announcement of the proposal during the preparation of the REF

A project webpage (www.transport.nsw.gov.au/roc), email address (ROC@transport.nsw.gov.au) and contact number (131500) have been established for more information and feedback.

4.4 Consultation during the REF public display

The REF is being exhibited for community comment for 14 days. The REF can be viewed electronically on the project website www.transport.nsw.gov.au/roc

A staffed display is being held during the public display period so community members can directly ask Sydney Trains representative's questions and provide further information that can be considered prior to the finalisation of the REF. The drop-in session is on:

- Tuesday 11 October 2016, 4pm to 6pm at Fire and Rescue NSW, 189 Wyndham Street, Alexandria.

During the public display period, Sydney Trains invites written feedback on the project.

The public display of the REF, including details of how to provide feedback, is being advertised on the project website and via mail-out to around 450 addresses in the local area.

4.5 Consultation during construction

Community involvement would continue as part of the construction of the project. A Communications and Stakeholder Engagement Plan has been developed and would be updated for implementation through construction and delivery of the project.

Consultation during construction period would likely involve:

- Development and implementation of a detailed communications plan
- 24-hour complaints line
- Project email address
- Clear signage at the construction site
- Letters for any out of hours work.

5 Environmental impact assessment

5.1 Assessment of applicable environmental factors

A scoping exercise has been completed for the proposal. The scoping exercise has considered the potential environmental impacts of the proposal to identify those environmental factors requiring further environmental impact assessment within this REF. The environmental factors relevant to the proposal are summarised in Table 11. For environmental factors that do not require further environmental assessment standard control measures are identified in Section 7.1.

Table 11 Applicable environmental factors

Environmental Factors	Comments	Detailed discussion in REF?		Where?
		Yes	No	
Landforms, geology and soils	The proposal would require excavation for the connection of services and foundation works. Discussion of the potential environmental risks and impacts associated with this activity has been included in Section 5.2	Yes	<input checked="" type="checkbox"/>	Section 5.2
		No	<input type="checkbox"/>	
Water quality and hydrology	Sheas Creek is located 90 metres south west of the proposal and Alexandra Canal is located about one kilometre south west of the proposal. Discussion of the potential environmental risks and impacts associated with this activity has been included in Section 5.3.	Yes	<input checked="" type="checkbox"/>	Section 5.3
		No	<input type="checkbox"/>	
Air quality	The proposal involves demolition and excavation and as such a discussion of the potential environmental risks and impacts associated with this activity has been included in Section 5.4.	Yes	<input checked="" type="checkbox"/>	Section 5.4
		No	<input type="checkbox"/>	
Biodiversity	There is no vegetation to remove as part of this proposal. The environmental risks and impacts associated with this activity has been included in Section 5.5.	Yes	<input checked="" type="checkbox"/>	Section 5.5
		No	<input type="checkbox"/>	
Noise and vibration	Plant and equipment would be required for the proposal and as such a discussion of the potential environmental risks and impacts associated with this activity has been included in Section 5.6.	Yes	<input checked="" type="checkbox"/>	Section 5.6
		No	<input type="checkbox"/>	
Aboriginal and non Aboriginal heritage	A basic search of the NSW Office Environment and Heritage (OEH) Aboriginal Heritage Information Management System (AHIMS) (OEH,	Yes	<input type="checkbox"/>	
		No	<input checked="" type="checkbox"/>	Standard control measures in Section 7.1

Environmental Factors	Comments	Detailed discussion in REF?		Where?
	<p>2015) did not identify any Aboriginal sites within two hundred metres from the proposal. As such no further discussion of the potential risks and impacts to Aboriginal heritage is required. The site is almost entirely covered in buildings or hardstand areas over disturbed material. There is almost no prospect of Aboriginal heritage on the surface.</p> <p>A search of the NSW State Heritage Register, RailCorp S170 Heritage Register and the City of Sydney LEP 2012 did not identify any heritage items on the site or on any adjacent land.</p> <p>The closest heritage item is located about one hundred metres north east of the proposal, and is situated at an adequate buffer distance as to not be impacted. As such no further discussion of the potential risks and impacts to non Aboriginal heritage is required.</p>			
Waste management	Waste would be generated from the proposal and as such further discussion of the potential environmental risks and impacts associated with this activity has been included in Section 5.7.	Yes	<input checked="" type="checkbox"/>	Section 5.7
		No	<input type="checkbox"/>	
Contaminated land and hazardous materials	The proposal site has had an industrial past and has been subject to modification for the construction of the proposal. As such there is the potential to encounter contaminated materials during construction activities. A discussion of the potential environmental risks and impacts associated with construction activities has been included in Section 5.8.	Yes	<input checked="" type="checkbox"/>	Section 5.8
		No	<input type="checkbox"/>	
Visual aesthetics and urban design	The proposal would result in temporary and permanent visual impacts and as such these impacts have been discussed in Section 5.9.	Yes	<input checked="" type="checkbox"/>	Section 5.9
		No	<input type="checkbox"/>	
Land use, zoning and socio-economic effects	The proposal is likely to impact on surrounding residents and businesses and as such these impacts are discussed further in Section 5.10.	Yes	<input checked="" type="checkbox"/>	Section 5.10
		No	<input type="checkbox"/>	
Traffic and access	The proposal would be undertaken in a busy business park area in Sydney. As such any risks and impacts associated with traffic and access have been included in Section 5.11.	Yes	<input checked="" type="checkbox"/>	Section 5.11
		No	<input type="checkbox"/>	

Environmental Factors	Comments	Detailed discussion in REF?		Where?
Climate change	In total, seventeen risks were identified for the proposal. Of these risks identified 30 per cent were low risks, 53 per cent were moderate risks and 17 per cent were high risks. Climate change adaptive actions have been developed to address medium and high risks in Section 5.12.	Yes	<input checked="" type="checkbox"/>	Section 5.12
		No	<input type="checkbox"/>	
Greenhouse gas emissions	The proposal has the potential to emit greenhouse gas emissions throughout its lifecycle included in Section 5.13.	Yes	<input checked="" type="checkbox"/>	Section 5.13
		No	<input type="checkbox"/>	
Demand on resources	The proposal would not result in the significant depletion of any resources and as such no further discussion of risks and impacts associated with this is required.	Yes	<input type="checkbox"/>	
		No	<input checked="" type="checkbox"/>	Standard control measures in Section 7.1
Cumulative environmental effects	Other development may be occurring simultaneously nearby the study area and as such further discussion of the risks and impacts associated with this is included in Section 5.14.	Yes	<input checked="" type="checkbox"/>	Section 5.145.14
		No	<input type="checkbox"/>	

5.2 Landforms, geology and soils

5.2.1 Existing environment

Topography

Reference to topographic maps show that the proposal site is relatively flat with an average elevation of ten metres AHD. The proposal and surrounding landscape is within a low lying drainage area with a general slight slope towards the west.

Geology

Reference to the Sydney 1:100,000 Geological Series Sheet (Herbert, 1983) indicates that the proposal is underlain by Quaternary alluvium comprising transgressive dunes with medium to fine-grained marine sand and often bands or layers of clay and silt which can be relatively continuous over large areas. The Hawkesbury Sandstone Formation is expected to underlie the alluvial soils. This formation consists of medium to coarse grained quartz sandstone, with very minor shale and laminite lenses.

Soil landscape

Reference to the Sydney 1:100 000 Soils Landscape Sheet (Chapman and Murphy, 1989) indicates the proposal lies within the Tuggerah Soil Landscape. This soil group is defined as representing gently undulating to rolling coastal dunefields. Local relief is generally up to twenty metres with slope gradients generally one-ten per cent. Soil types are described as deep (greater than > 200 centimetres) podsols on dunes and podsol/humus podsol intergrades on swales. Specific hazards associated with these soils are noted as extreme wind erosion hazard, non-cohesive, highly permeable soil, very low soil fertility, localised flooding and permanently high water tables.

Acid sulfate soils

Data supplied by the OEH, based on published 1:25,000 acid sulfate soil (ASS) risk mapping (Department of Land and Water Conservation, 1994-1998) indicates that the proposal is located within disturbed terrain where investigations are required to assess the area for ASS potential.

The City of Sydney Council LEP 2012 ASS maps indicate the proposal is within a Class 3 ASS risk where ASS are likely to be encountered at a depth of over one metre below the natural ground surface.

Geotechnical investigations undertaken by Douglas Partners (August 2015) for the proposal (in Lot 701 DP 713555 and Lot 2 DP 552864) found that the acid sulfate soil indicators known as the percentage sulfur and total potential acidity (TPA) for silty clays were below the action criteria level (NSW Acid Sulfate Soils Management Advisory Committee, August 1998), except for one sample shown in Table 12. The exceedance is at a depth within the proposed excavation. The borehole locations are shown in Figure 9.

Table 12 Acid sulfate results

Action criteria	Action criteria 1-1000 tonnes disturbed		BH1A depth 2.5 metres		BH6A Depth 3.4-3.5 metres	
	Sulfur trail % S oxidisable (oven-dry basis) eg STOS or SPOS	Acid trail mol H+/ tonne (oven-dry basis) eg, TPA or TSA	SPOS % S oxidisable	TPA mol H+/ tonne	SPOS % S oxidisable	TPA mol H+/ tonne
Fine texture – medium to heavy clays and silty clays	0.1	62	0.34	730	0.11	7

5.2.2 Potential impacts

The proposal has the potential to impact negatively on the surrounding environment due to excavations that may lead to erosion and sediment transfer offsite. Excavation works are required for foundation and for service connections to the proposal.

Given the proposal characteristics and the size of the proposal area, it is anticipated that erosion and sediment risks are short term and can be effectively managed through the implementation of standard measures as outlined in *EMS-09-PR-0012 Erosion and Sediment Control*.

The proposal would require minor excavation for foundation, including for service connections of up to two metres. Given the depth of the works and the Douglas Partners Report, July 2016 there is minimal risk of encountering ASS. The soil would be classified by a suitably qualified soil scientist to confirm the presence of ASS.

There is also the potential for the works to result in contamination or pollution of soils as a result of chemical spills from incorrect storage of materials or plant operation.

There are not expected to be any operational impacts on landform, geology or soils.

5.2.3 Control measures

During construction:

- An Erosion and Sedimentation Control Plan will be developed and maintained for the proposal in accordance with Managing Urban Stormwater, Soils and Construction Guidelines (Landcom, 2004) (the Blue Book)
- Appropriate stockpiling of materials will take place away (at least five metres) from drainage lines, waterways and drains
- Spill kits and a temporary refuelling bund will be installed and used onsite
- An Acid Sulfate Soil Management Plan (ASSMP) will be prepared to accompany the Construction Environmental Management Plan (CEMP)
- Spoil removed from site will be disposed of in accordance with the EPA's *Waste Classification Guidelines* (EPA 2014)
- Site rehabilitation of disturbed areas will be undertaken progressively as activities are completed during the proposal
- Adequate drainage measures will be provided to control entry of groundwater and prevent ingress of surface water runoff to open excavation trenches
- Excavation during periods of heavy rainfall will be avoided.

5.3 Water quality and hydrology

5.3.1 Existing environment

The proposal site consists of impervious surfaces of asphalt and concrete on-grade car parking and hardstand areas for parking of fire vehicles associated with the existing fire station and the adjoining fire rescue training facility.

The nearest surface water body is an ephemeral tributary of Sheas Creek running underground south west of the proposal, which flows into Alexandra Canal. There is an open stormwater drain on the south east corner of the FRNSW property which connects to this creek.

A search of the NSW Natural Resource Atlas database (Department of Natural Resources, 2014) for registered groundwater bores identified 22 bores located within a one kilometre radius of the proposal. Standing water levels available on the records indicate shallow depths of groundwater ranging between 0.79 metres and 3.66 metres. Groundwater investigations (Douglas Partners, 2015) undertaken as part of the geotechnical investigations indicated standing groundwater levels ranging between 1.5 – 3.3 metres below ground level (bgl) in the proposal area, intersecting the unconfined Botany Sands aquifer which has a regional southerly groundwater flow in the direction of Botany Bay. Based on this, it is anticipated that shallow groundwater water levels are likely to be encountered during construction.

Flooding throughout the catchment is caused by a combination of overland flow and mainstream flooding. Mainstream flooding issues tend to occur around Alexandra Canal and the open channels in the study area. Elsewhere, flooding is primarily a result of overland flow and the capacity of the stormwater network and overland flow paths.

A Floodplain Risk Management Plan for the Alexandra Canal was prepared for the City of Sydney Council (Cardno, 2014). Based on this plan, the proposal area falls within the Sheas Creek sub catchment of the Alexandra Canal catchment. Alexandra Canal catchment covers about 1,141 hectares (ha) within the City of Sydney LGA. Within this catchment area drainage consists of open channels, covered channels, in-ground pipes, culverts and pits which convey runoff from the catchment to Alexandra Canal which discharges into the Cooks

River. The majority of the trunk drainage system is owned by Sydney Water whilst the feeding drainage systems are primarily owned by City of Sydney Council. During large storm events runoff flows along roads from the north east towards the open channel at Wyndham Street.

5.3.2 Potential impacts

The proposal area is affected by mainstream flooding from Sheas Creek in the one per cent Annual Exceedance Probability (AEP) or above the Probable Maximum Flood (PMF) level in the area. The proposal's finished level (FL) is 11.2 metre, which is above the one per cent AEP. The local overland flow event for the proposal is at the reduced level (RL) of 9.05 metre and the future 7.5 metre wide access road has a RL of 10.10 metre. The top water level of the local PMF event in Bourke Road is at RL 10.85 metre.

The ROC facilities would be designed to be above the PMF level, however vehicle access would not be possible along Mandible Street or Wyndham Street during a PMF event. The FRNSW recommends vehicles not to drive in flood water deeper than 200 millimetre. The proposal is above flood liable land, but Mandible Street is located below flood liable land. Therefore Sydney Trains cannot access the site during flood periods. Emergency procedures would be prepared to address the flood scenario for both construction and operation of the proposal.

There is minor potential for water quality impacts during the construction phase. Contamination of water draining into the stormwater system could occur from incorrect storage of chemicals and oils. Appropriate control measures have been included in Section 5.3.3.

Groundwater in the proposal area is shallow so it is possible that groundwater may be intercepted during excavation for the service connections. Groundwater interception could result in contamination of the localised groundwater system given the potential presence of ASS.

The proposal would have concreting activities as part of the works and there would be minor concrete waste. A concrete wash down area would be nominated in the proposal area. During operation of the proposal all rainfall runoff would be captured from sealed areas. The rainfall from the roof of the proposal would be captured in a 63m³ on site detention tank. The tank would provide non-potable water for toilet and urinal flushing and local hose taps.

Overflow of the tank and the rest of the paved areas of the proposal would drain to the City of Sydney Council local stormwater system, however this is expected to have minimal impact to the system's operation. In addition, the ROC sewerage system would connect to the Sydney Water sewerage system and this would have minimal impact to the current operation of the Sydney Water' sewerage system, as the proposal would be submitted to Sydney Water as part of a Section 73 Compliance Certificate and comply with Sydney Water requirements.

5.3.3 Control measures

During construction:

- Construction water will be tested and treated prior to being discharged off site or released to the nearest local stormwater infrastructure in accordance with legislative requirements. All controls will be outlined in the CEMP
- Install a concrete wash down area on site that meets the NSW EPA Environmental Best Management Practice Guideline for Concreting Contractors (NSW EPA 2002)
- All chemicals and oils will be stored in accordance with the manufacturer's specification within a bunded area that is protected from rain
- The effectiveness of erosion and sediment controls will be regularly reviewed by the Sydney Trains environmental representative and adjusted or maintained if necessary

- Erosion and sediment controls are only to be removed once the area they are protecting has been stabilised
- An Acid Sulfate Soil Management Plan (ASSMP) will be prepared to accompany the Construction Environmental Management Plan (CEMP).

During operation:

- A flood and evacuation management plan will be developed for the proposal
- Drainage will be installed to carry stormwater connected into the existing council stormwater infrastructure
- The installed drainage system will include a water harvesting tank that prevents water volumes from exceeding City of Sydney council requirements for maximum discharge rates into the existing stormwater system.

5.4 Air quality

5.4.1 Existing environment

The OEH operates a comprehensive air quality monitoring network to provide the community with accurate and up-to-date information about air quality. Data from the monitoring network is presented online as ambient concentrations and air quality index (AQI) values which are updated hourly and stored in a database.

The air pollutants monitored by OEH and used in the AQI are ozone, carbon monoxide, sulphur dioxide, nitrogen dioxide, air particles, and visibility.

Randwick is the nearest air quality monitoring site to the proposal (about four kilometres away). A search of the OEH AQI on 3 May 2016 found that in the past 12 months there have been monthly exceedances of NO₂, ozone and particles at the Randwick monitoring site. In the Sydney east area, in 2015 there were a total of 5 days where ozone and particles exceeded the National Environment Protection Measures (NEPM) maximum goals.

