METRONET Stage 1: Morley-Ellenbrook Line

Noranda Station Development Approval Report

MEL–MLCX–AR–PER-00004

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Acronyms

ACROD: Australian Council for Rehabilitation of Disabled	**MRS**: Metropolitan Region Scheme
AEP: Annual Exceedance Probability	**PA**: Public Access
ASS: Acid Sulphate Soils	**PCA**: Planning Control Area
BMP: Bushfire Management Plan	**P&D Act**: Planning & Development Act 2005
BEEP: Bushfire Emergency Evacuation Plan	**PnR**: Park and Ride
CBD: Central Business District	**PSP**: Principal Shared Path
CCTV: Closed Circuit Tele Vision	**PTA**: Public Transport Authority
CPTED: Crime Prevention Through Environmental Design	**PUDO**: Pick Up Drop Off
DA: Development Application	**SP**: Station Precinct
dB: Decibel	**SPP**: State Planning Policy
DCP: Development Control Policy	**SWTC**: Scope of Works and Technical Criteria
KnR: Kiss and Ride	**TIA**: Transport Impact Assessment
Laeq: Equivalent sound level	**TOD**: Transport Orientated Development
LGA: Local Government Area	**VT**: Vertical Transport
LPS: Local Planning Scheme	**WA**: Western Australia
MEL: Morley Ellenbrook Line	**USB**: Universal Serial Bus
MELConnx: A partnership between Laing O'Rourke and the Public Transport Authority	

1. Executive Summary

Urbis acts as the planning consultant on behalf of the *MELConnx Consortium*, the appointed contractor to deliver the METRONET Morley – Ellenbrook Line on behalf of the Public Transport Authority (the delivery agency for the METRONET program). This development application seeks planning approval for the Noranda Station and associated infrastructure, being one of five new train stations proposed as part of the METRONET Morley Ellenbrook Line project.

The Noranda Station will be located approximately 14km north-east of Perth and will be the second station on the MEL line, which extends from Bayswater Station. Noranda Station will service the established residential suburbs of Noranda and Beechboro.

Once operating, Noranda Station is expected to reduce travel times for passengers, providing a journey time of 18 minutes from the station to the Perth CBD. Noranda Station will provide efficient transport links to the surrounding suburbs of Beechboro, Morley and Noranda while offering residents another transport choice when travelling to and from the Perth CBD, the north-eastern suburbs and the broader metropolitan area.

Noranda Station is proposed to be located in the City of Bayswater within the Tonkin Highway median (north of Benara Road bridge). The precinct includes a station entry building located to the east of Tonkin Highway which provides staff facilities and vertical circulation to a concourse level overpass linking to the Station building. The station facilities include roads, paths, drop-off by car and pedestrian/cycle access to the east of Tonkin Highway, with pedestrian access to the station via a pedestrian underpass.

The station will comprise the following:

- Station building with typical station amenities. The station is designed as an ‘up and over’ station design, with an at- grade station entry building east of Tonkin Highway. The at-grade station entry building leads to an elevated pedestrian overpass and connecting down to an island platform.
- An eastern pedestrian overpass providing sheltered access directly from the Station Entry building over Tonkin Highway, to the concourse level of the Station building with security gates to restrict access outside of operating hours.
- A southern pedestrian overpass providing sheltered access directly from the Benara Road bridge to the concourse level of the Station building with security gates to restrict access outside of operating hours.
- A north-south pedestrian underpass beneath Benara Road providing shared path connectivity and access from the southern side of Benara Road to the Noranda station precinct including connections to the existing path network.
- A welcome place (plaza) located immediately east of the Station Entry building, providing a meeting place where people can congregate or dwell before proceeding on their journeys. This area is to be developed with high quality landscaping and public artwork.
- Principal Shared Path (**PSP**) located south-east of the Station Entry building connecting the pedestrian underpass to the existing PSP network. This path will ultimately form part of a wider connection running parallel to the MEL track alignment. Inclusion of the SP/PSP provides increased connectivity to Noranda Station.
- Kiss and Ride bays are located immediately adjacent to the Station Entry building, with clockwise travel circulation.
- Park and Ride bays are located to the north of the Station Entry building, up to approximately 400m from the station entrance. All vehicle access to the passenger car park is provided via a road connection to Benara Road.

- Bicycle parking is provided immediately adjacent to the Station Entry building and the PSP to provide efficient access for cyclists.

Connectivity for pedestrians accessing and departing the station has been prioritised with efficient connections, clear sight lines and sheltered walkways. Passenger toilets, seating and universal access considerations also ensure comfort and convenience.

A key objective in the station design is to apply principles which support a future neighbourhood station precinct, encourage non-private vehicle use for connecting trips, and deliver an appropriate interface and opportunities for interaction with the surrounding area. This must be balanced with the pragmatic requirement for long-term car parking given the current urban form and age which will see a level of car dependence in the short to medium term. This parking is designed and provided in a way that is safe and does not unduly impact the long-term placemaking opportunities. To strike an appropriate balance between these competing objectives, the following infrastructure hierarchy has been specifically applied to the station design:

- Pedestrian desire lines and accessibility have been key drivers in the station design. This is demonstrated through the direct pedestrian overpass connections between the Station building, Station Entry building and Benara Road bridge, as well as provision of a Principle Shared Path located to the south-east of the Station Entry building, linking the Benara Road pedestrian underpass to the existing PSP aligned parallel to the eastern boundary of the site.
- Bus service convenience, with two on-street PTA bus stands on Benara Road. One being located on Benara Road South-East (west bound flow), and another located on Benara Road North-West (east bound flow). These bus stands will connect transferring passengers to the station via the Benara Road underpass, existing PSP's and future pedestrian overpasses.
- Drop-off and pick-up area adjacent the Station Entry building, which provides for on-demand transport options. This design enables patrons to conveniently access the Station Entry building and avoids potential conflict between pedestrians and vehicles.
- All day commuter parking is provided to the north of the Station Entry building, which includes a covered walkway extending from the Station Entry building to the northern boundary of the carpark. The parking layout has been configured to prioritise other modes of transport accessing the Station Entry building based on the spatial constraints of the site. The layout also considers retention and appropriate interface with the existing PSP.

This hierarchy encourages patrons to consider private car alternatives by delivering these as a more convenient mode of transport with a highly positive user experience, as well as removing the impact of large at grade parking from the highest pedestrian area immediately adjoining the station entry building.

This report provides the planning context and merit of the proposed development, including an overall explanation of the station and key design drivers. This includes an assessment of the application against the relevant planning framework, including the requirements of State Planning Policy No. 7 – Design of the Built Environment and the METRONET Station Precinct Design Guide. As demonstrated through this report, the thorough technical reporting, stakeholder consultation and careful design consideration have all come together through the Noranda Station design to produce a transformative asset for the region.

Acknowledgement of Country

MELconnx acknowledges the Whadjuk People of the Noongar Nation as the Traditional Custodians of the land and waters on which the Morley-Ellenbrook Line Project is located. We pay our respect to their Elders, both past and present and thank them for their continuing connection to the country, culture and community.

2. Project overview

2.1 Morley Ellenbrook Line Background

METRONET is a key project of the West Australian State Government and the single largest investment in public transport ever undertaken in Perth. METRONET will positively change how people live and travel in Perth and significantly improve connectivity across the metropolitan area.

The Morley Ellenbrook Line (MEL) project will deliver 21km of rail line spurring from the Bayswater Station to Ellenbrook. The project includes the delivery of 5 new stations at Morley, Noranda, Malaga, Whiteman Park and Ellenbrook, as well as future proofing works for a future station at Bennett Springs.

The MEL is part of METRONET Stage 1, with the Public Transport Authority (PTA) being the lead agency delivering the MEL project. The project will design and deliver all rail infrastructure and ancillary works to support operational passenger rail between Bayswater and Ellenbrook, including stations with inter-modal bus and rail, and associated road works at Bayswater, Morley, Noranda, Malaga, Whiteman Park and Ellenbrook stations.

Key works in the project include the following:

- A 21km rail spur from the Midland Line east of the Bayswater Station, travelling north in the Tonkin Highway median, east through land north of Marshall Road and north on the western side of Drumpellier Drive into Ellenbrook
- Stations at Morley, Noranda, Malaga, Whiteman Park and Ellenbrook with future-proofing for a station at Bennett Springs East
- Parking and bus interchanges/facilities at stations
- Significant grade separations at key road crossings
- Tunnels to allow the rail line to enter and exit the Tonkin Highway median
- Shared / Principal Shared Path for walking and cycling access along the rail line
- Track and associated infrastructure to connect to the existing Midland Line
- Road and bridge reconfiguration works

A contextual summary of the MEL extension is illustrated in **Figure 1**.


TO PERTH
Bedford
Grand Prom
Coode St
Morley
Morley Dr
Beenara Rd
Noranda
Malaga
Ballajura
Tonkin Hwy
MALAGA STATION
D
Beechboro Rd N
Broun Ave
MELTHAM STATION
Collier Rd
NORANDA STATION
C
BAYSWATER STATION
MORLEY STATION
B
Bayswater
Guildford Rd
A
Bennett Springs
Reid Hwy
Marshall Rd
Whiteman Park
Lexia
Ghangara Rd
J
I
ELLENBROOK STATION
Morley
Walter Rd E
E
Dulwich St
F
BENNETT SPRINGS EAST
(future station)
G
H
WHITEMAN PARK STATION
Youle-Dean Rd
Park St
Brabham
Henley Brook
Ellenbrook
Altone Rd
Beechboro
ASHFIELD STATION
Bassendean
BASSENDEAN STATION
Eden Hill
Lord St
Caversham
Dayton
Aveley
TO BULLSBROOK
N

2.2 Supporting Works Packages

Recognising the complexity of delivering the transport infrastructure for the MEL, the overall project works have been divided into three broad programs of work which make up the Ellenbrook Line – Program of Works:

1. New Bayswater Station (Evolve Alliance) – New station at Bayswater (to relocate and replace the existing station), including associated turnback infrastructure to allow the MEL to connect to the Midland Line.
2. Tonkin Gap and Associated Works (Tonkin Gap Alliance) – this project is being delivered by Main Roads and includes significant civil and structural works between Bayswater and Malaga, to prepare the Tonkin Highway median for access to/from and construction of the new rail line and stations.
3. Main MEL Project Works (MELconnx Consortium) – includes all rail systems and infrastructure from Bayswater, all stations and facilities within the Tonkin Highway median and road reserve, and all works north of Malaga to Ellenbrook

This development application only applies to the Noranda Station, which forms part of the Main MEL Project Works.

2.3 METRONET Scope and Requirements

In September 2020, the MELconnx Consortium (Laing O'Rourke Australia Construction) was named as the preferred proponent to design and construct the MEL, including the Noranda Station and associated 'land-side' station infrastructure.

As the MEL is a METRONET project, the funding for the project has been allocated by the State and Federal Governments, with the scope of the project being approved by Parliament of WA in the form of a Project Definition Plan. The scope of the project is captured within the contractual arrangements, including the METRONET specified Scope of Work and Technical Criteria (**SWTC**). This SWTC also sets the design criteria, standards and guidelines for the station design.

The SWTC for the Noranda Station defines the following design parameters relevant to the scope of this development application:

- The Noranda Station will be designed as an unattended operating without fare gates station (i.e. – an 'Open Station').
- Station Entry building to the east of the Station building with stairs and two passenger lifts providing access to an overpass above. The ground level of the entry building includes a seating area and lobby, drinking water fountain, public phone public toilets, staff toilets and shower, staff crib room, fire indicator panel, services cupboards and plant rooms.
- Station platforms, with a minimum length of 150m and designed to suit the operation of six car B and C series rail cars. The station platforms are required to have 70% of the operational platform length under cover providing weather protection to patrons.
- Two on-street PTA Bus Stands on Benara Road. One bus stand located on Benara Road South-East (west bound flow) and the other bus stand is on Benara Road North-West (east bound flow).
- Bicycle parking facilities, including a secure bicycle parking shelter not integrated into the station building structure to enable future expansion, and located within 100m of the station entry. A further 10 open U-rails adjacent to the Station Entry building. Provision must also be made for additional secure bicycle parking shelters to be added in the future.
- Landscaping to road reserves, Welcome Place and public open space on PTA controlled land.

- Car parking spaces, including a combination of long-term car parking, accessible bays, taxi bays, short term 'kiss-and-ride' bays, loading bays, PTA staff parking and tenant parking.
- A minimum of 10 covered motorcycle bays.

Importantly, the SWTC also sets key qualitative station design measures, such as:

- The requirement to deliver a multi-modal station with a Station building located within the Tonkin Highway median and a Station Entry building located to the east of Tonkin Highway, with two pedestrian overpasses to link the Station building to the Benara Road bridge and the Station Entry building.
- A Station Entry building which includes:
  - ground floor lift lobby
  - public toilet facilities (male toilet, female toilet and unisex accessible toilet)
  - public pay phone
  - staff amenity facilities (crib room, male toilet, female toilet and unisex accessible toilet)
  - stair and lift access
- A Station building with an unpaid concourse area which includes:
  - passenger tag on and off facilities
  - lift and stair access to the platform
  - seating
- A station platform of approximately 10 metres wide and 150m in length, accommodating typical station amenities such as seating, tag on and off facilities and information facilities.
- Various measures to ensure high quality landscaping is delivered, including the requirement for landscaping to be designed by a landscape architect.

This SWTC therefore sets the basic building blocks for the delivery of a highly functional and contemporary multi-modal train station. The role of the MELconnx Consortium is to interpret these requirements and apply them to the detailed station design, as proposed through this development application. The station development envelope is also strictly defined by spatial constraints associated with the Tonkin Highway road reserve.

In terms of the development approvals process, this essentially means that there are some fixed aspects to the project, and as a result there are limitations on the ability to make fundamental changes to the design scope and requirements. However, the opportunity to make pragmatic changes which remain within the scope of the SWTC and environmental approvals may still be considered.

3. Site Location and Context

3.1 Lots Subject to this application

The legal details of the land directly affected by works for the Noranda Station and requiring development approval are detailed in **Table 1** and **Table 2** below. A Cadastre Plan showing the subject site is provided in **Figure 2**.

Certificates of Title are enclosed within this application at **Appendix A**.

Table 1–Affected Lots

Lot	Plan	Vol/Folio	Proprietor
461	P21673	LR3153/593	State of Western Australia

Table 2–Affected Road Reserves

Land ID and Road Reserve	Proprietor
Land ID: 3854690 (Benara Road)	State of Western Australia
Land ID: 3502568 (small slither of land)	State of Western Australia

Figure 2-Cadastre Plan

3.2 Site Context

Noranda Station will be situated approximately 14km north-east of the Perth CBD in the City of Bayswater. The Station building is located in the Tonkin Highway median, immediately north of the Benara Road bridge. A Station Entry building is located on the eastern side of Tonkin Highway and includes stairs and lifts to a pedestrian overpass connecting to the Station building.

The residential suburb of Noranda is located to the west of the Station building. Noranda is an established residential suburb containing around 3,200 dwellings, community facilities and has a population of approximately 8,000 people. Dwelling structures are predominately single detached houses at an R25 density.

The established suburb of Morley is located to the east and south of the Station building. Morley is also an established residential suburb containing around 8,800 dwellings, community facilities and has a population of approximately 21,500 people. Dwelling structures are predominately single detached houses at an R25 density.

There are several schools within close proximity to Noranda Station including John Septimus Roe School, Noranda Primary School, West Beechboro Primary School and Hampton Park Primary School.

An aerial photograph showing the proposed station (in red) and site context is provided in **Figures 3** and **4** and **Table 3**.

Figure 3 –Current Aerial Photo

MEL connx

Table 3–Contextual Summary

Contextual Feature	Details
1. Lightning Swamp Bushland	Lightning Swamp Bushland is located 675m (approx.) north-west of Noranda Station and is the largest bushland reserve (approx. 71.5Ha) in the City of Bayswater. The natural reserve is important for the lifestyle quality of residents from both environmental and recreational perspectives.
2. Lightning Park	Lightning Park is located 500m (approx.) north-west of Noranda Station. Lightning Park is an active sporting ground and home to two football clubs. The Park includes club houses, change rooms, flood lighting playgrounds and a car parking.
3. John Septimus Roe Anglican Community School	John Septimus Roe Anglican Community School is located 500m (approx.) north-east of Noranda Station and has around 1,725 primary and high school students.
4. West Beechboro Primary School	West Beechboro Primary School is located 900m (approx.) to the north-east of Noranda Station and has around 500 students.
5. Morley	The residential suburb of Morley is located to the east and south of the Station building with a population of approximately 21,500 people.
6. Noranda Primary School	Noranda Primary School is located 850m (approx.) to the south-west of Noranda Station and has around 365 students.
7. Noranda	The residential suburb of Noranda is located to the west of the Station building with a population of approximately 8,000 people.
8. Beechboro Central Shopping Centre	Beechboro Central Shopping Centre is located approximately 650m east of Noranda Station and includes a range of speciality shops, restaurants, fast food outlets and a supermarket. It is also an important centre of employment for residents.
9. Hampton Park Primary School	Noranda Primary School is located 1,100m (approx.) to the south of Noranda Station and has around 385 students.
10 - Benara Road	Benara Road is a four-lane Distributor A road running east-west directly south of the site. It traverses Tonkin Highway above grade and travels from Camboon Road in the west to West Swan Road in the east, servicing the suburbs of Noranda, Morley, Beechboro, Kiara, Lockridge and Caversham. It currently carries approximately 14,000 vehicles per day with a posted speed limit of 70kph.

Figure 4 – Context Plan

3.3 Environmental Considerations

The following table provides a summary of environmental considerations applicable to the subject site, and proposed actions (where relevant).

Table 4–Summary of Environmental Conditions

Item	Summary
Bushfire Prone Areas	The Noranda Station site is identified as being partially located within a Bushfire Prone Area. A Bushfire Management Plan has been prepared to accompany this development application.
Contamination	The site is not an identified contaminated site.
Acid Sulphate Soils (ASS)	The site and surrounds are identified as moderate to low risk of ASS occurring within 3m of natural soil surface but high to moderate risk of ASS beyond 3m of natural soil surface. Further geotechnical investigations and management will be undertaken as part of the construction management plan.
Aboriginal Heritage	The site does not contain any site specific registered Aboriginal heritage sites.
European Heritage	The site does not contain any European heritage structures.

4. Proposed Works and Operating Hours

This development application seeks approval for the Noranda Station, which includes the main station building and platforms, Station Entry building, pedestrian overpasses, pedestrian underpass, car parking areas and pedestrian / cyclists links into the station. As detailed in later sections of this report, the majority of supporting infrastructure supporting the station does not require development approval and does not directly form part of this development application scope.

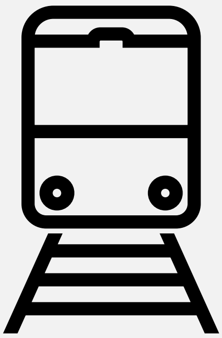
The Noranda Station is proposed to be open for operation in 2024. The Noranda Station building will operate between 4.30am and 12.30am each day of the year, with the Station building and Station Entry building to be locked outside of these hours to prevent the public from entering.

During the peak period of 7am – 9am and 4pm – 6pm, the station will provide five services per hour in each direction, reducing to 4 services per hour during off-peak.

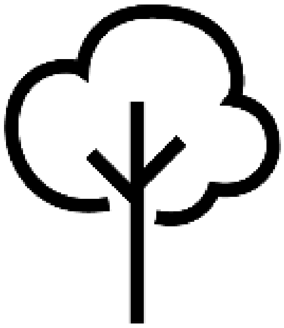
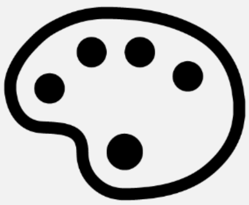
4.1 Station Works Subject to this Application

The following table provides details of the station works subject to this application. Development plans for the station work are provided at **Appendix B** of this report.

Table 5–Station Works Subject to this Application

PROPOSED	DETAILS
Train Station Building 	A Station Entry building which includes: ▪ ground floor lift lobby ▪ public toilet facilities (male toilet, female toilet and unisex accessible toilet) ▪ public pay phone ▪ staff amenity facilities (crib room, male toilet, female toilet and unisex accessible toilet) ▪ stair and lift access A Station building including: ▪ passenger tag on and off facilities ▪ lift and stair access to the platform ▪ seating A station platform of approximately 10 metres wide and 150m in length, accommodating typical station amenities such as seating, tag on facilities and information facilities. A Welcome Place public plaza immediately adjacent to the Station Entry building, including high quality landscaping and furniture.

Pedestrian Overpass	An enclosed pedestrian overpass to the south of the Station building providing access directly from the PSP located on Benara Road to the concourse level of the Station building, with security gates to restrict access outside of operating hours. An enclosed pedestrian overpass to the east of the Station building providing access directly from the Station Entry building (over Tonkin Highway) to the concourse level of the Station building, with security gates to restrict access outside of operating hours.
Pedestrian Underpass	A north-south pedestrian underpass beneath Benara Road providing shared path connectivity and access from the south side of Benara Road to the Noranda station precinct including connections to the existing path network.
Station Parking	Park and Ride car parking with 394 spaces, including: ▪ 357 standard all day bays ▪ 21 standard short-term bays ▪ 2 EV charging bays ▪ 7 ACROD bays ▪ 2 service/loading bays ▪ 4 open staff parking bays ▪ 1 taxi bay Kiss and Ride car parking with 6 spaces, including: ▪ 5 standard pick-up/drop-off bays (PUDO) ▪ 1 ACROD bay Bicycle parking, including; ▪ Secure bicycle storage shelters, with storage for approximately 53 bicycles ▪ 10 U-rail bicycle stands located adjacent the Station Entry building.

Landscaping 	High quality hard and soft landscaping design for the Noranda Station. The key principles underpinning the landscape design are as follows: • Use of low maintenance vegetation species. This is achieved by using local natural species (such as Banksia, Eucalyptus and Melaleuca varieties) where possible, supported by exotic species only where specific vegetation characteristics are required. • Water reduction through species selection. Species which do not require long-term irrigation have been selected for the majority of the station landscaping. • Reduction of heat island effects, specifically: • Planting large trees within the station forecourt, with a mix of grouped medium sized trees (500L) and large feature trees (1500L) providing shading and relief to the paved Welcome Place. • Paving and road materiality is used to create subtle wayfinding ques and define pedestrian priority areas including the use of high-quality pavers around the station forecourt. • Large quantities of seating is required, but must be delivered in a manner which minimises obstruction to key movement areas. In-situ seating incorporated into raised planters will be applied where possible to achieve this. The key challenge for the station landscaping is maximising canopy coverage whilst also ensuring vegetation does not restrict CCTV coverage. As a result, the landscaping design focuses widespread tree coverage around the periphery of the station precinct, with planting in the station forecourt focussed on quality feature planting. The Landscape Plan is provided at **Appendix C** of this report.
Public Art 	Public art within the station will be delivered in accordance with the requirements of the WA State Government Percent for Art. This artwork will be delivered as part of the 'METRONET Public Art Strategy', with the thematic framework strongly built around the Gnarla Biddi story of 'Our Pathways'. The integration of this artwork into the station design will be further developed through the detailed design phase, and it is expected that an associated standard condition of approval will be applied. A detailed public art plan including themes and opportunities for the MEL alignment and Noranda Station is provided at **Appendix G** of this report.

5. Design Principles

5.1 Architectural Design Statement

The scope of works set by the projects SWTC includes a number of qualitative design measures which must be met in the station's architectural design. These requirements have been interpreted and applied by the project architects Woods Bagot and TRCB, which has resulted in common line-wide architectural themes and a site-specific interpretation for Noranda Station. The design was presented to the Office of the Government Architect (OGA) who undertook a review in accordance with the Design Principles of State Planning Policy 7.0: Design of the Built Environment. The architectural designs have been refined to respond to OGA comments, acknowledging the long-term success of Noranda Station will be its integration with the existing suburb and provision of a safe and amenable travel experience for patrons. The themes and design drivers are best summarised as follows.

Line wide Architecture Overview

The design approach for the Morley-Ellenbrook Line is to create a family of buildings tied together through a common design language to establish a line-wide identity. The approach is to have a degree of commonality between the five stations while also allowing the stations to have unique elements to convey their own local identity and speak to the community in which they located. A 'kit-of-parts' approach has been taken to identify standardisation of components (where appropriate) to maximise efficiency of construction and maintain similar elements that informed the shared language across all the stations. Thus, Noranda Station shares line-wide consistencies with the other stations on the Morley-Ellenbrook Line in terms of the simple roof geometries, materiality, geometric form, kit of parts assembly and modular designs

Noranda Station Architecture

Noranda Station is the second station along the new Morley – Ellenbrook Train Line which diverts from Bayswater Train Station. Located alongside and within the Tonkin Highway median, directly north of Benara Road overpass, the precinct is adjacent to existing residential neighbourhoods. It is proposed to serve residents of Noranda and Morley, as well as Beechboro, Kiara and Lockridge.

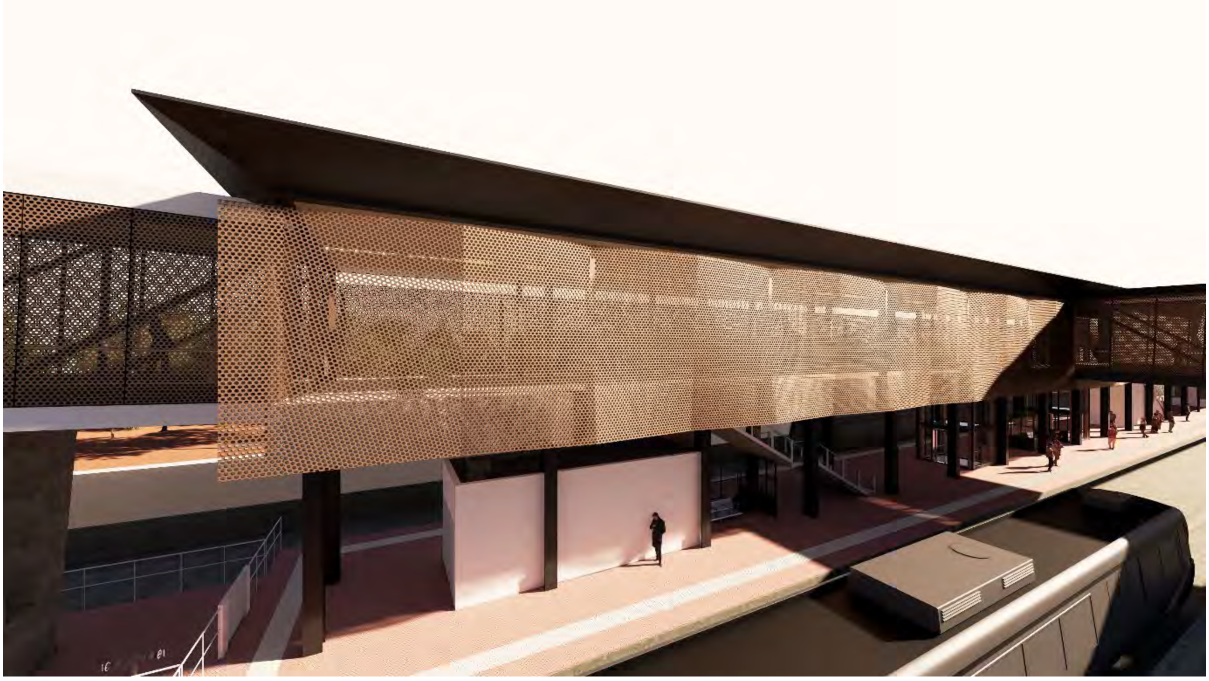
The architectural design of Noranda Station considers a holistic approach, whereby the station building forms an integral part of the precinct and surrounding context. The location of it within an established residential environment requires an approach to design that considers the projects functional and operational requirements while striving to deliver a sustainable and efficient built form that is sympathetic to, and considerate of its surroundings.

MELconnx set out to deliver Noranda station precinct as a place that feels occupied and 'owned' by the community it services. This requires a sense of place with an authentic character that reflects its context and the local community's aspirations, making the place cared for, safer and activated. The design needs to be sensitive to local culture and how people within the neighbouring precinct will experience the station in their day to day lives.

Station architecture itself considers the line wide narrative including architectural elements such as simple forms, floating roofs, materiality and the 'kit of parts' approach while also maintaining a unique identity in its overall form, scale and presence.

Upon approach to the station there is a clear heirachy of forms. The Station Entry building and vertical transportation lobby are the tallest. Adjacent accommodation modules and shade canopies are scaled down to reflect user proportion. The station roofs offer a more modest approach than preceeding stations on the line, although the main architectural components including roof edge profile, skylight detail and extent remain. Lightweight perforated mesh screening to the station building and pedestrian link bridges offers visual permeability, natural ventilation and weather protection simultaneously. This design testing is illustrated in **Figures 5** and **6**.

Figure 5 - Pedestrian overpass, Station concourse and Station platform



The Station Entry building is accessible from the Welcome Place, which forms the heart of this precinct. Clear access is provided to its entryway using lighting and signage, and the architectural scale of the two-storey built structure will help people to establish their location at the heart of the precinct.

The Station Entry building provides connectivity between the precinct level and raised concourse level which is accessible via lifts and stairs to the south of the station. Perforated materials to the façade of the entry building allow some visibility to the transport modes within the structure and allude to the vertical transport strategy connecting the ground plane to the concourse level.

Figure 6 – Welcome Place and Station Entry building

The station building entrance is covered by a large canopy that provides protection from rain and the western sun. It includes two lifts and a staircase connecting to the concourse. Within the enclosed verticle transport lobby there is seating, a water fountain, and a public telephone.

Connected to the Station building is a single storey accommodation building. It contains public toilet facilities inclusive of male toilet, female toilet and a separate unisex accessible toilet as well as staff amenity facilities and building infrastructure services

Entry onto the platform is through the elevated concourse and associated pedestrian link bridges (refer to **Figure 7**). The concourse is connected, via the Station Entry building to the kiss and ride, the bike shelter, and the pedestrian shared path links through the Welcome Place. To the south the concorse is connected to Benara Road via a pedestrian link bridge.

Figure 7 - Context and Character Considerations

The concourse is a transient area with tag on and off facilities, passenger service module, concourse information display, two lifts and two sets of stairs, as well as typical building services. A dynamic bus passenger information display is located at the southern end of concourse adjacent the pedestrian link bridge. The primary purpose of the concourse however is to link passengers to the island platform within the Tonkin Highway median.

The island platform is 10m wide by 150m long and located at rail level. The spine of the roof structure follows the vertical transport pathways to the paved platform and enhances natural light access while providing continuity in architectural language of the station. The platform area is naturally ventilated and has a minimum of 70% under canopy cover providing weather protection to station visitors. Within the platform space there is a passenger safe zone, seating, information facilities, staff amenities and station operational service facilities.

5.2 SPP 7.0 – Assessment of Good Design

MELconnx have referenced the 10 Principles of Good Design, outlined under, 'State Planning Policy 7.0 Design of the Built Environment, to develop an appropriate design response and sense of place for the station design. The following sections provide detailed information illustrating the measures incorporated to achieve a high quality design and built form outcome.

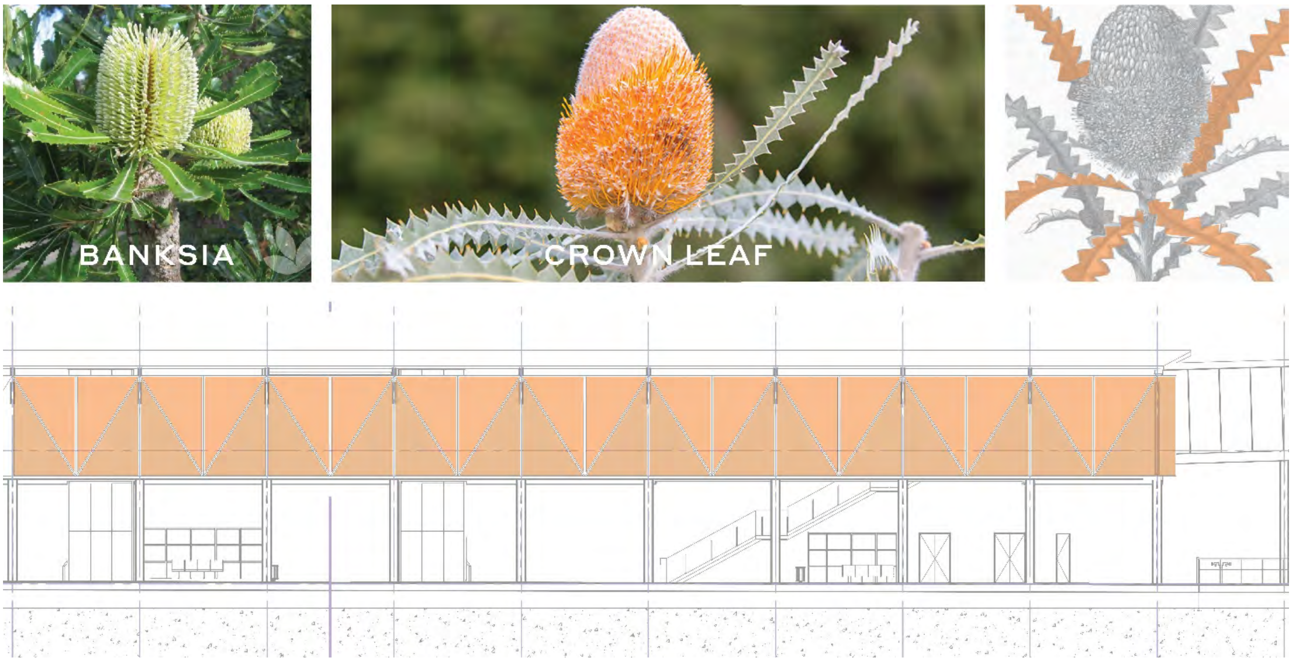
5.2.1 Context and Character

Design Principle Statement: *Good design responds to and enhances the distinctive characteristics of a local area, contributing to a sense of place*

Inclusion of distinctive characteristics, prominent natural and built features, local civic gestures and distinctiveness, intended future character and civic identity. Engagement undertaken with Whadjuk Noongar culture and the Gnarla Biddi has informed the station design and integrated into the public art strategy and landscape design.

Intuitive landscape and architectural qualities blend the spaces between natural habitat and the station precinct. The strategy integrates patterns that echo the patterned geology and qualities of the Swan Coastal Plain, as well as the folded geometric forms of the surrounding context. As seen **Figure 8**, the triangulated concourse rainscreen geometry is reminiscent of the form of the banksia plant leaves.

Figure 8 – Noranda Station Rainscreen Geometry Informed by Banksia Plant Structure



5.2.2 Landscape Quality

Design Principle Statement: *Good design recognises that together landscape and buildings operate as an integrated and sustainable system, within a broader ecological context*

The planting palette for the Noranda Station precinct will include a range of native and exotic plant species to implement a Paradise Garden aesthetic. The Paradise Garden idea is not unfamiliar to the area, with hints of its gardenesque style permeating throughout Perth as seen at the Harold Boas Gardens in West Perth, Queens Park in East Perth, Stirling Square in Guildford, and the garden of the Supreme Court of Western Australia. It is important to update the Paradise Garden with sustainability principles by balancing exotic plants with species that are native to the region. The design aims to update this historical style to suit a modern Western Australia and the suburb of Noranda.

In addition to the exotic species that are common to the Paradise Garden aesthetic, the planting strategy also focus heavily on incorporating wildflower species in line with the Main Roads Wildflower Capital Initiative and instilling a sense of place by selecting species reflective of the Noongar Six Seasons. The species will provide shady canopies, year-round flower displays, habitat for native birds and insects, a celebration of cultural significance, important drainage and rehabilitation functions, and hierarchical arrangement within the public realm.

Integration of trees and planting to the forecourt / drop-off is incorporated to create a more welcoming arrival experience as well as providing shade and reducing ambient temperatures during summer. Opportunities to increase the extent of landscaping and improve tree canopy levels have been considered and adopted where possible.

Figure 9 shows landscaping to the station entry and surrounds.

Figure 9 – Landscaping to station surrounds

5.2.3 Built Form and Scale

Design Principle Statement: ***Good design ensures that the massing and height of development is appropriate to its setting and successfully negotiates between existing built form and the intended future character of the local area.***

The individuality of Noranda station is highlighted through its reflection of local geographical conditions, flora and fauna. Materials convey a narrative of the surrounding natural patterns, as well as the local residential identity.

This has resulted in a warm toned station with clear connections for way-finding. Banksia plants have informed the screening structure. Line wide bushland narrative as well as proximity to local swamplands has informed the timber-look soffits the Station Entry building, concourse, and platform soffits. Further, triangulated screening and perforated metal cladding reflect the suburban and industrial roof profiles and character of Noranda architecture. Together, these material elements informed by the site narrative, endeavour to create an inviting, detailed development that feels comforting and comfortable.

The façade of the concourse incorporates shadow groves to break up the form. Further detailing of the materiality, panel break up and colour selection will be refined at the detailed design stage. Windows have been provided to the Customer Service Office on platform, which is visible as passengers descend the northern staircase from concourse.

Figure 10 illustrates the built form and scale of Noranda station.

Figure 10 – Noranda Station Built Form and Scale

5.2.4 Functionality and Build Quality

Design Principle Statement: ***Good design meets the needs of users efficiently and effectively, balancing functional requirements to perform well and deliver optimum benefit over the full lifecycle.***

The Station Entry building is accessible from the Welcome Place, which forms the heart of this precinct. Clear access is provided to the entryway using lighting and signage, and the architectural scale of the two-storey built structure to help people establish their location at the heart of the precinct.

The Station Entry building provides connectivity between the precinct level and raised concourse level which is accessible via lifts and stairs to the south of the station. Perforated materials to the façade of the entry building allow some visibility to the transport modes within the structure and allude to the vertical transport strategy connecting the ground plane to the concourse level.

The Station concourse boasts a well-illuminated, generous space which acts as a circulation spine both in and out of the station. The Station concourse connects to Benara Road to the south via a weather protected pedestrian overpass, and additionally, across Tonkin Highway back to the Station Entry building (refer to **Figure 11**). Largely transient in its purpose, it is noted that the placement of any furniture, lighting, signage, or passenger information services will not inhibit pedestrian circulation.

Folded perforated screens continue the length of the concourse. These provide weather protection to visitors, while also maintaining visibility in and out of the station. Voids are incorporated into the concourse design to allow the provision of stairs to platform. This also facilitates a visual connection from one to the other.

The train station platform is free-standing and occupied by standard PTA stainless steel seating with adjacent options for wheelchairs as well as passenger information modules and displays. The spine of the roof structure over concourse follows the vertical transport pathways down to platform level and enhances natural light and ventilation strategies.

Figure 11 – Summary of key pedestrian routes

5.2.5 Sustainability

Design Principle Statement: ***Good design provides successful places that offer a variety of uses and activities while optimising internal and external amenity for occupants, visitors and neighbours, providing environments that are comfortable, productive and healthy.***

The principles of the METRONET sustainability strategy have been incorporated in the design, including social sustainability by providing connectivity, amenity, resilience, and adaptability (refer to **Figure 12**). It is also a sensitively designed environment that considers biodiversity, water and the local climatic conditions providing optimal shading and natural vegetation.

A stormwater drainage basin is located on the western side of Tonkin Highway. As part of the project's revegetation initiative, this basin will be landscaped appropriately to help aid in stormwater treatment. This can be a highly effective and sustainable approach to urban water drainage and will be pursued in the greater station precinct zone. These areas are to be re-vegetated as part of the station works.

Unfortunately, due to the confined nature of the site, a naturalistic planted solution for stormwater treatment will not a viable solution for the area east of Tonkin Highway. Most of the surface area is required to accommodate sufficient parking bays, yet significant amount of stormwater will be directed to and through the site, which will require subsurface drainage infrastructure including underground tanks. The large number of tanks required for stormwater retention prevents large trees being planted to the whole of the site as their root systems may cause damage. As such, larger trees will be confined to the Welcome Place.

The design of the station buildings, carparks and public realm areas ensures future adaptability and climate resilience.

Figure 12 – Summary of Sustainability Outcomes

5.2.6 Amenity

Design Principle Statement: ***Good design provides successful places that offer a variety of uses and activities while optimising internal and external amenity for occupants, visitors and neighbours, providing environments that are comfortable, productive and healthy.***

Spaces have been designed to be welcoming and comfortable, universally accessible with good levels of natural daylight and ventilation. The inclusion of trees alongside the PSP, where possible, provides shade for pedestrians and cyclists.

The north-south carpark pedestrian canopy link provides shade and weather protection for its user. The Welcome Place incorporates a range of furniture items as well as power and water (to allow for potential coffee van installation), USB charging stations and seating walls. Additional bicycle racks are incorporated within the Welcome Place in addition to the main bicycle shelter located to the east of the Kiss and Ride.

5.2.7 Legibility

Design Principle Statement: ***Good design results in buildings and places that are legible, with clear connections and easily identifiable elements to help people find their way around.***

The Station entrance is legible from both the Welcome Place and adjacent car park to the north. From the Welcome Place and station entry, there are clear views across the highway out to the platform and concourse, which is a unique feature of this station.

The architecture of the Station building aids in creating strategic wayfinding, as its mass can be viewed from various angles of the surrounding precinct. The linear nature of the car park shade canopies reinforces a pedestrian link from the carpark direct to the station entry.

The Station building incorporates a suspended verandah which is considered welcoming and familiar. Beyond this is a direct link to the concourse via pedestrian overpass. From the vertical transport lobby at the Station Entry concourse there is a direct visual link to the concourse located above the platform. This offers clear wayfinding across the pedestrian overpass to the concourse and then onto the platform. The station concourse offers clear wayfinding, supported by a linear skylight above that aligns with the direction of travel. To the south of the station a pedestrian overpass from Benara road links passengers directly to the concourse where both stairs and elevators to platform are immediately visible.

Additionally, a linear skylight running the length of the roof acts as an intuitive wayfinding tool that leads patrons through to the platform and back once on the concourse. Perforated materials to the façade of the Station Entry building provide visibility to the stairs and lifts connecting the ground plane to the concourse level. Illumination, signage, and the scale of the building make it clear to visitors and staff of their whereabouts.

5.2.8 Safety

Design Principle Statement: ***Good design optimises safety and security, minimising the risk of personal harm and supporting safe behaviour and use.***

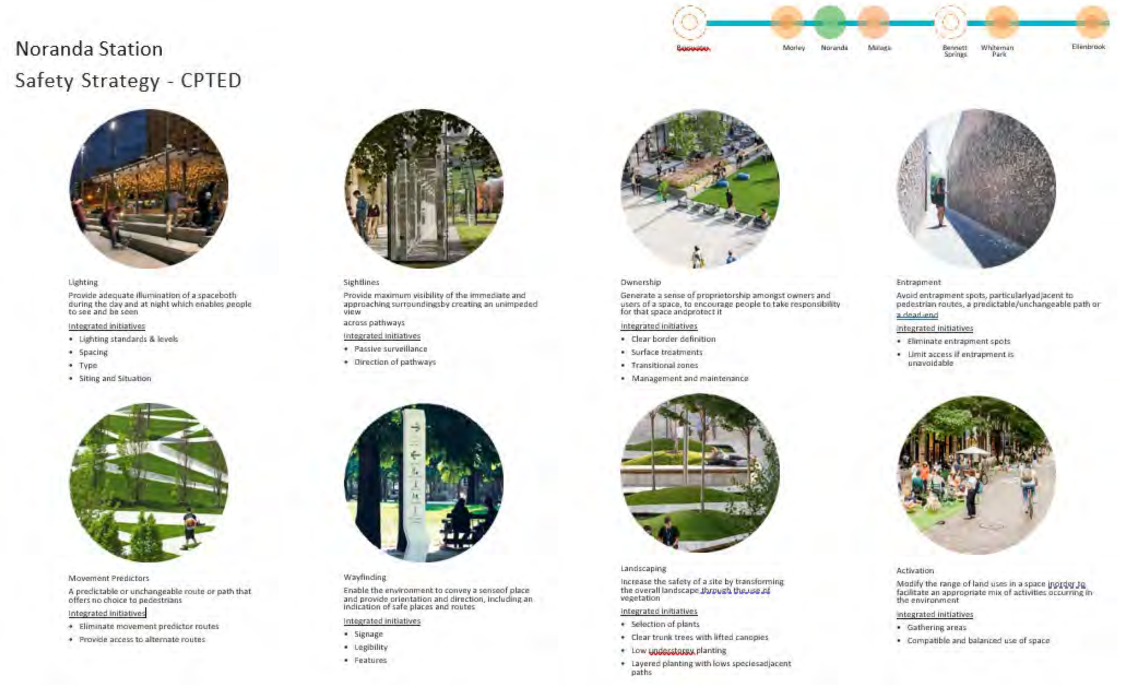
Safety is an important consideration for this station, given that it is located in a low lying area and will be isolated from more populous areas by both Benara Road and Tonkin Highway, and will be an un-manned station. Notwithstanding this, the fundamentals of CPTED have been integrated into the design, including lighting, clear sightlines, clear ownership and boundaries, elimination of entrapment spots, elimination of movement predictors, legible wayfinding, landscaping, and activation (refer to **Figure 13**).

CPTED issues are considered, ensuring clear sightlines in all areas between 700mm and 2000mm above pavement level. Linear planning of the concourse provides good passive surveillance, and the customer service office has reasonable sightlines across the platform and up to concourse.

Sightlines have been refined across the station and site to improve passive surveillance, with particular attention paid to entrance areas, pedestrian routes and the PSP along the eastern edge.Further consideration to lighting and sightlines associated with the PSP underpass proposed to the south- eastern corner of the site will be undertaken through the detailed design process.

In addition, the precinct is to be monitored by 24/7 CCTV surveillance. CCTV viewsheds will be modelled to assess impacts of tree development over time and ensure sufficient surveillance coverage.

Figure 13 – Summary of Crime Prevention Through Design Measures



5.2.9 Community

Design Principle Statement: ***Good design responds to local community needs as well as the wider social context, providing environments that support a diverse range of people and facilitate social interaction.***

Noranda is a landlocked residential suburb bound by Reid Highway to the north and Tonkin Highway to the east. The suburb has one major retail centre and a hub of services that support the local community. Noranda has many public reserves and parks, including Lightning Swamp to the north. Neighbouring suburbs of Morley, Mirrabooka and Dianella provide additional retail, social services and infrastructure. Nearby, Beechboro has a large community hub including an aquatic centre, library, community centre and skate park.

Given the isolated nature of the Station, it is intended that the precinct will provide opportunities to build a community within itself, through design and amenity. The Welcome Place becomes a pivotal design element in achieving this. The Welcome Place is intended to be a place of arrival with opportunities for short or longer periods of contemplation and socialising consisting of a tree lined garden walk, an array of seating typologies and vegetated planting beds. Furthermore, the provision of water and power provide infrastructure for small coffee trucks or food carts. Shaded seating and a flexible lawn space also provide an open area for activity.

5.2.10 Aesthetics

Design Principle Statement: Good design is the product of a skilled, judicious design process that results in attractive and inviting buildings and places that engage the senses.

The station design aims to be an attractive and inviting precinct with an elegant and coherent design that responds to Noranda and its immediate surrounds. Public art, aboriginal culture, articulation of place and character integrated into the architecture and landscape giving it a clear sense of place and character.

Local residential vernacular is referenced both by utilising masonry as a key building material and additionally within the landscape seen throughout Noranda, Beechboro, Morley and surrounds. The mesh screen to the eastern overpass presents a public art opportunity, given its visual prominence for drivers travelling along Tonkin Highway.

While still in development, the artwork approach explores the Station building as a sculptural form floating in the traffic stream - a still point with the ebb and flow of daily life. It also emphasises the experience of passage and movement, at a human scale, as pedestrians and cyclists pass through the station precinct.

6. Technical Reports

6.1 Acoustic Report

A Noranda Station Acoustic Design Report is provided at **Appendix D** of this report. The key points identified within the Acoustic Report are noted below.

- Overall environmental rail noise levels, when assessed at nearby potential noise sensitive premises are expected to comply with applicable state noise regulations and planning policy. Rail vibration levels are expected to be compliant with recommended levels.
- Road transport noise from car parking areas and local vehicle traffic movements will increase significantly in the area from current conditions but are expected to remain compliant with relevant state policies.
- Car parking areas should avoid the use of speed humps, loose laid road coverings or smooth concrete surfaces to minimise noise emissions.
- Design of the station plant and facilities such as mechanical services, public address and crowding areas to meet applicable environmental noise regulations may be achieved through conventional / industry standard design approaches and therefore is not anticipated to require specialist design input.

Stations on the Morley Ellenbrook Line (MEL) Project are required to meet the following acoustic requirements:

- Environmental Protection (Noise) Regulations 1997
- Green Star Design and As-built Requirements for Railway Stations (v1.1) Credit 14.

The above key requirements will formulate the basis for detailed acoustic design to ensure that Noranda Station arrives at an acceptable and compliant acoustic outcome. Importantly, the acoustic design of the station office spaces, concourses and platforms should sufficiently address the project requirements. This will involve:

- Sound absorption within offices, cribs and tea rooms.
- Sound insulation between spaces.
- Control of noise associated with services and other fixed infrastructure.
- Maintain desired reverberation levels and careful speaker positioning to retain speech intelligibility of the Public Address (PA) system.

Specific construction advice in line with the architectural intent will be provided during the design and coordinated with other technical disciplines to ensure compliance with SPP 5.4 – Road and Rail Noise.

6.2 Transport Impact Assessment

A Transport Impact Assessment (**TIA**) is provided at **Appendix E** of this report. This TIA considers Noranda Station's impact on the wider transport network, including consideration on the area's existing and future transport context, changes to the transport network and integration of surrounding land uses.

The traffic modelling assessment informing the TIA concluded that the Noranda Station access located along Benara Road will operate with reasonable performance up to and including 10-years post opening of the station.

The existing U-Turn facility located approximately 350 metres east of the station access along Benara Road is expected to perform within capacity and with queues that are contained within the available storage capacity up to and including the opening +5 years scenarios. However, due to significant background traffic growth forecast for the opposing westbound through movement, the U-Turn movement is expected to perform overcapacity with queues that extend beyond the pocket length within ten years of the station opening.

Based on the operational analysis and assessment of the access and supporting network, the TIA provides the following recommendations:

- Construction of the cycle infrastructure outlined in Department of Transport's Long Term Cycle Network Strategy for the surrounding vicinity of the proposed site should be prioritised, to enhance active transport connectivity to and through the station precinct.
- Further investigations into the bus services' accessing Noranda Station to better service the surrounding residential catchment areas north and south of the station to provide improved connectivity of the bus services.
- Further investigations by Main Roads into extending the pocket length of the U-Turn facility located 350m east of Noranda Station on Benara Road.

Importantly, the TIA acknowledges that the station is fit for purpose, facilitating safe and adequate access for pedestrians, cyclists and general vehicles.

6.3 Stormwater Considerations

Due to spatial constraints within the site, utilisation of bioretention areas within the carpark and drop off / pick-up area is not feasible. As the site will be filled up to 2.5 m above the existing surface level it was deemed practical to incorporate underground storage.

As large volumes of stormwater from an external catchment contribute to the precinct catchment it is proposed to separate the on-site and off-site flows into a series of underground storages to be managed and maintained by the respective authorities. Five underground storage chambers are provided to retain and infiltrate the 1% AEP event flow from the PTA infrastructure (precinct and car park). Each inlet into the underground storage chambers includes a treatment device to provide treatment for the 1EY 1 hour event.

The proposed drainage cells have been located to account for the precinct buildings, amenities, facilities, site and utility services. Further details of stormwater management is included within the Noranda Station Civil Design report at **Appendix F.**

Key principles underpinning the stormwater management design include:

- The signal equipment room is located at the northern end of the car park, with the compound graded to the west. Kerbing along the perimeter of the trafficable compound area will convey 10% AEP runoff to soak wells. Runoff from the 1% AEP flood event will be conveyed within a swale to the northern end of the site to a depression. The flood depth within the signal equipment room compound does not exceed the maximum allowance of 200 mm.
- The pick-up/drop off loop is located to the east of the station access building at the southern end of the car park. The loop is graded towards the central island with runoff to be collected and conveyed by a pit and pipe network into underground storage. Major rainfall events will overtop and pond within the central island, with ponding depth over the pavement not exceeding the maximum allowance of 200 mm.
- The car park is generally crowned in the centre of each vehicular aisle to direct runoff towards the parking bay medians. A pit and pipe network collects and conveys runoff into underground storage beneath the car park and pedestrian thoroughfares. Major rainfall events pond over the pavement but will not exceed the maximum allowance of 200 mm. Events greater than the 1% AEP will exit the site onto the Tonkin Highway.
- The precinct access road has a one-way crossfall towards the outbound lane. A pit and pipe system on the low side will collect and convey runoff to the underground storage located to the east of the station access building. In the 1% AEP flood event, ponding over the pavement will not exceed the maximum allowance of 200 mm.
- The Station building, Station Entry building and eastern overpass drainage systems will be conveyed into the car park drainage system, with three points of discharge. The existing MRWA pipes under the Tonkin Highway will be retained to convey flows from the track and platform areas.

The preliminary stormwater design is provided to indicatively demonstrate water management design principles. The final stormwater design is expected to be delivered as a condition of approval, similar to previous METRONET station projects. Specifically, the following condition has generally been applied to previous METRONET station development approvals:

> *A Drainage Management Plan shall be submitted and approved by the Western Australian Planning Commission, on the advice of the Department of Water and Environmental Regulation and the City of Bayswater, prior to the commencement of relevant building works. Once approved, the plan is to be implemented in its entirety.*

7. Exemptions Legislation and Considerations

The nature of this project will require a substantial component of infrastructure to support the functional operation of the station. For the Noranda Station, this will require a number of supporting road connections / upgrades and rail related infrastructure. The majority of this infrastructure supporting the Noranda Station is considered exempt from the requirement for planning approval and is therefore outside the scope of this development application. The following sections outline the head of power which underpins these exemptions.

7.1 Section 6 Public Works

Section 6 of the *Planning and Development Act 2005* states provides exemption for the requirement to obtain planning approval under the relevant local planning scheme for 'public works' or the taking of land associated with that public work.

To achieve this public works test, the following two tests must be met:

1. The authority undertaking the work is an agent of the crown; and
2. The scope of works meets the definition of 'public work' as defined by the *Public Works Act 1902*.

The PTA is considered an 'Agent of the Crown', and the MELconnx Alliance acts on behalf of the PTA. The proposed forward works will therefore meet the first test of public works.

Section 2 of the *Public Works Act 1902* includes the following within the definition of 'Public Work'.

> *(2) any railway authorised by special Act or any work whatsoever authorised by any Act;*
> *(20) any road, stock route, viaduct, or canal;*

Given the proposed Noranda Station works are included within the scope of the METRONET Act enabling legislation, the proposed works also meet this second test.

The Noranda Station works will thereby meet the Section 6 exemption and does not require approval under the City's local planning scheme.

7.2 Railway (METRONET) Act 2018

The *Railway (METRONET) Act 2018* (METRONET Act) is the enabling legislation applicable to the construction of the METRONET railway extensions. Section 3 specifically provides the authority to construct the MEL. The legislation constitutes a special Act for the purposes of the *Public Works Act 1902*.

From a planning approvals perspective, this enabling legislation introduced a number of exemptions from planning approval beyond what is provided for within the PD Act and MRS. Specifically, Section 6 of the METRONET Act provides the following exemption applicable to this application:

> *Despite anything in the Metropolitan Region Scheme, the following development may be commenced or carried out without the approval of the Planning Commission —*
>
> > *(B) METRONET works on non-railway land.*

'METRONET Works' defined as follows:

> > *means works for the purpose of, or in connection with, a METRONET railway* ***but does not include the construction or alteration of a railway station, or any related car parks, public transport interchange facilities or associated means of pedestrian or vehicular access****;*

This clause will provide an exemption from planning approval for METRONET works which extend beyond the Railways reservation. Importantly, for the construction or alteration of a railway station, or any related car parks, public transport interchange facilities or associated means of pedestrian or vehicular access, the requirements under the Metropolitan Region Scheme will apply.

As this development application fundamentally involves the construction of a railway station, a development application is required. However, some works ancillary to the station will be exempt from approval under this clause.

7.3 Metropolitan Region Scheme (MRS) Exemptions

The site is reserved as a Primary Regional Road under the MRS. For reserved land, exemptions available under the MRS are provided through Clause 16 of the MRS.

Section 16(2) of the MRS enables reserved land owned by or vested in a public authority to be used or developed for any other purpose approved by the Commission with or without approval of the Commission.

Importantly, for this METRONET project, the enabling legislation of the METRONET Act re-instates the majority, but not all, of these exemptions.

7.4 Supporting Works Exempt from Approval

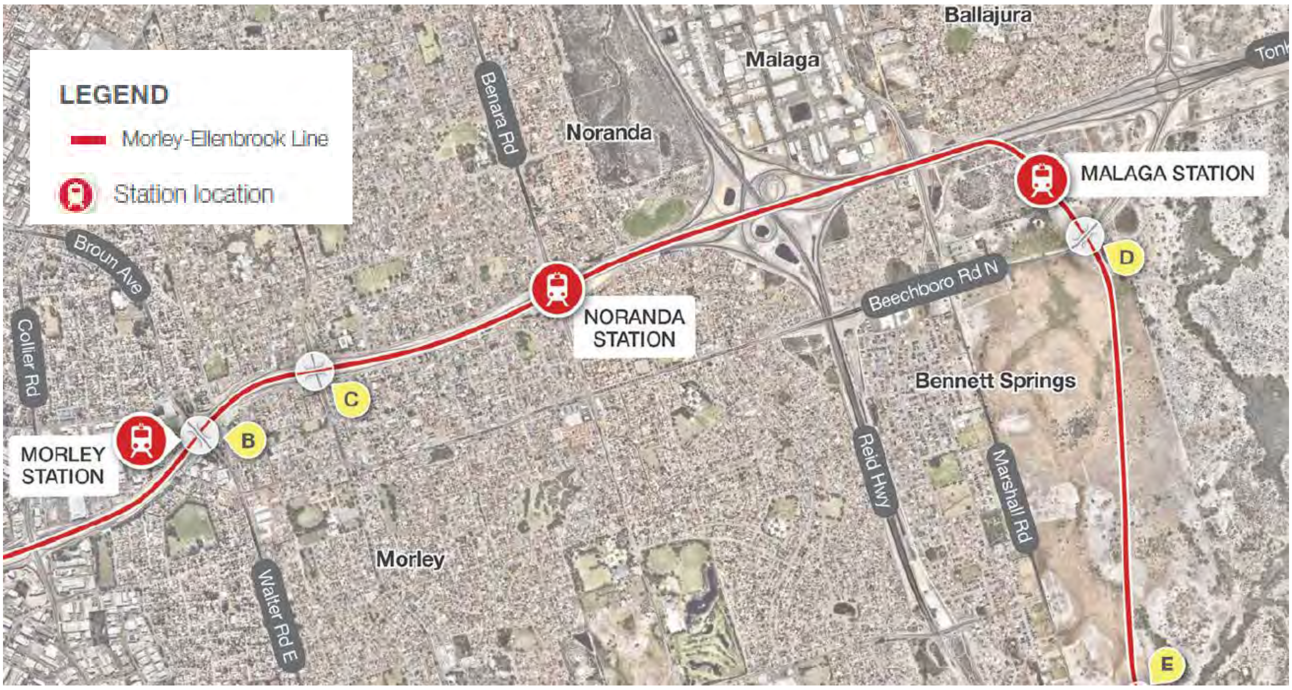
Table 6 outlines these supporting works relevant to the Noranda Station, but which are not in the scope of the development application.

In the case of Noranda Station, as the future station land is not zoned 'Railways' under the MRS, the key legislation guiding exemptions is the METRONET Act. The below table provides a summary of how the exemptions have been applied to the station.

Table 6–Supporting Works Outside of Scope

Works	Summary
Rail track	The rail track extension is considered operational and does not provide vehicle or pedestrian access to the station. Accordingly, the rail track is exempt from development approval through the METRONET Act. The Noranda Station location and rail alignment is illustrated in **Figure 14**.
Shared / Principal Shared Path outside of the subject site	The MEL scope of works will generally fill gaps in the existing Shared / Principal Shared Path network. These connections are considered exempt from planning approval where they are outside of the 'subject site' as this is considered the point where the pathway does not provide 'direct' access to the station.
All operational infrastructure	All operational infrastructure is directly associated with rail operations are considered exempt from approval under the METRONET Act. For example, access tracks, monopoles, telecommunication towers, signalling structures, rail monopoles etc.
PTA Bus Stops	Two on-street PTA Bus Stands on Benara Road. One bus stand located on Benara Road South East (west bound flow) and the other bus stand is located on Benara Road North West (east bound flow). These bus stops are considered exempt from planning approval as they are outside of the limit of works within the subject site.

Figure 14 – Noranda Station Location Plan and rail alignment



8. Planning Considerations

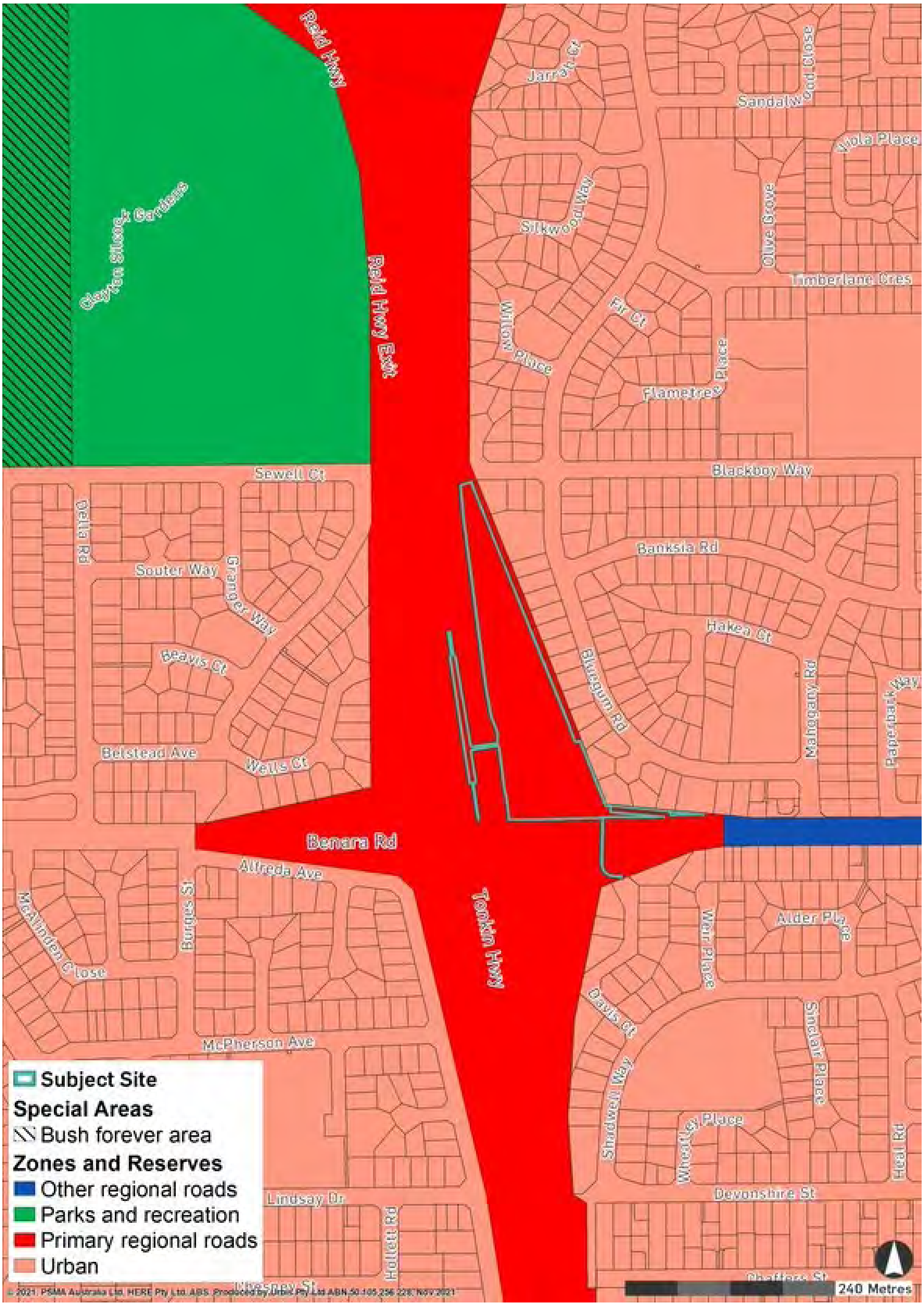
8.1 State Planning Assessment

Table 7–Summary of State Planning Assessment

Item	Summary
MRS	The site is reserved for 'Primary Regional Road' under the MRS, as shown in **Figure 15**. The Noranda Station will provide complementary infrastructure for the function of this reserve and assist in alleviating traffic congestion on the regional road network by delivering an alternative form of transport.
State Planning Policy No. 3.7 – Planning in Bushfire Prone Areas (SPP 3.7)	The northern portion of the project area has been designated as bushfire prone in accordance with the Department of Fire and Emergency Services Map of Bushfire Prone Areas. On this basis, a Bushfire Management Plan (BMP) has been prepared to address requirements under Policy Measures 6.2 and 6.5 of *State Planning Policy 3.7 Planning in Bushfire-Prone Areas.* The proposed development is considered a vulnerable land use which triggers additional requirements under Policy Measure 6.6 of SPP 3.7. In accordance with Policy Measure 6.6.1 and Section 5.5 of the Guidelines, development applications for vulnerable land uses require a Bushfire Emergency Evacuation Plan (BEEP) detailing the emergency management provisions for the facility, accompanies the BMP. For this project, it is proposed that a BEEP is not prepared at this time but is included as a future implementation measure within the BMP and conditioned as part of the DA approval. The BMP confirms that with appropriate implementation actions, the proposed development is able to conform to the relevant provisions of SPP 3.7. A copy of the BMP is provided at **Appendix H.**
SPP 5.4–Road and Rail Noise	SPP5.4 guides the interface of noise sensitive development and major road and rail transport routes, with the overall aim of protecting significant transport routes whilst minimising the adverse impact of transport noise on sensitive development. As all new proposed railways are required to meet the specified noise targets of SPP5.4, a noise and vibration assessment has been completed in support of the Noranda Station. Future sensitive land uses within 100m of Noranda Station may require 'quiet house' design standards being applied.

The project is committed to further assessment of potential railway noise and vibration mitigation measures associated with future development surrounding Noranda Station, to ensure outcomes are consistent with stakeholder expectations. While railway infrastructure and system works are excluded from the development approvals process and as such this application, design of these elements will further consider and where necessary seek to reduce noise and vibration outcomes associated with the railway. The project will also continue to work closely with the METRONET Office and other key stakeholders in planning for the surroundings, with a view to achieving best practice outcomes from an integrated transport and land use planning perspective.