The ambient air quality of the surrounding environment is dominated by proximity to busy roads such as Bourke Road and Wyndham Street, with the predominant cause of local air pollution being vehicle exhaust. The general industrial nature of much of the suburb also contributes to local air quality.

5.4.2 Potential impacts

During construction there is the potential for dust to be generated by plant movements and the excavation works. Plant emissions from the combustion of fuel during the construction phase of the proposal would be negligible in comparison to the air quality impacts from traffic on Bourke Road, Wyndham Street, Mandible Street and the general surrounding urban environment.

Given the temporary nature of construction and the proposed control measures identified below air quality impacts from the proposal would be minimal.

There are not expected to be any operational impacts on air quality

5.4.3 Control measures

During construction:

- Dust suppression will be carried out on site, using either water (in compliance with water restrictions) or ground cover
- Machinery and plant kept on site will be serviced according to manufactures specifications

- Any machines or plant that is producing excessive visual exhaust will be repaired or removed from site
- Plant or machinery will not be left idling
- Stockpiles will be maintained and contained to minimise dust
- Trucks transporting spoil and other waste materials from site will be covered
- Disturbed areas will be rehabilitated as soon as practicable.

5.5 Biodiversity

5.5.1 Existing environment

A database search of the proposal area and surrounding areas was undertaken using the following resources:

- EPBC Protected Matters Search Tool undertaken on 16 February 2016
- Search of NSW OEH Atlas of NSW Wildlife, data obtained through the NSW Office of Environment and Heritage and BioNet Atlas of NSW Wildlife website accessed 31 August 2016.

Environmental Protection and Biodiversity Conservation Act 1999

The EPBC Protected Matters Search Tool identified the following MNES that could potentially be in the vicinity of the proposal area:

- One listed threatened ecological communities (TEC)
- 20 listed threatened species
- 13 listed migratory species.

Of the MNES, the majority of the species do not persist in urbanised environments, and therefore the likelihood of occurrence is very low to negligible.

The listed species and TECs that may occur in the proposal are presented in Table 13.

Table 13 Potentially occurring EPBC Act threatened listed species and ecological communities

Species	Common Name	EPBC Act Status	TSC Act status	Likelihood of occurrence
Birds				
<i>Anthochaera phrygia</i>	Regent Honeyeater	Critically Endangered	Critically Endangered	Low – this species is associated with Box-Ironbark woodlands. It is unlikely to utilise the highly degraded vegetation of the proposal.
<i>Botaurus poiciloptilus</i>	Australasian Bittern	Endangered	Endangered	Low – this species occurs in terrestrial freshwater wetlands. No such habitat occurs within the proposal.
<i>Dasyornis brachypterus</i>	Eastern Bristlebird	Endangered	Endangered	Low – this species is associated with low, dense vegetation and is extremely sensitive to human disturbance. No such habitat occurs within the proposal.

Species	Common Name	EPBC Act Status	TSC Act status	Likelihood of occurrence
<i>Grantiella picta</i>	Painted Honeyeater	Vulnerable	Vulnerable	Low – this species occurs in open woodland and its presence has a strong correlation with the presence of mistletoe species. No such habitat occurs within the proposal.
<i>Lathamus discolor</i>	Swift Parrot	Endangered	Endangered	Low – this species overwinters in mainland Australia and is associated with Box-Ironbark woodlands. It is unlikely to utilise the highly degraded vegetation of the proposal.
<i>Rostratula australis</i>	Orange-bellied Parrot	Critically Endangered	Critically Endangered	Low – this species overwinters in mainland Australia and is associated with coastal saltmarsh vegetation types. No such habitat occurs within the proposal.
<i>Rostratula australis</i>	Australian Painted Snipe	Endangered	Endangered	Low – this species is associated with terrestrial freshwater, both large and small. No such habitat occurs within the proposal area.
Mammals				
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat, Large Pied Bat	Vulnerable	Vulnerable	Low - the vegetation may provide limited foraging resources however this species relies on caves, rocky cliffs and mine shafts for roosting. No such habitat occurs within the proposal.
<i>Dasyurus maculatus maculatus</i>	Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population)	Endangered	Vulnerable	Low – these species require large areas of intact vegetation for foraging. No such habitat occurs within the proposal.
<i>Isodon obesulus obesulus</i>	Southern Brown Bandicoot	Endangered	Endangered	Low – this species is reliant on dense understorey cover (both native and exotic). No such habitat occurs within the proposal.

Species	Common Name	EPBC Act Status	TSC Act status	Likelihood of occurrence
<i>Phascolarctos cinereus</i>	Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory)	Vulnerable	Vulnerable	Low – no feed tree species occur within the proposal and it is a highly modified landscape.
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	Vulnerable	Vulnerable	Moderate – the vegetation to be cleared may provide limited foraging resources for this species, however the proposal does not support a camp site.
Amphibians				
<i>Heleioporus australiacus</i>	Giant Burrowing Frog	Vulnerable	Vulnerable	Low – no wetland vegetation or habitat within the proposal area. This species does not occur within urbanised settings or cleared land.
<i>Litoria aurea</i>	Green and Golden Bell Frog	Vulnerable	Endangered	Low – no wetland vegetation or habitat within the proposal.
Plants				
<i>Acacia terminalis</i> subsp. <i>terminalis</i> MS	Sunshine Wattle	Endangered	Endangered	Low – this species is found within open coastal eucalypt woodland or forest typically a few kilometres from the coastline. No such habitat occurs within the proposal.
<i>Caladenia tessellata</i>	Thick-lipped Spider-orchid, Daddy Long-legs	Vulnerable	Endangered	Low – does not occur on degraded sites.
<i>Cryptostylis hunteriana</i>	Leafless Tongue-orchid	Vulnerable	Vulnerable	Low – does not occur on degraded sites.
<i>Genoplesium baueri</i>	Yellow Gnat-orchid	Endangered	N/A	Low – does not occur on degraded sites.
<i>Syzygium paniculatum</i>	Magenta Lilly Pilly	Vulnerable	Endangered	Low – species occurs in rainforest or stabilised quarterly sand dunes. No such habitat occurs within the proposal.
<i>Thesium australe</i>	Austral Toadflax	Vulnerable	Vulnerable	Low – does not occur on degraded sites.
Migratory Species				

Species	Common Name	EPBC Act Status	TSC Act status	Likelihood of occurrence
<i>Apus pacificus</i>	Fork-tailed Swift	N/A	N/A	Species may occur within the proposal on occasion but impacts would be negligible.
<i>Cuculus optatus</i>	Oriental Cuckoo	N/A	N/A	Species may occur within the proposal on occasion but impacts would be negligible.
<i>Hirundapus caudacutus</i>	White-throated Needletail	N/A	N/A	Species may occur within the proposal on occasion but impacts would be negligible.
<i>Merops ornatus</i>	Rainbow Bee-eater	N/A	N/A	Species may occur within the proposal on occasion but impacts would be negligible.
<i>Monarcha melanopsis</i>	Black-faced Monarch	N/A	N/A	Species may occur within the proposal on occasion but impacts would be negligible.
<i>Monarcha trivirgatus</i>	Spectacled Monarch	N/A	N/A	Species may occur within the proposal on occasion but impacts would be negligible.
<i>Motacilla flava</i>	Yellow Wagtail	N/A	N/A	Species may occur within the proposal on occasion but impacts would be negligible.
<i>Myiagra cyanoleuca</i>	Satin Flycatcher	N/A	N/A	Species may occur within the proposal on occasion but impacts would be negligible.
<i>Rhipidura rufifrons</i>	Rufous Fantail	N/A	N/A	Species may occur within the proposal on occasion but impacts would be negligible.
Ecological Community				
	Coastal Upland Swamps in the Sydney basin Bioregion	Endangered Ecological Community	Endangered Ecological Community	Low – Community does not occur in the proposal area.

Table Notes

EPBC Status – CE = Critically Endangered, E = Endangered, V = Vulnerable, MM = Migratory Marine, MT = Migratory Terrestrial, MW = Migratory Wetland

TSC Status – CE = Critically Endangered, E = Endangered, V = Vulnerable, NS – No Status

Threatened Species Conservation Act 1995

A threatened species search using the NSW Atlas Search (Bionet) has been undertaken to identify the threatened species and ecological communities that may occur in the proposal area. The following species have been sighted within two kilometres of the proposal area:

- Powerful owl (*Ninox strenua*)
- Red goshawk (*Erythrotriorchis radiatus*)
- Thin lip spider orchid (*Caladenia xanthochila*)
- Grey headed flying fox (*Pteropus poliocephalus*)

- Magenta lilly-pilly (*Syzygium paniculatum*)
- Superb fruit dove (*Ptilinopus superbus*)
- Green and golden bell frog (*Litoria aurea*).

None of these threatened species were identified within the proposal area. Apart from marginal habitat for the Grey headed flying fox, no suitable habitat for these threatened fauna species was identified within the proposal area.

A site inspection revealed that the proposal is in a heavily modified environment with vegetation being restricted to native and exotic planted street trees, shrubs and weeds. There are no street trees and shrubs within the proposal. None of the vegetation found within the proposal site or the vicinity of the proposal site is considered remnant native vegetation.

5.5.2 Potential impacts

There are no construction impacts expected on biodiversity as a result of the proposal.

Given the disturbed nature of the area and the lack of suitable habitat, the proposal is not expected to have any adverse impacts on fauna.

There are no operational impacts expected on biodiversity as a result of the proposal.

5.5.3 Control measures

During construction:

- The offset of clearing impacts will be undertaken in accordance with Sydney Trains Biodiversity Offset Strategy
- If any fauna species is identified on site, Wildlife Information, Rescue and Education Service (WIRES) will be contacted to relocate it offsite to a suitable habitat area
- Site inductions will include discussion and photographs of threatened species in the area and the process to be followed if threatened species are encountered
- Noxious weeds will be managed in accordance with the requirements of the *Noxious Weeds Act 1993*, including disposal off-site in sealed bags to a licensed waste disposal facility.

5.6 Noise and vibration

5.6.1 Existing environment

A Noise and Vibration Assessment addressing construction noise and vibration for the proposal was undertaken by Aurecon in April 2016 (refer to Appendix E) and another addressing operational noise was undertaken by Acoustic Logic in April 2016 (refer to Appendix F). The assessments involved:

- Background noise monitoring at one representative location to determine existing noise levels in the vicinity of the proposal
- An assessment of the potential for noise and vibration impacts was undertaken in accordance with the DECC 2009 Interim Construction Noise Guideline.

There are six commercial properties, two residential properties, and one school located within about 150 metres of the proposal area. Table 14 outlines the noise catchment areas (NCAs) and Figure 8 shows the location of the receiver types. It was noted that predominant ambient noise at most of the residential and commercial properties is contributed by traffic on nearby roads.

Table 14 Receivers surrounding the proposal

Noise catchment area	Receiver type	Address	Minimum distance from the proposal (metres)
NCA1	Commercial	23 Mandible Street, 9 Mandible Street, 1-3 Mandible Street 7-11 Mandible Street	23
NCA2	Commercial	22-26 Mandible Street 5-7 Bourke Road 9-13 Bourke Road	58
NCA3	Commercial	290-294 Botany Road 269-298 Botany Road 284 Wyndham Street 290-294 Botany Road	21
NCA4	Commercial	2-18 Bourke Road 20- 32 Bourke Road 1053 Bourke Street, Waterloo	135
NCA5	Residential	2-6 Mandible Street, 282-288 Botany Road	20
NCA6	Commercial	276-280 Botany Road	85
NCA7	Residential	240 Wyndham Street	37
NCA8	School	Green Square School 237 Botany Road, Waterloo	143
NCA9	Commercial	179-189 Wyndham Street	10

Background noise levels were obtained from a noise logger located at a commercial property at 70 Bourke Road, Alexandria in July 2015. This location was chosen as it was unaffected by existing site noise levels and was considered to be representative of typical background noise in the area. The noise environment was found to be dominated by road traffic noise and commercial/industrial noise sources. Table 15 summarises the noise measurement results.

Table 15 Background noise levels

Time period	Leq_{15 minutes} (dBA)	RBL (Rating Background Level) (dBA)
Day	58	49
Evening	55	47
Night	51	41

Construction noise criteria

The monitoring data and categorisation of nearby sensitive receivers were used to establish noise management levels for the proposal, in accordance with the DECC *Interim Construction Noise Guidelines* (ICNG, 2015) and Sydney Trains *Construction and Maintenance Noise and Vibration Management 2014* (Sydney Trains, 2014). Table 16 identifies recommended noise management criteria for the different noise catchments as well as sleep disturbance criteria.

Table 16 Management levels for the construction stage of the proposal

NCA	Noise sensitive receiver	Rating Background Level (RBL dBA)			Management level DECC ICNG 2009 guidelines (L _{Aeq} 15 minutes) dBA			Highly affected residential level (Sydney Trains, 2014) (L _{Aeq} 15 minutes) dBA			L _{A1} (1min) dBA Sleep disturbance criteria (external)			
		Day	Evening	Night	Day	Evening	Night	Day	Evening	Night	Day	Evening	Night	
NCA 8	School	49	47	41	45 (Internal) 60 (External) ¹	-	-	-	-	-	-	-	-	
NCA 5/ 7	Residential				59	52	46	75	70	60	-	-	50-55 (Internal) 56 (External) ²	
NCA 1/ 2/ 3/ 4/ 6/ 9	Commercial				70	-	-	-	-	-	-	-	-	-
-	Industrial				75	-	-	-	-	-	-	-	-	-

Note: 1 Classroom internal noise level would be 45dBA as per DECC ICNG 2009 which equates to 60dBA at the façade considering 15dBA attenuation from the façade wall with closed window.

2 Residential internal noise level would be between 50-55dBA as per the ECCW RNP 2011 and external noise level is based on WHO GCN 1999.



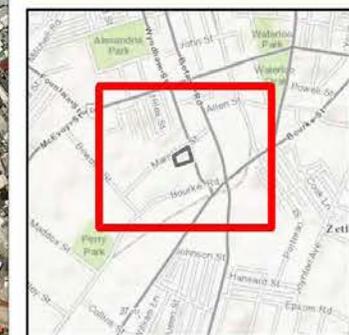
Legend

- The proposal
- Watercourse
- Railway station
- Railway line
- Noise monitoring location

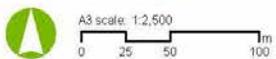
Receivers

- Commercial/Industrial NCA
- Residential NCA
- School NCA

Extent map



Source: Nearmap, Aurecon, RailCorp



Job No: 247572
Projection: MGA Zone 56

Rail Operations Centre **Review of Environmental Factors**

Figure 8: Sensitive receivers and noise catchment areas

Operational noise criteria

The intrusiveness and amenity criteria in Table 17 for this proposal has been determined using the guidelines presented in the EPA *Industrial Noise Policy, 2000* (EPA INP 2000) and the unattended noise monitoring data.

Table 17 Management levels for the operational stage of the proposal

NCA	Noise sensitive receiver	Rating Background Level (RBL dBA)			Management level EPA INP 2000 guidelines (L _{Aeq} 15 minutes) dBA Intrusiveness criterion			Management level EPA INP 2000 guidelines (L _{Aeq} 15 minutes) dBA Amenity criterion			L _{A1} (1min) dBA Sleep disturbance criteria (external)			
		Day	Evening	Night	Day	Evening	Night	Day	Evening	Night	Day	Evening	Night	
NCA 8	School	49	47	41	-	-	-	40 (Internal) 60 (External) ¹	-	-	-	-	-	-
NCA 5/ 7	Residential				54	52	46	60	50	45	-	-	50-55 (Internal) 56 (External) ²	
NCA 1/ 2/ 3/ 4/ 6/ 9	Commercial				-	-	-	65	-	-	-	-	-	
-	Industrial				-	-	-	70	-	-	-	-	-	

Note: 1 Classroom internal noise level would be 40dBA as per EPA INP 2000 which equates to 55dBA at the façade considering 15dBA attenuation from the façade wall with closed window.

2 Residential internal noise level would be between 50-55dBA as per the ECCW RNP 2011 and external noise level is based on WHO GCN 1999.

Construction vibration criteria

The Office of Environment and Heritage guideline *Assessing vibration: A Technical Guideline* (OEH 2006) provides guidance in protecting people from vibration levels above preferred and maximum values felt inside buildings. Vibration and its associated effects with regards to human comfort are usually classified as continuous, impulsive or intermittent. Table 18 provides criteria for exposure to continuous and impulsive vibration with respect to human comfort and Table 19 provides acceptable vibration dose values for intermittent vibration.