Figure 15 - MRS Map



8.1.1 METRONET Station Precinct Design Guide

The METRONET Station Precinct Design Guide provides specific design guidance aimed at the design and planning of station precincts, including objectives which are fundamental to the delivery of a METRONET station.

Importantly, the METRONET Station Precinct Design Guide emphasises that a 'one-size-fits-all' approach cannot be applied to station design, and instead a station must be designed on a case-by-case basis considering the transit function, context and development potential over time. This is particularity relevant to the MEL stations given the surrounding centres are in a state of transition, and the ultimate activity centre station design may vary as the supporting activity centre development evolves.

The Station Precinct Design Guide sets out 8 critical element objectives which require the specific planning response to support successful long-term station development. These requirements vary depending on the station precinct type.

The Preliminary Place Plan & Indicative Layout Response prepared for the Noranda Station has identified the station starts as a Transit Node (SP6) and Neighbourhood (SP5) type station precinct.

The respective descriptions of these station typologies are as follows:

Transit Node SP6

> *Transit node precincts primary role is to provide access to stations for a wide catchment with the provision of park and ride and/or transit interchange from other services.*

Neighbourhood SP5

> *Neighbourhood station precincts are primarily residential communities with good transit accessibility and support a basic mix of uses to meet the needs of local residents.*

Many of these 'critical elements' are most applicable to future development surrounding the station and is beyond the scope of the Noranda station development. However, the applicable aspects are:

- Critical Element 4: Intersections and Crossings
- Critical Element 5a: Transit Integration – Rail
- Critical Element 5b: Transit Integration – Bus
- Critical Element 6: Station Type
- Critical Element 7a: Station Dedicated Parking
- Critical Element 8: Public Realm and Public Open Space.

Table 8 applies these critical elements to the proposed Noranda station design.

Table 8–Station Critical Element

STATION CRITICAL ELEMENT	DETAILS
Critical Element 4: Intersection and Crossings	
Preferred: controlled four way intersection, no splitter lanes. *Considered: Micro roundabout*	All intersections within the PTA car park are sign-controlled intersections with no splitter lanes.
Critical Element 5a: Transit Integration - Rail	
Preferred:  *Underground Tunnel*  *Cut and Cover*  *Open cut*	Noranda Station is designed as an 'up and over' station design, with an at- grade Station Entry building with pedestrian overpasses from the Station Entry building and Benara Road connecting to an elevated concourse providing access to the station platforms. Whilst this is not a preferred design for the station typology, it is a suitable station design, and allows the station to integrate well with its surroundings. Furthermore, there are numerous advantages to an up and over station in this locality, including: - Ability to incorporate pedestrian overpasses linking to the Station Entry building and Benara Road to accommodate different modes of transport accessing the station; - Safe and separate interface with vehicle traffic on the adjacent road network; and - Good integration with an existing transport corridor
Critical Element 5b: Transit Integration – Bus	
Preferred: on street. Integrated/stacked interchange loop at grade	Noranda station provides for two on-street PTA bus stands located on Benara Road. This is consistent with the preferred approach.
Critical Element 6: Station Type	
Preferred: integrated station, underground station.	The following design elements demonstrate that the Noranda Station is best classified as an integrated station, consistent with the 'preferred' approach for a Transport Node / Neighbourhood station. <u>Integrated into the streetscape / form a seamless part of the urban streetscape</u> Multiple aspects of the station have been designed to appropriately interface with surrounding development. This includes the integration of the Station building with Benara Road, the Station Entry building and adjacent Welcome Place. The pedestrian overpasses linking to Benara Road and the Station Entry building

STATION CRITICAL ELEMENT	DETAILS
	also provide a logical connection to different modes of transport accessing the station. Streetscape to be dedicated for entry ways to the station The entrance experience for the Noranda Station is enhanced by the use of the Station Entry building, pedestrian overpasses, Welcome Place and open space area. Combined, these areas create clear wayfinding cues to the station entrance, as well as creating a pleasant entrance experience.
Critical Element 7a: Station Dedicated Parking	
Preferred (Core): no park'n'ride *Considered (Core): limited park'n'ride (stacked/decked)*	Noranda Station provides at grade parking for passengers. This is recognised as a considered form of parking for a transit node / neighbourhood station precinct type. Providing some degree of parking is a requirement of the SWTC and is therefore politically a necessary component of delivering the train station. The focus is therefore delivering this parking with the least impact on station amenity, whilst also reducing the barrier to the potential redevelopment and re-use of the car parking areas. As at-grade parking requires the least structural investment, this form of parking is more conducive to urban redevelopment, as compared to stacked or decked parking. Further to the above, stacked/decked parking should be considered only when it is viable to construct it in the future to respond to passenger demand. Otherwise, the scale of the parking would detract from the amenity of the station and surrounds. In terms of integration with the surrounding areas, the car parking layout is deliberately contained within one single cell to the north of the Station Entry building, to enable integration of the Station Entry building and Welcome Place with the Station building

Critical Element 8: Public Realm and Public Open Space	
Preferred: people streets plaza/square, play space urban park	Noranda Station provides a 'Welcome Place' located immediately east of the Station Entry building, providing a meeting place where people can congregate or dwell before proceeding on their journeys, as well as increasing the opportunities for mutual passive surveillance. This area is to be developed with high quality landscaping and artworks and will be the heart of the station precinct.

8.1.2 Planning Control Area No. 146 (PCA 146)

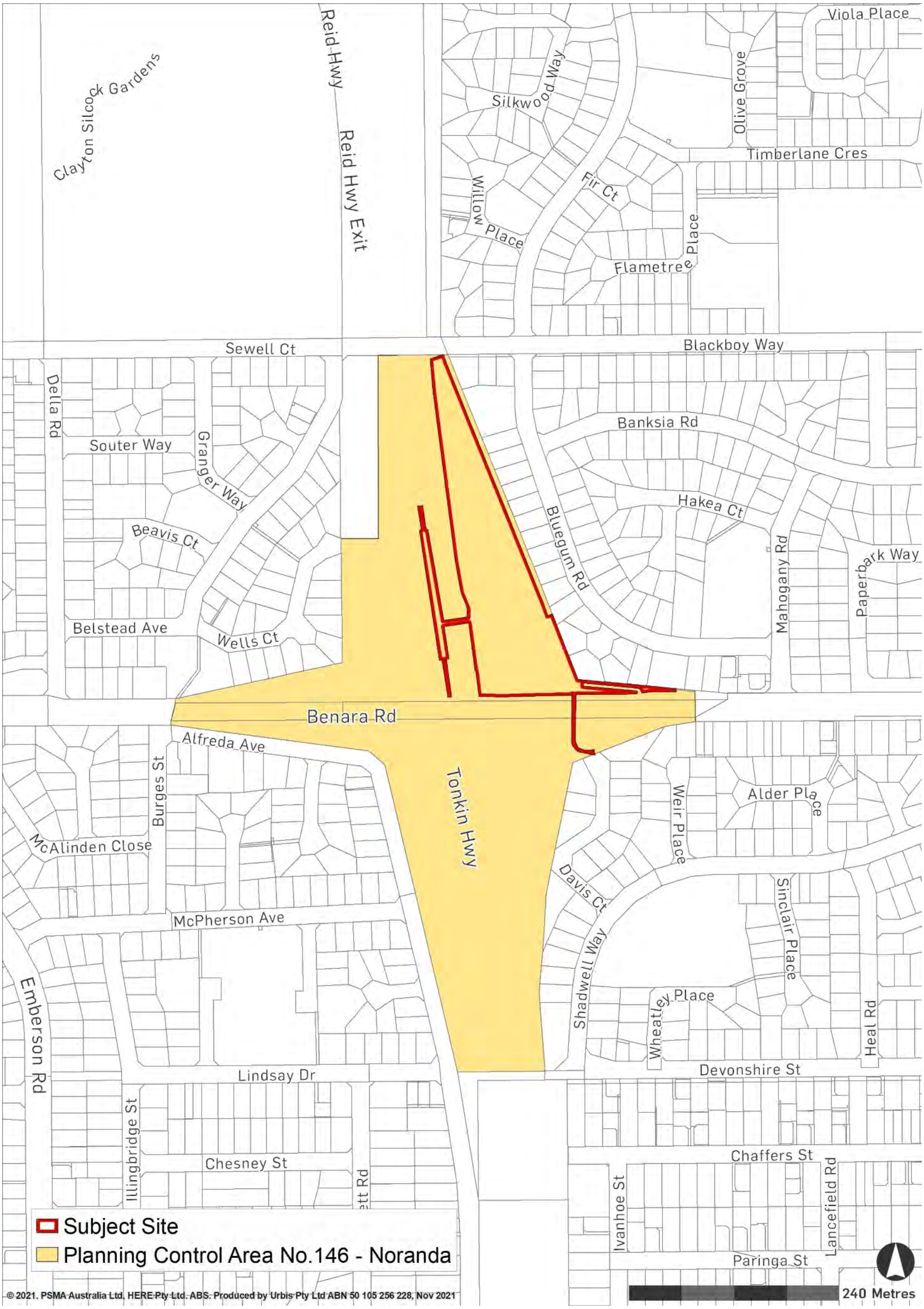
The proposed Noranda Train Station works are wholly located within PCA146, which has been established for the purpose of facilitating the development of the land for the purpose of railways and other related road widening purposes. PCA 146 is shown in **Figure 16**.

The Planning and Development Act 2005 (PD Act) outlines the planning processes for a PCA. This process is summarised as follows:

- The development application is to be lodged with the City of Bayswater. The local authority is to forward the application and its recommendation to the WAPC within 30 days of receiving the application (Section 115(3) of the PD Act).
- The Commission must then make a decision within 60 days of receiving the forwarded application (Section 250(3) of the PD Act).

Under Section 130 of the PD Act, the PCA provisions prevail over every other provision of the PD Act, including any region planning scheme or local planning scheme. However, this alone does not negate the requirement to obtain approval under the region planning scheme or local planning scheme, where applicable.

Figure 16-PCA 146



8.2 Local Planning Framework

As noted earlier in this report, the proposed development meets the categorisation of 'Public Works' and is exempt under Section 6 of the *Planning and Development Act 2005*. Regardless, as the interface between the Noranda Station and the surrounding areas is an essential consideration in the successful station planning design, and the driving principles and objectives of the have been considered for this application.

8.2.1 City of Bayswater Local Planning Scheme No. 24 (LPS 24)

The City of Bayswater Local Planning Scheme No. 24 (LPS 24) sets out the local government's planning aims and intentions for the Scheme area.

The site is not reserved under the Scheme but shown as a "Regional Reserve" on the Scheme Map and reserved under the Metropolitan Region Scheme. The approval of the local government under the Scheme is not required for the commencement or carrying out of any use or development on a Regional Reserve.

8.2.2 Perth and Peel @ 3.5 million

Perth and Peel @ 3.5 million guides the future growth of the Perth and Peel regions as a compact consolidated and connected city that can accommodate a population of 3.5 million by 2050.

Perth and Peel @3.5 million and the Central Sub Regional Planning Framework identify four key rail proposals included within METRONET Stage 1, including a new rail line extending from the Midland rail line to the Ellenbrook town centre with additional stations at Morley, Malaga and Ellenbrook. The MEL METRONET initiative is noted as an integral part of service provision within the Central Sub region to provide greater connection with the surrounding areas as well as the Perth CBD.

Noranda Station is consistent with the overarching strategic framework. The Station will formulate an integral component of the MEL METRONET initiative and will deliver a high frequency public transport service for the emerging population of the sub- region.

Noranda Station is located within the Central Sub region with the population predicted to grow by more than 468,000 people by 2050, bringing the total population to more than 1.2 million people. It is expected that population growth within the City of Bayswater will increase from 65,340 people in 2011 to 100,000 people in 2050, with an additional 15,750 dwellings required.

Noranda Station provides a critical piece of transport infrastructure underpinning future urban expansion of the Central Sub-region.

9. Supporting Approvals and Management Plans

The following table provides a summary of those approvals.

Table 9–Summary of Supporting Approvals and Management Measures

CONSIDERATION	DETAIL
Noise Monitoring Program	A noise monitoring program will be implemented within three months of the opening of the MEL line, and again at 18 months, to assess the effectiveness of noise mitigation. Specifically, the program will: ▪ Confirm the as-built and operating railway achieves the Policy target LAeq (Day) 55 dB and LAeq (Night) 50 dB unless higher levels are permitted due to the incorporation of specified house facade protection. ▪ Assess the accuracy of the pre-construction noise modelling predictions that were used to determine noise reduction treatments. The PTA also has existing procedures for receiving noise complaints, which will be extended to the MEL operations.
Out of Hours Work	Due to the nature and scale of the project, it is likely that some degree of 'out of hours' and 'night shift' work will be required during the construction stage of this project. An Out of Hours Construction Noise and Vibration Management Plan will be provided to the City of Bayswater prior to these out of hours works occurring. Acceptance of this Construction Noise and Vibration Management Plan will meet the notification / approval requirements as required by the Environmental Nosie Regulations. For the purpose of the planning approval process, we request that any condition of approval related to construction hours is worded in a manner that does not restrict these out of hours works (subject to acceptance of the Construction Noise and Vibration Management Plan).
Construction Management	MELConnx's Construction Management Plan has been approved by the PTA and issued for use.
Dilapidation survey	A dilapidation survey, prior to demolition and excavation works commencing on site, will be commissioned 100m beyond the works area to document existing conditions of adjoining properties and infrastructure. A re-inspection post project completion will also be commissioned to assess conditions against those reported before works commenced.
Access and approvals	The Project Alliance will obtain permission for site access to all work areas from the relevant stakeholders prior to commencing construction works. All environmental, LGA and rail authority approvals shall be gained prior to construction works commencing onsite.

CONSIDERATION	DETAIL
Traffic Management Plan	The Project Traffic Management Plan will ensure: ▪ Existing paths are maintained or alternative sealed pathways are provided. ▪ Temporary paths where required will have secure fencing and appropriate lighting ▪ Height clearances for roads is not reduced to less than 5.3m where possible. Approval to be sort should this not be possible ▪ Ensure security to adjacent properties ▪ Construction personnel will be encouraged to use public transport where possible Construction personnel's vehicles or construction vehicles are to park only in designated parking bays within the construction site. It is expected that the delivery of a traffic management plan will be a condition of development approval.

10. Conclusion

The METRONET Morley Ellenbrook Line from Bayswater to Ellenbrook seeks to implement best practice urban design and transport planning principles to the emerging north-east corridor of Perth. The Noranda Station is an exceptional example of this approach, which by placing the Noranda Station within the Tonkin Highway median will establish the opportunities for an alternative transport mode which does not rely solely on private vehicle travel.

The station design has been well thought out, with careful consideration to ensure the station building and its supporting facilities interface appropriately with land available to support development and the surrounding area. This has included careful consideration to matters including desire lines, road hierarchy, potential future land uses, pedestrian movements and their interface with the station building and supporting infrastructure.

This report concludes that the Noranda Station achieves these essential pillars of a contemporary station, as evidenced through the following:

- A pedestrian first approach to the station building design, which provides for logical and direct links to the existing PSP network. This is best evidenced through the pedestrian underpass and the pedestrian overpass(s) linking the Station building to the Station Entry building and existing PSP network.
- Providing essential pedestrian connecting infrastructure, including an extension of the existing shared path network to the Noranda Station.
- Recognising the need for park-and-ride facilities for a train station in an emerging urban setting, the station design accommodates car parking in a manner which considers the immediate surrounds.
- Development of the Welcome Place is proposed to create an attractive and usable space within the immediate vicinity of the Station Entry building and provides a connection to the shared path network.

Whilst the development application is for 'public works' and has limited statutory assessment controls under the local government framework, this has in no way resulted in a compromised design outcome for the Noranda Station. As demonstrated via a planning assessment against the qualitative controls of SPP7, the METRONET Station Design Guide and other relevant State and local planning frameworks, the Noranda Station is designed to be fit for purpose and will be the catalyst for further supporting high quality development within the surrounding areas.

Disclaimer

This report is dated 19 November 2021 and incorporates information and events up to that date only and excludes any information arising, or event occurring, after that date which may affect the validity of Urbis Pty Ltd **(Urbis)** opinion in this report. Urbis prepared this report on the instructions, and for the benefit only, of MELConnx / Public Transport Authority **(Instructing Party)** for the purpose of Development Application **(Purpose)** and not for any other purpose or use. To the extent permitted by applicable law, Urbis expressly disclaims all liability, whether direct or indirect, to the Instructing Party which relies or purports to rely on this report for any purpose other than the Purpose, and to any other person which relies or purports to rely on this report for any purpose whatsoever (including the Purpose).

In preparing this report, Urbis was required to make judgements which may be affected by unforeseen future events, the likelihood and effects of which are not capable of precise assessment.

All surveys, forecasts, projections and recommendations contained in or associated with this report are made in good faith and on the basis of information supplied to Urbis at the date of this report, and upon which Urbis relied. Achievement of the projections and budgets set out in this report will depend, among other things, on the actions of others over which Urbis has no control.

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Whilst Urbis has made all reasonable inquiries it believes necessary in preparing this report, it is not responsible for determining the completeness or accuracy of information provided to it. Urbis (including its officers and personnel) is not liable for any errors or omissions, including in information provided by the Instructing Party or another person or upon which Urbis relies, provided that such errors or omissions are not made by Urbis recklessly or in bad faith.

This report has been prepared with due care and diligence by Urbis and the statements and opinions given by Urbis in this report are given in good faith and in the reasonable belief that they are correct and not misleading, subject to the limitations above.

Appendix A-Certificates of Title

REGISTER NUMBER	
461/P21673	
DUPLICATE EDITION **N/A**	DATE DUPLICATE ISSUED **N/A**

WESTERN AUSTRALIA

VOLUME **LR3153** FOLIO **593**

RECORD OF CERTIFICATE OF CROWN LAND TITLE

UNDER THE TRANSFER OF LAND ACT 1893
AND THE LAND ADMINISTRATION ACT 1997

NO DUPLICATE CREATED

The undermentioned land is Crown land in the name of the STATE OF WESTERN AUSTRALIA, subject to the interests and Status Orders shown in the first schedule which are in turn subject to the limitations, interests, encumbrances and notifications shown in the second schedule.

BGRoberts

REGISTRAR OF TITLES

LAND DESCRIPTION:

LOT 461 ON PLAN 21673

STATUS ORDER AND PRIMARY INTEREST HOLDER:
(FIRST SCHEDULE)

STATUS ORDER/INTEREST: ROAD

PRIMARY INTEREST HOLDER: STATE OF WESTERN AUSTRALIA

LIMITATIONS, INTERESTS, ENCUMBRANCES AND NOTIFICATIONS:
(SECOND SCHEDULE)

1. K777922 DEDICATED ROAD REGISTERED 20/11/2008.

Warning: A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required. Lot as described in the land description may be a lot or location.

--END OF CERTIFICATE OF CROWN LAND TITLE--

STATEMENTS:

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents or for local government, legal, surveying or other professional advice.

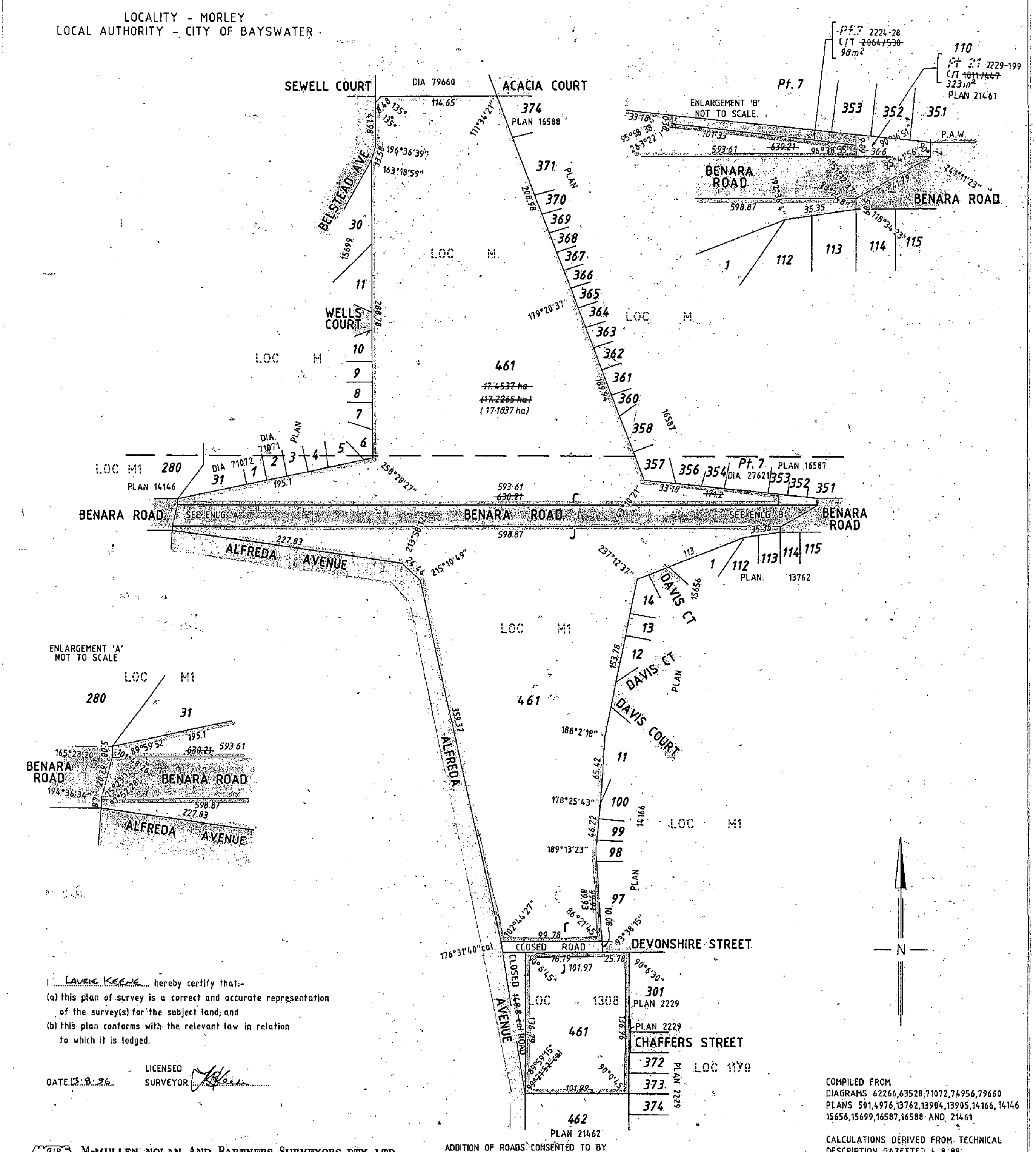
SKETCH OF LAND:	P21673
PREVIOUS TITLE:	25-367A, 25-368A, 404-145, 563-145, 1015-332, 1117-615, 1201-258, 1206-101, 1212-657, 1342-601, 1342-602, 1657-236, 1693-525, 1703-984, 1731-701, 1749-965, 1749-995, 1866-888, 1867-958, 1877-493, 1877-494, 1877-495, LR3153-594
PROPERTY STREET ADDRESS:	NO STREET ADDRESS INFORMATION AVAILABLE.
LOCAL GOVERNMENT AUTHORITY:	CITY OF BAYSWATER
RESPONSIBLE AGENCY:	MAIN ROADS WESTERN AUSTRALIA (ROAD)

NOTE 1: K777921 CORRESPONDENCE FILE 50635-2003-02RO

LAND DESCRIPTION	ON	CERTIFICATE OF TITLE	FIELD BOOK	TOTAL AREA
Pt. SWAN LOCATIONS M, M1 & 1308	PLANS ~~501~~,2178,4976,15699 13782,21461 DIAGRAMS 44208,51536,62266 63528,65769,69660 71072,74956 INDEX BG34 (2) 16.33,16.34,17.33	VOLUME FOLIO 25-367A,25-368A,404-145 563-145,~~1011-447~~,1015-332 1117-615,1201-258,1206-101 1212-657,1342-601,1342-602 1657-236,1693-525,1703-984 1731-701,1749-965,1749-995 1866-888,~~2064-530~~,1867-958 1877-493,1877-494,1877-495	COMPILED	17·1837 ha ~~17.2265 ha~~ ~~17.4537 ha~~

PLAN 21673

LOCALITY - MORLEY
LOCAL AUTHORITY - CITY OF BAYSWATER



I Laurie Keene hereby certify that:-
(a) this plan of survey is a correct and accurate representation of the survey(s) for the subject land; and
(b) this plan conforms with the relevant law in relation to which it is lodged.

DATE 13·8·96 LICENSED SURVEYOR [signature]

COMPILED FROM
DIAGRAMS 62266,63528,71072,74956,79660
PLANS 501,4976,13762,13904,13905,14166,14146
15656,15699,16587,16588 AND 21461

CALCULATIONS DERIVED FROM TECHNICAL DESCRIPTION GAZETTED 4-8-89

MCMULLEN NOLAN AND PARTNERS SURVEYORS PTY LTD

ADDITION OF ROADS CONSENTED TO BY W.A.P.C. IN LETTER DATED 5.3.1999.

SURVEYOR'S CERTIFICATE

~~REG 34.1~~ .... hereby certify that:
(a) this plan of survey ~~is a correct and accurate representation of the survey carried out by me personally / under my own personal supervision, inspection and field check, and recorded in field books lodged for the purposes of this plan of survey;~~
(b) the measurements are in strict accordance with ~~the Licensed Surveyors (Guidance of Surveyors) Regulations 1961 and in particular regulations 23 and 34 of those regulations; and~~
(c) this survey and this plan of survey are in strict accordance with the requirements ~~of the Licensed Surveyors (Guidance of Surveyors) Regulations 1961 and the relevant law in relation to which it is lodged.~~
Licensed Surveyor .... Date ....

~~REG 56D.1~~ .... hereby certify that:
(a) this plan is ~~correct and was prepared under my supervision and is the result of calculations from measurements made by me personally / under my own personal supervision, inspection and field checks as recorded in the field books lodged for the purposes of this plan;~~
(b) the measurements are in strict accordance with the Licensed Surveyors ~~(Guidance of Surveyors) Regulations 1961 and in particular regulations 23 and 34 of those regulations; and~~
(c) this plan of survey conforms with the relevant law in relation to which it is lodged.
Licensed Surveyor .... Date ....

APPROVED BY WESTERN AUSTRALIAN PLANNING COMMISSION
FILE ~~87951~~ 105948
[signature]
FOR CHAIRMAN
DATE 03-DEC-1998

LODGED
DATE 13.8.96
FEE PAID $708
ASSESSMENT No. 136789

EXAMINED ~~FULL AUDIT~~ LEGAL COMPONENT [signature] 6.9.96
DOCKET PLAN/~~DIAGRAM~~ 21400
CERTIFIED CORRECT [signature] 6/9/96
F.S.O. No.

SCALE 1:2500
50 0 200
ALL DISTANCES ARE IN METRES.

IN ORDER FOR DEALINGS
SUBJECT TO Resumption of land on Plan 21461 & 2 owners.
[signature] 12.7.99
FOR INSPECTOR OF PLANS & SURVEYS DATE

APPROVED 20.11.2008
APPROVED
INSPECTOR OF PLANS & SURVEYS

DOLA
Department of LAND ADMINISTRATION

OFFICE OF TITLES
PLAN
21673

Appendix B - Development Plans

00##	Sheet #
0001	SHEET 01
01##	PLACEHOLDER
0002	SHEET 01
02##	Sheet #
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0004	ROOM DATA SHEETS - PLACEHOLDER
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0006	PLACEHOLDER
0007	PLACEHOLDER
0008	PLACEHOLDER
0009	PLACEHOLDER
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0012	LIMIT OF WORKS PLAN
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0014	EARTHING AND BONDING ARCHITECTURAL DETAILS
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0016	CONCOURSE LEVEL
0017	ROOF
0018	PLAN
0019	ROOF PLAN
0020	PLACEHOLDER
0021	PLACEHOLDER
0022	PLACEHOLDER
0023	PLACEHOLDER
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0026	SECTIONS - SHEET 1
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0028	PLACEHOLDER
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0030	PLATFORM LEVEL - SHEET 1
0031	PLATFORM LEVEL - SHEET 2
0032	PLATFORM LEVEL - SHEET 3
0033	CONCOURSE LEVEL - SHEET 1
0034	CONCOURSE LEVEL - SHEET 2
0035	CONCOURSE LEVEL - SHEET 3
0036	ROOF LEVEL - SHEET 1
0037	ROOF LEVEL - SHEET 2
0038	ROOF LEVEL - SHEET 3
0039	PLACEHOLDER
0040	PLATFORM LEVEL - SHEET 1
0041	PLATFORM LEVEL - SHEET 2
0042	PLATFORM LEVEL - SHEET 3
0043	CONCOURSE LEVEL - SHEET 1
0044	CONCOURSE LEVEL - SHEET 2
0045	CONCOURSE LEVEL - SHEET 3
0046	ROOF LEVEL - SHEET 1
0047	ROOF LEVEL - SHEET 2
0048	ROOF LEVEL - SHEET 3
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0050	VERTICAL TRANSPORT BUILDING - CONCOURSE
0051	VERTICAL TRANSPORT BUILDING - ROOF
0052	SERVICES COMPOUND
0053	SERVICES COMPOUND - ROOF
0054	PLACEHOLDER
0055	PLACEHOLDER

0056	PLACEHOLDER
0057	PLACEHOLDER
0058	PLACEHOLDER
0059	PLACEHOLDER
0060	PLATFORM LEVEL - SHEET 1
0061	PLATFORM LEVEL - SHEET 2
0062	PLATFORM LEVEL - SHEET 3
0063	CONCOURSE LEVEL - SHEET 1
0064	CONCOURSE LEVEL - SHEET 2
0065	CONCOURSE LEVEL - SHEET 3
0066	PLACEHOLDER
0067	PLACEHOLDER
0068	PLACEHOLDER
0069	PLACEHOLDER
0070	PLATFORM LEVEL - SHEET 1
0071	PLATFORM LEVEL - SHEET 2
0072	PLATFORM LEVEL - SHEET 3
0073	CONCOURSE LEVEL - SHEET 1
0074	CONCOURSE LEVEL - SHEET 2
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0089	SHORT SECTION - SHEET 1
0090	SHORT SECTION - SHEET 2
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0101	BICYCLE SHELTER PLAN
0102	WET AREAS - PUBLIC
0103	WET AREAS - PUBLIC
0104	EASTERN ENTRY BUILDING
0104X	WET AREAS - STAFF
0105	EASTERN OVERPASS
0105X	WET AREAS - STAFF
0106	SOUTHERN OVERPASS
0107	CARPARK AND KISS + RIDE SHADE STRUCTURE
0108	BIKE STORE - SUBSTATION - PUMPS & TANKS
0109	STAIR
0110	LIFTS
0111	LIFTS
0112	LIFTS
0113	Unnamed
0120	VT BUILDING DETAILS - SHEET 1
0121	DETAILED SECTIONS
0122	DETAILED SECTIONS
0123	DETAILED SECTIONS
0124	THRESHOLD DETAILS
0125	PLACEHOLDER
0126	PLACEHOLDER
0127	PLACEHOLDER
0128	PLACEHOLDER
0129	PLACEHOLDER
0130	WINDOW TYPES AND DETAILS
0131	WINDOW TYPES AND DETAILS
0132	WINDOW TYPES AND DETAILS- PLACEHOLDER
0133	LOUVER TYPES AND DETAILS
0134	LOUVER TYPES AND DETAILS - PLACEHOLDER
0135	DOOR TYPES AND FRAME PROFILES

0136	PLACEHOLDER
0137	PLACEHOLDER
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0178	PLACEHOLDER
0179	PLACEHOLDER
0180	PLATFORM LEVEL - SHEET 1
0181	PLATFORM LEVEL - SHEET 2
0182	PLATFORM LEVEL - SHEET 3
0183	CONCOURSE LEVEL - SHEET 1
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0185	CONCOURSE LEVEL - SHEET 3
0186	FIRE SAFETY & THERMAL COMPLIANCE
0187	PLACEHOLDER
0188	PLACEHOLDER
0189	PLACEHOLDER
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0191	PLACEHOLDER
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0199	PLACEHOLDER
0200	PLACEHOLDER

PRELIMINARY ONLY

NOT FOR CONSTRUCTION

REFERENCE DESIGN

REV	DATE	AMENDMENT	DSN	DRN	CHK	APP
A	08.11.21	REFERENCE DESIGN	SK	NG	DO	
A02	30.09.21	ISSUED FOR RD-IDC	SK	NG	DO	

ORIG SIZE A1

0 10 20 30 40 50 100mm AT ORIGINAL PLOT SIZE

MEL CONNX

REFERENCES

SCALE (@ A1)