Table 18 Criteria for exposure to continuous and impulsive vibration for human comfort

Location	Assessment period	Peak velocity (mm/s)	
		Preferred	Maximum
Continuous vibration			
Residences	Day time	0.28	0.56
	Night time	0.20	0.40
Offices, schools, educational institutions and places of worship	Day time or Night time	0.56	1.1
Workshops	Day time or Night time	1.1	2.2
Impulsive vibration			
Residences	Day time	8.6	17.0
	Night time	2.8	5.6
Offices, schools, educational institutions and places of worship	Day time or Night time	18.0	36.0
Workshops	Day time or Night time	18.0	36.0

Table 19 Acceptable vibration dose values for intermittent vibration (m/s 1.75) for human comfort

Location	Assessment period	Low probability of disturbance (m/s ^{1.75})	
		Preferred	Maximum
Intermittent vibration			
Residences	Day time	0.2	0.4
	Night time	0.13	0.26
Offices, schools, educational institutions and places of worship	Day time or Night time	0.40	0.80
Workshops	Day time or Night time	0.80	1.60

Structural damage

The German Standard *DIN4150-3 Structural Vibration – Effects of Vibration on Structures* is used to assess the likelihood of structural damage from vibration. Table 20 outlines the frequency-dependent vibration criteria for residential and commercial properties.

Table 20 Guideline values for vibration velocity to be used when evaluating the effects of short-term vibration on structures

Type of structures	Guideline values for velocity in mm/s			
	Vibration at the foundation at a frequency of			Vibration at horizontal plane of highest floor at all frequencies
	1 Hz to 10 Hz	10 Hz to 50 Hz	50 Hz to 100 Hz	
Buildings used for commercial purposes, industrial buildings, and buildings of similar design	20	20 to 40	40 to 50	40
Dwellings and building of similar design and/or occupancy	5	5 to 15	15 to 20	15
Structures that, because of their particular sensitivity to vibration, are of great intrinsic value (e.g. listed buildings under preservation order)	3	3 to 8	8 to 10	8

Operational vibration criteria

The proposal vibration criteria will be formulated using the EPA guideline *Assessing Vibration: A Technical Guideline, 2006* (EPA, 2006). Table 21 provides the recommended vibration criteria for different locations, the preferred values will be adopted. Where vibration is intermittent then the methodology promulgated in Section B2 of the Guideline would be adopted to assess vibration levels.

Table 21 Preferred and maximum weighted rms values for continuous and impulsive vibration acceleration (m/s²) 1-80 Hz

Location	Assessment period ¹	Preferred values		Maximum values	
		z-axis	X and y-axis	z-axis	X and y-axis
Continuous vibration					
Critical areas ²	Day or night time	0.0050	0.0036	0.010	0.0072
Residences	Day time	0.010	0.0071	0.020	0.014
	Night time	0.007	0.005	0.014	0.010
Office, schools, educational institutions and places of worship	Day or night time	0.020	0.014	0.040	0.028
Workshops	Day or night time	0.04	0.029	0.080	0.058
Impulsive vibration					
Critical areas ²	Day or night time	0.0050	0.0036	0.010	0.0072
Residences	Day time	0.30	0.21	0.60	0.42

Location	Assessment	Preferred values		Maximum values	
	Night time	0.10	0.071	0.20	0.14
Office, schools, educational institutions and places of worship	Day or night time	0.64	0.46	1.28	0.92
Workshops	Day or night time	0.64	0.46	1.28	0.92

Note: 1 Day time is 7:00am to 10:00pm and night time is 10:00pm to 7:00pm
 2 Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. There may be cases where sensitive equipment or delicate tasks require more stringent criteria than the human comfort criteria specified above. Stipulation of such criteria is outside the scope of this policy and other guidance documents (eg relevant standards should be referred to: Source: BS 6472-1992).

5.6.2 Potential impacts

Construction noise

Aurecon 2016 undertook an assessment to determine the potential noise impacts associated with the proposal during the construction phase. Generally the works would be undertaken during standard working hours and on Saturday 7am to 3pm. Deliveries and utility connection (power, communications water and sewer) in Mandible Street and Wyndham Street during construction of the proposal involving oversize or overmass vehicles would need to be undertaken out of hours.

Potential interruptions to traffic movements on road sections near or at capacity, particularly during the peak periods where proposed construction activities (such as but not limited to lane closures), may have the potential to impact the throughput of traffic, consequently causing significant delays. There would be road closures required for: installation of noise screening and installation of 'B' class hoarding around the perimeter of the ROC proposal at Wyndham Street and Mandible Street. These works may need to be undertaken out of hours to prevent impacting on the road network. The timing would be dependent on the road occupancy licence issued by Roads and Maritime.

Table 22 provides the noise contribution predicted from each construction activity at the specified NCAs and compares this to the noise management levels determined for both day and night periods at each catchment.

Noise management levels are likely to be exceeded in NCAs 1, 5, 7 and 9 during most construction activities. The activities most likely to cause disturbance are associated with demolition of the existing demountable buildings and sawing of the asphalt activities. These activities are only for short periods of time.

Sleep disturbance criteria is likely to be exceeded in NCAs 5 and 7 during stage 1 activities for out of hours works. These exceedances are not likely to occur on consecutive nights.

The predicted noise levels are considered worst case and are not expected to occur for the entire construction period. As plant and equipment moves around the various work locations, the propagation distances and paths to the nearest receiver would change, thus altering noise levels at each receiver.

Table 22 Predicted noise levels with noise mitigation measures

Activity/ Stage	Mobile plant/ equipment	Predicted noise levels (worst Case) LAeq 15min dBA								
Receiver locations*		NCA 1	NCA 2	NCA 3	NCA 4	NCA 5	NCA 6	NCA 7	NCA 8	NCA 9
Noise Management Levels (Day) dBA		70	70	70	70	59	70	59	60	70
Noise Management Levels (Night) dBA		-	-	-	-	46	-	46	-	
Sleep disturbance criteria dBA		-	-	-	-	56	-	56	-	
Stage 1 Install site compounds and clearing (day and night time works)	Cumulative noise impact	68	57	66	50	69	54	61	49	75
Stage 2 Install new building (day and night time works)	Cumulative noise impact	71	60	69	52	72	56	64	52	78
Stage 3 Commissioning (day time works)	Cumulative noise impact	55	44	53	37	56	41	48	36	63

Note: Values in blue cells exceed the construction management level (day time or night time) and values in yellow exceed the sleep disturbance criteria in Table 22.

Additional noise mitigation measures would be employed as the construction noise levels would be exceeded at few of the receiver locations. Refer to Section 5.6.3 for additional noise mitigation measures and Appendix E.

Noise impacts during operation

The proposal consists of a control room, associated office space and employee facilities, a commercial café, carpark and loading dock and associated services plant and equipment rooms. These areas have the potential to cause noise impacts during the operation of the proposal. An Assessment of Operational Noise Emissions report (AONE) was performed to determine the extent of any operational noise impacts on surrounding receivers (Appendix F).

The proposal would operate on a 24 hour 7 day a week basis, with the exception of the café, which will primarily be open during daytime hours. The activities occurring within the building are essentially quiet, office type functions. The commercial café would generally operate during daytime hours. Therefore the main source of noise emissions would be from plant and equipment associated with ventilation and air conditioning plant, and from emergency power generating plant. These items would be located within plant rooms and on the roof of the proposal.

The proposal includes internal car parking for a limited number of vehicles (47 cars and 11 motorcycle), and a loading dock area for deliveries which would primarily be used during the day for a limited number of deliveries. Given the relatively low number of vehicle movements generated compared to existing traffic flows, and the low intensity, and generally daytime, use of the loading dock, adverse noise impacts from vehicle movements generated by the proposal are not expected.

The nearest and “most impacted” potentially affected residential receivers are the multi-storey buildings located to the east, opposite Wyndham Street. The remaining residential or educational receivers are significantly more distant from the proposal and would not be impacted.

The AONE determined that if the control measures were implemented, noise emissions from the proposal would comply with the guidelines presented in the *NSW Industrial Noise Policy* (EPA, 2000) and not produce adverse impact.

Vibration impacts for construction

Human comfort

Table 23 provides estimations of the vibration levels of various items of construction equipment and mobile plant (that would be used in the construction activity). The nearest residential property (NCA 5) is 20 metres away and the nearest commercial property (NCA 9) is ten metres away. There would only be small areas of compaction required, due to the extent of the works. Therefore only small compactors are likely to be required. Based on the vibration velocity criteria for continuous / impulsive vibrations from the construction activities in Table 20, it is unlikely that these activities would exceed the relevant human comfort criteria at the residential premises and commercial properties.

Table 23 Safe working distances for typical equipment

Plant	Rating/ description	Cosmetic damage (m)		Human response (m)
		Residential	Industrial	
Vibratory Roller	< 50 kN (Typically 1-2T)	5	2	15-20
	< 100 kN (Typically 2-4T)	6	2	20
	< 200 kN (Typically 4-6T)	12	3	40
	< 300 kN (Typically 7-13T)	15	4	100
	> 300 kN (Typically 13-18T)	20	6	100

Plant	Rating/ description	Cosmetic damage (m)		Human response (m)
		Residential	Industrial	
	> 300 kN (> 18 T)	25	8	100
	10 kJ per cycle	15	3.5	100
Small Hydraulic Hammer	(300 kg – 5-12T excavator)	2	<1	7
Medium Hydraulic Hammer	(900 kg – 12-18T excavator)	7	2	23
Large Hydraulic Hammer	(1,600 kg – 18-34T excavator)	22	7	73
Drop Hammer	3t Enclosed (30kJ per blow assumed)	23	6	100
	25 kJ per blow	23	6	100
	5 kJ per blow	10	3	35
Hydraulic Jacking Rig	-	1.5	<1	Avoid contact with structure
Vibratory Rig	50 kJ per cycle	30	8	100
	10 kJ per cycle	15	3.5	100
Pile Boring	≤ 800 mm	2 m	<1	N/A
Jackhammer	Handheld	1 m nominal	<1	Avoid contact with structure
Dozer	D810 with ripper	<2m (nominal)	<1	10

Structural damage

As the nearest commercial/industrial property is located no closer than ten metres from the proposal, it is not expected that there would be any vibration sufficient to exceed the level for cosmetic damage at the commercial properties nearby the proposal area. It should, however be noted that the DIN4150 standard states that vibration levels at or above the criteria would not necessarily result in structural damage, only that further investigations are needed if these criteria are significantly exceeded.

Vibration Impacts for operation

Vibration sources from the proposal would be limited to air conditioning, ventilation and power generating plant. These sources would be supported on vibration isolating mounts to control vibration within the subject building. Consequently, no perceptible vibration will be transmitted to other properties.

5.6.3 Control measures

During construction:

- A Construction Noise and Vibration Management Plan (CNVMP) would be prepared as part of the Construction Environmental Management Plan. Measures documented in the CNVMP would be consistent with the mitigation measures outlined in Appendix

E and the Interim Construction Noise Guideline where practicable. These measures may include (but would not be limited to):

- Sydney Trains 24-hour complaints hotline to the community.
- Letter box drops, individual briefings, respite periods, or where highly intrusive noise levels are anticipated, alternative accommodation for specific construction activities
- Use of localised acoustic hoarding around significant noise generating items of plant
- Briefing of the work team in order to create awareness of the locality of sensitive noise receivers and the importance of minimising noise emissions
- Planning the higher-noise activities and work near residential noise receivers to be undertaken predominantly during less sensitive periods
- Ensuring spoil is placed and not dropped into awaiting trucks
- Use of less noise-intensive equipment
- Noise monitoring
- All construction plant and vehicles would be fitted with non-tonal reversing alarms

During operation:

- Provide attenuators/acoustic louvres on air intakes/discharges within the fire pump room. In addition ensure that the fire pump room external door is acoustically rated. Ensure there are mufflers on all engine exhausts within the fire pump room
- Ensure attenuators, acoustic louvres and lined ducting on air intakes/discharges in the level 3 mechanical plant room
- Select a silenced packaged generator with sound power level not exceeding 95 dB(A) for the level 5 generator room
- Ensure there are attenuators, acoustic louvres and lined ducting on air intakes/discharges for the roof level mechanical plant room
- Enclose the cooling and heating plant located on the roof to screen the plant from the residential receivers
- Acoustically treat roof level cooling and heating plant using lined ducting, attenuators or acoustic louvres as required to meet the noise criteria
- Undertake a detailed Assessment of Operational Noise Emissions report once plant selections are made and plant noise emission levels are known.

5.7 Waste management

5.7.1 Policy setting

Waste disposal in NSW is regulated by the POEO Act and associated regulations. The POEO Act requires waste to be categorised and regulates the way in which such waste can be disposed of.

In addition, the *Waste Avoidance and Resource Recovery Act 2001* (WARR Act) promotes waste avoidance and resource recovery. The purpose of the WARR Act is, broadly, to prevent degradation of the environment, eliminate harmful wastes, reduce the amount of waste generated and establish priorities for waste reuse, recovery and recycling.

The WARR Act establishes a waste hierarchy, which comprises the following principles:

- Avoidance
- Reuse
- Disposal.

Sydney Trains is dedicated to the minimisation of waste. Recycled content materials are proposed where they are cost and performance competitive.

5.7.2 Potential impacts

The majority of waste that would be produced by the proposal is expected during the construction period. Potential waste sources include:

- Excess spoil from earthworks where it is not deemed suitable for re-use within the proposal
- Excess construction materials including concrete, asphalt and scrap metal
- Small volumes of excess fuels, oils and chemicals resulting from plant and vehicle maintenance
- Wastewater generated by stormwater runoff from construction areas
- Paper waste, food waste and general rubbish generated by the construction workforce.

Excess spoil from earthworks is likely to be the main source of waste for the proposal.

Small quantities of waste would be generated during the operation of the proposal but this is considered standard for a commercial/office space and would have a negligible impact.

5.7.3 Control measures

During construction:

- A waste management plan (WMP) will form part of the CEMP that details the process for treatment of waste materials generated onsite and details measures to mitigate waste material impacts
- All waste will be classified prior to disposal as per the EPA's *Waste Classification Guidelines* (EPA, 2014)
- Ensure at least 95 per cent of construction and demolition waste (by weight) is diverted from landfill, and either recycled or reused.

5.8 Contaminated land and hazardous materials

5.8.1 Existing environment

A search of the NSW EPA Record of Contaminated Sites (EPA, 2015a) and Contaminated Lands Register (EPA, 2015b) was completed on 4 December 2015. This online register provides a list of written notices issued by the NSW EPA under Section 58 of the CLM Act in relation to the investigation or remediation of site contamination that presents a significant risk of harm to human health or the environment.

Three contaminated site records were found within the suburb of Alexandria. Of these, two were within one kilometre of the proposal site – Alexandria Canal Sediments (one kilometre south west) and former Cadbury Schweppes (one kilometre south west). Given their distance from the proposal they are not expected to pose a risk of contamination to the proposal.

A search of the NSW SafeWork Dangerous Goods database indicated that dangerous goods were previously stored on the proposal site. From the records, it appears that six depots were licensed at the proposal site and included one flammable liquids cabinet, four

underground storage tanks (USTs) and one above ground storage tank. Records from 1998 indicate that all four USTs and the above ground storage tank were 'removed completely from service'. Letters detailing tank decommissioning for the four USTs indicate that all four USTs were filled with sand and cement or clean fill and associated pipework was sealed or removed. Stored goods included paint, diesel, unleaded petrol, LPG and thinners.

Douglas Partners, July 2015 prepared a detailed site (contamination) investigation for the proposal for preliminary planning purposes and to assess the site suitability of the ROC proposal (refer to Appendix A).

Douglas Partners, July 2015 identified the following key sources of contamination:

- Uncontrolled fill associated with past demolition activities
- Fuel storage associated with a former service station
- Past commercial and industrial land uses including former uses as a workshop, crystal glass manufacturing, storage of steel products and former fire truck maintenance
- Existing adjacent fire rescue activities including oily residues within underground water tank, fire simulation activities and urban stormwater within the culvert
- Existing demountable buildings on site.

The following contaminants of potential concern are associated with the sources identified above:

- Metals
- Total petroleum hydrocarbon
- Benzene, toluene, ethylbenzene and xylenes
- Polycyclic aromatic hydrocarbons
- Phenols
- Volatile organic compounds
- Octacalcium phosphate
- Polychlorinated biphenyl
- Trichloroethene (TCE)
- Asbestos.

TCE was detected below the site assessment criteria (SAC) at BH1A (22 µg/L) and BH7A (40 µg/L) compared to the SAC of 330 µg/L.

The soil analytical results were then compared against EPA *Waste Classification Guidelines* (EPA, 2014). Douglas Partners, July 2015 found that the proposal area is preliminarily classified as General Solid Waste with the exception of soils at BH7A impacted by lead (about 1.5 metres (bgl)) which is preliminarily classified as Restricted Solid Waste and soils at BH6A impacted by asbestos (about 3 metres bgl) which is preliminarily classified as Special Waste (asbestos waste). Borehole locations are shown in Figure 9.