DATUM

HORIZONTAL: PCG2020

VERTICAL: AHD71

DESIGNED S. KINGWELL

DRAWN N. GRIME

CHECKED D O'BRIEN

APPROVED Approver

DATE 08.11.21

Government of Western Australia Public Transport Authority

MORLEY ELLENBROOK LINE

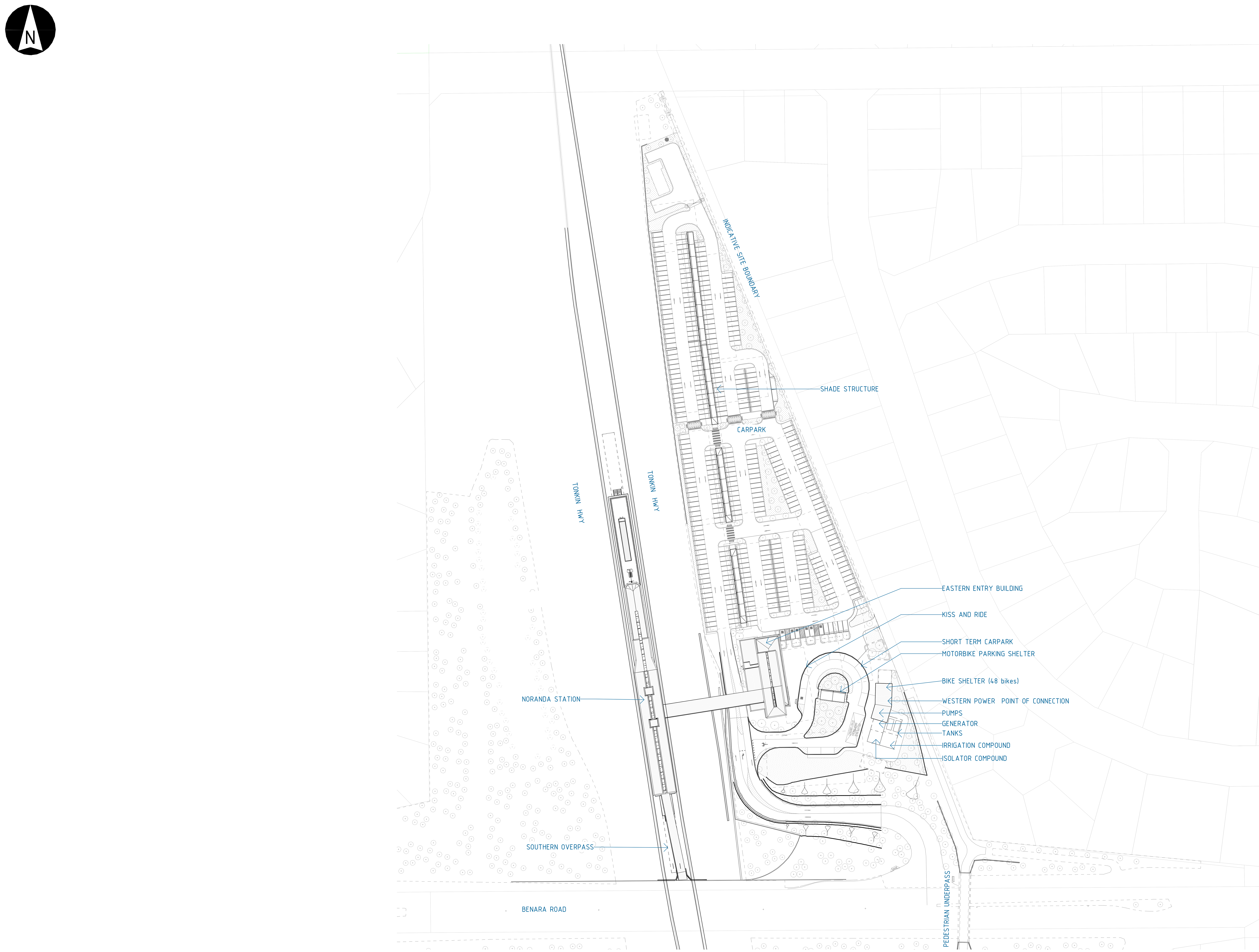
NORANDA STATION - ARCHITECTURAL

DRAWING LIST

SHEET 01

PTA Drawing No: 25-A-286-AR0002 Rev: A

CAD DRAWING PATHNAME BIM 360://160729_Metronet Morley Ellenbrook Line/25-B-286-AR0001.rvt



1 NORANDA STATION - LOCATION PLAN / SITE PLAN
SCALE 1 : 1000

PRELIMINARY ONLY
NOT FOR CONSTRUCTION

REFERENCE DESIGN

REV	DATE	AMENDMENT	DSN	DRN	CHK	APP
A	08.11.21	REFERENCE DESIGN	SK	NG	DO	
A02	30.09.21	ISSUED FOR RD-IDC	SK	NG	DO	
A01	06.08.21	ISSUED FOR INFORMATION	SK	NG	DO	

ORIG SIZE A1

0 10 20 30 40 50 100mm
AT ORIGINAL PLOT SIZE

MEL connx

REFERENCES

SCALE 1 : 1000 (@ A1)

DATUM
HORIZONTAL: PCG2020
VERTICAL: AHD71

DESIGNED S. KINGWELL
DRAWN N.GRIME
CHECKED D. O'BRIEN
APPROVED Approver
DATE 08.11.21

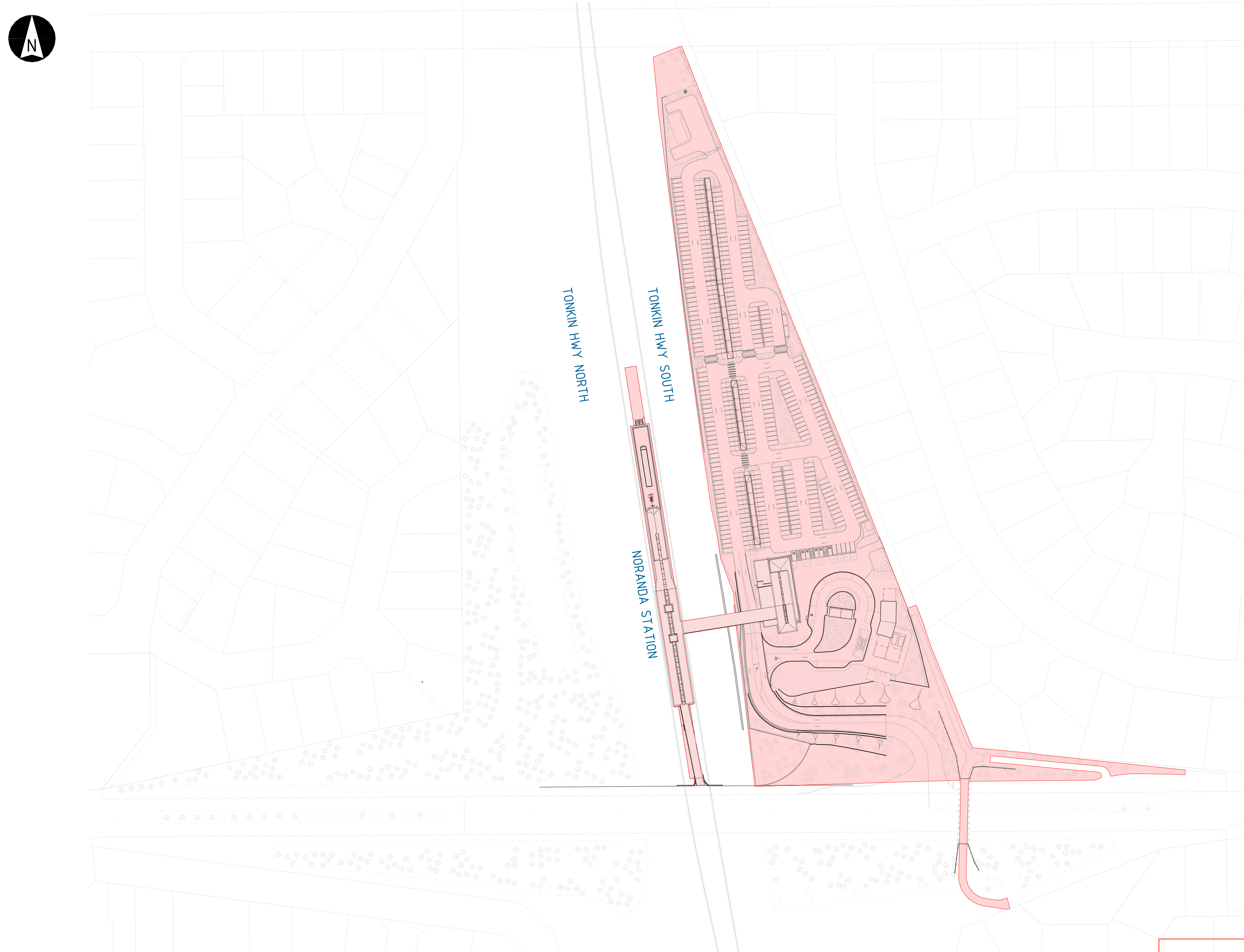
Government of Western Australia Public Transport Authority

MORLEY ELLENBROOK LINE

NORANDA STATION - ARCHITECTURAL
OVERALL PLANS
LOCATION PLAN

PTA Drawing No: 25-A-286-AR0010 Rev: A

CAD DRAWING PATHNAME BIM 360://160729_Metronet Morley Ellenbrook Line/25-B-286-AR0001.rvt



PRELIMINARY ONLY
NOT FOR CONSTRUCTION

REFERENCE DESIGN

REV	DATE	AMENDMENT	DSN	DRN	CHK	APP
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A01	30.09.21	ISSUED FOR RD-IDC	SK	NG	DO	

ORIG SIZE A1

0 10 20 30 40 50 100mm
AT ORIGINAL PLOT SIZE

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MEL connx

REFERENCES

SCALE 1 : 1000 (@ A1)

DATUM
HORIZONTAL: PCG2020
VERTICAL: AHD71

DESIGNED	S. KINGWELL
DRAWN	N. GRIME
CHECKED	D. O'BRIEN
APPROVED	Approver
DATE	08.11.21

Government of Western Australia Public Transport Authority

MORLEY ELLENBROOK LINE

NORANDA STATION - ARCHITECTURAL
OVERALL PLANS
LIMIT OF WORKS PLAN

PTA Drawing No: 25-A-286-AR0012 Rev: A

CAD DRAWING PATHNAME BIM 360://160729_Metronet Morley Ellenbrook Line/25-B-286-AR0001.rvt

1 OVERALL PLATFORM PLAN
SCALE 1 : 250

PRELIMINARY ONLY

NOT FOR CONSTRUCTION

REFERENCE DESIGN

REV	DATE	AMENDMENT	DSN	DRN	CHK	APP
A	08.11.21	REFERENCE DESIGN	SK	NG	DO	
A02	30.09.21	ISSUED FOR RD-IDC	SK	NG	DO	
A01	06.08.21	ISSUED FOR INFORMATION	SK	NG	DO	

ORIG SIZE A1 — AT ORIGINAL PLOT SIZE (0 10 20 30 40 50 100mm)

MEL CONNX

REFERENCES

KEYPLAN (Zone 1, Zone 2, Zone 3, Zone 4)

SCALE 1 : 250 (@ A1)

DATUM
HORIZONTAL: PCG2020
VERTICAL: AHD71

DESIGNED	S. KINGWELL
DRAWN	N. GRIME
CHECKED	D. O'BRIEN
APPROVED	Approver
DATE	08.11.21

Government of Western Australia Public Transport Authority

MORLEY ELLENBROOK LINE

NORANDA STATION - ARCHITECTURAL
STATION OVERALL PLAN
PLATFORM LEVEL

PTA Drawing No: 25-A-286-AR0015 Rev: A

CAD DRAWING PATHNAME BIM 360://160729_Metronet Morley Ellenbrook Line/25-B-286-AR0001.rvt

1 OVERALL CONCOURSE PLAN
SCALE 1 : 250

PRELIMINARY ONLY
NOT FOR CONSTRUCTION

REFERENCE DESIGN

REV	DATE	AMENDMENT	DSN	DRN	CHK	APP
A	08.11.21	REFERENCE DESIGN	SK	NG	DO	
A02	30.09.21	ISSUED FOR RD-IDC	SK	NG	DO	
A01	06.08.21	ISSUED FOR INFORMATION	SK	NG	DO	

ORIG SIZE A1 — 0 10 20 30 40 50 100mm AT ORIGINAL PLOT SIZE

MEL connX

REFERENCES
KEYPLAN
Zone 4
Zone 1
Zone 2
Zone 3

SCALE 1 : 250 (@ A1)
DATUM
HORIZONTAL: PCG2020
VERTICAL: AHD71

DESIGNED	S. KINGWELL
DRAWN	N. GRIME
CHECKED	D. O'BRIEN
APPROVED	Approver
DATE	08.11.21

Government of Western Australia
Public Transport Authority

MORLEY ELLENBROOK LINE
NORANDA STATION - ARCHITECTURAL
STATION OVERALL PLAN
CONCOURSE LEVEL

PTA Drawing No: 25-A-286-AR0016 Rev: A

CAD DRAWING PATHNAME BIM 360://160729_Metronet Morley Ellenbrook Line/25-B-286-AR0001.rvt

1 OVERALL ROOF PLAN
SCALE 1 : 250

PRELIMINARY ONLY
NOT FOR CONSTRUCTION

REFERENCE DESIGN

REV	DATE	AMENDMENT	DSN	DRN	CHK	APP
A	08.11.21	REFERENCE DESIGN	SK	NG	DO	
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A01	06.08.21	ISSUED FOR INFORMATION	SK	NG	DO	

ORIG SIZE A1

0 10 20 30 40 50 100mm
AT ORIGINAL PLOT SIZE

CAD DRAWING PATHNAME BIM 360://160729_Metronet Morley Ellenbrook Line/25-B-286-AR0001.rvt

MEL connx

REFERENCES
KEYPLAN
Zone 1 Zone 2 Zone 3 Zone 4

SCALE 1 : 250 (@ A1)

DATUM
HORIZONTAL: PCG2020
VERTICAL: AHD71

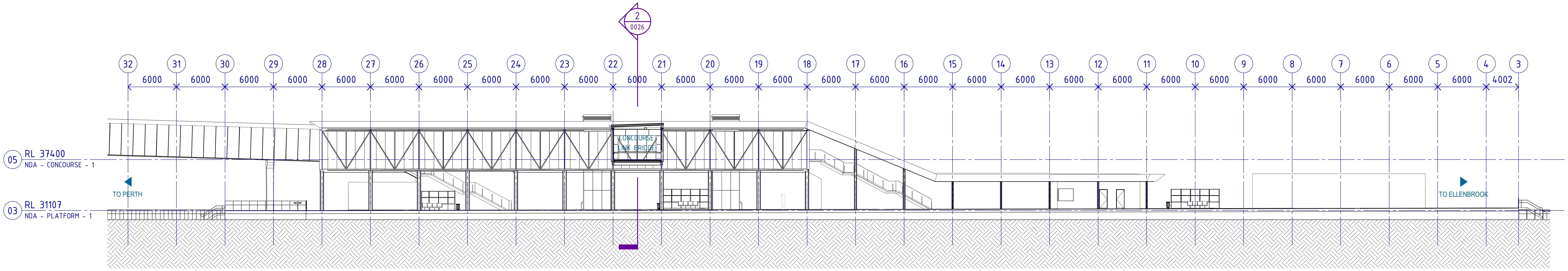
DESIGNED S. KINGWELL
DRAWN N. GRIME
CHECKED D. OBRIEN
APPROVED Approver
DATE 08.11.21

Government of Western Australia
Public Transport Authority

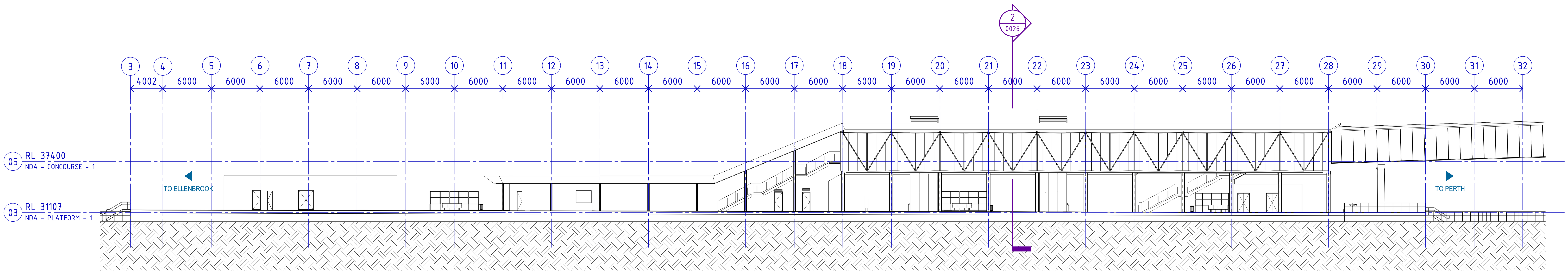
MORLEY ELLENBROOK LINE

NORANDA STATION - ARCHITECTURAL
STATION OVERALL PLAN
ROOF

PTA Drawing No: 25-A-286-AR0017 Rev: A



1 OVERALL ELEVATION 01
SCALE 1 : 250



2 OVERALL ELEVATION 02
SCALE 1 : 250

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NOT FOR CONSTRUCTION

REFERENCE DESIGN

REV	DATE	AMENDMENT	DSN	DRN	CHK	APP
A	08.11.21	REFERENCE DESIGN	SK	NG	DO	
A01	30.09.21	ISSUED FOR RD-IDC	SK	NG	DO	

ORIG SIZE A1 — 0 10 20 30 40 50 100mm AT ORIGINAL PLOT SIZE

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MEL CONNX

REFERENCES

SCALE	1 : 250 (@ A1)
DATUM	
HORIZONTAL:	PCG2020
VERTICAL:	AHD71
DESIGNED	S. KINGWELL
DRAWN	N. GRIME
CHECKED	D. O'BRIEN
APPROVED	Approver
DATE	08.11.21

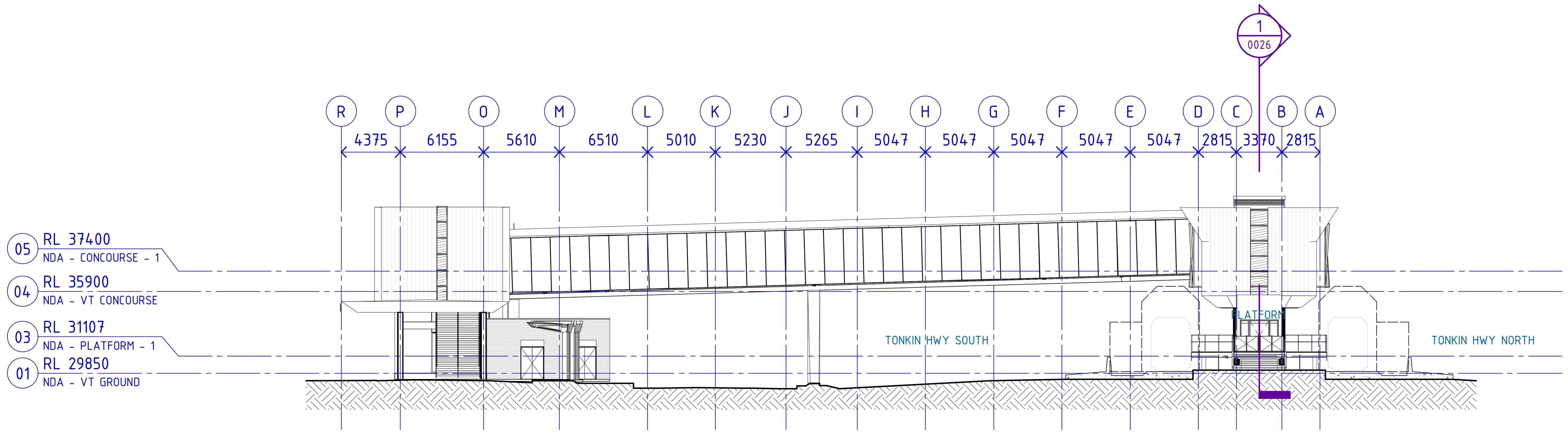
Government of Western Australia Public Transport Authority

MORLEY ELLENBROOK LINE

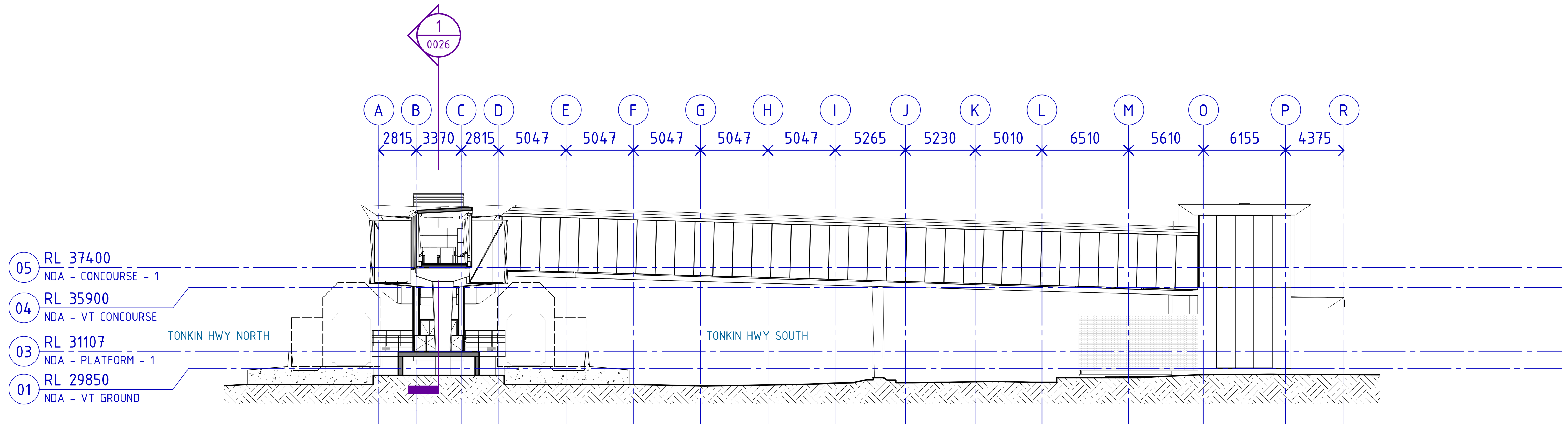
NORANDA STATION - ARCHITECTURAL
OVERALL ELEVATIONS
STATION ELEVATION - SHEET 1

PTA Drawing No: 25-A-286-AR0024 Rev: A

CAD DRAWING PATHNAME BIM 360://160729_Metronet Morley Ellenbrook Line/25-B-286-AR0001.rvt



1 OVERALL ELEVATION 03
SCALE 1 : 250



2 OVERALL ELEVATION 04
SCALE 1 : 250

PRELIMINARY ONLY
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REFERENCE DESIGN

REV	DATE	AMENDMENT	DSN	DRN	CHK	APP
A	08.11.21	REFERENCE DESIGN	SK	NG	DO	
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ORIG SIZE A1
0 10 20 30 40 50 100mm
AT ORIGINAL PLOT SIZE

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REFERENCES

SCALE 1 : 250 (@ A1)

DATUM
HORIZONTAL: PCG2020
VERTICAL: AHD71

DESIGNED S. KINGWELL
DRAWN N. GRIME
CHECKED D. O'BRIEN
APPROVED Approver
DATE 08.11.21

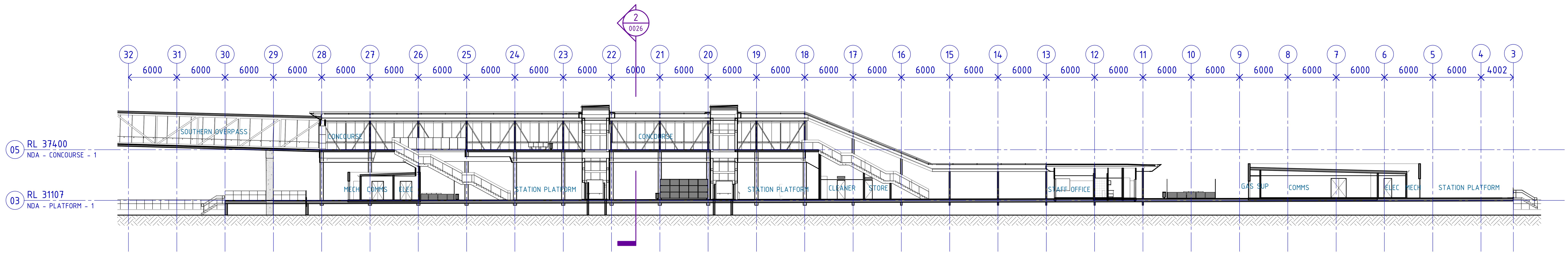
Government of Western Australia
Public Transport Authority

MORLEY ELLENBROOK LINE

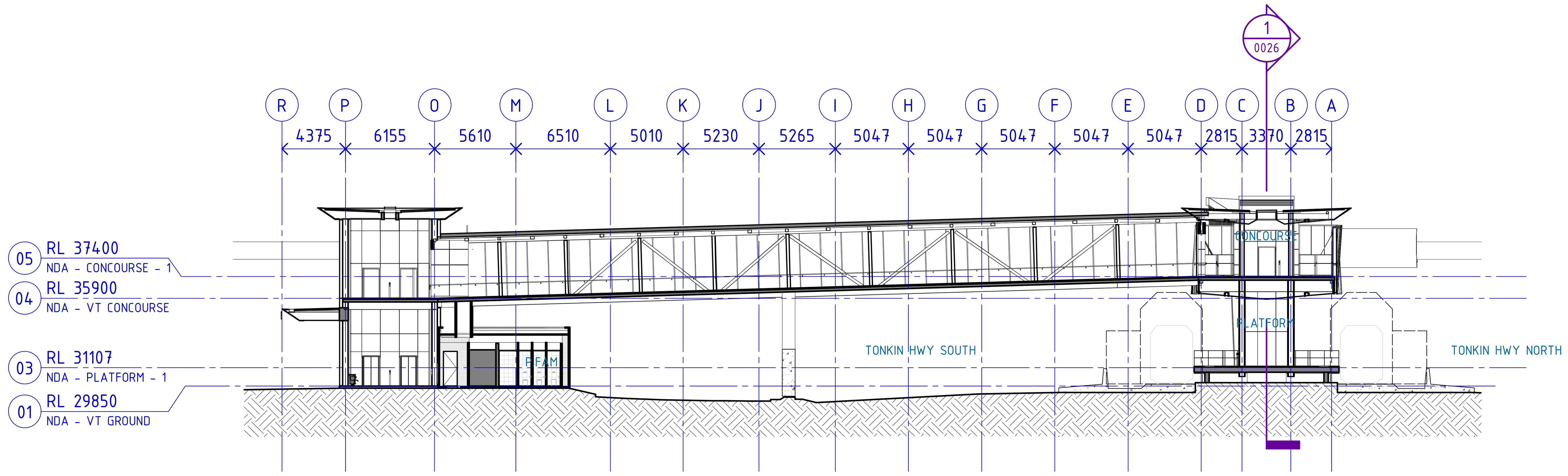
NORANDA STATION - ARCHITECTURAL
OVERALL ELEVATIONS
STATION ELEVATION - SHEET 2

PTA Drawing No: 25-A-286-AR0025 Rev: A

CAD DRAWING PATHNAME BIM 360://160729_Metronet Morley Ellenbrook Line/25-B-286-AR0001.rvt



1 OVERALL SECTION 01
SCALE 1 : 250



2 OVERALL SECTION 02
SCALE 1 : 250

PRELIMINARY ONLY
NOT FOR CONSTRUCTION

REFERENCE DESIGN

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A	08.11.21	REFERENCE DESIGN	SK	NG	DO	
A02	30.09.21	ISSUED FOR RD-IDC	SK	NG	DO	
A01	06.08.21	ISSUED FOR INFORMATION	SK	NG	DO	

ORIG SIZE A1 — 0 10 20 30 40 50 100mm AT ORIGINAL PLOT SIZE

MEL connx

REFERENCES

SCALE 1 : 250 (@ A1)

DATUM
HORIZONTAL: PCG2020
VERTICAL: AHD71

DESIGNED	S. KINGWELL
DRAWN	N. GRIME
CHECKED	D. O'BRIEN
APPROVED	Approver
DATE	08.11.21

Government of Western Australia Public Transport Authority

MORLEY ELLENBROOK LINE

NORANDA STATION - ARCHITECTURAL
OVERALL SECTIONS
SECTIONS - SHEET 1

PTA Drawing No: 25-A-286-AR0026 Rev: A

CAD DRAWING PATHNAME BIM 360://160729_Metronet Morley Ellenbrook Line/25-B-286-AR0001.rvt

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REV	DATE	AMENDMENT	DSN	DRN	CHK	APP
A01	06.08.21	ISSUED FOR INFORMATION	SK	NG	DO	

ORIG SIZE A1

0 10 20 30 40 50 100mm AT ORIGINAL PLOT SIZE

CAD DRAWING PATHNAME BIM 360://160729_Metronet Morley Ellenbrook Line/25-B-286-AR0001.rvt

MEL connx

REFERENCES

SCALE 1 : 100 (@ A1)

DATUM
HORIZONTAL: PCG2020
VERTICAL: AHD71

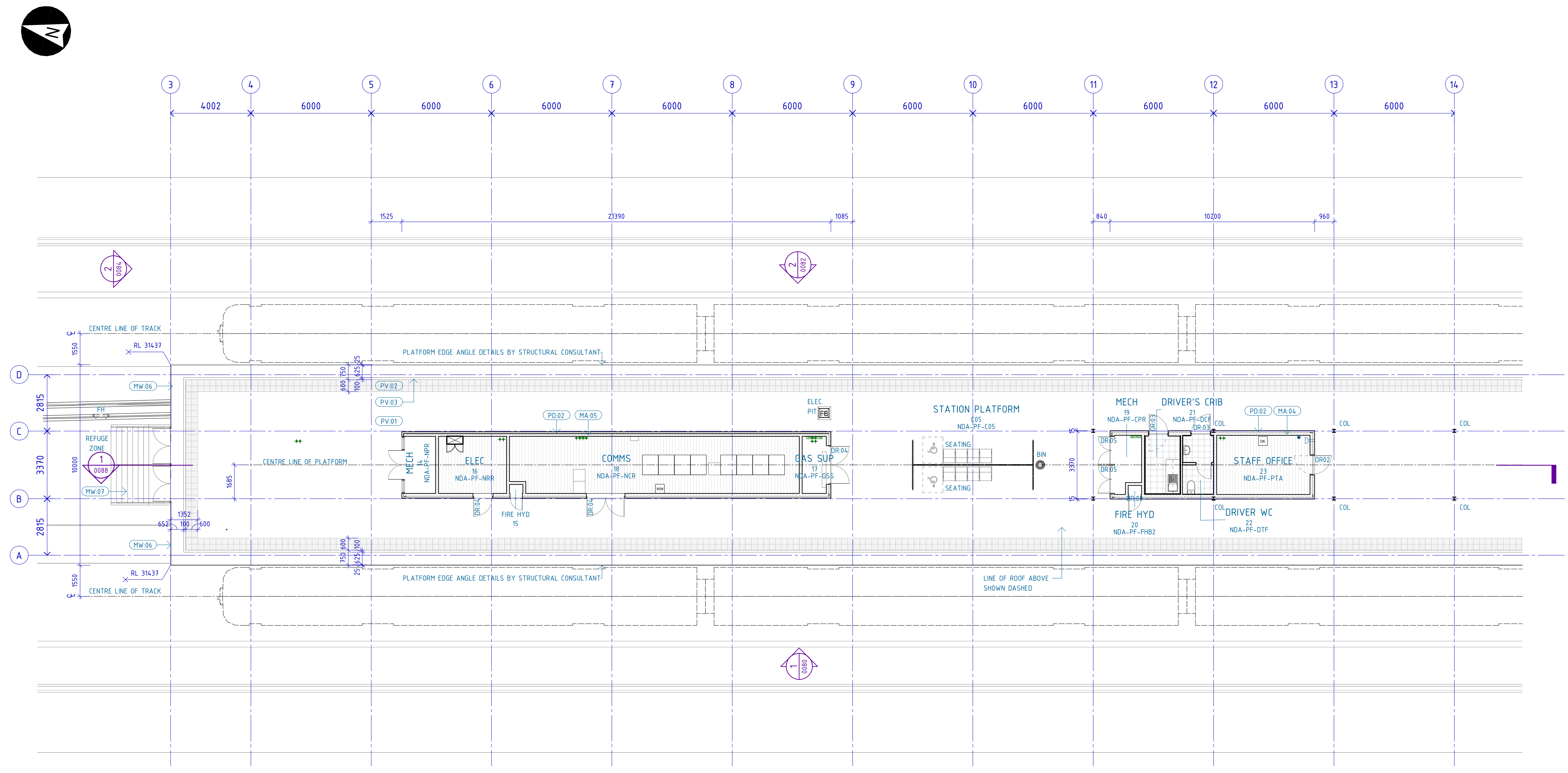
DESIGNED S. KINGWELL
DRAWN N. GRIME
CHECKED D. O'BRIEN
APPROVED Approver
DATE 06.08.21

Government of Western Australia Public Transport Authority

MORLEY ELLENBROOK LINE

NORANDA STATION - ARCHITECTURE
OVERALL SECTIONS
SECTIONS - SHEET 2

PTA Drawing No: 25-A-286-AR0027 Rev: A01



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A01	06.08.21	ISSUED FOR INFORMATION	SK	NG	DO	
REV	DATE	AMENDMENT	DSN	DRN	CHK	APP

ORIG SIZE A1

0 10 20 30 40 50 100mm AT ORIGINAL PLOT SIZE

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REFERENCES

KEYPLAN

Zone 1 Zone 2 Zone 3 Zone 4

SCALE 1 : 100 (@ A1)