A second round of groundwater sampling (17 December 2015) with the samples analysed for arsenic, zinc, chlorinated hydrocarbons (including TCE) and PFCs (Table 4) indicated that:

- Arsenic and zinc were recorded at concentrations below the laboratory limits of reporting or below the SAC with the exception of zinc at MW1A of 0.13 mg/L compared to the GIL of 0.031 mg/L (corrected for hardness). This was in the same

order of magnitude as recorded in the first round of groundwater sampling. It was noted that arsenic was recorded at MW9A (8 µg/L) below the GIL of 13 µg/L

- TCE (MW1A: 16 µg/L; MW7A: 13 µg/L; MW9A: 1 µg/L) and cis-1, 2-dichloroethene (MW1A: 2µg/L; MW7A: 14 µg/L; MW9A: 12 µg/L) were again recorded in groundwater at similar but lower levels than the first round of sampling and were well below the SAC
- The PFCs 6:2 flourotelomer sulfonate (FtS) and 8:2 FtS were recorded at concentrations below the adopted human interim screening levels
- The PFC perfluorooctane sulfonate (PFOS) was recorded at concentrations exceeding the adopted human interim screening level (for drinking water) of 0.2 µg/L in all wells (MW1A: 1.22 µg/L; MW7A: 0.56 µg/L; MW9A: 3.98 µg/L)
- The PFC, perfluorooctanoic acid (PFOA) was recorded at a concentration exceeding the adopted human interim screening level (for drinking water) of 0.4 µg/L (MW9A: 0.52 µg/)
- No concentrations of PFOS or PFOA were recorded above ecological interim screening levels.

Douglas Partners (2016) found that the site can be made suitable for the use, subject to the following:

- Additional soil testing is recommended within the existing building footprints following demolition of the buildings. Target analytes should include metals, Total petroleum hydrocarbon, Polycyclic aromatic hydrocarbons, asbestos and PFCs
- If the existing buildings contain hazardous building materials, a clearance certificate would be required following demolition. Any clearance certificates must be conducted by a hygienist independent of the demolition contractor
- Visual confirmation (as appropriate) of the spoil excavated from the limited areas of excavation against the preliminary waste classification provided in DP (2016)
- Ex-situ waste classifications of spoil generated from:
 - The excavation of the site detention tank noting the larger volume expected and source depths of about two metres
 - Excavations undertaken in the vicinity of BH7A (~ 1.5 metres bgl) which is preliminarily classified as Restricted Solid Waste and at BH6A (~ 3 metres bgl) which is classified as Special Waste (asbestos)
- The adoption of an unexpected finds protocol (UFP) as part of the Construction Management Plan to manage unexpected contamination which may include asbestos encountered during the redevelopment works
- An Acid Sulfate Soil Management Plan (ASSMP) is developed and implemented to guide remediation/construction works.

5.8.2 Potential impacts

There would be excavation works for the proposal at a depth of up to two metres for connection to services. The construction works have the potential to expose contaminated soils from historical site uses. The findings indicated that there is a low risk to surface water and groundwater in contamination from existing TCE. There is the potential for asbestos containing material (ACM) to become exposed during earthworks or heavy rain events. It is anticipated that the excavation works for the building foundations and basement construction would remove some of the contaminated soils. Any remaining soils would be tested before they are reused on site.

There is the potential for incorrect storage and handling of hazardous materials resulting in spills or leaks during construction of the proposal that could cause contamination to occur.

5.8.3 Control measures

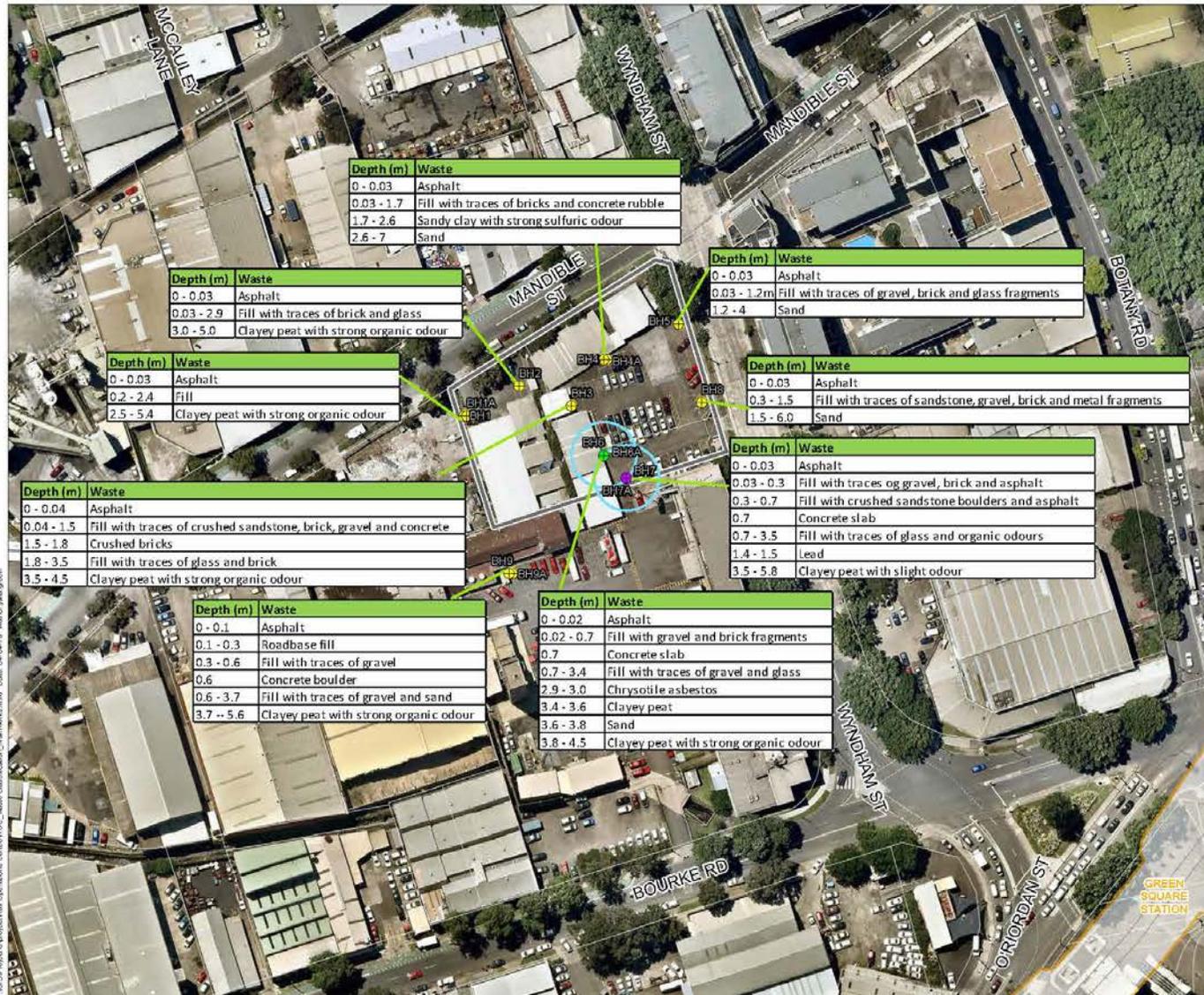
During construction:

- Additional soil testing is recommended within the existing building footprints following demolition of the buildings. Target analytes should include metals, TPH, PAH, asbestos and PFCs
- If the existing buildings contain hazardous building materials, a clearance certificate would be required following demolition. Any clearance certificates must be conducted by a hygienist independent of the demolition contractor;
- Visual confirmation (as appropriate) of the spoil excavated from the limited areas of excavation against the preliminary waste classification provided in DP (2016).
- Ex-situ waste classifications of spoil generated from:
 - The excavation of the OSD tank noting the larger volume expected and source depths of approximately 2 m.
 - Excavations undertaken in the vicinity of BH7A (~ 1.5 m bgl) which is preliminarily classified as Restricted Solid Waste and at BH6A (~ 3 m bgl) which is classified as Special Waste (asbestos);
- The adoption of an unexpected finds protocol (UFP) as part of the Construction Management Plan to manage unexpected contamination which may include asbestos encountered during the redevelopment works.
- An Acid Sulfate Soil Management Plan (ASSMP) is developed and implemented to inform construction works.
- Spill kits and a temporary refuelling bund will be installed and used on site.

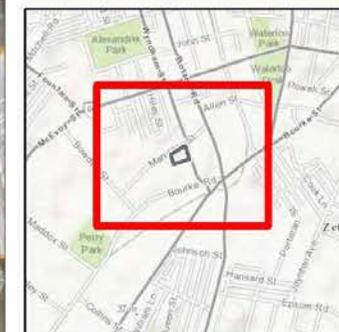


Legend

- Railway Station
- Railway Line
- General Solid Waste
- Special Waste (Asbestos)
- Restricted Solid Waste (Lead)
- 10m buffer around contaminated soils



Extent map



Source: Neasmap, Aurecon, RailCorp

Rail Operations Centre Review of Environmental Factors

Figure 9: Waste Classification



A3 scale: 1:1,200
0 12.5 25 50 m

Job No: 247572
Projection: MGA Zone 56

5.9 Visual aesthetics and urban design

5.9.1 Existing environment

The site currently comprises various demountable buildings and other single storey buildings. There is a two storey building on the eastern extent of the property. There is an open car park area with space for up to 50 vehicles. The southern extent of the site has a five storey training building and other single storey buildings as well as a further 60 car parking spaces.

The site is currently in use 24 hours per day and has night-time lighting.

5.9.2 Potential impacts

During construction, the potential visual impacts would include:

- Presence of plant and equipment on site
- Temporary construction compounds
- Temporary stockpiles
- Light spill from security lighting and any night works.

Surrounding businesses and residents may experience a reduction in visual amenity during construction. However these impacts would be restricted to the construction period and all disturbed areas would be restored to pre-existing condition or better post construction.

During construction some night works would be required. There would be road closures for: installation of noise screening and installation of 'B' class hoarding around the perimeter of the ROC proposal at Wyndham Street and Mandible Street. These works may need to be undertaken out of hours to prevent impacting on the road network. The timing would be dependent on the road occupancy licence issued by Roads and Maritime. As such night lighting may impact neighbouring properties, however this would be temporary and limited to periods where night works are required.

During operation it is anticipated that the site may be in use continuously through the night and day and therefore lighting would be required for security purposes. External security lighting would be installed in a manner which minimises light spill to areas beyond the site boundary.

The completed building would be four storeys high and therefore has the potential to impact surrounding properties during the operational phase. Given the size of the building there is potential for sunlight to be blocked to surrounding properties.

Figure 10, Figure 11 and Figure 12 show the indicative shadow analysis of the buildings and the proposal at 9am, 11am and 1pm on the 21 June 2016 according to the City of Sydney LEP 2012. The shadow diagram of the proposal indicates there would be some impact from shadow to the Dangrove building to the west of the proposal as well as to the Sydney Trains owned lots to the south of the proposal. The shadow diagram shows the worst case scenario during winter.

The building facades are of robust masonry constructions and feature two massive arches embracing the street frontages. Each is about ten metres high with a span of about 60 metres between supports. These arches have been designed to bring natural light into the internal spaces.

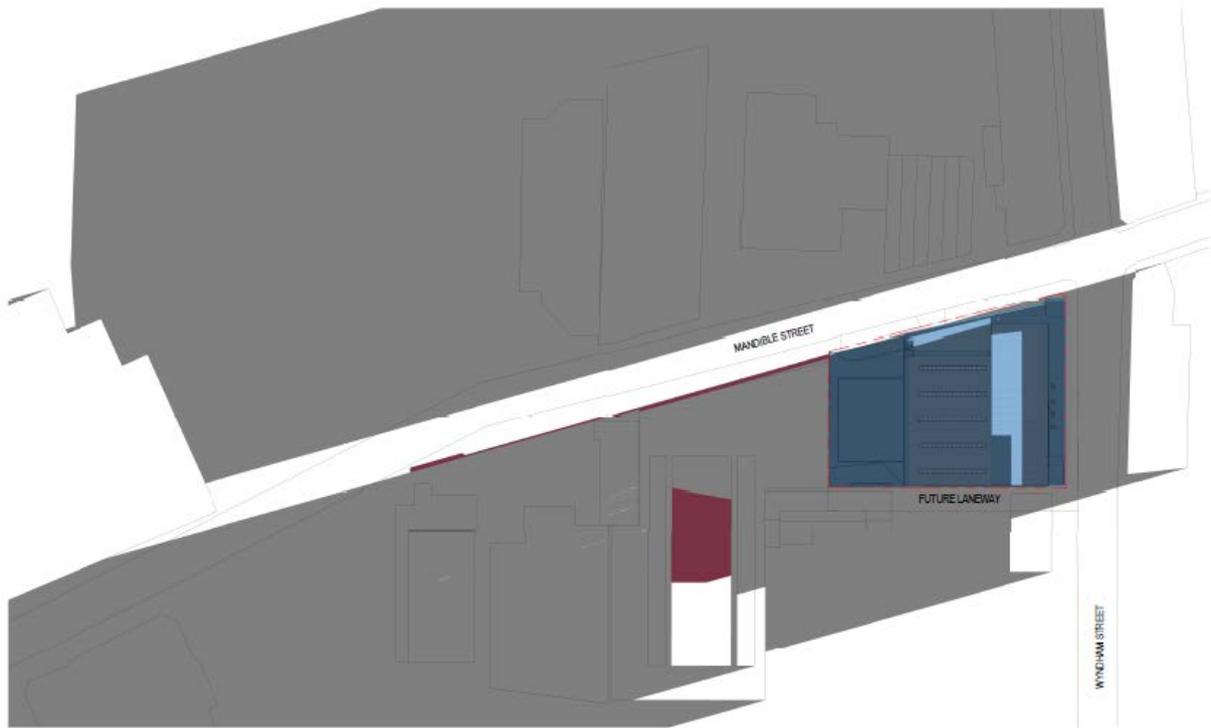
The building stands at about 26 metres tall from ground to roof parapet, with the plant room set further back from the primary facades up to 31.2 metres (Wyndham and Mandible Street). The building is below the 35 metres, the maximum allowable height of buildings, as shown on City of Sydney Council LEP Sheet HOB_010.

The western façade is built to the proposal boundary with no opening. Also located on the proposal boundary, the southern façade would feature windows to bring natural light to generic offices and support/service floors.

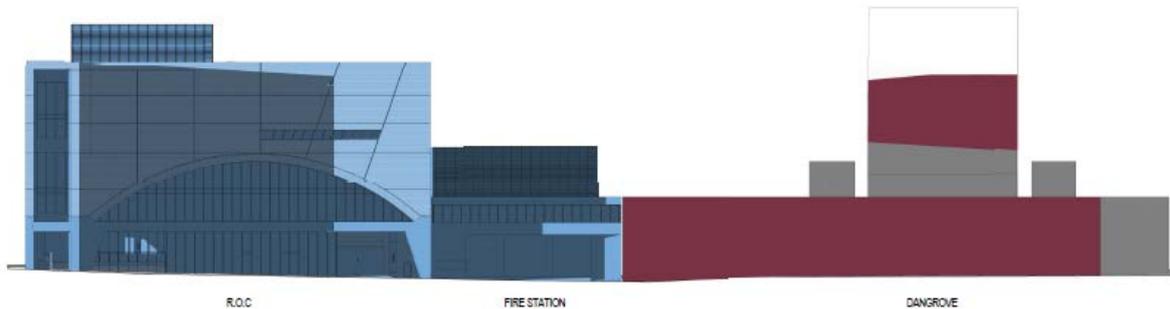
5.9.3 Control measures

During operation:

- Lighting will be designed, operated and installed in accordance with Australian/New Zealand Standard (AS/NZS) 1680.1 – 2006
- A detailed Public Domain Plan.