DATUM

HORIZONTAL: PCG2020

VERTICAL: AHD71

DESIGNED S.KINGWELL

DRAWN N.GRIME

CHECKED D.O'BRIEN

APPROVED Approver

DATE 08.11.21

PRELIMINARY ONLY

NOT FOR CONSTRUCTION

REFERENCE DESIGN

Government of Western Australia Public Transport Authority

MORLEY ELLENBROOK LINE

NORANDA STATION - ARCHITECTURAL

GENERAL ARRANGEMENT FLOOR PLAN

PLATFORM LEVEL - SHEET 1

PTA Drawing No: 25-A-286-AR0040 Rev: A

CAD DRAWING PATHNAME BIM 360://160729_Metronet Morley Ellenbrook Line/25-B-286-AR0001.rvt

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REFERENCE DESIGN

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A	08.11.21	REFERENCE DESIGN	SK	NG	DO	
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A01	06.08.21	ISSUED FOR INFORMATION	SK	NG	DO	

ORIG SIZE A1 — 0 10 20 30 40 50 100mm AT ORIGINAL PLOT SIZE

CAD DRAWING PATHNAME BIM 360://160729_Metronet Morley Ellenbrook Line/25-B-286-AR0001.rvt

MEL connx

REFERENCES
KEYPLAN
Zone 4
Zone 2
Zone 1
Zone 3

SCALE 1 : 100 (@ A1)
DATUM
HORIZONTAL: PCG2020
VERTICAL: AHD71

DESIGNED S.KINGWELL
DRAWN N.GRIME
CHECKED D.O'BRIEN
APPROVED Approver
DATE 08.11.21

Government of Western Australia Public Transport Authority

MORLEY ELLENBROOK LINE

NORANDA STATION - ARCHITECTURAL
GENERAL ARRANGEMENT FLOOR PLAN
PLATFORM LEVEL - SHEET 2

PTA Drawing No: 25-A-286-AR0041 Rev: A

A	08.11.21	REFERENCE DESIGN	SK	NG	DO	
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REV	DATE	AMENDMENT	DSN	DRN	CHK	APP

ORIG SIZE A1

0 10 20 30 40 50 100mm AT ORIGINAL PLOT SIZE

CAD DRAWING PATHNAME BIM 360://160729_Metronet Morley Ellenbrook Line/25-B-286-AR0001.rvt

MEL connx

REFERENCES

KEYPLAN

Zone 1 Zone 2 Zone 3 Zone 4

SCALE 1 : 100 (@ A1)

DATUM

HORIZONTAL: PCG2020

VERTICAL: AHD71

DESIGNED S KINGWELL

DRAWN N GRIME

CHECKED D O'BRIEN

APPROVED Approver

DATE 08.11.21

PRELIMINARY ONLY

NOT FOR CONSTRUCTION

REFERENCE DESIGN

Government of Western Australia Public Transport Authority

MORLEY ELLENBROOK LINE

NORANDA STATION - ARCHITECTURAL

GENERAL ARRANGEMENT FLOOR PLAN

PLATFORM LEVEL - SHEET 3

PTA Drawing No: 25-A-286-AR0042 Rev: A

PRELIMINARY ONLY

NOT FOR CONSTRUCTION

REFERENCE DESIGN

REV	DATE	AMENDMENT	DSN	DRN	CHK	APP
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A01	06.08.21	ISSUED FOR INFORMATION	SK	NG	DO	

ORIG SIZE A1

0 10 20 30 40 50 100mm

AT ORIGINAL PLOT SIZE

CAD DRAWING PATHNAME BIM 360://160729_Metronet Morley Ellenbrook Line/25-B-286-AR0001.rvt

MEL CONNX

REFERENCES

KEYPLAN

Zone 1 Zone 2 Zone 3 Zone 4

SCALE	1 : 100 (@ A1)
DATUM	
HORIZONTAL:	PCG2020
VERTICAL:	AHD71
DESIGNED	S. KINGWELL
DRAWN	N. GRIME
CHECKED	D. O'BRIEN
APPROVED	Approver
DATE	08.11.21

Government of Western Australia Public Transport Authority

MORLEY ELLENBROOK LINE

NORANDA STATION - ARCHITECTURAL
GENERAL ARRANGEMENT FLOOR PLAN
CONCOURSE LEVEL - SHEET 1

PTA Drawing No: 25-A-286-AR0043 Rev: A

PRELIMINARY ONLY

NOT FOR CONSTRUCTION

REFERENCE DESIGN

REV	DATE	AMENDMENT	DSN	DRN	CHK	APP
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A01	06.08.21	ISSUED FOR INFORMATION	SK	NG	DO	

ORIG SIZE A1

0 10 20 30 40 50 100mm AT ORIGINAL PLOT SIZE

CAD DRAWING PATHNAME BIM 360://160729_Metronet Morley Ellenbrook Line/25-B-286-AR0001.rvt

REFERENCES

KEYPLAN

Zone 1 Zone 2 Zone 3 Zone 4

SCALE 1 : 100 (@ A1)

DATUM

HORIZONTAL: PCG2020

VERTICAL: AHD71

DESIGNED S. KINGWELL

DRAWN N. GRIME

CHECKED D. O'BRIEN

APPROVED Approver

DATE 08.11.21

Government of Western Australia Public Transport Authority

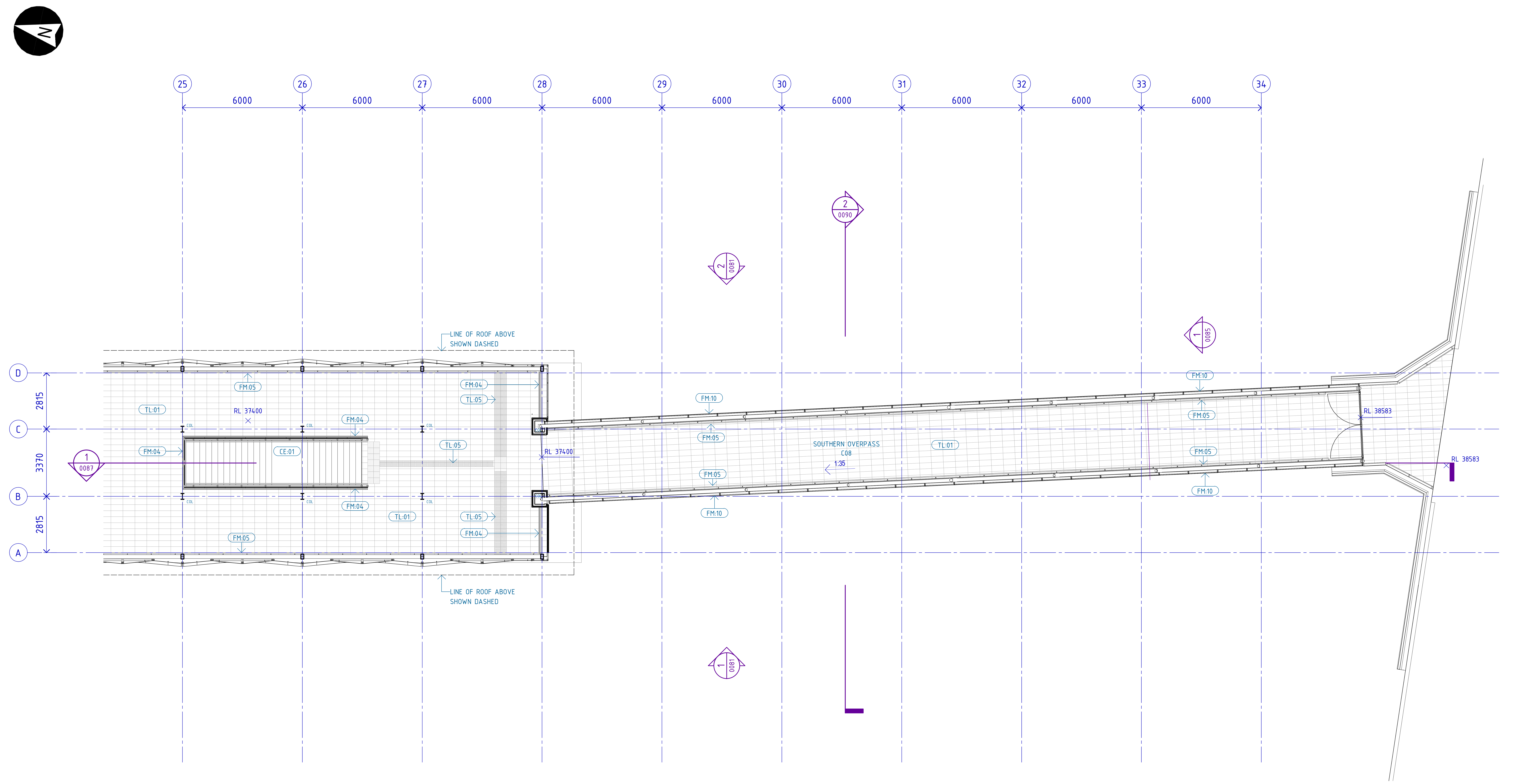
MORLEY ELLENBROOK LINE

NORANDA STATION - ARCHITECTURAL

GENERAL ARRANGEMENT FLOOR PLAN

CONCOURSE LEVEL - SHEET 2

PTA Drawing No: 25-A-286-AR0044 Rev: A



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REFERENCE DESIGN

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A01	06.08.21	ISSUED FOR INFORMATION	SK	NG	DO	

ORIG SIZE A1

0 10 20 30 40 50 100mm AT ORIGINAL PLOT SIZE

MEL CONNX

REFERENCES

KEYPLAN

Zone 1 Zone 2 Zone 3 Zone 4

SCALE 1 : 100 (@ A1)

DATUM

HORIZONTAL: PCG2020

VERTICAL: AHD71

DESIGNED S. KINGWELL

DRAWN N. GRIME

CHECKED D. O'BRIEN

APPROVED Approver

DATE 08.11.21

Government of Western Australia Public Transport Authority

MORLEY ELLENBROOK LINE

NORANDA STATION - ARCHITECTURAL

GENERAL ARRANGEMENT FLOOR PLAN

CONCOURSE LEVEL - SHEET 3

PTA Drawing No: 25-A-286-AR0045 Rev: A

CAD DRAWING PATHNAME BIM 360://160729_Metronet Morley Ellenbrook Line/25-B-286-AR0001.rvt

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REFERENCE DESIGN

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A01	06.08.21	ISSUED FOR INFORMATION	SK	NG	DO	

ORIG SIZE A1

0 10 20 30 40 50 100mm

AT ORIGINAL PLOT SIZE

MEL connX

REFERENCES

KEYPLAN

Zone 1 Zone 2 Zone 3 Zone 4

SCALE 1 : 100 (@ A1)

DATUM

HORIZONTAL: PCG2020

VERTICAL: AHD71

DESIGNED S. KINGWELL

DRAWN N. GRIME

CHECKED D. O'BRIEN

APPROVED Approver

DATE 08.11.21

Government of Western Australia Public Transport Authority

MORLEY ELLENBROOK LINE

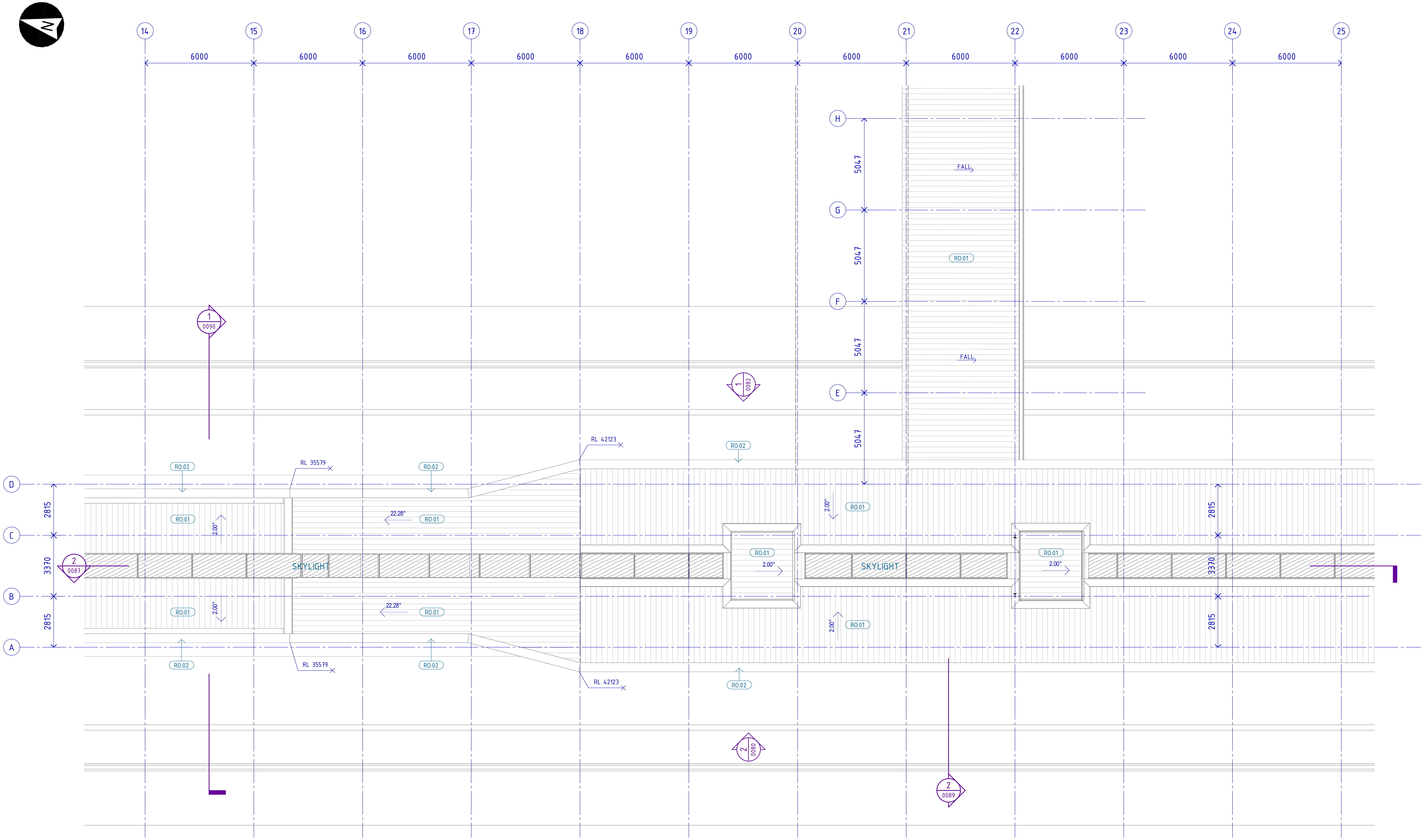
NORANDA STATION - ARCHITECTURAL

GENERAL ARRANGEMENT FLOOR PLAN

ROOF LEVEL - SHEET 1

PTA Drawing No: 25-A-286-AR0046 Rev: A

CAD DRAWING PATHNAME BIM 360://160729_Metronet Morley Ellenbrook Line/25-B-286-AR0001.rvt



1 OVERALL ROOF PLAN

REV	DATE	AMENDMENT	DSN	DRN	CHK	APP
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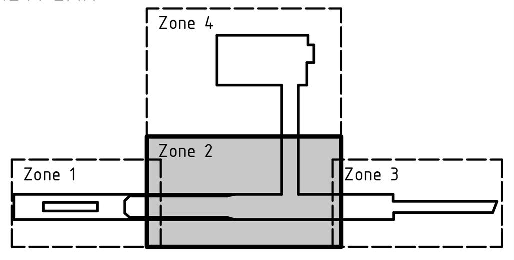
ORIG SIZE A1

0 10 20 30 40 50 100mm AT ORIGINAL PLOT SIZE

CAD DRAWING PATHNAME BIM 360://160729_Metronet Morley Ellenbrook Line/25-B-286-AR0001.rvt

REFERENCES

KEYPLAN



SCALE 1 : 100 (@ A1)

DATUM
HORIZONTAL: PCG2020
VERTICAL: AHD71

DESIGNED S. KINGWELL
DRAWN N. GRIME
CHECKED D. O'BRIEN
APPROVED Approver
DATE 08.11.21

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REFERENCE DESIGN

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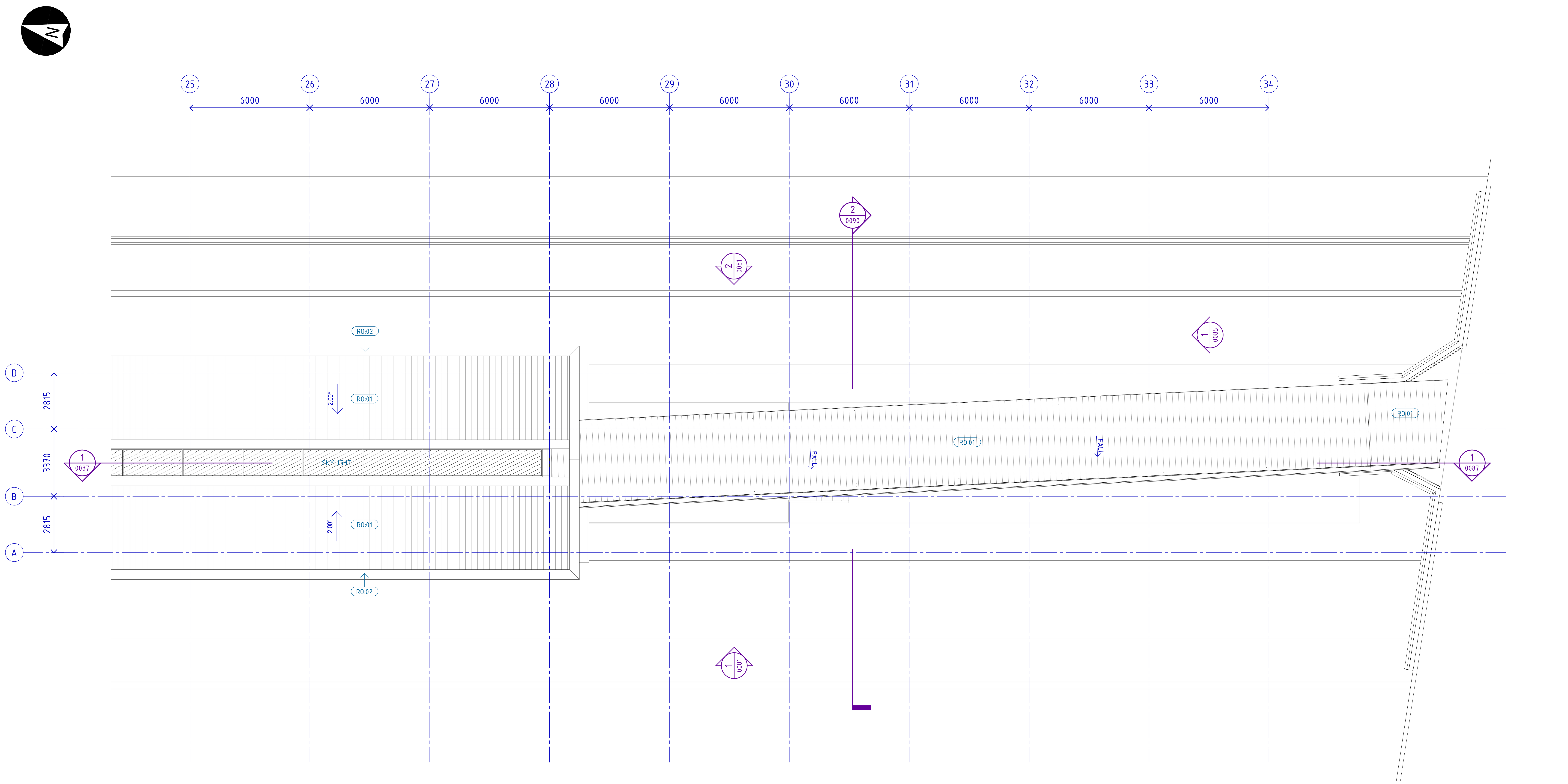
MORLEY ELLENBROOK LINE

NORANDA STATION - ARCHITECTURAL GENERAL ARRANGEMENT FLOOR PLAN ROOF LEVEL - SHEET 2

PTA Drawing No: 25-A-286-AR0047 Rev: A



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REFERENCE DESIGN

REV	DATE	AMENDMENT	DSN	DRN	CHK	APP
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A01	06.08.21	ISSUED FOR INFORMATION	SK	NG	DO	

ORIG SIZE A1

0 10 20 30 40 50 100mm AT ORIGINAL PLOT SIZE

CAD DRAWING PATHNAME BIM 360://160729_Metronet Morley Ellenbrook Line/25-B-286-AR0001.rvt

REFERENCES

KEYPLAN

Zone 1 Zone 2 Zone 3 Zone 4

SCALE 1 : 100 (@ A1)

DATUM

HORIZONTAL: PCG2020

VERTICAL: AHD71

DESIGNED S. KINGWELL

DRAWN N. GRIME

CHECKED D. O'BRIEN

APPROVED Approver

DATE 08.11.21

Government of Western Australia Public Transport Authority

MORLEY ELLENBROOK LINE

NORANDA STATION - ARCHITECTURAL

GENERAL ARRANGEMENT FLOOR PLAN

ROOF LEVEL - SHEET 3

PTA Drawing No: 25-A-286-AR0048 Rev: A

PRELIMINARY ONLY

NOT FOR CONSTRUCTION

REFERENCE DESIGN

REV	DATE	AMENDMENT	DSN	DRN	CHK	APP
A	08.11.21	REFERENCE DESIGN	SK	NG	DO	
A01	30.09.21	ISSUED FOR RD-IDC	SK	NG	DO	

ORIG SIZE A1

0 10 20 30 40 50 100mm AT ORIGINAL PLOT SIZE

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REFERENCES

KEYPLAN

Zone 1 Zone 2 Zone 3 Zone 4

SCALE 1 : 100 (@ A1)

DATUM

HORIZONTAL: PCG2020

VERTICAL: AHD71

DESIGNED S. KINGWELL

DRAWN N. GRIME

CHECKED D. OBRIEN

APPROVED Approver

DATE 08.11.21

Government of Western Australia Public Transport Authority

MORLEY ELLENBROOK LINE

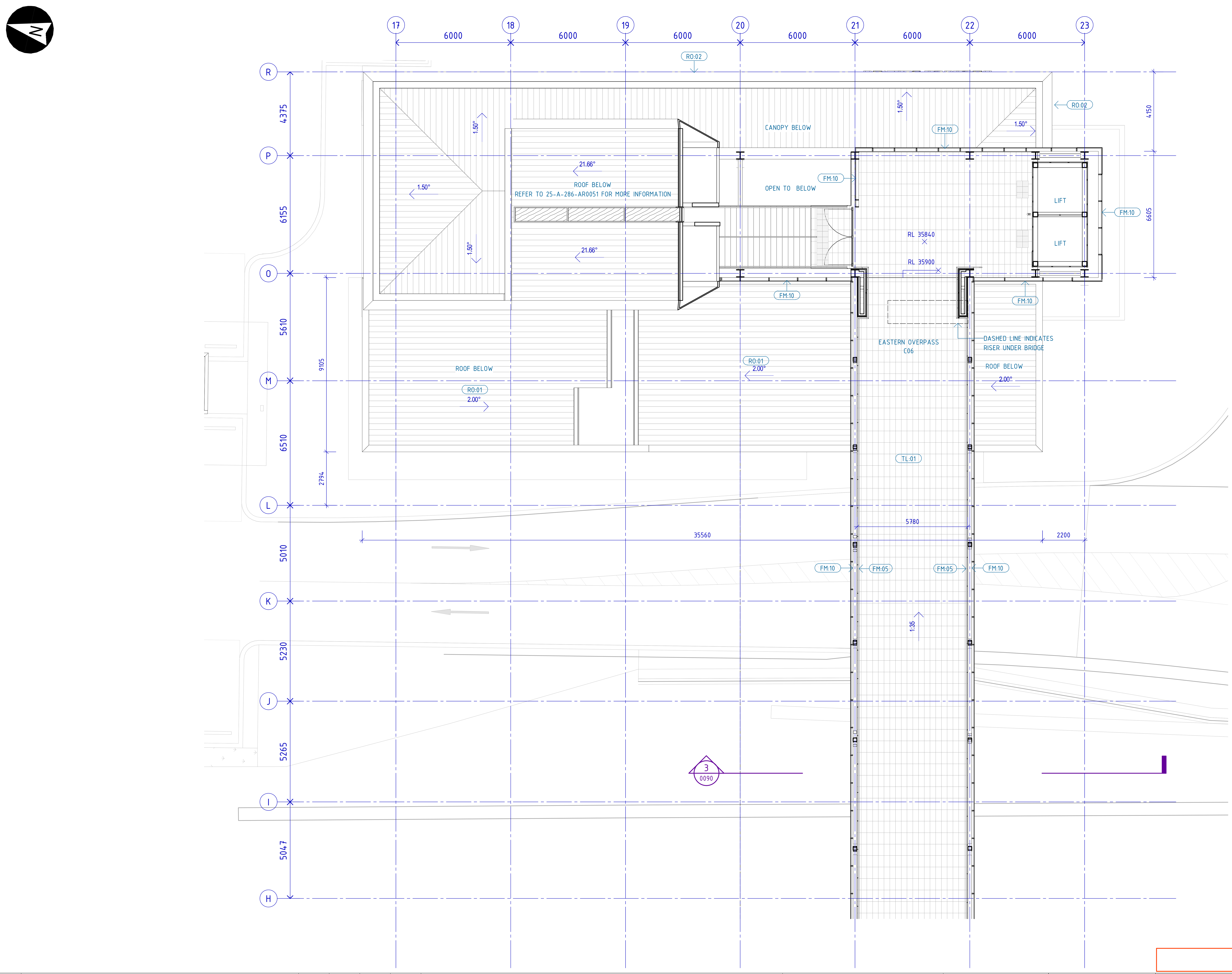
NORANDA STATION - ARCHITECTURAL

GENERAL ARRANGEMENT FLOOR PLAN

VERTICAL TRANSPORT BUILDING - GROUND FLOOR

PTA Drawing No: 25-A-286-AR0049 Rev: A

CAD DRAWING PATHNAME BIM 360://160729_Metronet Morley Ellenbrook Line/25-B-286-AR0001.rvt



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REFERENCE DESIGN

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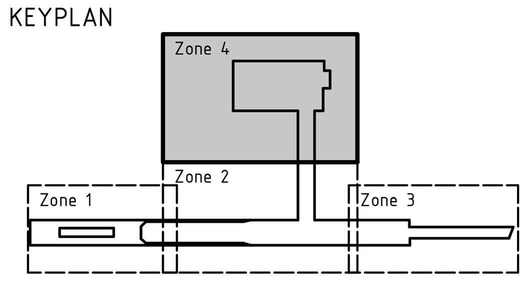
ORIG SIZE A1 — 0 10 20 30 40 50 100mm AT ORIGINAL PLOT SIZE

CAD DRAWING PATHNAME BIM 360://160729_Metronet Morley Ellenbrook Line/25-B-286-AR0001.rvt

REFERENCES

KEYPLAN



SCALE 1 : 100 (@ A1)

DATUM
HORIZONTAL: PCG2020
VERTICAL: AHD71

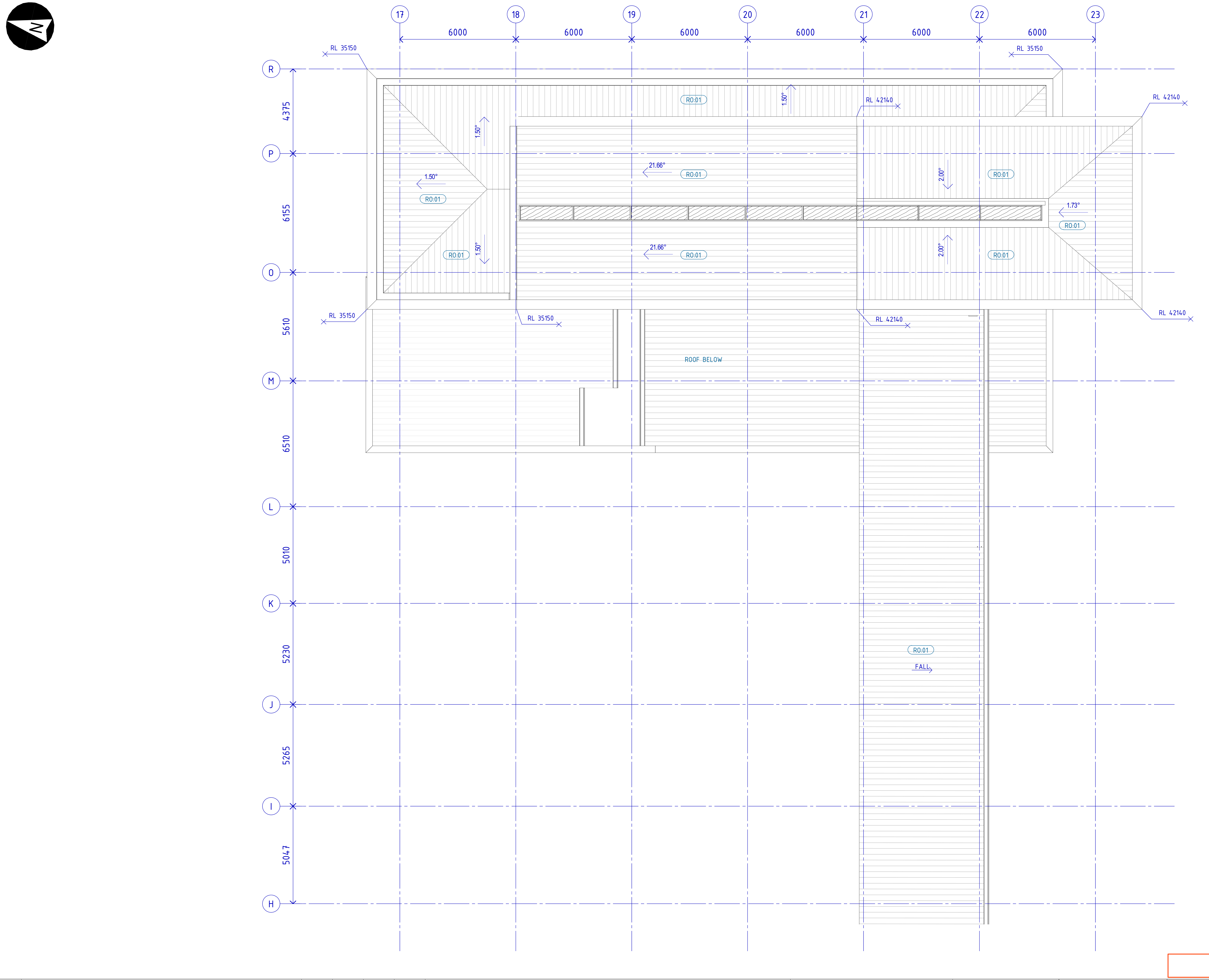
DESIGNED	S. KINGWELL
DRAWN	N. GRIME
CHECKED	D. O'BRIEN
APPROVED	Approver
DATE	08.11.21

Government of Western Australia
Public Transport Authority

MORLEY ELLENBROOK LINE

NORANDA STATION - ARCHITECTURAL
GENERAL ARRANGEMENT FLOOR PLAN
VERTICAL TRANSPORT BUILDING - CONCOURSE

PTA Drawing No: 25-A-286-AR0050 Rev: A



PRELIMINARY ONLY
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REFERENCE DESIGN

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ORIG SIZE A1 — 0 10 20 30 40 50 100mm AT ORIGINAL PLOT SIZE

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REFERENCES
KEYPLAN
Zone 4
Zone 1
Zone 2
Zone 3

SCALE 1 : 100 (@ A1)

DATUM
HORIZONTAL: PCG2020
VERTICAL: AHD71

DESIGNED S. KINGWELL
DRAWN N. GRIME
CHECKED D. O'BRIEN
APPROVED Approver
DATE 08.11.21

Government of Western Australia Public Transport Authority

MORLEY ELLENBROOK LINE

NORANDA STATION - ARCHITECTURAL
GENERAL ARRANGEMENT FLOOR PLAN
VERTICAL TRANSPORT BUILDING - ROOF

PTA Drawing No: 25-A-286-AR0051 Rev: A

CAD DRAWING PATHNAME BIM 360://160729_Metronet Morley Ellenbrook Line/25-B-286-AR0001.rvt

1 NDA - SERVICE BUILDINGS

PRELIMINARY ONLY
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REFERENCE DESIGN

REV	DATE	AMENDMENT	DSN	DRN	CHK	APP
A	08.11.21	REFERENCE DESIGN	SK	NG	DO	

ORIG SIZE A1 — 0 10 20 30 40 50 100mm AT ORIGINAL PLOT SIZE

MEL connX

REFERENCES

SCALE 1 : 100 (@ A1)