SITE PLAN - 21 JUNE, 9am



NORTH ELEVATION - 21 JUNE, 9am

Figure 10 Indicative shadow analysis at 9am

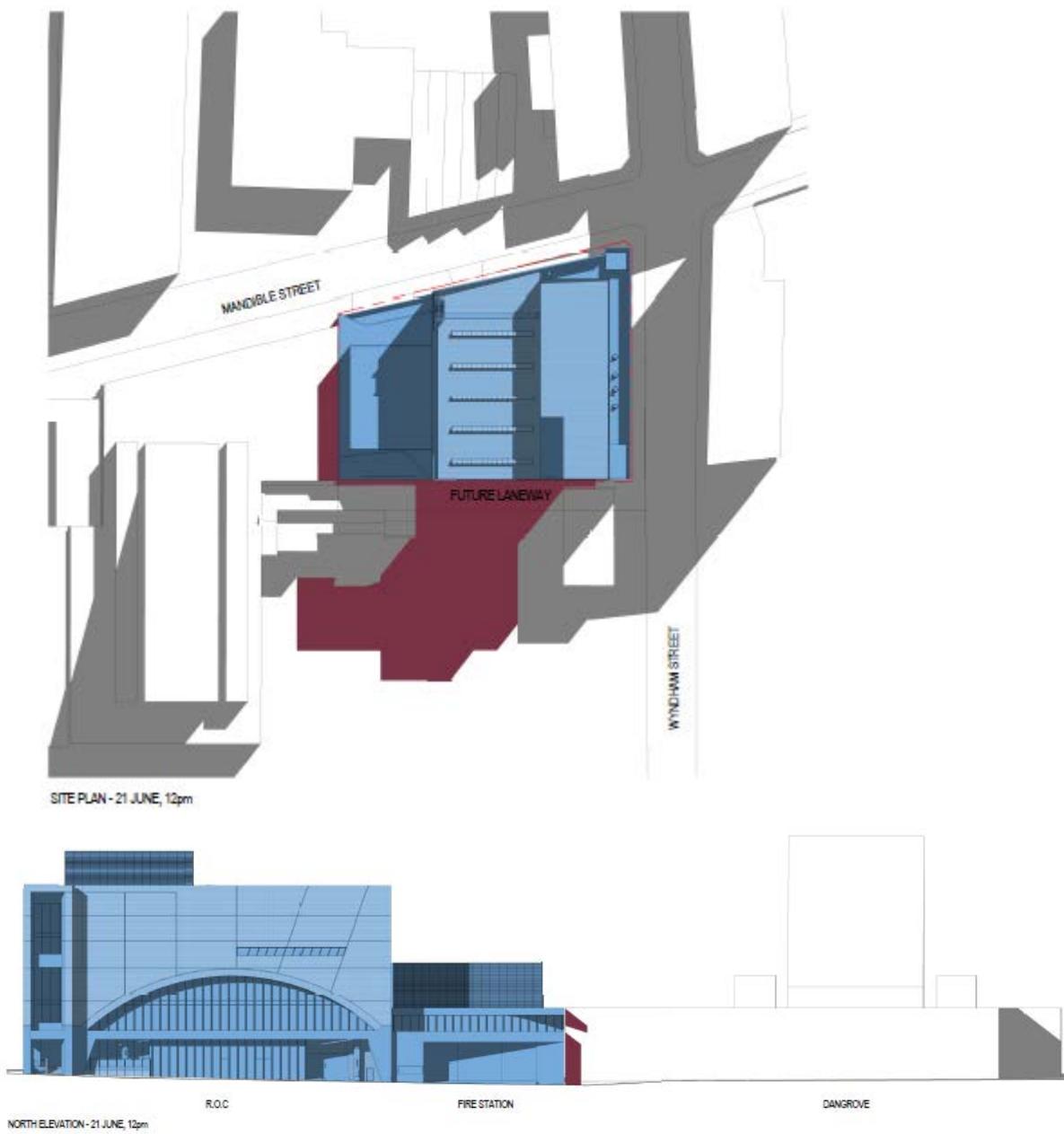


Figure 11 Indicative shadow analysis at 12pm

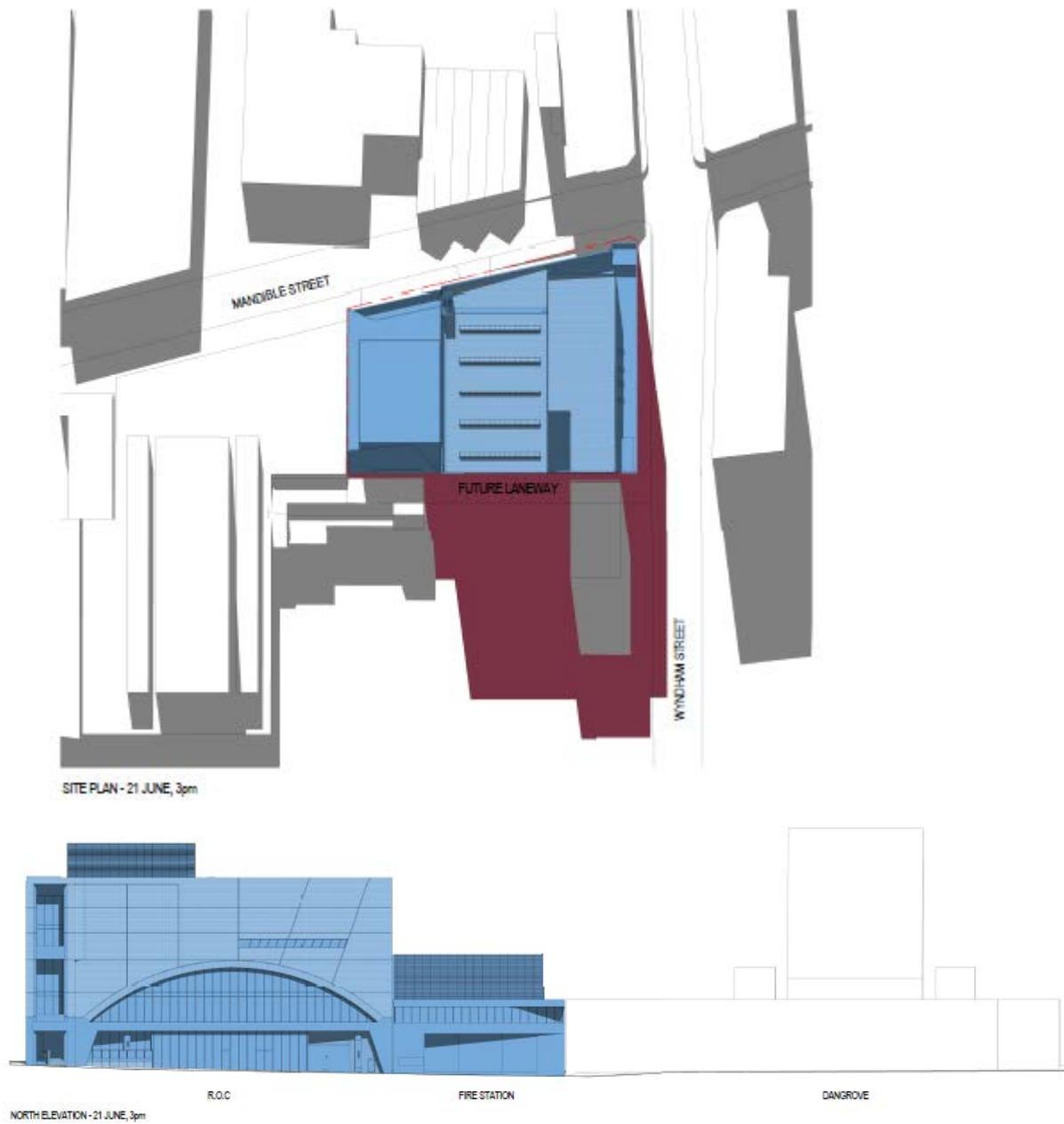


Figure 12 Indicative shadow analysis at 3pm

5.10 Land use, zoning and socio-economic effects

5.10.1 Existing environment

The proposal is located in the following two Lots: Lot 701 in DP 713555 and Lot 2 DP 552864. The proposal site is currently occupied by the FRNSW who use the site for training purposes, offices, a fire station and a 000 emergency centre. The site is zoned as 'Business Park' under the City of Sydney council LEP, and is surrounded by 'mixed use' and 'general industrial' zones. The surrounding area is largely commercial and industrial; however there are some high density residential towers along Botany Road, Wyndham Street and Mandible Street to the north west of the proposal. Green Square Station and Waterloo Public School are both located within 300 metres of the proposal.

The proposal is located wholly within the City of Sydney LGA. City of Sydney Council provides online community profile information based on results of Census and Australian Bureau of Statistics data. The proposal is within the Alexandria to Beaconsfield area. Alexandria - Beaconsfield is a residential and industrial area which has recently experienced redevelopment. The area also includes some commercial land use. The area was predominantly industrial in the 1900s due to its proximity to the rail yards and brick works. Population increased in the area after 1996 due to urban renewal. Many large scale industrial and warehouse sites were replaced with residential and employment uses.

The 2011 population of Alexandria was 7,971. 60.4 per cent of the population in Alexandria is Australian born and 63.1 per cent is aged between 25 and 49 years old. The population density is 20.01 persons per ha, with the majority of residents comprising of one persons or couples without children. There is a 96.5 per cent employment rate with the majority of workers employed in the financial/insurance services and professional, scientific and technical services. In 2011, Alexandria - Beaconsfield had the lowest level of disadvantage in the City of Sydney Council area, with a Socio-Economic Indexes for Areas (SEIFA) index score of 1,096.5.

5.10.2 Potential impacts

The proposal does not impact on the operation of the FRNSW personnel, as FRNSW have relocated south of the proposal area and provided a new training facility, so that they can continue their existing operations of fire and rescue for the community of Alexandria.

The proposal may impact upon the accessibility and useability of the site by FRNSW during construction. However this would be limited to stages during construction only.

The surrounding land use would not be adversely affected by the proposal.

Potential socio-economic impacts as a result of the proposal include:

- Amenity reduction
- Access and connectivity impacts
- Business impacts.

Amenity impacts can be expected through both the construction and operational phases of the proposal. Amenity impacts would include noise, air quality, visual and light spill impacts (these are assessed in detail in other sections of this REF).

During construction there is anticipated to be some impacts to pedestrian movement along the southern footpath of Mandible Street and the western footpath of Wyndham Street. Access would be maintained to all surrounding businesses and therefore any impacts would be minimal and temporary.

The impacts to business would be short term, as traffic control would be operated to limit any access restrictions. There would be no impact to any of the business driveways. There would be road closures for: installation of noise screening and installation of 'B' class hoarding

around the perimeter of the ROC proposal at Wyndham Street and Mandible Street. These works may need to be undertaken out of hours to prevent impacts to any businesses. The timing would be dependent on the road occupancy licence issued by Roads and Maritime. Deliveries of the building modules during construction would also be undertaken out of hours to the surrounding business.

5.10.3 Control measures

During construction:

- Consultation with City of Sydney Council and any other relevant stakeholders regarding other developments will be undertaken on an ongoing basis during construction
- Consultation with Ausgrid will be undertaken at least two weeks prior to any excavation works.

5.11 Traffic and access

5.11.1 Existing environment

A Traffic and Transport Impact Assessment (TTIA) report (refer to Appendix G) was prepared to understand the potential impacts arising from the construction and operation of the proposal and to identify and recommend any control measures that would be appropriate.

There are two access points to the proposal – on Mandible Street and Wyndham Street Alexandria as shown in Figure 13. According to the Roads and Maritime classified road network maps, the roads leading to the proposal are classified as Regional Roads or Local Roads. The Regional Roads are under the governing authority of Roads and Maritime and the Local Roads are under the governing authority of City of Sydney Council. Figure 13 identifies the key roads surrounding the proposal, access routes and parking options. Table 24 outlines the key roads surrounding the proposal and briefly describes their features and associated constraints.

Table 24 Road network features and constraints

Road name	Characteristics	Constraints
Mandible Street	<ul style="list-style-type: none"> • Local road, typically 11 metres wide, two lanes, two-way undivided carriageway • Speed limit 50 km/h. • Services mainly commercial/industrial land uses. 	<ul style="list-style-type: none"> • Segregated cycle lane on northern side of kerb • Unrestricted on-street parallel parking permitted on southern side of kerb, west of Wyndham Street • No right turn from Mandible Street east approach to Wyndham Street north.
Wyndham Street	<ul style="list-style-type: none"> • Regional Road, typically 13 metres wide, two lanes, two-way undivided carriageway • Speed limit 50 km/h • Connects at south to Bourke Road, parallel to Botany Road. 	<ul style="list-style-type: none"> • Four lanes, two-way south of Mandible Street with no on-street parking • Two lanes, two-way north of Mandible Street with on-street parking • No left turn for vehicles over 6 metres from south approach to Mandible Street • No right turn for vehicles over 9 metres from south approach to Mandible Street • No left turn for vehicles over 6.4

<i>Road name</i>	<i>Characteristics</i>	<i>Constraints</i>
		metres from north approach to Mandible Street.

Restricted access vehicles

Roads and Maritime has roads and zones throughout Sydney which are approved for Restricted Access Vehicles (RAV) as well as Higher Mass Limits (HML) for certain heavy vehicles to travel along.

Generally, vehicles in excess of 2.5 metres in width, 4.3 metres in height and 19 metres in length are considered RAV and would require special permits. Prior to any construction transportation tasks proceeding, the appropriate oversize and/or overmass permits must be sought from Roads and Maritime.

Figure 13 illustrates the classified roads within vicinity of the proposal that are approved RAV routes. Roads and Maritime and/or City of Sydney Council permission is required where construction vehicles greater than the allowable conditions require access to roads that contain RAV restrictions.

Based on the road classification, there is potentially one haulage route along classified roads that provide access/egress for the proposal. The possible haulage route is to/from Botany Road (main road number: MR170) via Bourke Road or Wyndham Street, as shown in Figure 13.

Public transport, pedestrian and cyclist facilities.

Green Square Station is about 200 metres south east of the proposal. According to the Sydney Buses network map (TfNSW, 2014), bus 370 operates from McEvoy Street along Botany Road. No bus routes operate along Wyndham Street or Mandible Street. There are dedicated cycle lanes on Mandible Street and Bourke Road. There are pedestrian footpaths along Mandible Street, Bourke Road and Wyndham Street.

Traffic volume

Traffic volume data is obtained from Roads and Maritime count stations, which record Annual Average Daily Traffic (AADT) volumes. Table 25 shows the count stations nearest to the proposal.

Table 25 Annual average daily traffic volume

Station number	Road	Location	Annual average daily traffic volume (AADT)		
			1999	2002	2005
00.232	Wyndham Street (north/south)	McEvoy Street (east/west). Waterloo-TCS 48	34,240	31,174	32,602
02.245	Botany Road, MR170	Zetland north of Mandible Street	27,354	24,388	24,860
02.312	Botany Road, MR170	Zetland south of R2008, Bourke Street	26,079	28,441	24,030
02.309	Bourke Road, SR2008	Bourke Road, north of O'Riordan Street	19,257	17,096	17,436

There have generally been decreases in AADT volumes between 1999 and 2005 for the count locations surrounding the proposal. The data indicates that AADT have remained reasonably consistent with fluctuations of between 7.5 per cent and 10 per cent being recorded over the six years of most recently available data.

Peak traffic periods are experienced between 7.45am – 8.45am and between 5.00pm and 6.00pm. Table 26 provides a summary of the traffic volumes at the intersections surrounding the proposal, during peak hour periods.

Table 26 Traffic volumes at intersections

Intersection	AM & PM peak period	Traffic volume by approach for AM/PM (vehicles/hour)			
		N	S	E	W
Wyndham Street / Mandible Street	7.45 – 8.45	943	1114	442	187
	17.00 – 18.00	823	989	357	176

Note: there was no data available for the intersection at Bourke Road and Wyndham Street.

Intersection operations

According to the Roads and Maritime Guide to Traffic Generating Developments, October 2002, the capacity of urban roads is generally determined by the capacity of the intersections. Typical one-way mid-block lane capacities on urban roads under interrupted flow and clearway conditions are 900-1000 vehicles/hour/lane. This capacity reduces to 600 vehicles per hour for a kerbside lane with vehicles occasionally parked.

Therefore as a general guide, the mid-block Level of Service (LOS) for the roads/approaches would be assessed in accordance with criteria set out in the Guide to Traffic Generating Developments. Table 27 outlines the LOS criteria.

Table 27 Level of service for urban roads peak hour flows per direction

Level of Service	One Lane (vehicles/hour)	Two Lanes (vehicles/hour)
A	200	900
B	380	1400
C	600	1800
D	900	2200
E	1400	2800

Based on Table 27 above, traffic volumes along the roads outlined in Table 26 relating to the proposal are currently operating at LOS A for Wyndham Street and LOS C for Mandible Street in terms of mid-block volumes. LOS A relates to delay of less than 14 secs/vehicle from good operation of traffic signals and roundabouts and good operation of give way and stop signs. LOS C relates to delay of less than 29 to 42 secs/vehicle from satisfactory operation of traffic signals and roundabouts, and satisfactory operation of give way and stop signs.

5.11.2 Potential impacts

Construction

Earthworks and concrete pours are expected to generate the most traffic movements to/from the proposal during construction. Additional traffic volumes would be generated from the delivery of plant/equipment as well as the arrival and departure of employees/contractors. It can be expected that about 10 per cent of the generated traffic movements would occur during the peak hour periods identified in Table 26.

For the purposes of approximating a worst case scenario of traffic generated by the construction activities, the following assumptions have been adopted:

- The delivery of construction plant/machinery is estimated at 20 vehicle movements per day, or rather two vehicle movements during the peak hour period (that is one trip in / one trip out)
- At most ten vehicle movements would be related to construction staff arriving/departing the site. That is, ten incoming trips occur during the morning peak period and similarly ten outgoing trips in the afternoon
- At least 20 vehicle movements per day would be in relation to concrete trucks during peak pours (or two vehicle movements per hour; that is one trip in / one trip out)
- The expected number of truck movements in relation to the transfer of excavated soil shall be taken as four vehicle movements per hour (that is two trips in / two trips out).

Therefore totalling the above generated vehicles, it is estimated that a total of 18 vehicle movements per peak hour period or 50 vehicle movements per day would be generated by the construction activities. This number of generated construction movements may be revised depending on the scheduling of works and staging.

There would be minor impacts to pedestrians at the entry/exit locations of the proposal during standard working hours and out of hours during road closures. A control measure has been include for pedestrian/vehicle management personnel to be provided at all access points of entry/exit to the proposal during construction of the proposal.

Parking

It is anticipated that during construction about five car parking spaces would be required for construction staff parking. These would be provided in a leased office space near the

proposal. Construction staff would be encouraged to car pool to the area to minimise the amount of required parking spaces on site and the number of vehicles trips to/from the proposal.

Operation

The operational traffic impact assessment determined there would overall be a marginal increase in traffic volumes on the adjacent road network as a result of the ROC proposal. By comparing with and without proposal scenarios it is evident that background traffic growth for the local area would impact the road network more than traffic volumes associated with the ROC.

The operational traffic impact assessment also determined that due to safety and network operational reasons, site access/egress for the proposal is not preferred along Wyndham Street.

The Access/egress proposed would be in a forward direction only via the driveway adjoining Mandible Street at the western end of the proposal. For this driveway access to function the existing on-street parking on the southern side of Mandible Street, in front of the proposal, is required to be removed (about 40 metres or six car spaces) with the installation of no parking signs in place. The removal of the on-street parking spaces and installation of no parking signs requires approval from the City of Sydney.

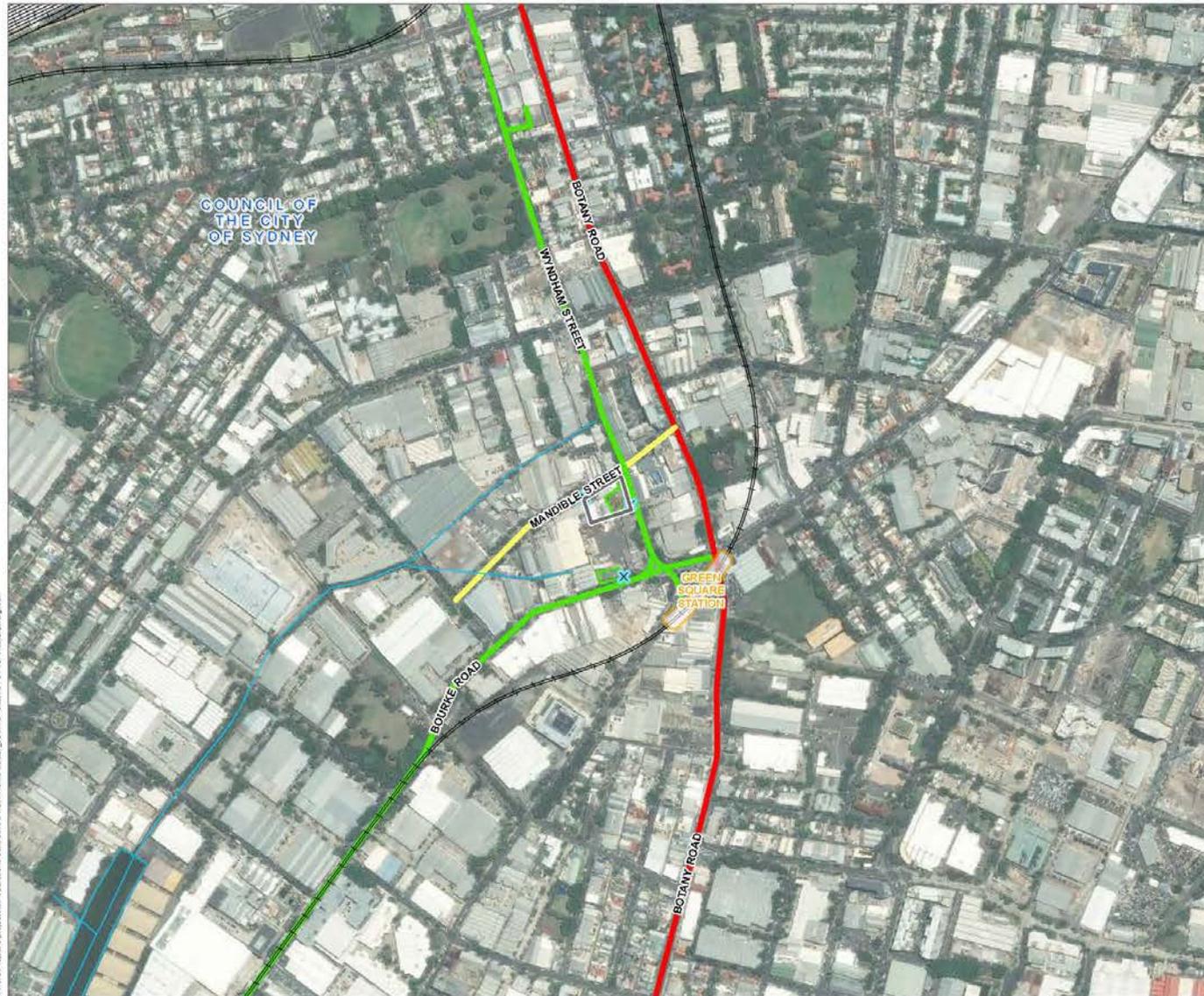
5.11.3 Control measures

During construction:

- The traffic management plan will be developed in consultation with the relevant authorities and implemented
- Roads and Maritime Services approvals and permits will be obtained prior to construction commencing in this area
- Construction vehicles, materials and equipment will be scheduled for deliveries to minimise coinciding with the road network peak periods
- Traffic management and signage will be established at the site entrance and exit to minimise risks to workers, motorists, cyclists and pedestrians
- Pedestrian/vehicle management personnel to be provided at all access points of entry/exit to the proposal during construction of the proposal
- A condition report for Wyndham Street, Mandible Street and Bourke Road will be completed prior to construction commencing and at the conclusion of construction
- All pavement and road surfaces damaged during construction will be restored when work is finished.

During operation:

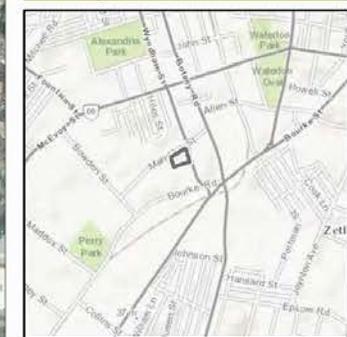
- Request City of Sydney approval to remove the existing on-street parking (about 40 metres or 6 car spaces) and install no parking signs on the southern side of Mandible Street (north of the ROC site).



Legend

- The proposal
- Watercourse
- Railway station
- Railway line
- Site access point
- Existing car parking
- NSW road classification**
- Local Road
- Regional Road
- State Road

Extent map



Source: Neamap, Aurecon, RailCorp



A3 scale: 1:7,000
0 75 150 300 m

Job No: 247572
Projection: MGA Zone 56

Rail Operations Centre **Review of Environmental Factors**

Figure 13: Traffic and access

5.12 Climate change

5.12.1 Potential impacts

A Climate Change Impact Assessment (CCIA) report (refer to Appendix H) was prepared to determine the hazards and risks associated with future climatic conditions and the effect they have on infrastructure and community. The risk assessment determined the potential impacts on the long term operation of the proposal as a result of projected climate change. Table 28 summarises the predicted impacts associated with key projected climate change trends.

Table 28 Climate change risk assessment 2030 and 2070

Climate change trend	Impact on the ROC	2030			2070		
		Likelihood	Consequence	Risk priority	Likelihood	Consequence	Risk priority
Increased average temperature and number of hot days	Higher average temperatures and increased peak temperatures will put pressure on HVAC systems. This would increase maintenance and operational costs as well as reduce the capacity of these systems to adequately cool buildings leading to user discomfort.	C5	L3	Medium	C6	L2	Medium
	Higher average temperatures and increased peak temperatures will put pressure on HVAC systems. This may reduce the capacity of these systems to keep mechanical and electrical components cool and therefore functioning. This could result in temperature related failures/shutdowns/blackouts/brown outs. There is the risk that this could cause substation and/or transformer failure leading to a breakdown of systems operation.	C3	L3	High	C3	L3	High

Climate change trend	Impact on the ROC	2030			2070		
		Likelihood	Consequence	Risk priority	Likelihood	Consequence	Risk priority
	Higher temperatures have the potential compromise the structural integrity of road surfaces leading to quicker deterioration and cracking. This increases maintenance costs for these assets.	C4	L5	Low	C4	L4	Medium
	High heat days have the potential to cause heat stress in staff members, resulting in poor performance and consequently safety concerns. In addition passengers may suffer from heat stress leading to health issues and fainting. Urban heat island effects may be exacerbated.	C4	L3	Medium	C3	L2	High
Increased intensity of extreme rainfall event	Extreme rainfall events have the potential to create flows of water which exceed the capacity of drainage and storm water infrastructure. This infrastructure could become stressed and fail which could have flow on effects including localized flooding and spills to natural waterways.	C4	L4	Medium	C4	L3	Medium
	Increased intensity of extreme rainfall events.	C3	L4	Medium	C3	L3	High

Climate change trend	Impact on the ROC	2030			2070		
		Likelihood	Consequence	Risk priority	Likelihood	Consequence	Risk priority
	Extreme rainfall events and wind could cause trees or limbs to fall onto overhead wiring and associated aboveground infrastructure. This could cause power loss and consequently train cancellations.	C2	L5	Medium	C2	L5	Medium
	Flash flooding as a result of extreme rainfall events could cause damage to pavements.	C4	L5	Low	C5	L4	Low
Increased time spent in drought	Extended periods of drought conditions can cause decrease in soil moisture resulting in ground shrinkage and soil movements. This has the potential to damage underground infrastructure which could compromise serviceability.	C4	L5	Low	C4	L4	Medium
	Extended periods of drought conditions can cause decrease in soil moisture resulting in ground shrinkage and soil movements. This can cause ground surfaces to shrink and crack if movement is restricted.	C5	L4	Low	C5	L4	Low
More frequent and intense fire weather	Direct loss of property, assets and lives as a result of bushfire.	C1	L6	Medium	C1	L6	Medium

Table 29 shows the climate change adaptation actions in response to the medium and high risk priorities identified in Table 28. Other relevant control measure are outlined below Table 29.

Table 29 Climate change adaptation actions

Ref	Impact	Impact on development	Risk Priority 2030	Risk Priority 2070	Adaptation	Actions	Risk priority after adaptation 2030	Risk priority after adaptation 2070
1	Building	Higher average temperatures and increased peak temperatures will put pressure on HVAC systems. This would increase maintenance and operational costs as well as reduce the capacity of these systems to adequately cool buildings leading to user discomfort.	Medium	Medium	<ul style="list-style-type: none"> Critical equipment located in ambient conditions (such as chillers, pumps, VSD's) shall be able to operate at: <ul style="list-style-type: none"> ASHRAE n=50 years Summer 46.1 degrees °C Dry Bulb and 23.7 degrees °C Wet Bulb and full solar load Winter 1.2 degrees °C Dry Bulb The chillers will continue to operate at ambient temperatures higher than 46.1°C with de-rated capacity. Design requirements for R-values include: <ul style="list-style-type: none"> External walls: 2.8, suspended slab (L1, 	<ul style="list-style-type: none"> The HVAC system will be designed to operate with high cooling loads due to increased average temperature and increased number of consecutive extremely hot days. 	Low	Low

Ref	Impact	Impact on development	Risk Priority 2030	Risk Priority 2070	Adaptation	Actions	Risk priority after adaptation 2030	Risk priority after adaptation 2070
					<p>L2, L3, L4, L5): 2, L6 slab: 4.2, Control room roof: 4.2.</p> <ul style="list-style-type: none"> Central cooling plant (including chillers) are designed in an N + 1 configuration to ensure 100% of critical equipment can be served on any one system up to ambient temperature of 46.1°C Equipment will be provided with uninterrupted power supply 			
2	Mechanical and electrical elements including signalling	Higher average temperatures and increased peak temperatures will put pressure on HVAC systems. This may reduce the capacity of	High	High	<ul style="list-style-type: none"> Critical equipment located in ambient conditions (such as chillers, pumps, VSD's) shall be able to operate at: ASHRAE n=50 years Summer 46.1 degrees °C Dry Bulb and 23.7 degrees °C 	<ul style="list-style-type: none"> The use of a back-up power supply will reduce the impact of a power outage when one occurs and reduce the likelihood that an outage would cause service interruptions. 	Low	Low

<i>Ref</i>	<i>Impact</i>	<i>Impact on development</i>	<i>Risk Priority 2030</i>	<i>Risk Priority 2070</i>	<i>Adaptation</i>	<i>Actions</i>	<i>Risk priority after adaptation 2030</i>	<i>Risk priority after adaptation 2070</i>
		these systems to keep mechanical and electrical components cool and therefore functioning. This could result in temperature related failures/shutdowns/blackouts/brownouts. There is the risk that this could cause substation and/or transformer failure leading to a breakdown of systems operation.			Wet Bulb and full solar load	<ul style="list-style-type: none"> • Winter 1.2 degrees °C Dry Bulb • The chillers will continue to operate at ambient temperatures higher than 46.1°C with derated capacity. • Design requirements for R-values include: • External walls: 2.8, suspended slab (L1, L2, L3, L4, L5): 2, L6 slab: 4.2, Control room roof: 4.2. • Central cooling plant (including chillers) are designed in an N + 1 configuration to ensure 100% of critical equipment can be served on any one system up to ambient temperature of 46.1°C 		

Ref	Impact	Impact on development	Risk Priority 2030	Risk Priority 2070	Adaptation	Actions	Risk priority after adaptation 2030	Risk priority after adaptation 2070
					<ul style="list-style-type: none"> Equipment will be provided with uninterrupted power supply 			
3	Road surfaces	Higher temperatures have the potential compromise the structural integrity of road surfaces leading to quicker deterioration and cracking. This increases maintenance costs for these assets.	Low	Medium	<ul style="list-style-type: none"> Specify materials in the design with improved heat resilience properties. 	<ul style="list-style-type: none"> By specifying heat resilient materials in road/pavement designs the likelihood that they would be impacted by heat stress decreases. 	Low	Low
4	Staff	High heat days have the potential to cause heat stress in staff members, resulting in poor performance and consequently	Medium	High	<ul style="list-style-type: none"> Glazed areas on the façades are set back from the façade to minimise heat gain on the northern and eastern sides. Balconies on the intermediate floors are covered and in deep recesses. A 	<ul style="list-style-type: none"> By implementing the measures listed the frequency of heat related illnesses amongst staff and passengers would be decreased. However the consequences resulting when 	Medium	Medium

Ref	Impact	Impact on development	Risk Priority 2030	Risk Priority 2070	Adaptation	Actions	Risk priority after adaptation 2030	Risk priority after adaptation 2070
		safety concerns. In addition passengers may suffer from heat stress leading to health issues and fainting. Urban heat island effects may be exacerbated.			fully covered entry foyer on the eastern façade ensures heat exposure is minimum outside the building. Trees in the public domain along the street frontages will provide shade in outdoor areas. Kitchenette points for potable cold water are incorporated in the design.	these instances do occur remains moderate.		
5	Drainage and storm water infrastructure	Extreme rainfall events have the potential to create flows of water which exceed the capacity of drainage and storm water infrastructure. This infrastructure could become stressed and fail which	Medium	Medium	<ul style="list-style-type: none"> The area of impermeable surface between pre and post development will remain the same. Onsite Detention (OSD) tank of 63 m3 with a rate of 152litres/s will be constructed to manage stormwater. 	<ul style="list-style-type: none"> By including the listed adaptation measures there is less likelihood that the capacity of infrastructure will be exceeded. 	Low	Low

Ref	Impact	Impact on development	Risk Priority 2030	Risk Priority 2070	Adaptation	Actions	Risk priority after adaptation 2030	Risk priority after adaptation 2070
		could have flow on effects including localized flooding and spills to natural waterways.						
6	Building	Extreme rainfall events and associated hail and wind could cause direct damage to above ground buildings including the car park, substations, station building etc. In addition sever weather conditions could cause trees to fall and cause additional damage.	Medium	High	<ul style="list-style-type: none"> New footpath, kerb and gutter would be constructed. The footpath would be constructed from reinforced concrete and kerb. 	<ul style="list-style-type: none"> By implementing the actions listed the likelihood of storms causing damage to buildings is decreased. In addition by choosing materials which are more resilient, the extent of damage may be reduced. 	Medium	Medium