DATUM
HORIZONTAL: PCG2020
VERTICAL: AHD71

DESIGNED S. KINGWELL
DRAWN N. GRIME
CHECKED D O'BRIEN
APPROVED Approver
DATE 08.11.21

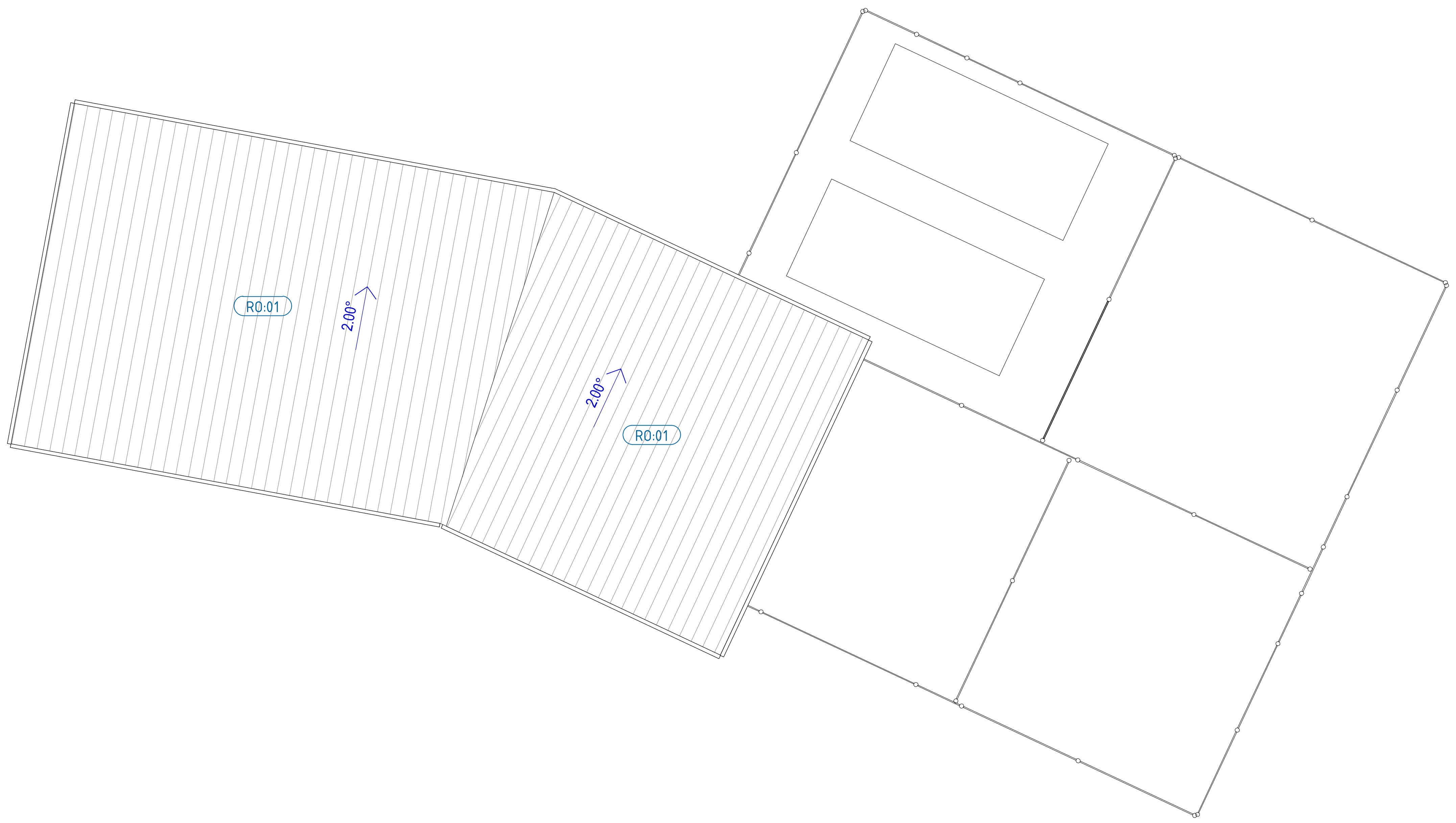
Government of Western Australia Public Transport Authority

MORLEY ELLENBROOK LINE

NORANDA STATION - ARCHITECTURAL
GENERAL ARRANGEMENT FLOOR PLAN
SERVICES COMPOUND

PTA Drawing No: 25-A-286-AR0052 Rev: A

CAD DRAWING PATHNAME BIM 360://160729_Metronet Morley Ellenbrook Line/25-B-286-AR0001.rvt



1 NDA - SERVICE BUILDINGS ROOF PLAN

PRELIMINARY ONLY
NOT FOR CONSTRUCTION

REFERENCE DESIGN

REV	DATE	AMENDMENT	DSN	DRN	CHK	APP
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ORIG SIZE A1 — 0 10 20 30 40 50 100mm AT ORIGINAL PLOT SIZE

MEL CONNX

REFERENCES

SCALE 1 : 100 (@ A1)

DATUM
HORIZONTAL: PCG2020
VERTICAL: AHD71

DESIGNED S. KINGWELL
DRAWN N.GRIME
CHECKED D. O'BRIEN
APPROVED Approver
DATE 08.11.21

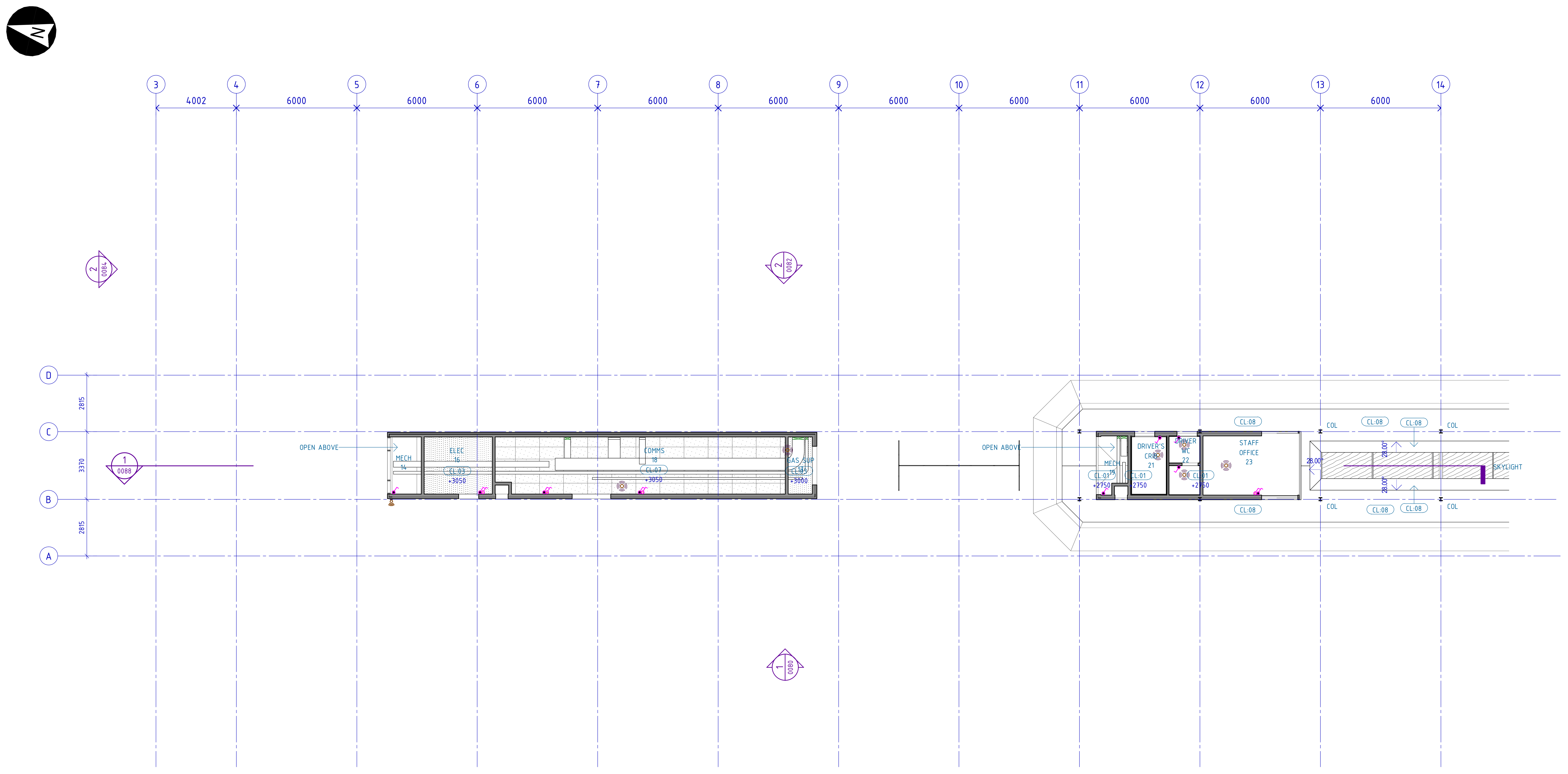
Government of Western Australia Public Transport Authority

MORLEY ELLENBROOK LINE

NORANDA STATION - ARCHITECTURAL
GENERAL ARRANGEMENT FLOOR PLAN
SERVICES COMPOUND - ROOF

PTA Drawing No: 25-A-286-AR0053 Rev: A

CAD DRAWING PATHNAME BIM 360://160729_Metronet Morley Ellenbrook Line/25-B-286-AR0001.rvt



PRELIMINARY ONLY

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A	08.11.21	REFERENCE DESIGN	SK	NG	DO	
A02	30.09.21	ISSUED FOR RD-IDC	SK	NG	DO	
A01	06.08.21	ISSUED FOR INFORMATION	SK	NG	DO	

ORIG SIZE A1

0 10 20 30 40 50 100mm

AT ORIGINAL PLOT SIZE

CAD DRAWING PATHNAME BIM 360://160729_Metronet Morley Ellenbrook Line/25-B-286-AR0001.rvt

MEL CONNX

REFERENCES

KEYPLAN

Zone 1 Zone 2 Zone 3 Zone 4

SCALE 1 : 100 (@ A1)

DATUM

HORIZONTAL: PCG2020

VERTICAL: AHD71

DESIGNED S. KINGWELL

DRAWN N. GRIME

CHECKED D. O'BRIEN

APPROVED Approver

DATE 08.11.21

Government of Western Australia
Public Transport Authority

MORLEY ELLENBROOK LINE

NORANDA STATION - ARCHITECTURAL

REFLECTED CEILING PLAN

PLATFORM LEVEL - SHEET 1

PTA Drawing No: 25-A-286-AR0070 Rev: A

PRELIMINARY ONLY

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REFERENCE DESIGN

REV	DATE	AMENDMENT	DSN	DRN	CHK	APP
A	08.11.21	REFERENCE DESIGN	SK	NG	DO	
A01	30.09.21	ISSUED FOR RD-IDC	SK	NG	DO	

ORIG SIZE A1

0 10 20 30 40 50 100mm AT ORIGINAL PLOT SIZE

MEL connx

REFERENCES

KEYPLAN

Zone 1 Zone 2 Zone 3 Zone 4

SCALE 1 : 100 (@ A1)

DATUM

HORIZONTAL: PCG2020

VERTICAL: AHD71

DESIGNED S. KINGWELL

DRAWN N. GRIME

CHECKED D. O'BRIEN

APPROVED Approver

DATE 08.11.21

Government of Western Australia Public Transport Authority

MORLEY ELLENBROOK LINE

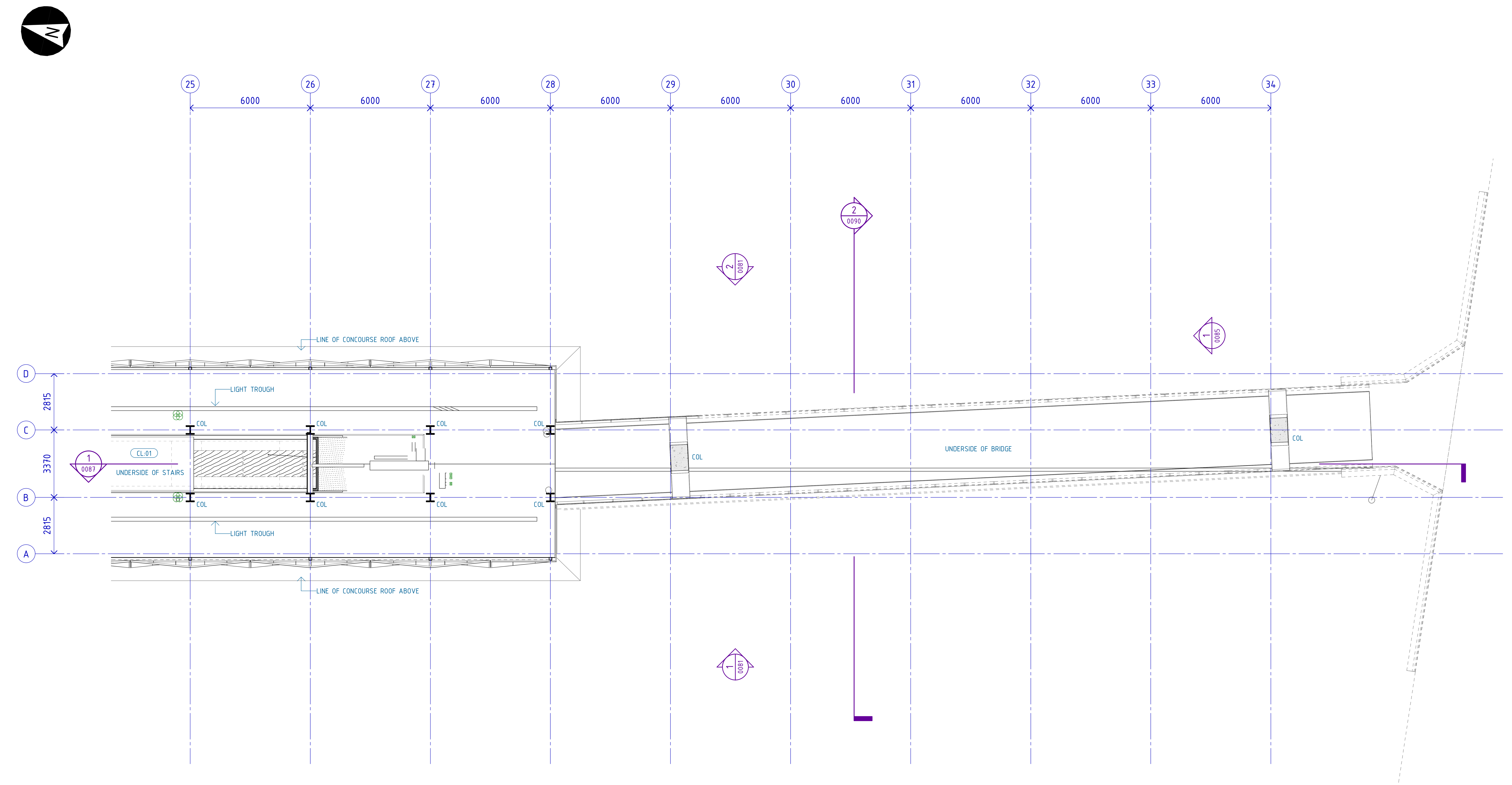
NORANDA STATION - ARCHITECTURAL

REFLECTED CEILING PLAN

PLATFORM LEVEL - SHEET 2

PTA Drawing No: 25-A-286-AR0071 Rev: A

CAD DRAWING PATHNAME BIM 360://160729_Metronet Morley Ellenbrook Line/25-B-286-AR0001.rvt



PRELIMINARY ONLY

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REFERENCE DESIGN

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A01	30.09.21	ISSUED FOR RD-IDC	SK	NG	DO	

ORIG SIZE A1

0 10 20 30 40 50 100mm AT ORIGINAL PLOT SIZE

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REFERENCES

KEYPLAN

Zone 1 Zone 2 Zone 3 Zone 4

SCALE 1 : 100 (@ A1)

DATUM

HORIZONTAL: PCG2020

VERTICAL: AHD71

DESIGNED S. KINGWELL

DRAWN N. GRIME

CHECKED D. O'BRIEN

APPROVED Approver

DATE 08.11.21

Government of Western Australia Public Transport Authority

MORLEY ELLENBROOK LINE

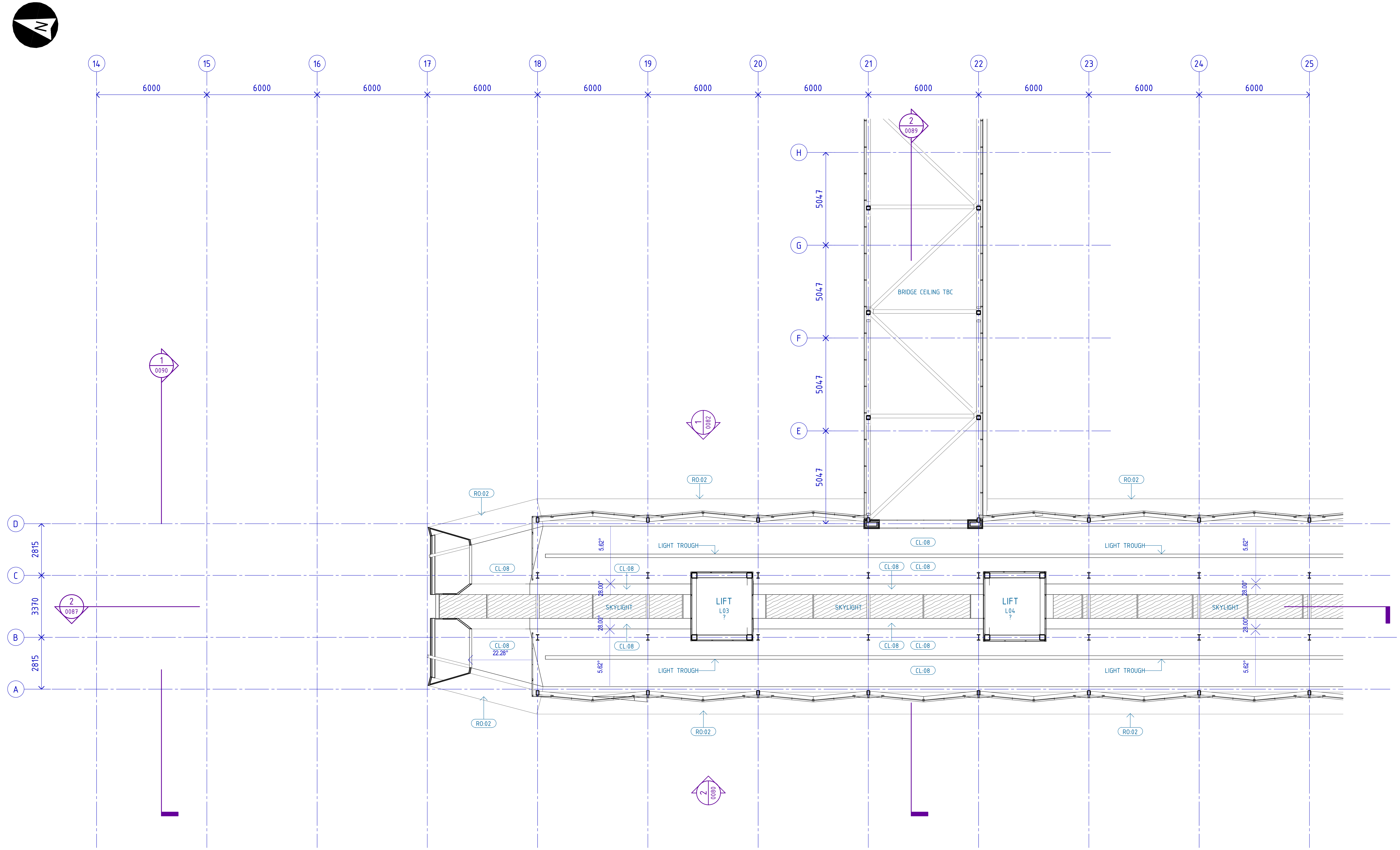
NORANDA STATION - ARCHITECTURAL

REFLECTED CEILING PLAN

PLATFORM LEVEL - SHEET 3

PTA Drawing No: 25-A-286-AR0072 Rev: A

CAD DRAWING PATHNAME BIM 360://160729_Metronet Morley Ellenbrook Line/25-B-286-AR0001.rvt



PRELIMINARY ONLY

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REFERENCE DESIGN

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A01	06.08.21	ISSUED FOR INFORMATION	SK	NG	DO	

ORIG SIZE A1

0 10 20 30 40 50 100mm

AT ORIGINAL PLOT SIZE

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CAD DRAWING PATHNAME BIM 360://160729_Metronet Morley Ellenbrook Line/25-B-286-AR0001.rvt

MEL CONNX

REFERENCES

KEYPLAN

Zone 4 Zone 2 Zone 1 Zone 3

SCALE 1 : 100 (@ A1)

DATUM

HORIZONTAL: PCG2020

VERTICAL: AHD71

DESIGNED S. KINGWELL

DRAWN N. GRIME

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APPROVED Approver

DATE 08.11.21

Government of Western Australia Public Transport Authority

MORLEY ELLENBROOK LINE

NORANDA STATION - ARCHITECTURAL

REFLECTED CEILING PLAN

CONCOURSE LEVEL - SHEET 1

PTA Drawing No: 25-A-286-AR0073 Rev: A

PRELIMINARY ONLY
NOT FOR CONSTRUCTION

REFERENCE DESIGN

REV	DATE	AMENDMENT	DSN	DRN	CHK	APP
A	08.11.21	REFERENCE DESIGN	SK	NG	DO	
A01	30.09.21	ISSUED FOR RD-IDC	SK	NG	DO	

ORIG SIZE A1

0 10 20 30 40 50 100mm AT ORIGINAL PLOT SIZE

MEL connX

REFERENCES

KEYPLAN

Zone 4 Zone 2 Zone 1 Zone 3

SCALE 1 : 100 (@ A1)

DATUM
HORIZONTAL: PCG2020
VERTICAL: AHD71

DESIGNED	S. KINGWELL
DRAWN	N. GRIME
CHECKED	D. O'BRIEN
APPROVED	Approver
DATE	08.11.21

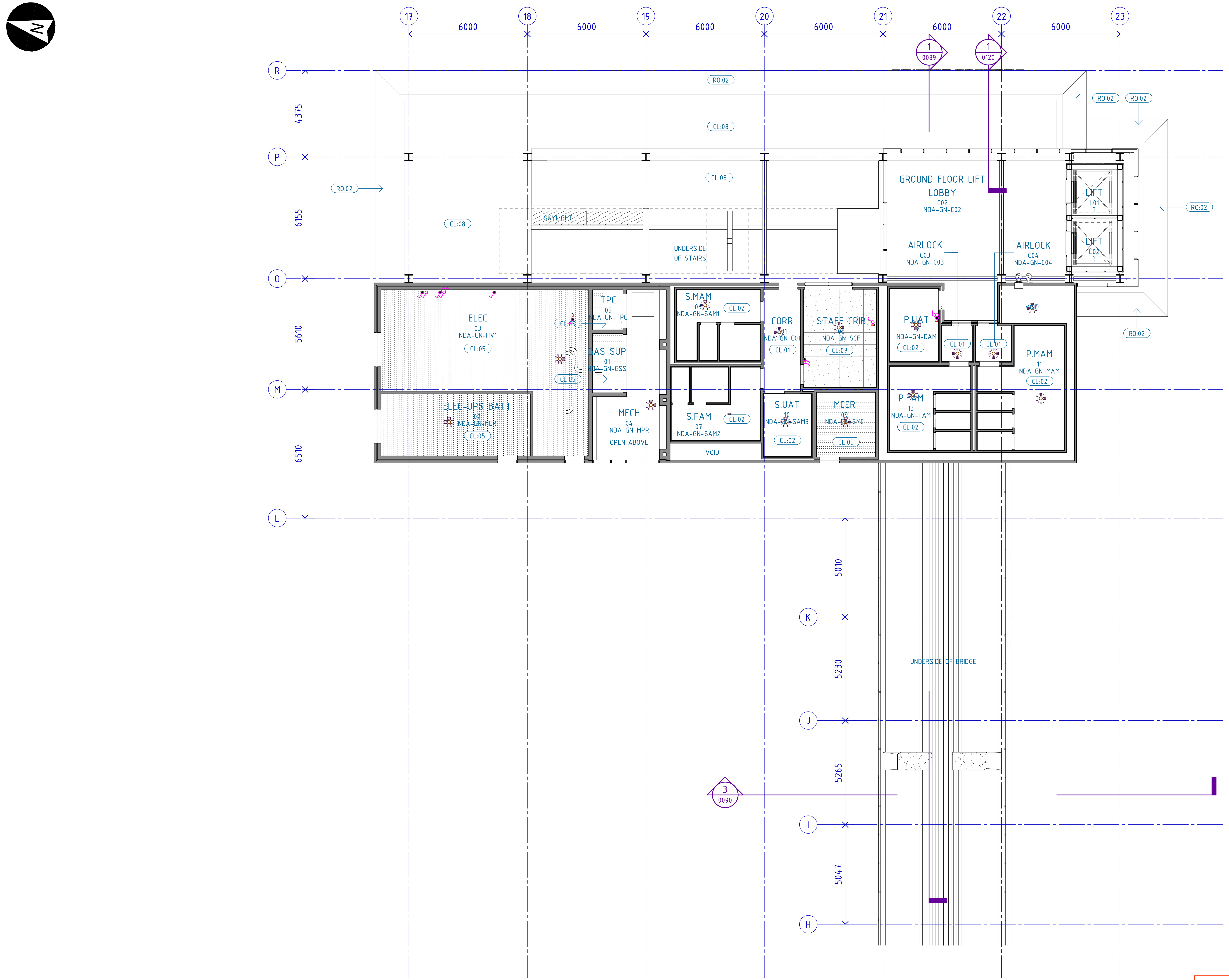
Government of Western Australia Public Transport Authority

MORLEY ELLENBROOK LINE

NORANDA STATION - ARCHITECTURAL
REFLECTED CEILING PLAN
CONCOURSE LEVEL - SHEET 2

PTA Drawing No: 25-A-286-AR0074 Rev: A

CAD DRAWING PATHNAME BIM 360://160729_Metronet Morley Ellenbrook Line/25-B-286-AR0001.rvt



PRELIMINARY ONLY

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REFERENCE DESIGN

REV	DATE	AMENDMENT	DSN	DRN	CHK	APP
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ORIG SIZE A1

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CAD DRAWING PATHNAME BIM 360://160729_Metronet Morley Ellenbrook Line/25-B-286-AR0001.rvt

REFERENCES

KEYPLAN

Zone 4 Zone 1 Zone 2 Zone 3

SCALE 1 : 100 (@ A1)

DATUM

HORIZONTAL: PCG2020

VERTICAL: AHD71

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DRAWN N. GRIME

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APPROVED Approver

DATE 08.11.21

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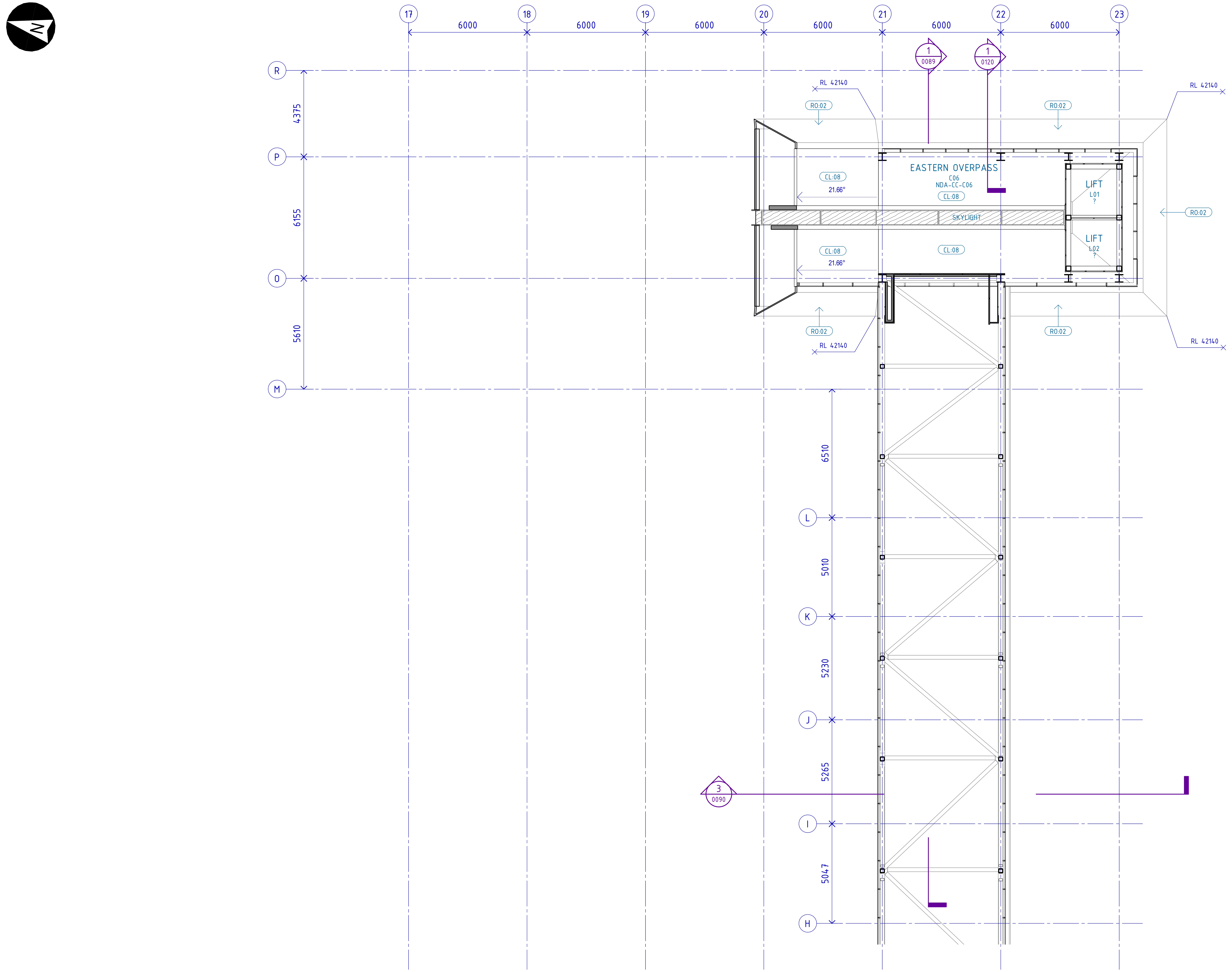
MORLEY ELLENBROOK LINE

NORANDA STATION - ARCHITECTURAL

VERTICAL TRANSPORT BUILDING - GROUND FLOOR

PTA Drawing No: 25-A-286-AR0075 Rev: A



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REFERENCE DESIGN

REV	DATE	AMENDMENT	DSN	DRN	CHK	APP
A	08.11.21	REFERENCE DESIGN	SK	NG	DO	
A01	30.09.21	ISSUED FOR RD-IDC	SK	NG	DO	

ORIG SIZE A1

0 10 20 30 40 50 100mm
AT ORIGINAL PLOT SIZE

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REFERENCES

KEYPLAN
Zone 4
Zone 1
Zone 2
Zone 3

SCALE
1 : 100 (@ A1)

DATUM
HORIZONTAL: PCG2020
VERTICAL: AHD71

DESIGNED S. KINGWELL
DRAWN N. GRIME
CHECKED D. O'BRIEN
APPROVED Approver
DATE 08.11.21

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MORLEY ELLENBROOK LINE

NORANDA STATION - ARCHITECTURAL
REFLECTED CEILING PLAN
VERTICAL TRANSPORT BUILDING - CONCOURSE

PTA Drawing No: 25-A-286-AR0076 Rev: A

CAD DRAWING PATHNAME BIM 360://160729_Metronet Morley Ellenbrook Line/25-B-286-AR0001.rvt

1 NDA - SERVICE BUILDINGS

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REFERENCE DESIGN

REV	DATE	AMENDMENT	DSN	DRN	CHK	APP
A	08.11.21	REFERENCE DESIGN	SK	NG	DO	

ORIG SIZE A1

0 10 20 30 40 50 100mm AT ORIGINAL PLOT SIZE

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REFERENCES

SCALE 1 : 100 (@ A1)

DATUM

HORIZONTAL: PCG2020

VERTICAL: AHD71

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DRAWN N. GRIME

CHECKED D. O'BRIEN

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DATE 08.11.21

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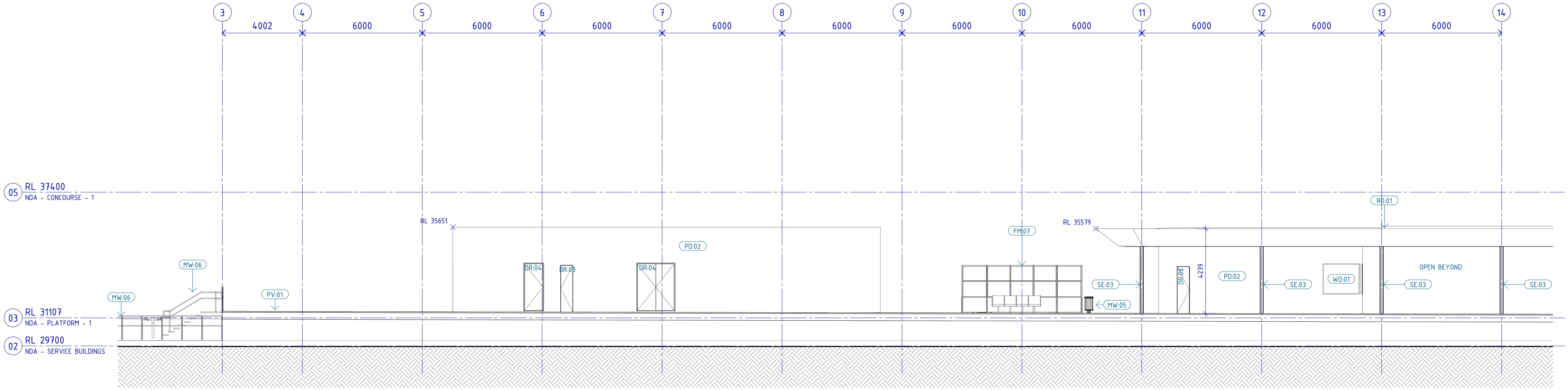
MORLEY ELLENBROOK LINE

NORANDA STATION - ARCHITECTURAL

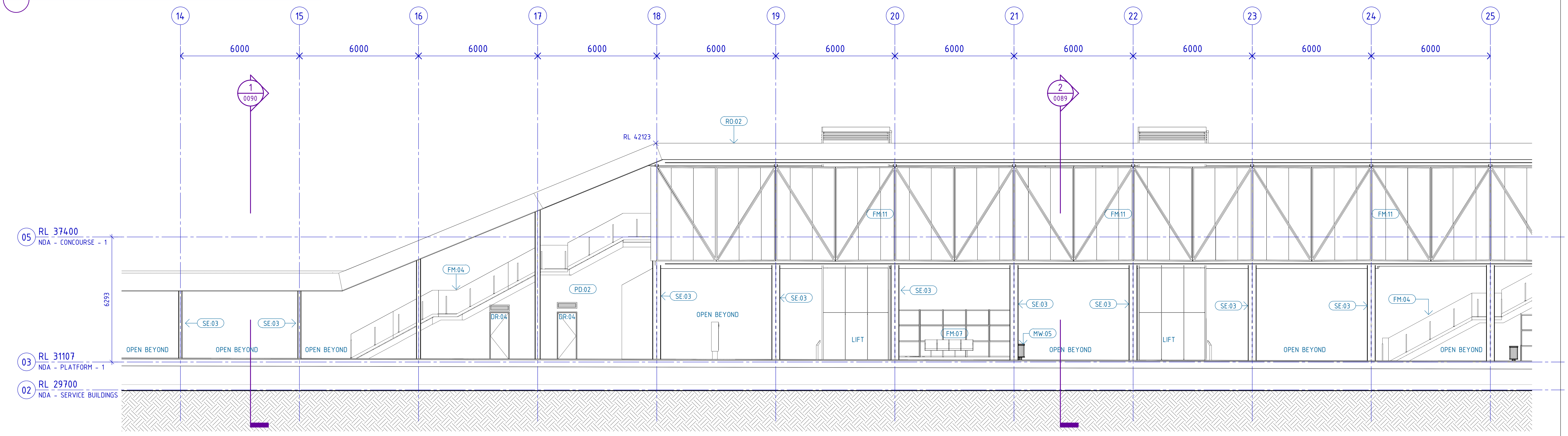
REFLECTED CEILING PLAN - SERVICE COMPOUND

PTA Drawing No: 25-A-286-AR0077 Rev: A

CAD DRAWING PATHNAME BIM 360://160729_Metronet Morley Ellenbrook Line/25-B-286-AR0001.rvt



1 WEST ELEVATION - 01



2 WEST ELEVATION - 02

PRELIMINARY ONLY
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REFERENCE DESIGN

REV	DATE	AMENDMENT	DSN	DRN	CHK	APP
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A02	30.09.21	ISSUED FOR RD-IDC	SK	NG	DO	
A01	06.08.21	ISSUED FOR INFORMATION	SK	NG	DO	

ORIG SIZE A1

0 10 20 30 40 50 100mm
AT ORIGINAL PLOT SIZE

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REFERENCES

SCALE 1 : 100 (@ A1)

DATUM
HORIZONTAL: PCG2020
VERTICAL: AHD71

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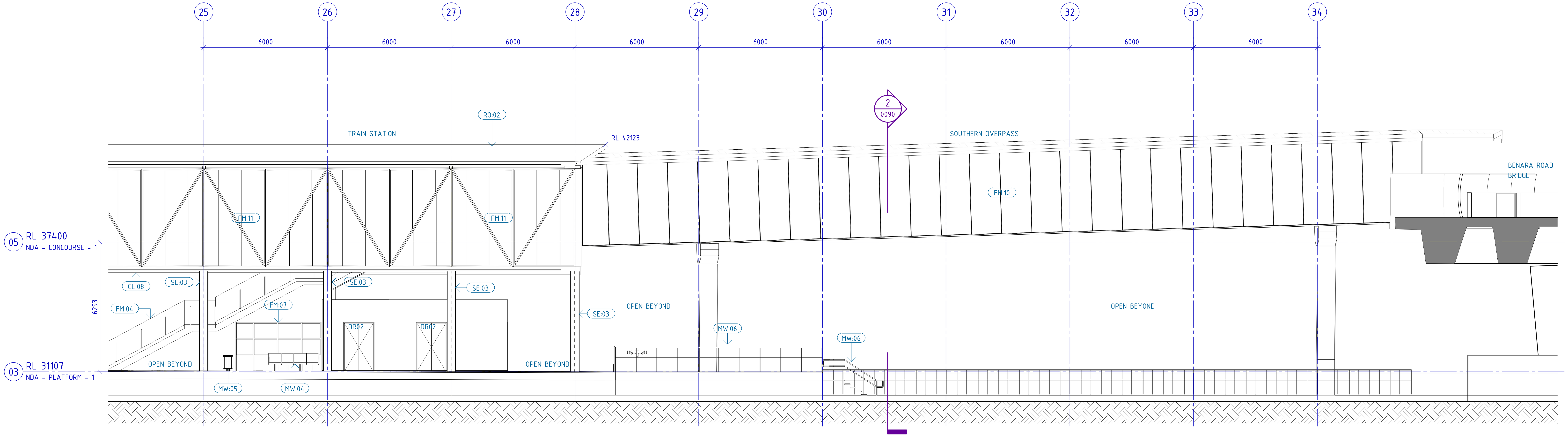
MORLEY ELLENBROOK LINE

NORANDA STATION - ARCHITECTURAL
GENERAL ARRANGEMENT
LONG ELEVATION - SHEET 1

PTA Drawing No: 25-A-286-AR0080 Rev: A

CAD DRAWING PATHNAME BIM 360://160729_Metronet Morley Ellenbrook Line/25-B-286-AR0001.rvt



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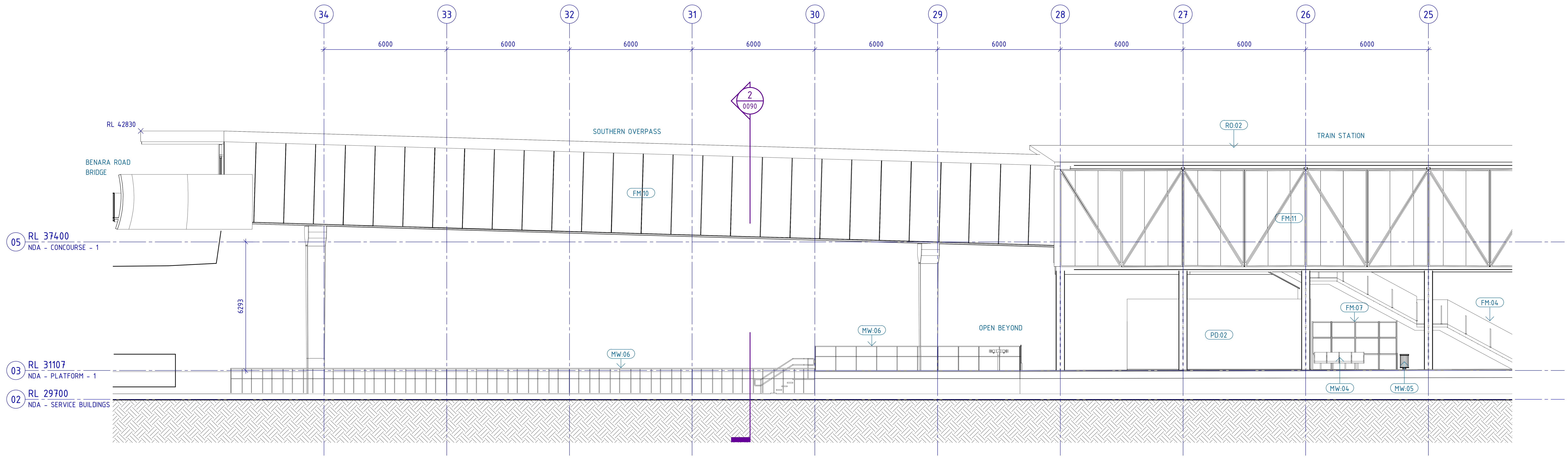
SCALE 1 : 100



2 EAST ELEVATION - 01
SCALE 1 : 100

PRELIMINARY ONLY
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REFERENCE DESIGN

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A01	30.09.21	ISSUED FOR RD-IDC	SK	NG	DO	

ORIG SIZE A1

0 10 20 30 40 50 100mm
AT ORIGINAL PLOT SIZE

MEL connX

REFERENCES

SCALE 1 : 100 (@ A1)

DATUM
HORIZONTAL: PCG2020
VERTICAL: AHD71

DESIGNED S. KINGWELL
DRAWN N. GRIME
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APPROVED Approver
DATE 08.11.21

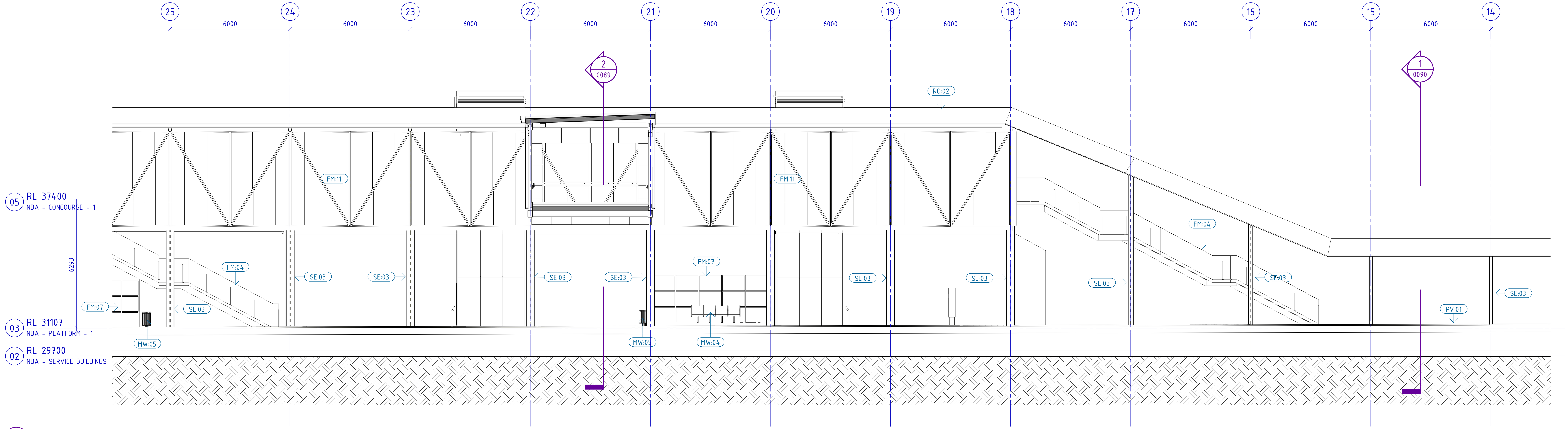
Government of Western Australia Public Transport Authority

MORLEY ELLENBROOK LINE

NORANDA STATION - ARCHITECTURAL
GENERAL ARRANGEMENT
LONG ELEVATION - SHEET 2

PTA Drawing No: 25-A-286-AR0081 Rev: A

CAD DRAWING PATHNAME BIM 360://160729_Metronet Morley Ellenbrook Line/25-B-286-AR0001.rvt



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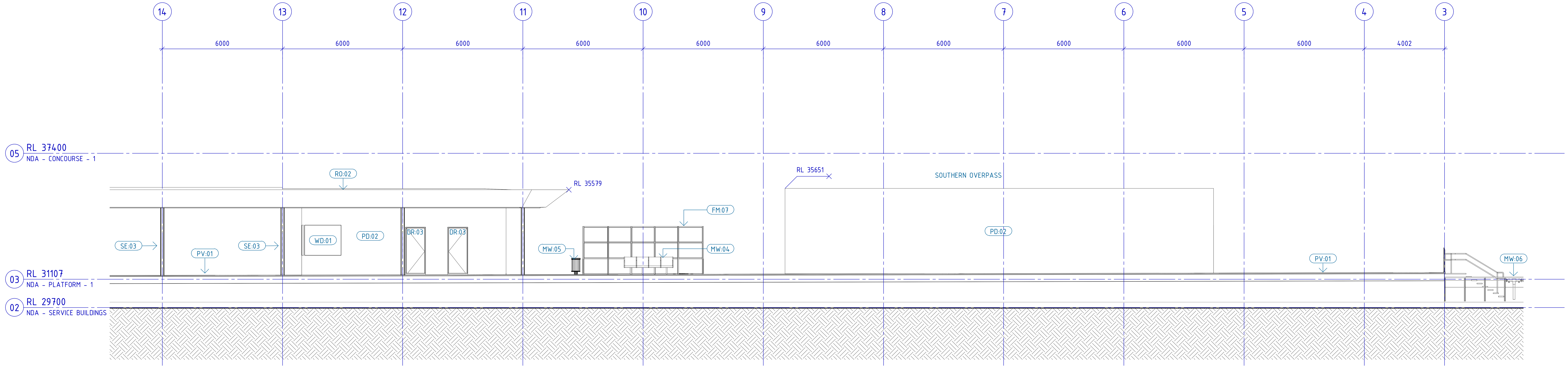
SCALE 1 : 100



2 EAST ELEVATION - 03
SCALE 1 : 100

PRELIMINARY ONLY

NOT FOR CONSTRUCTION

REFERENCE DESIGN

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ORIG SIZE A1 — 0 10 20 30 40 50 100mm AT ORIGINAL PLOT SIZE

MEL CONNX

REFERENCES

SCALE 1 : 100 (@ A1)

DATUM
HORIZONTAL: PCG2020
VERTICAL: AHD71

DESIGNED S. KINGWELL
DRAWN N. GRIME
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APPROVED Approver
DATE 08.11.21

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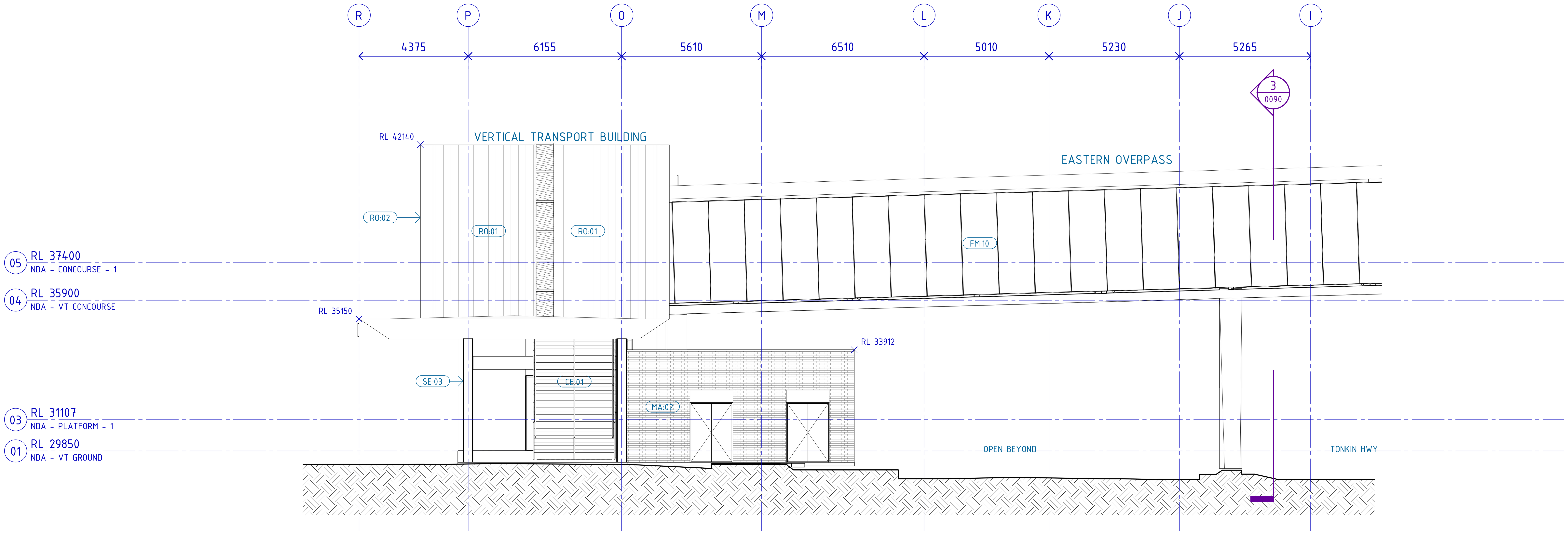
MORLEY ELLENBROOK LINE

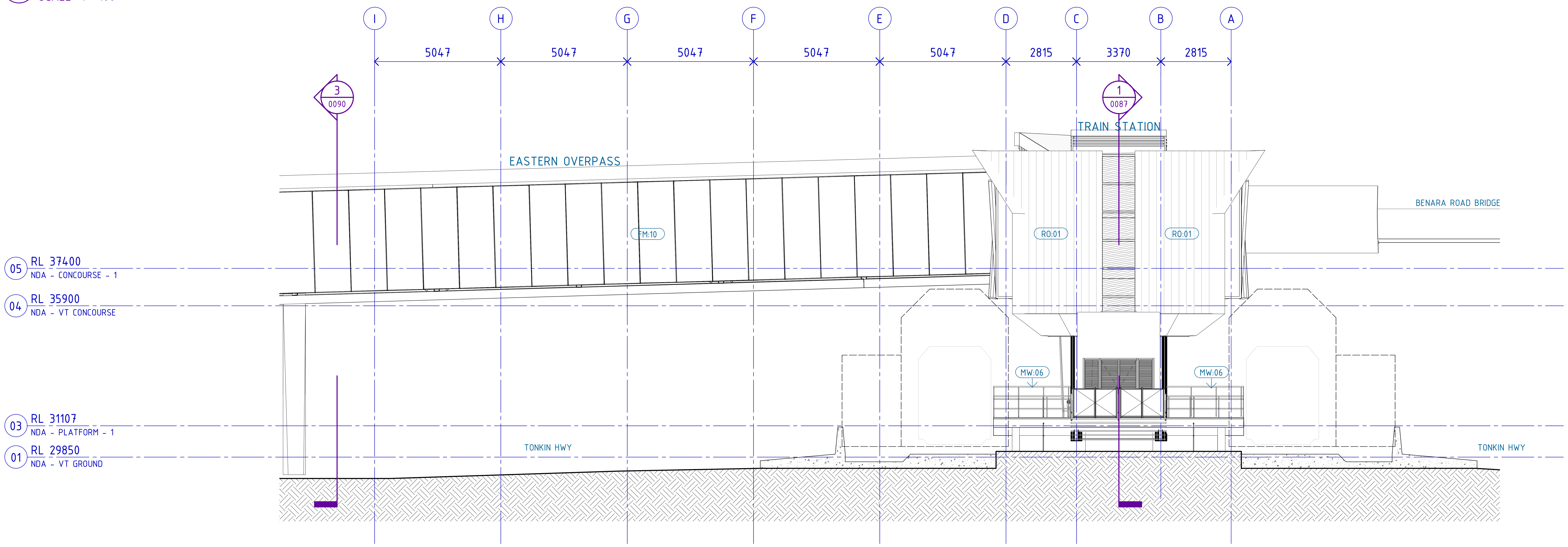
NORANDA STATION - ARCHITECTURAL
GENERAL ARRANGEMENT
LONG ELEVATION - SHEET 3

PTA Drawing No: 25-A-286-AR0082 Rev: A

CAD DRAWING PATHNAME BIM 360://160729_Metronet Morley Ellenbrook Line/25-B-286-AR0001.rvt



1 NORTH ELEVATION - 01
SCALE 1 : 100



2 NORTH ELEVATION - 02
SCALE 1 : 100

PRELIMINARY ONLY
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REFERENCE DESIGN

REV	DATE	AMENDMENT	DSN	DRN	CHK	APP
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ORIG SIZE A1 — 0 10 20 30 40 50 100mm AT ORIGINAL PLOT SIZE

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REFERENCES

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DATUM
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VERTICAL: AHD71

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APPROVED Approver
DATE 08.11.21

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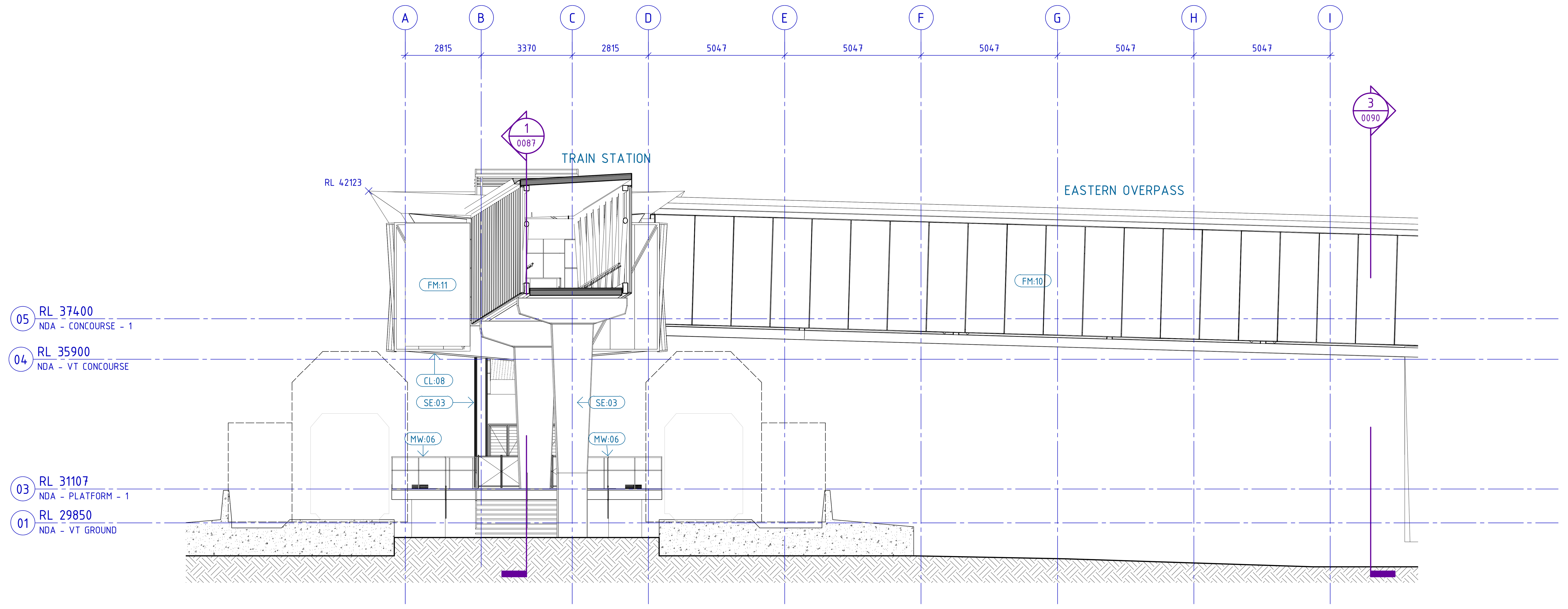
MORLEY ELLENBROOK LINE

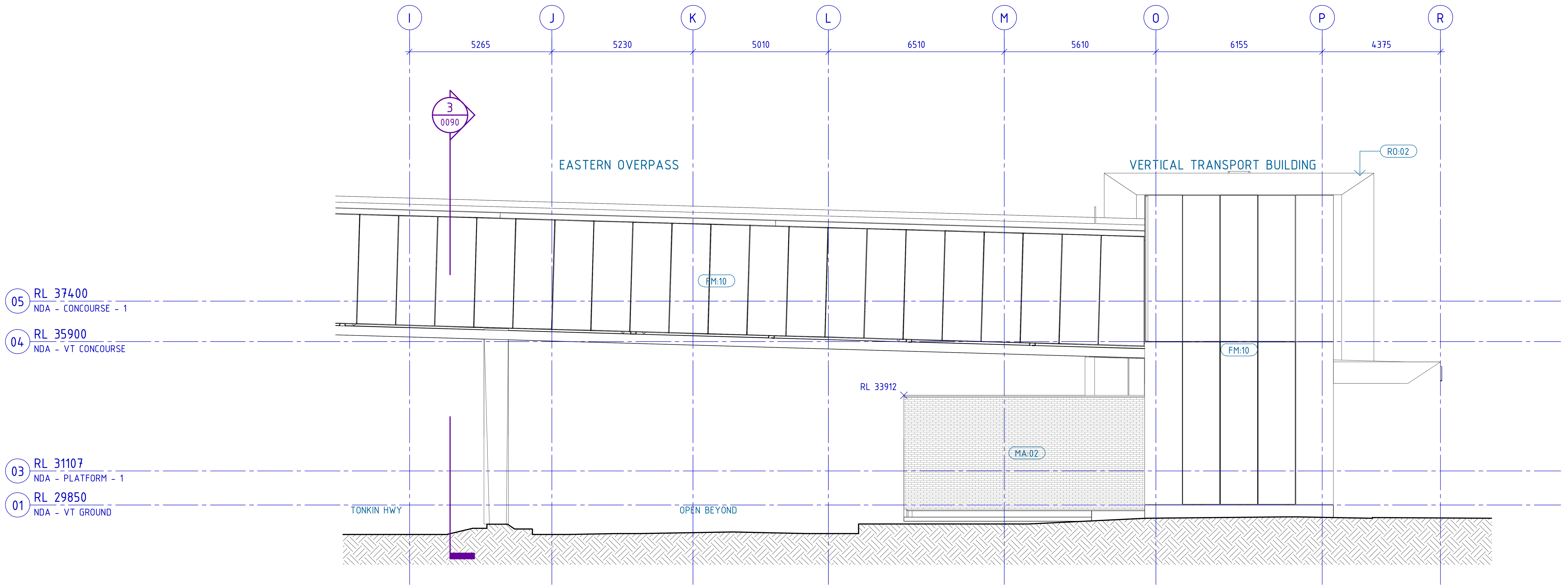
NORANDA STATION - ARCHITECTURAL
SHORT ELEVATION - SHEET 1

PTA Drawing No: 25-A-286-AR0084 Rev: A

CAD DRAWING PATHNAME BIM 360://160729_Metronet Morley Ellenbrook Line/25-B-286-AR0001.rvt



1 SOUTH ELEVATION - 01
SCALE 1 : 100



2 SOUTH ELEVATION - 02
SCALE 1 : 100

PRELIMINARY ONLY
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REFERENCE DESIGN

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ORIG SIZE A1
0 10 20 30 40 50 100mm
AT ORIGINAL PLOT SIZE

MEL CONNX

REFERENCES

SCALE 1 : 100 (@ A1)

DATUM
HORIZONTAL: PCG2020
VERTICAL: AHD71

DESIGNED S. KINGWELL
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APPROVED Approver
DATE 08.11.21

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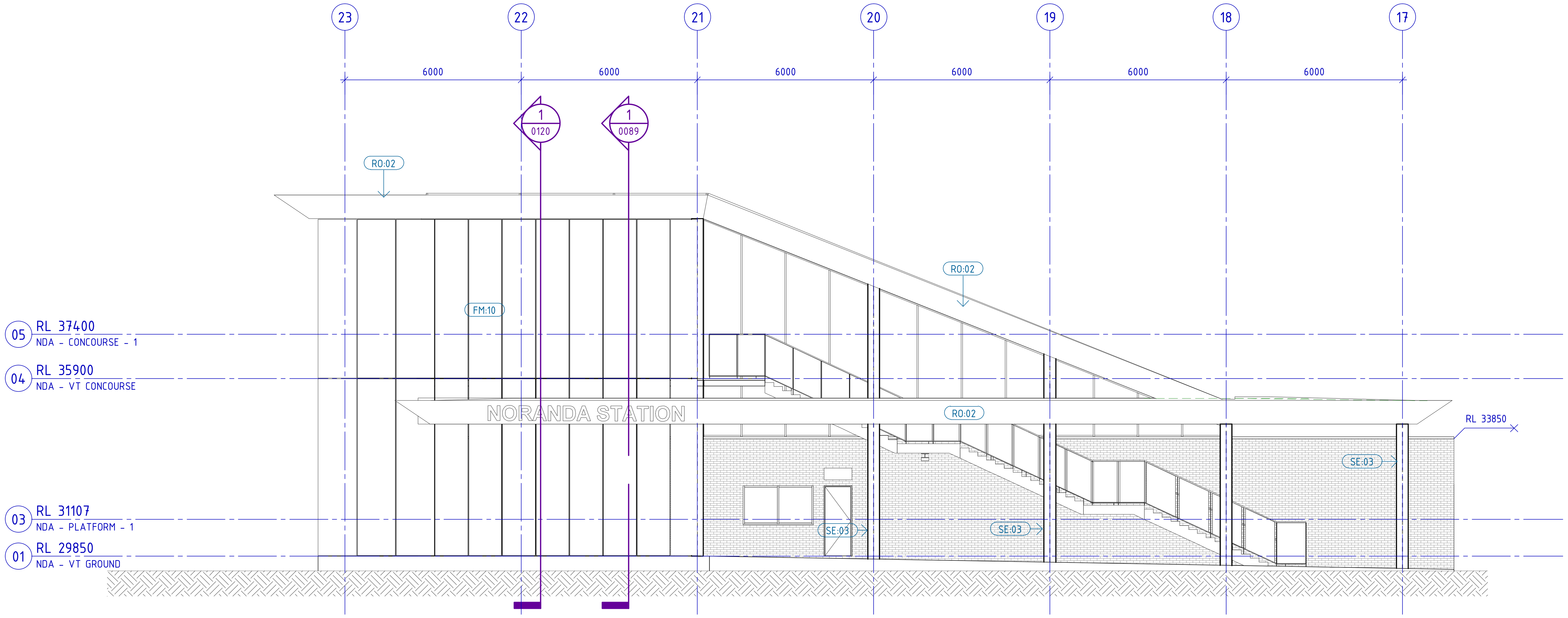
Public Transport Authority

MORLEY ELLENBROOK LINE
NORANDA STATION - ARCHITECTURAL
SHORT ELEVATION - SHEET 2

PTA Drawing No: 25-A-286-AR0085 Rev: A

CAD DRAWING PATHNAME BIM 360://160729_Metronet Morley Ellenbrook Line/25-B-286-AR0001.rvt



1 EAST ELEVATION
SCALE 1 : 100

PRELIMINARY ONLY
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REFERENCE DESIGN

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ORIG SIZE A1
0 10 20 30 40 50 100mm
AT ORIGINAL PLOT SIZE

MEL connX

REFERENCES

SCALE
1 : 100 (@ A1)

DATUM
HORIZONTAL: PCG2020
VERTICAL: AHD71

DESIGNED	S. KINGWELL
DRAWN	N. GRIME
CHECKED	D. O'BRIEN
APPROVED	Approver
DATE	08.11.21

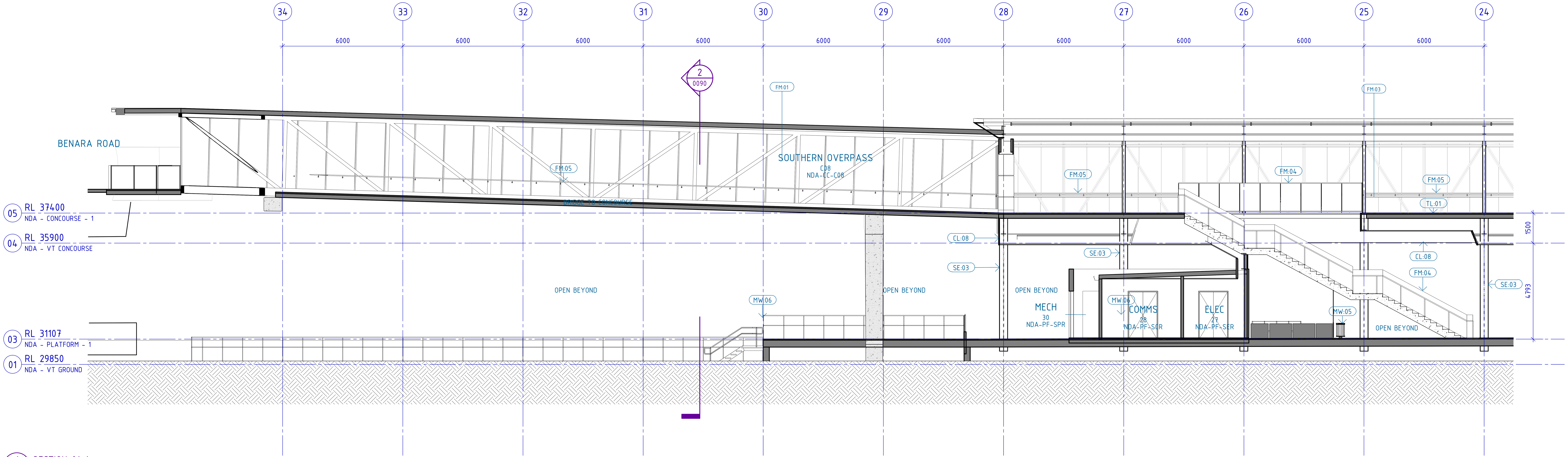
Government of Western Australia
Public Transport Authority