Ref	Impact	Impact on development	Risk Priority 2030	Risk Priority 2070	Adaptation	Actions	Risk priority after adaptation 2030	Risk priority after adaptation 2070
7	Above ground infrastructure (ie overhead wiring)	Extreme rainfall events and wind could cause trees or limbs to fall onto overhead wiring and associated aboveground infrastructure. This could cause power loss and consequently train cancellations.	Medium	Medium	<ul style="list-style-type: none"> The aboveground power poles on Mandible Street would be placed underground. Monitor structural stability of new trees near assets, maintain clearance zones and trim/remove as required. 	<ul style="list-style-type: none"> By relocating infrastructure underground the risk of damage to wiring during storms is dramatically reduced. If this is not possible, the risk reduction is less, however monitoring new trees should reduce the likelihood of impact to infrastructure during storms. 	Medium	Medium

Ref	Impact	Impact on development	Risk Priority 2030	Risk Priority 2070	Adaptation	Actions	Risk priority after adaptation 2030	Risk priority after adaptation 2070
8	Underground infrastructure (ie foundations, pipes etc)	Extended periods of drought conditions can cause decrease in soil moisture resulting in ground shrinkage and soil movements. This has the potential to damage underground infrastructure which could compromise serviceability.	Low	Medium	<ul style="list-style-type: none"> Garden beds would be installed along Mandible Street and Wyndham Street. The beds would reduce offsite runoff and allow moisture to penetrate ground. 	<ul style="list-style-type: none"> The listed measures would reduce the likelihood of ground becoming dry enough to cause infrastructure damage. 	Low	Low

Ref	Impact	Impact on development	Risk Priority 2030	Risk Priority 2070	Adaptation	Actions	Risk priority after adaptation 2030	Risk priority after adaptation 2070
9	All assets	Direct loss of property, assets and lives as a result of bushfire.	Medium	Medium	<ul style="list-style-type: none"> Chillers, Heating hot water units and pumps will continue to operate in all fire scenario The HVAC systems for fire affected floors will shut down and smoke exhaust systems will operate Maintain asset protection zones. Where possible include fire resistant materials in asset designs. Earthing and lightning protection would be provided to the building in accordance with AS1768. 	<ul style="list-style-type: none"> The measures listed would reduce the likelihood and frequency of a fire impacting the asset. 	Medium	Medium

5.12.2 Control measures

During operation:

- The HVAC system will be designed with sufficient design redundancy, to maintain the operation of critical electrical components during consecutive extremely hot days
- Back-up power has been included in the concept design to ensure system operations in the event of power failure
- Ensure there are heat refuges placed in and around the ROC facilities
- Provide access to water bubblers
- Specify storm resilient materials in design of new buildings and associated infrastructure
- Monitor structural stability of trees near assets and trim/remove as required.

5.13 Greenhouse gas emissions

5.13.1 Existing environment

A greenhouse gas assessment report was prepared (refer to Appendix I). The Greenhouse gas emissions (GHG) are classified as either scope 1, 2 or 3 emissions depending on their source. Scope 1 emissions are direct emissions to the atmosphere such as the burning of coal or the combustion of fuel in a vehicle. Scope 2 emissions are indirect emissions associated with the purchase of electricity such as from the NSW grid. Scope 3 emissions are indirect emissions from sources not owned or directly controlled by the entity but related to the entity's activities such as embodied carbon in materials or transmissions and distribution losses resulting from purchased electricity.

Green Square Station is less than two hundred metres south east of the proposal. The surrounding road network, including Mandible Street to the north, Wyndham Street to the east and Bourke road to the south are considerable sources of direct emissions (scope 1) in the area through the combustion of fuel in vehicles. Much of the surrounding land use is dominated by commercial, industrial and residential properties which are the primary contributing sources of greenhouse gas emissions (GHG) in the area.

To the east of the proposal there is one school which would have high energy requirements and a reasonable footprint through scope 2 emissions. The trains which run adjacent to the proposal's location are also energy intensive and would have a large footprint through the purchase of electricity (scope 2) and through transmissions and distribution losses (scope 3). Other scope 3 emissions sources in the area include other indirect emissions, such as the extraction and production of purchased materials and fuels, transport-related activities in vehicles not owned or controlled by the proposal.

5.13.2 Potential impacts

Construction

The proposal has the potential to emit GHGs throughout its lifecycle. The primary emissions would occur during the construction of the proposal.

GHGs are usually expressed as carbon dioxide equivalents (CO₂-e) which has a global warming potential of one. Construction emissions would primarily result from following processes:

- Combustion of fuel in construction equipment
- Combustion of fuel used to transport materials to and from the proposal

- Clearance of vegetation which would otherwise continue to sequester carbon
- Purchase of electricity to power temporary site offices
- Transmissions and distribution losses from purchased electricity
- Embodied carbon stored in the materials used to construct the proposal.

5.13.3 Control measures

During construction:

- Use of construction material containing recycled content, such as recycled aggregates in bricks, or recycled steel, where reasonable and feasible
- Use more energy efficient equipment during construction
- Project planning will be undertaken to ensure that vehicle movements and construction activities have been planned efficiently and to minimise double handling of materials and waste, haulage distances and fuel use. Small construction site which is accessible via Green Square Station, as such alternative fuels not considered necessary. Alternative fuels will be used where it is feasible
- Use modular and replaceable finishing elements
- Planning and scheduling can be done by pull scheduling using the Last Planner System™ (LPS), or an equivalent system, to achieve efficiencies in project delivery (such as reduced program times). At a minimum the system must include a milestone schedule, collaboratively created phase schedules, make-ready look ahead plans, weekly work plans, and a method for measuring. Refer to the Lean Construction Institute website for free online resources
- Using 'just in time' methods of equipment and supply delivery; reducing overall storage requirements and potential for waste materials/equipment.

5.14 Cumulative environmental impacts

In accordance with clause 82 of the EP&A Regulation, any cumulative environmental effects of the proposal associated with other existing and likely future activities must be taken into account in determining the potential impacts of the proposal on the environment.

Cumulative environmental impacts occur when other proposals and works occur in close time proximity to the construction of the proposal.

5.14.1 Major proposals

A search of the Department of Planning and Environment major proposals register was undertaken on 27 November 2015. The search revealed one major proposal in the suburb of Alexandria - a proposed waste management facility at 154 Euston Road. That other proposal is about two kilometres away from the proposal site and is therefore not expected to result in cumulative impacts.

5.14.2 Council development applications

City of Sydney Council's development application register on 27 November 2015 revealed development applications within the vicinity of the proposed works.

D/2014/1761 at 12-20 Mandible Street is currently being undertaken located 100 metres north of the proposal. The development involves the demolition of existing office building and partial demolition of a warehouse building. A new building would be constructed and fitout for the purpose of a private art storage facility, and would include ancillary offices, workshops, caretakers flat and on-site parking. Once complete, the facility is expected to have about 15 full time employees and would operate from 8am – 6pm Monday to Saturday. Street trees

would not be removed to facilitate this development. This Development Application includes a Section 96 (1A) modification which proposes changes to the design of the ground floor level facing Mandible Street and roof as well as some internal changes. Demolition of the existing office building and partial demolition of a warehouse building has already been completed.

If construction works at this site are expected to overlap with the construction timing of the ROC there is the potential for cumulative impacts including from noise and traffic impacts.

There are three approved Development Applications along Wyndham Street:

- D/2015/502 at 128 Wyndham Street which involves alterations and additions to an existing house including new rear extension, new second storey addition and internal changes
- D/2014/201 at 158 Wyndham Street which involves the demolition of existing structures and construction of a new mixed-use building including ground floor retail and café, apartments and parking
- D/2015/696 at 192 Wyndham Street which involves alterations and additions to existing dwelling.

Given the minor nature of these works and their distance from the proposal, no cumulative effects are expected.

There are two other Development Applications on exhibition in the vicinity of the proposal being:

- D/2015/1683 at 320-323 Botany Road, Alexandria which proposes the use of the site for display and storage of motor vehicles for hire
- D/2015/1536 at 1037-1047 Bourke Street, Waterloo which proposes the development of a six storey mixed use development including retail and residential space.

Given the location of the proposal, and the approval of these proposed developments, there is unlikely to be cumulative effects to the proposal.

5.14.3 Sydney Trains associated works

Sydney Trains is proposing the following works:

- The ROC Early Works included the relocation of the FRNSW training facility as well as preparatory works for the main ROC including service connections and demolition of existing buildings. The relocation of the FRNSW training facility has been completed. The service connections and demolition of existing buildings of the previously approved ROC Early Works REF will be completed prior to works starting on the proposal site. Similarly the ROC Early Works REF – Addendum Piling Works will be completed prior to the works starting on the proposal site.
- The ROC Services Route would involve installation of electricity cables between the ROC proposal building and a substation – most likely Green Square substation. The route would most likely operate along Mandible Street and Wyndham Street.

Sydney Trains would stage construction works at each of these proposals to minimise cumulative environmental impacts where possible. A separate REF would be prepared for the ROC Services Route.

6 Consideration of State and Commonwealth Environmental Factors

6.1 Clause 228 Factors

Table 30 Clause 228 factors

Clause 228 Factors		Impact
(a)	Any Environmental Impact on a Community?	There would be minor impacts to nearby residents and FRNSW staff which have been addressed in the REF.
(b)	Any transformation of a locality?	The proposal would remove six shrubs within the proposal area and eight trees in the nature strip and install a new building. The proposal would cause minor impact to the nature of the surrounding land uses.
(c)	Any environmental impact on the ecosystems of the locality?	Impacts on ecosystems are anticipated to be non-significant if the recommended control measures identified in Section 7.1 are followed.
(d)	Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality?	The proposal site currently retains little aesthetic, recreational, scientific or other environmental value and the proposal would not reduce this.
(e)	Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations?	The proposal would not have an effect on a locality, place or building of significance or other special value for present or future generations. There would be no impact to any listed heritage items.
(f)	Any impact on the habitat of protected fauna (within the meaning of the <i>National Parks and Wildlife Act 1974</i>)?	The proposal would not have any impact on the habitat of any protected or endangered fauna due to the built up environment of the site and the implementation of the control measures in this REF.
(g)	Any endangering of any species of animal, plant or other form of life whether living on land, in water or in the air?	The proposal would not endanger any species of animal, plant or other form of life, whether living on land, in water or in the air due to the built up environment of the site and the implementation of the control measures in this REF.
(h)	Any long term effects on the environment?	There are no expected long term environmental effects due to the built up environment and the implementation of the control measures in this REF.
(i)	Any degradation of the quality of the environment?	There is no expected degradation of the quality of the environment due to the built up environment and the implementation of the control measures in this REF.

Clause 228 Factors		Impact
(j)	Any risk to the safety of the environment?	There is no expected risk to the safety of the environment due to the built up environment and the implementation of the control measures in this REF.
(k)	Any reduction in the range of beneficial uses of the environment?	There would be no reduction in the range of beneficial uses of the environment as a result of the works.
(l)	Any pollution of the environment?	The proposal could potentially cause pollution of the environment during construction however the potential impacts would be minimised with the implementation of the control measures given in this REF.
(m)	Any environmental problems associated with the disposal of waste?	The waste generated during the proposal would be contained and removed for disposal to approved recycling facilities or to licensed landfill in accordance with the implementation of the control measures provided in this REF. No environmental problems are anticipated for the disposal of waste.
(n)	Any increased demands on resources (natural or otherwise) that are or are likely to become in short supply?	No resources that are being used as part of this proposal are likely to become in short supply.
(o)	Any cumulative environmental effect with other existing or likely future activities?	No cumulative environmental effects are expected as a result of the proposal.
(p)	Any impact on coastal processes and coastal hazards, including those under projected climate change conditions?	There are no impacts on coastal processes or hazards that would result as part of the proposal.

6.2 Matters of National Environmental Significance Factors

Under the environmental assessment provisions of the EPBC Act, the following matters of NES and impacts on Commonwealth land are required to be considered to assist in determining whether the proposal would be referred to the Australian Government Department of the Environment. Table 31 addresses the matters of NES for the proposal.

Table 31 Matters of NES

Matters of NES	Impact
Any environmental impact on a World Heritage property?	Nil The proposal would not be undertaken within proximity to any World Heritage property.
Any environmental impact on National heritage places?	Nil The proposal would not be undertaken within proximity to any National heritage places.
Any environmental impact on RAMSAR wetlands?	Nil The proposal would not be undertaken within proximity to any

Matters of NES	Impact
	RAMSAR wetland.
Any environmental impact on Commonwealth listed threatened species or ecological communities?	Nil The proposal would not impact upon any Commonwealth listed threatened species or ecological communities
Any environmental impact on Commonwealth listed migratory species?	Nil The proposal would not impact upon any Commonwealth listed migratory species.
Does any part of the project involve nuclear action?	Nil The proposal does not involve any nuclear action.
Any environmental impact on a Commonwealth marine area?	Nil The proposal would not impact upon a Commonwealth marine area.
Any impact on Commonwealth land?	Nil The proposal would not impact any Commonwealth land.

There are no matters of NES that would be affected as a result of this proposal. No commonwealth land would be affected, either directly or indirectly, as a result of this proposal.

7 Environmental management measures

7.1 Summary of control measures

The following control measures have either been identified through the assessment undertaken in this REF or are standard best practice environmental management controls. They will be incorporated into the detailed design phase of the proposal and during construction and operation of the proposal, should it proceed. These control measures would minimise any potential adverse environmental impacts arising from the proposal. The controls measures are summarised in Table 32.

Table 32 Summary of control measures

Aspect	Potential Impact Tick relevant aspects	Control measures Typical measures included below
Landforms, Geology and Soils	<input checked="" type="checkbox"/> Soil Erosion / Stability <input checked="" type="checkbox"/> Site Rehabilitation <input checked="" type="checkbox"/> Acid Sulfate Soils	During construction: <ul style="list-style-type: none"> • An Erosion and Sedimentation Control Plan will be developed and maintained for the proposal in accordance with Managing Urban Stormwater, Soils and Construction Guidelines (Landcom, 2004) (the Blue Book). • Appropriate stockpiling of materials will take place away (at least 5 m) from drainage lines, waterways and drains. • Spill kits and a temporary refuelling bund will be installed and used onsite. • An Acid Sulfate Soil Management Plan (ASSMP) will be prepared to accompany the Construction Environmental Management Plan (CEMP). • Spoil removed from site will be disposed of in accordance with the EPA's Waste Classification Guidelines (EPA, 2014). • Site rehabilitation of disturbed areas will be undertaken progressively as activities are completed during the proposal. • Adequate drainage measures will be provided to control entry of groundwater and prevent ingress of surface water runoff to open excavation trenches. • Excavation during periods of heavy rainfall will be avoided.
Water Quality	<input checked="" type="checkbox"/> Pollution	During construction:

Aspect	Potential Impact <i>Tick relevant aspects</i>	Control measures <i>Typical measures included below</i>
and Hydrology	<input checked="" type="checkbox"/> Sedimentation <input type="checkbox"/> Oil Spills	<ul style="list-style-type: none"> • A flood and evacuation management plan will be developed for the proposal. • Drainage will be installed to carry stormwater collected into the existing council stormwater infrastructure. • The installed drainage system will include a water harvesting tank that prevents water volumes from exceeding City of Sydney council requirements for maximum discharge rates into the existing stormwater system. • Construction water will be tested and treated prior to being discharged off site or released to the nearest local stormwater infrastructure in accordance with legislative requirements. All controls will be outlined in the CEMP. • Install a concrete wash down area on site that meets the NSW EPA Environmental Best Management Practice Guideline for Concreting Contractors (NSW EPA 2002). • All chemicals and oils will be stored in accordance with the manufacturer's specification within a bunded area protected from rain. • The effectiveness of erosion and sediment controls will be regularly reviewed by the Sydney Trains environmental representative and adjusted or maintained if necessary. • Erosion and sediment controls are only to be removed once the area they are protecting has been stabilised. • An Acid Sulfate Soil Management Plan (ASSMP) will be prepared to accompany the Construction Environmental Management Plan (CEMP).
Air Quality	<input checked="" type="checkbox"/> Dust <input checked="" type="checkbox"/> Odour & Fumes <input checked="" type="checkbox"/> Greenhouse Gases	<p>During construction:</p> <ul style="list-style-type: none"> • Dust suppression will be carried out on site, using either water (in compliance with water restrictions) or ground cover. • Machinery and plant kept on site will be serviced according to manufactures specifications. • Any machines or plant that is producing excessive visual exhaust will be repaired or removed from site. • Plant or machinery will not be left idling. • Stockpiles will be maintained and contained to minimise dust. • Trucks transporting spoil and other waste materials from site will be covered. • Disturbed areas will be rehabilitated as soon as practicable.

Aspect	Potential Impact Tick relevant aspects	Control measures Typical measures included below
Biodiversity	<input type="checkbox"/> Trimming and removal of trees <input checked="" type="checkbox"/> Noxious weeds <input type="checkbox"/> Native vegetation <input type="checkbox"/> Habitat <input type="checkbox"/> Threatened species <input type="checkbox"/> Sensitive areas	<p>During construction:</p> <ul style="list-style-type: none"> • The offset of clearing impacts will be undertaken in accordance with Sydney Trains Biodiversity Offset Strategy. • If any fauna species is identified on site, Wildlife Information, Rescue and Education Service (WIRES) will be contacted to relocate it offsite to a suitable habitat area. • Site inductions will include discussion and photographs of threatened species in the area and the procedure to be followed if threatened species are encountered. • Noxious weeds will be managed in accordance with the requirements of the <i>Noxious Weeds Act 1993</i>, including disposal off-site in sealed bags to a licenced waste disposal facility.
Noise and Vibration	<input checked="" type="checkbox"/> Noise <input checked="" type="checkbox"/> Vibration <input checked="" type="checkbox"/> Adjoining landowners	<p>During construction:</p> <ul style="list-style-type: none"> • A Construction Noise and Vibration Management Plan (CNVMP) would be prepared as part of the Construction Environmental Management Plan. Measures documented in the CNVMP would be consistent with the mitigation measures outlined in Appendix E and the Interim Construction Noise Guideline where practicable. These measures may include (but would not be limited to): <ul style="list-style-type: none"> ○ Sydney Trains 24-hour complaints hotline to the community. ○ Letter box drops, individual briefings, respite periods, or where highly intrusive noise levels are anticipated, alternative accommodation for specific construction activities ○ Use of localised acoustic hoarding around significant noise generating items of plant ○ Briefing of the work team in order to create awareness of the locality of sensitive noise receivers and the importance of minimising noise emissions ○ Planning the higher-noise activities and work near residential noise receivers to be undertaken predominantly during less sensitive periods ○ Ensuring spoil is placed and not dropped into awaiting trucks ○ Use of less noise-intensive equipment ○ Noise monitoring ○ All construction plant and vehicles would be fitted with non-tonal reversing alarms

Aspect	Potential Impact Tick relevant aspects	Control measures Typical measures included below
		<p>During operation:</p> <ul style="list-style-type: none"> • Provide attenuators/acoustic louvres on air intakes/discharges within the fire pump room. In addition ensure that the fire pump room external door is acoustically rated. Ensure there are mufflers on all engine exhausts within the fire pump room. • Ensure attenuators, acoustic louvres and lined ducting on air intakes/discharges in the level 3 mechanical plant room. • Select a silenced packaged generator with sound power level not exceeding 95 dB(A) for the level 5 generator room. • Ensure there are attenuators, acoustic louvres and lined ducting on air intakes/discharges for the roof level mechanical plant room. • Enclose the cooling and heating plant located on the roof to screen the plant from the residential receivers. • Acoustically treat roof level cooling and heating plant using lined ducting, attenuators or acoustic louvres as required to meet the noise criteria. • Undertake a detailed Assessment of Operational Noise Emissions report once plant selections are made and plant noise emission levels are known.
Heritage	<input type="checkbox"/> Aboriginal Heritage <input type="checkbox"/> Non Aboriginal Heritage <input type="checkbox"/> Conservation area <input type="checkbox"/> Archaeological potential	<p>During construction:</p> <ul style="list-style-type: none"> • Should an unexpected historic relic or Aboriginal object be identified during construction, work in the immediate vicinity of the find is to stop and the area must be fenced off with suitable markers (star pickets, flagging or barrier mesh). The Sydney Trains Project Manager and Environment Division are to be notified. All Sydney Trains Policies and procedures are to be followed should there be an unexpected find. Engage an archaeologist to determine the significance of the find, and if required, determine the notification, consultation, and approval requirements. Works must not recommence until Sydney Trains has provided written approval to do so.
Waste Management	<input checked="" type="checkbox"/> Spoil <input checked="" type="checkbox"/> Litter <input checked="" type="checkbox"/> Chemicals <input checked="" type="checkbox"/> Hazardous, Liquid or	<p>During construction:</p> <ul style="list-style-type: none"> • A waste management plan (WMP) will form part of the CEMP that details the process for treatment of waste materials generated onsite and details measures to mitigate waste material impacts. • All waste will be classified prior to disposal as per the EPA's <i>Waste Classification Guidelines</i> (EPA, 2014).

Aspect	Potential Impact Tick relevant aspects	Control measures Typical measures included below
	Special Waste <input checked="" type="checkbox"/> Solid waste	<ul style="list-style-type: none"> • Ensure at least 95 per cent of construction and demolition waste (by weight) is diverted from landfill, and either recycled or reused.
Contaminated Land and Hazardous Materials	<input checked="" type="checkbox"/> Soil Contamination <input checked="" type="checkbox"/> Hazardous spills	During construction: <ul style="list-style-type: none"> • Additional soil testing is recommended within the existing building footprints following demolition of the buildings. Target analytes should include metals, TPH, PAH, asbestos and PFCs • If the existing buildings contain hazardous building materials, a clearance certificate would be required following demolition. Any clearance certificates must be conducted by a hygienist independent of the demolition contractor; • Visual confirmation (as appropriate) of the spoil excavated from the limited areas of excavation against the preliminary waste classification provided in DP (2016). • Ex-situ waste classifications of spoil generated from: <ul style="list-style-type: none"> ○ The excavation of the OSD tank noting the larger volume expected and source depths of approximately 2 m. ○ Excavations undertaken in the vicinity of BH7A (~ 1.5 m bgl) which is preliminarily classified as Restricted Solid Waste and at BH6A (~ 3 m bgl) which is classified as Special Waste (asbestos). • The adoption of an unexpected finds protocol (UFP) as part of the Construction Management Plan to manage unexpected contamination which may include asbestos encountered during the redevelopment works. • An Acid Sulfate Soil Management Plan (ASSMP) is developed and implemented to inform construction works. • Spill kits and a temporary refuelling bund will be installed and used on site.
Visual Aesthetics and Urban Design	<input checked="" type="checkbox"/> Visual <input type="checkbox"/> Views and vistas <input checked="" type="checkbox"/> Overshadowing <input checked="" type="checkbox"/> Light spill	During operation: <ul style="list-style-type: none"> • Lighting will be designed, operated and installed in accordance with Australian/New Zealand Standard (AS/NZS) 1680.1 – 2006. • A detailed Public Domain Plan.
Land Use, Zoning	<input type="checkbox"/> Land Use	During construction:

Aspect	Potential Impact <i>Tick relevant aspects</i>	Control measures <i>Typical measures included below</i>
and Socio-Economic Effects	<input checked="" type="checkbox"/> Property Effects <input type="checkbox"/> Economic Effects <input checked="" type="checkbox"/> Other community impacts	<ul style="list-style-type: none"> • Consultation with City of Sydney Council and any other relevant stakeholders regarding other developments will be undertaken on an ongoing basis through construction. • Consultation with Ausgrid will be undertaken two weeks prior to any excavation works.
Transport	<input checked="" type="checkbox"/> Traffic and access <input type="checkbox"/> Transport	<p>During construction:</p> <ul style="list-style-type: none"> • The traffic management plan will be developed in consultation with the relevant authorities and implemented. • Roads and Maritime Services approvals and permits will be obtained prior to construction commencing in this area. • Vehicles should avoid using the intersection of Mandible Street and Wyndham Street to access the site during peak periods, as it is currently operating close to capacity. • Construction vehicles, materials and equipment will be scheduled for deliveries to minimise coinciding with the road network peak periods. • Traffic management and signage will be established at the site entrance and exit to minimise risks to workers, motorists, cyclists and pedestrians. • Pedestrian/vehicle management personnel to be provided at all access points of entry/exit to the proposal during construction of the proposal. • A condition report for Wyndham Street, Mandible Street and Bourke Road will be completed prior to construction commencing and at the conclusion of construction. • All pavement and road surfaces damaged during construction will be restored when work is finished. <p>During operation:</p> <ul style="list-style-type: none"> • Request City of Sydney approval to remove the existing on-street parking (about 40 metres or 6 car spaces) and install no parking signs on the southern side of Mandible Street (north of the ROC site).

Aspect	Potential Impact Tick relevant aspects	Control measures Typical measures included below
Climate change	<input checked="" type="checkbox"/> Climate change	<p>During operation:</p> <ul style="list-style-type: none"> • The HVAC system will be designed with sufficient design redundancy, to maintain the operation of critical electrical components during consecutive extremely hot days. • Back-up power has been included in the concept design to ensure system operations in the event of power failure. • Ensure there are heat refuges placed in and around the ROC facilities. • Provide access to water bubblers. • Specify storm resilient materials in design of new buildings and associated infrastructure.
Greenhouse gas emissions	<input checked="" type="checkbox"/> Greenhouse gas emissions	<p>During construction:</p> <ul style="list-style-type: none"> • Use of construction material containing recycled content, such as recycled aggregates in bricks, or recycled steel, where reasonable and feasible. • Use more energy efficient equipment during construction. • Project planning will be undertaken to ensure that vehicle movements and construction activities have been planned efficiently and to minimise double handling of materials and waste, haulage distances and fuel use. Small construction site which is accessible via Green Square Station, as such alternative fuels not considered necessary. Alternative fuels will be used where it is feasible. • Use modular and replaceable finishing elements. • Planning and scheduling can be done by pull scheduling using the Last Planner System™ (LPS), or an equivalent system, to achieve efficiencies in project delivery (such as reduced program times). At a minimum the system must include a milestone schedule, collaboratively created phase schedules, make-ready look ahead plans, weekly work plans, and a method for measuring. Re • Using 'just in time' methods of equipment and supply delivery; reducing overall storage requirements and potential for waste materials/equipment.

7.2 Implementation process

The environmental management measures contained in this REF would be implemented to ensure that the environment is adequately protected and that adverse impacts are avoided or otherwise substantially ameliorated.

The construction contractor would be required to prepare a specific CEMP incorporating environmental control measures for construction works including the control measures specified in this REF. A copy of this REF and the CEMP is to be retained on site and produced upon request. The CEMP is to include the following:

- Identification of the environmental issues and risks of the proposal
- Details of environmental controls to be implemented including location and timing
- Details of statutory requirements including those of any approvals and licences
- Assignment of responsibility for implementation and monitoring of environmental controls
- Reporting, incident notification and emergency procedures
- Contact details for all site personnel and agency contacts
- Monitoring and evaluation of the effectiveness of the measures, and adjustments to reflect the outcome of those processes
- Corrective action requirements and their verification.

8 Finalisation

8.1 Justification and conclusion

The REF has examined and taken into account to the fullest possible extent all matters affecting or likely to affect the environment by reason of the proposed activity. The proposal as described in the REF best meets the proposal objectives. Control measures proposed as detailed in this REF would minimise expected impacts that are considered to be minor. The proposal would improve the rail operations of the Sydney Trains network by making it more centralised. The proposal is therefore considered justified.

The proposal is not likely to significantly affect the environment and therefore it is not necessary for an EIS to be prepared and approval sought for the proposal from the Minister for Planning under Part 5.1 of the EP&A Act. The proposal is unlikely to affect threatened species, populations or ecological communities or their habitats, within the meaning of the *Threatened Species Conservation Act 1995* or *Fisheries Management Act 1994* and therefore a Species Impact Statement is not required. The proposal is also unlikely to affect Commonwealth land or have an impact on any matters of national environmental significance.

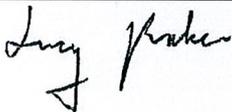
8.2 REF determination

8.2.1 Author declaration

I declare that:

- This REF addresses the requirements of Section 111 of the EP&A Act
- In consideration of the activity an examination and assessment has been undertaken to take into account to the fullest extent possible, all matters affecting or likely to affect the environment by reason of that activity, as addressed in this REF
- The likely significance of the environmental impacts of the activity has been assessed in accordance with Clause 228 of the EP&A Regulation
- An assessment of the impacts of the activity on critical habitat and on threatened species, populations or ecological communities or their habitats, for both terrestrial and aquatic species has been undertaken. The activity described in the REF will not significantly affect threatened species, populations or ecological communities or their habitats. Therefore, no Species Impact Statement is required
- The assessment has addressed the potential impacts on the activity on matters of national environmental significance and any impacts on Commonwealth land and concluded that there will be no significant impacts. Therefore there is no need for a referral to be made to the Australian Government Department of the Environment for a decision by the Commonwealth Minister for the Environment on whether assessment and approval is required under the EPBC Act
- The activity described in the REF will have some environmental impacts that can be satisfactorily ameliorated. Considering the control measures proposed, the REF has considered that the proposal is not likely to significantly affect the environment, and therefore no environmental impact statement is required and approval for the proposal does not need to be sought under Part 5.1 of the EP&A Act
- This REF provides a true and fair review of the activity in relation to the likely impacts of the proposed activity on the environment, and details the control measures to be implemented to minimise the potential impact on the environment

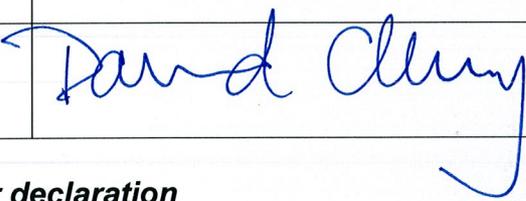
- I have complied with the Sydney Trains EMS-09-WI-0124 Part 5 Review of Environmental Factors Process.

Author:		
Name:	Lucy Baker	
Position:	Senior Project Leader Environment	
Signature		Date: 290916

8.2.2 Assessor declaration

I declare that:

- I have independently reviewed this REF
- It is my judgement that the declaration made by the Author is correct and not false or misleading in a material respect
- I have complied with the Sydney Trains EMS-09-WI-0124 Part 5 Review of Environmental Factors Process
- It is recommended that the proposal proceed subject to the implementation of all control measures identified in this REF and compliance with all other relevant statutory approvals, licences, permits and authorisations.

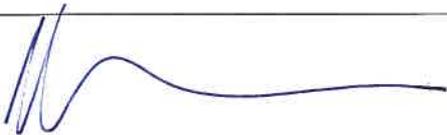
Assessor:		
Name:	David Cleary	
Position:	Environmental Professional	
Signature		Date: 26/10/16

8.2.3 Certifier declaration

I declare that:

- The description of the proposal in this REF thoroughly and accurately represents the proposed activities associated with the proposal
- The REF provides a true and fair review of the activity in relation to the likely impacts of the proposed works on the environment, and details the control measures to be implemented to minimise the potential impact on the environment. I have reviewed stages 1 - 2 of the EMS-09-WI-0124 Part 5 Review of Environmental Factors Process and am satisfied that stages 1 - 2 were adequately completed
- I accept the REF on behalf of Sydney Trains
- A copy of this REF will be retained onsite and produced upon request
- All control measures described in this REF (or an agreed equivalent) will be implemented

- The following plans will be developed and in place before work commences and will be implemented throughout the construction phase. Copies of the plans will be retained onsite and produced upon request:
 - A Construction Environmental Management Plan (CEMP) which must at a minimum detail the risks and mitigation measures identified in this REF
 - An Erosion and Sediment Control Plan (ESCP)
 - An Environmental Controls Map with erosion controls, access points, important contacts, sensitive receivers, location of amenities and any vegetation clearing or trimming; and
 - Any other management plan required by this REF
- Personnel will be briefed during site induction on the location of sensitive areas and control measures identified in the CEMP, ESCP and Environmental Controls Map
- Control measures will be regularly monitored and maintained to ensure effectiveness
- Any additional approvals, licences or permits required under relevant environmental legislation will be obtained and the conditions therein diligently implemented
- I have complied with the Sydney Trains EMS-09-WI-0124 Part 5 Review of Environmental Factors Process
- I acknowledge that I will be held accountable for implementing all of the activities listed under the Certifier Declaration.

Certified by:		
Name:	Andrew Parker	
Position:	ROC Infrastructure Program Manager	
Signature:		Date: 26/10/2016

8.2.4 Determiner's declaration

I declare that:

- Having considered the scope of the proposal, the impacts and controls identified in the REF, I approve the undertaking of the proposal as described by the REF.
- This proposal determination will remain current for five years until 26/10/21 at which time it shall lapse if works have not been physically commenced.
- I have complied with the EMS-09-WI-0124 Part 5 Review of Environmental Factors Process.

Determiner's declaration and approval:		
Name:	Matt McInnes	
Position:	ROC Program Director	
Signature:		Date: 27/10/16

9 References

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Appendices

Appendix A Contamination report

Appendix B EPBC search

Appendix C Sustainability design checklist

Appendix D Flood report

Appendix E Construction noise and vibration report

Appendix F Operational noise report

Appendix G Traffic and transport report

Appendix H Climate change impact assessment report

Appendix I Greenhouse gas assessment report