MORLEY ELLENBROOK LINE

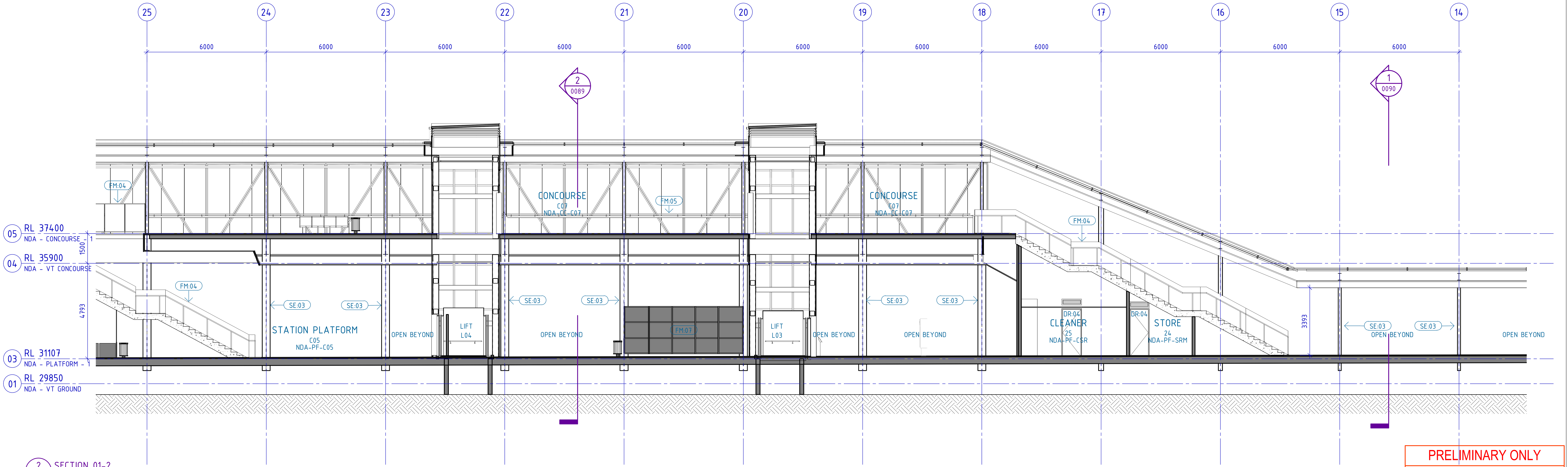
NORANDA STATION - ARCHITECTURAL
VERTICAL TRANSPORT BUILDING ELEVATION -SHEET 1

PTA Drawing No: 25-A-286-AR0086 Rev: A

CAD DRAWING PATHNAME BIM 360://160729_Metronet Morley Ellenbrook Line/25-B-286-AR0001.rvt



1 SECTION 01-1
SCALE 1 : 100



2 SECTION 01-2
SCALE 1 : 100

PRELIMINARY ONLY
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REFERENCE DESIGN

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ORIG SIZE A1 — AT ORIGINAL PLOT SIZE — 0 10 20 30 40 50 100mm

MEL CONNX

REFERENCES

SCALE 1 : 100 (@ A1)

DATUM
HORIZONTAL: PCG2020
VERTICAL: AHD71

DESIGNED S. KINGWELL
DRAWN N. GRIME
CHECKED D. OBRIEN
APPROVED Approver
DATE 08.11.21

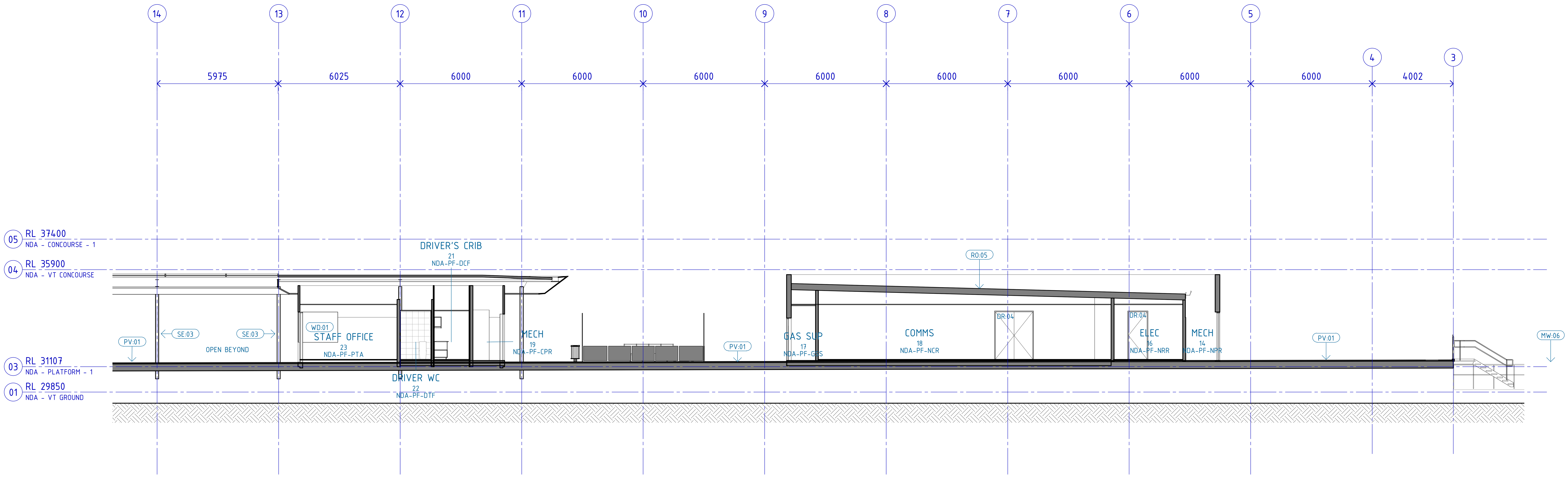
Government of Western Australia Public Transport Authority

MORLEY ELLENBROOK LINE

NORANDA STATION - ARCHITECTURAL
GENERAL ARRANGEMENT
LONG SECTION - SHEET 1

PTA Drawing No: 25-A-286-AR0087 Rev: A

CAD DRAWING PATHNAME BIM 360://160729_Metronet Morley Ellenbrook Line/25-B-286-AR0001.rvt



1 SECTION 01-3
SCALE 1 : 100

PRELIMINARY ONLY
NOT FOR CONSTRUCTION

REV	DATE	AMENDMENT	DSN	DRN	CHK	APP
A	08.11.21	REFERENCE DESIGN	SK	NG	DO	
A01	30.09.21	ISSUED FOR RD-IDC	SK	NG	DO	

ORIG SIZE A1 — 0 10 20 30 40 50 100mm AT ORIGINAL PLOT SIZE

MEL CONNX

REFERENCES

SCALE 1 : 100 (@ A1)

DATUM
HORIZONTAL: PCG2020
VERTICAL: AHD71

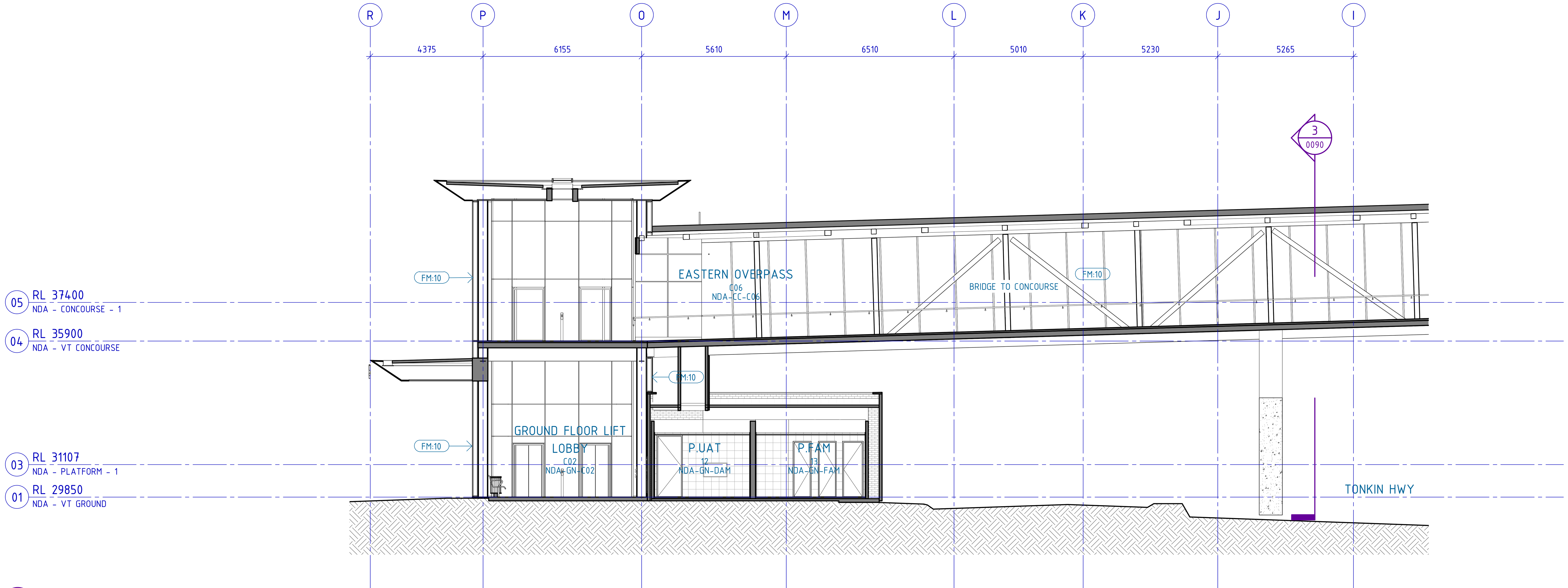
DESIGNED S. KINGWELL
DRAWN N. GRIME
CHECKED D. O'BRIEN
APPROVED Approver
DATE 08.11.21

Government of Western Australia Public Transport Authority

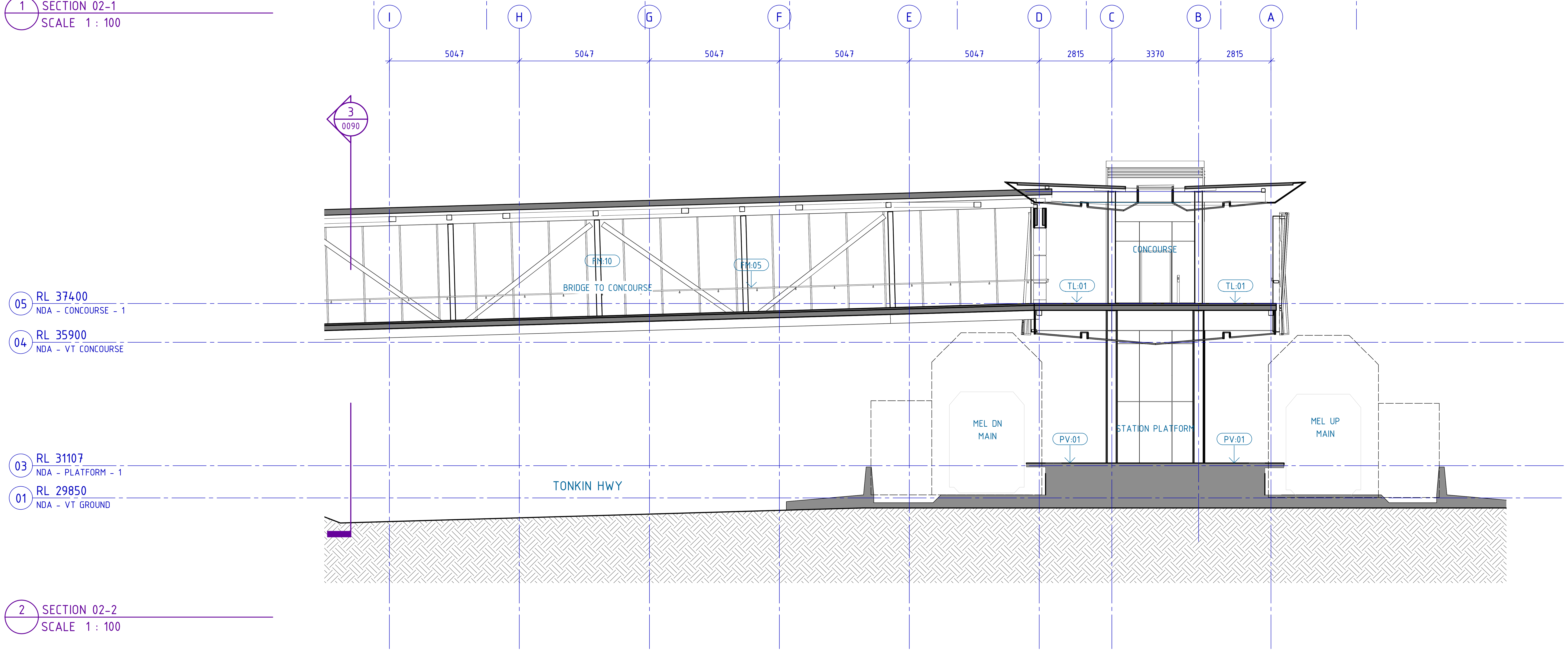
MORLEY ELLENBROOK LINE
NORANDA STATION - ARCHITECTURAL
GENERAL ARRANGEMENT
LONG SECTION - SHEET 2

PTA Drawing No: 25-A-286-AR0088 Rev: A

CAD DRAWING PATHNAME BIM 360://160729_Metronet Morley Ellenbrook Line/25-B-286-AR0001.rvt



1 SECTION 02-1
SCALE 1 : 100



2 SECTION 02-2
SCALE 1 : 100

PRELIMINARY ONLY
NOT FOR CONSTRUCTION

REFERENCE DESIGN

REV	DATE	AMENDMENT	DSN	DRN	CHK	APP
A	08.11.21	REFERENCE DESIGN	SK	NG	DO	
A01	30.09.21	ISSUED FOR RD-IDC	SK	NG	DO	

ORIG SIZE A1

0 10 20 30 40 50 100mm
AT ORIGINAL PLOT SIZE

MEL connX

REFERENCES

SCALE 1 : 100 (@ A1)

DATUM
HORIZONTAL: PCG2020
VERTICAL: AHD71

DESIGNED S. KINGWELL
DRAWN N. GRIME
CHECKED D. O'BRIEN
APPROVED Approver
DATE 08.11.21

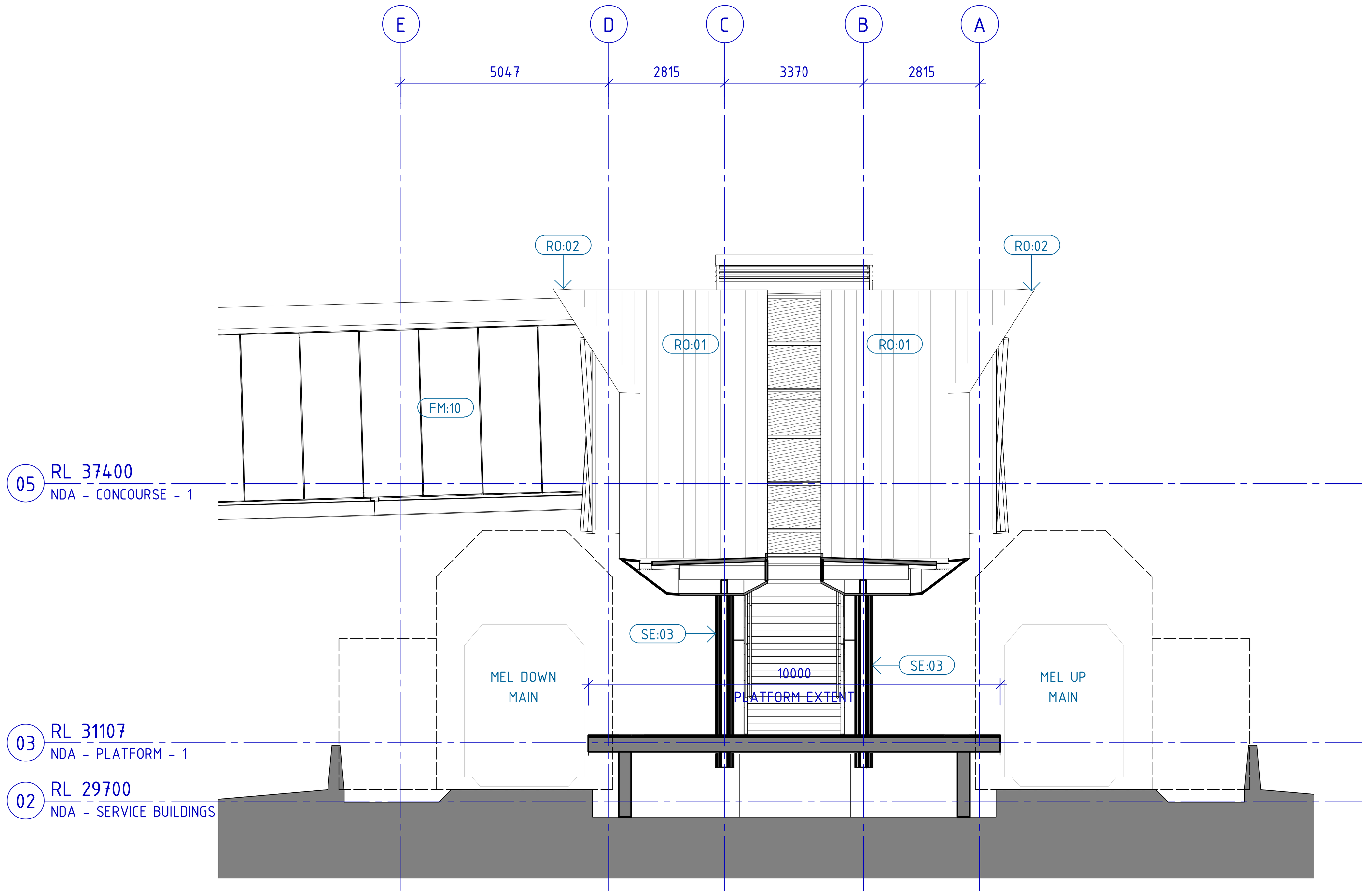
Government of Western Australia
Public Transport Authority

MORLEY ELLENBROOK LINE

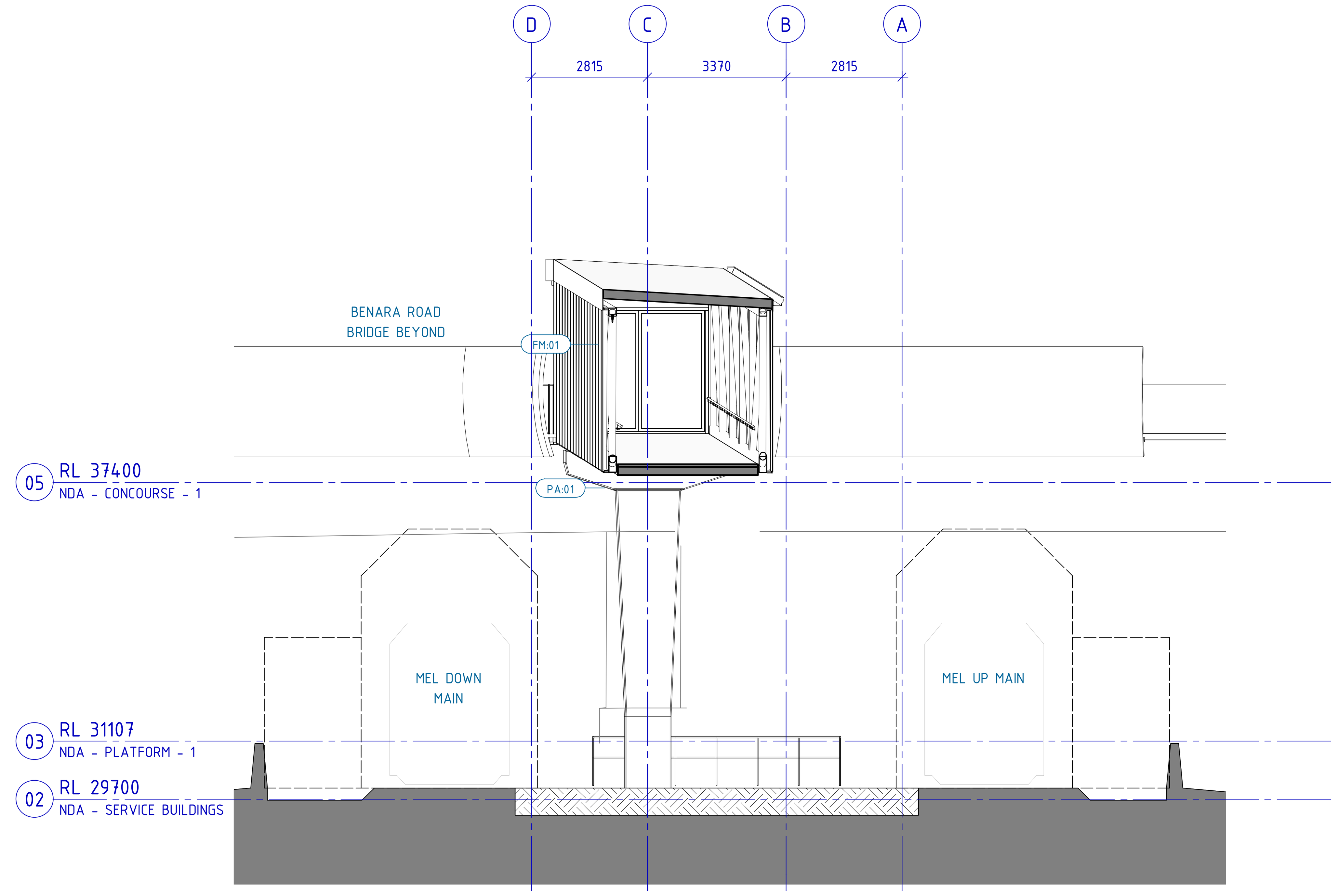
NORANDA STATION - ARCHITECTURAL
GENERAL ARRANGEMENT
SHORT SECTION - SHEET 1

PTA Drawing No: 25-A-286-AR0089 Rev: A

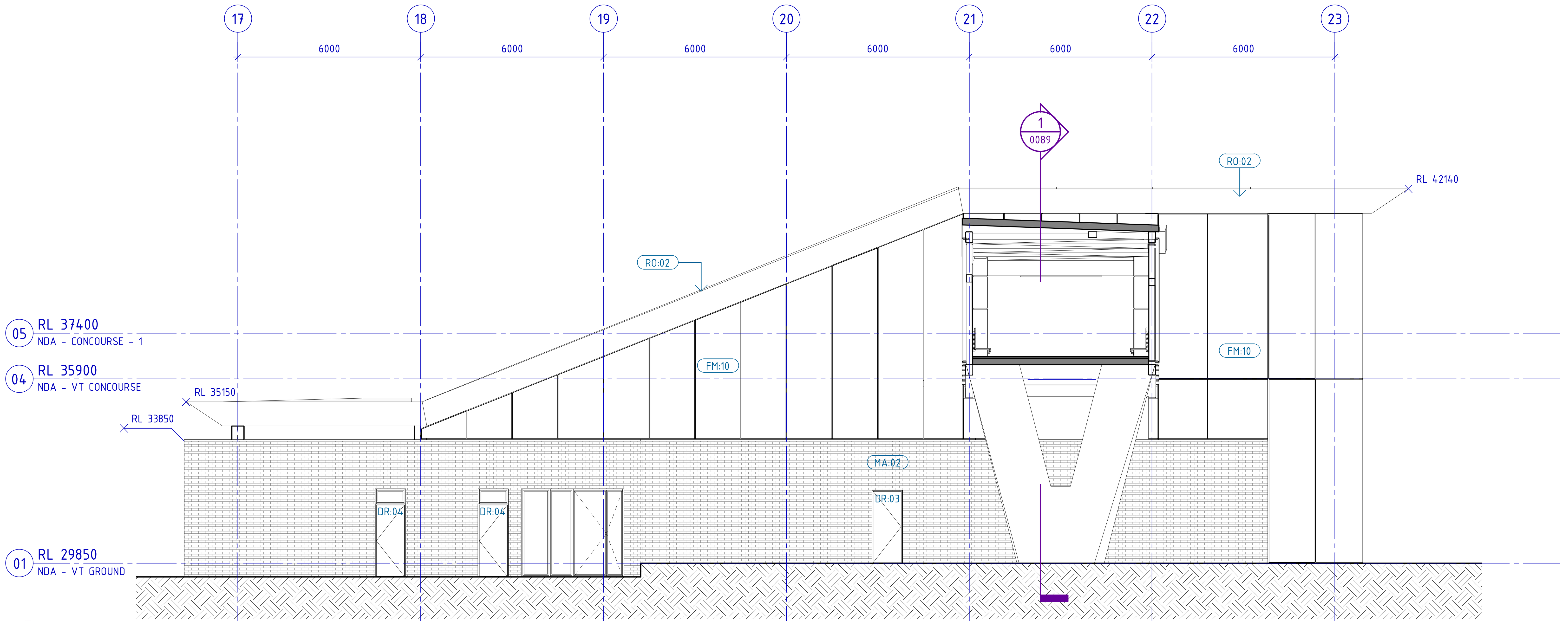
CAD DRAWING PATHNAME BIM 360://160729_Metronet Morley Ellenbrook Line/25-B-286-AR0001.rvt



1 SECTION 03
SCALE 1 : 100



2 SECTION 04
SCALE 1 : 100



3 SECTION 05
SCALE 1 : 100

PRELIMINARY ONLY
NOT FOR CONSTRUCTION

REFERENCE DESIGN

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A	08.11.21	REFERENCE DESIGN	SK	NG	DO	
A01	30.09.21	ISSUED FOR RD-IDC	SK	NG	DO	

ORIG SIZE A1

0 10 20 30 40 50 100mm
AT ORIGINAL PLOT SIZE

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MEL connx

REFERENCES

SCALE 1 : 100 (@ A1)

DATUM
HORIZONTAL: PCG2020
VERTICAL: AHD71

DESIGNED S. KINGWELL
DRAWN N. GRIME
CHECKED D. O'BRIEN
APPROVED Approver
DATE 08.11.21

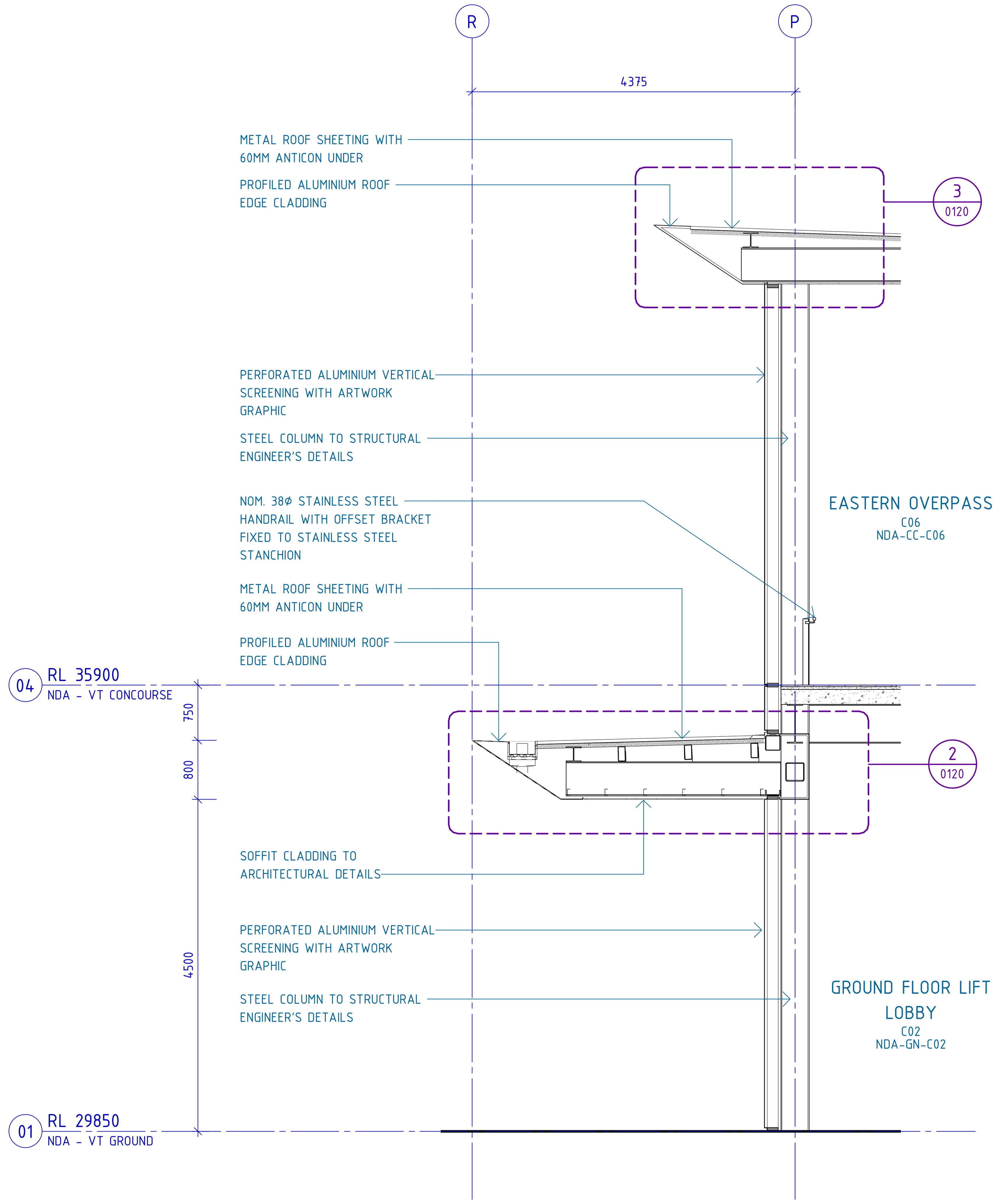
Government of Western Australia
Public Transport Authority

MORLEY ELLENBROOK LINE

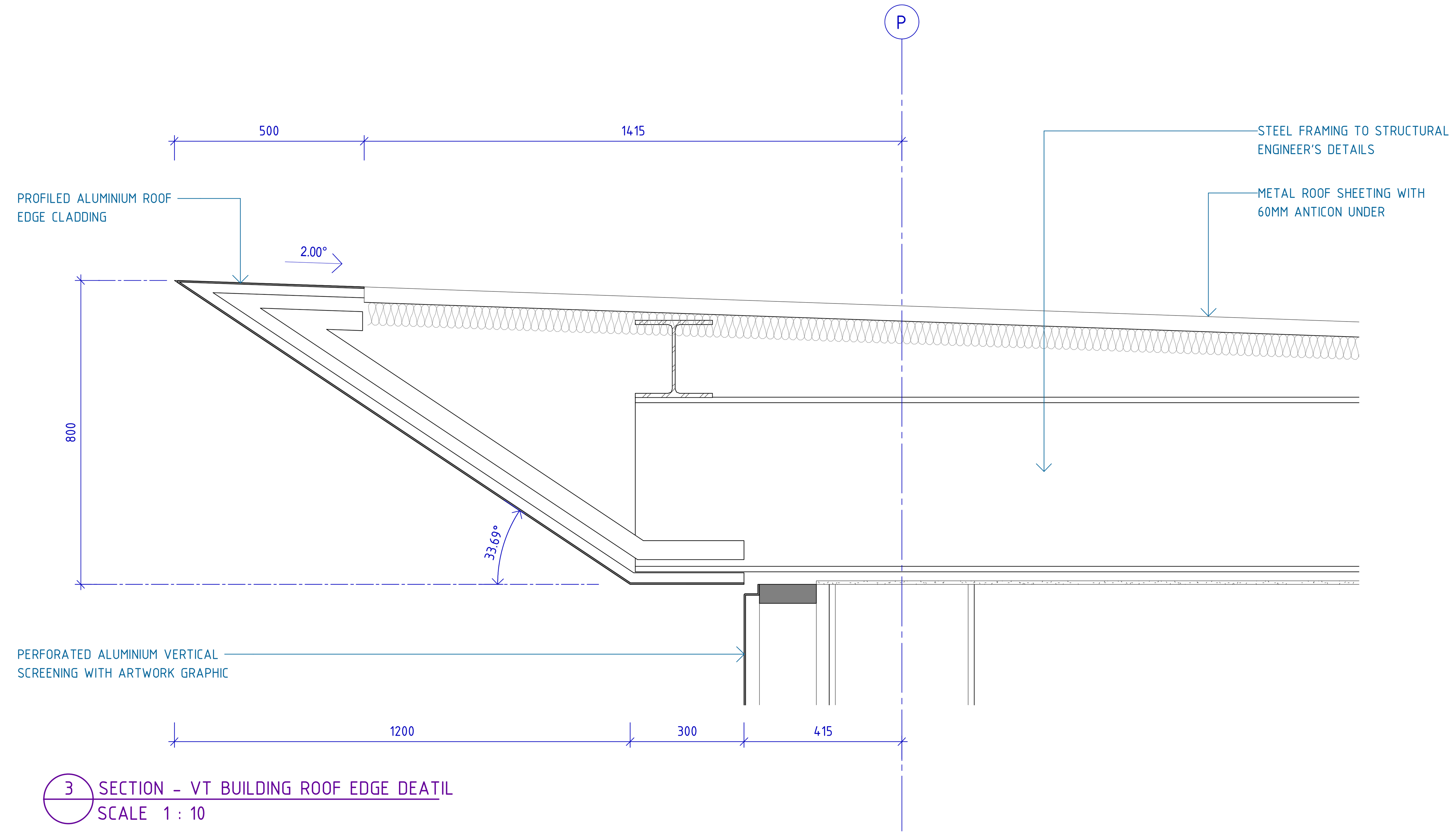
NORANDA STATION - ARCHITECTURAL
GENERAL ARRANGEMENT
SHORT SECTION - SHEET 2

PTA Drawing No: 25-A-286-AR0090 Rev: A

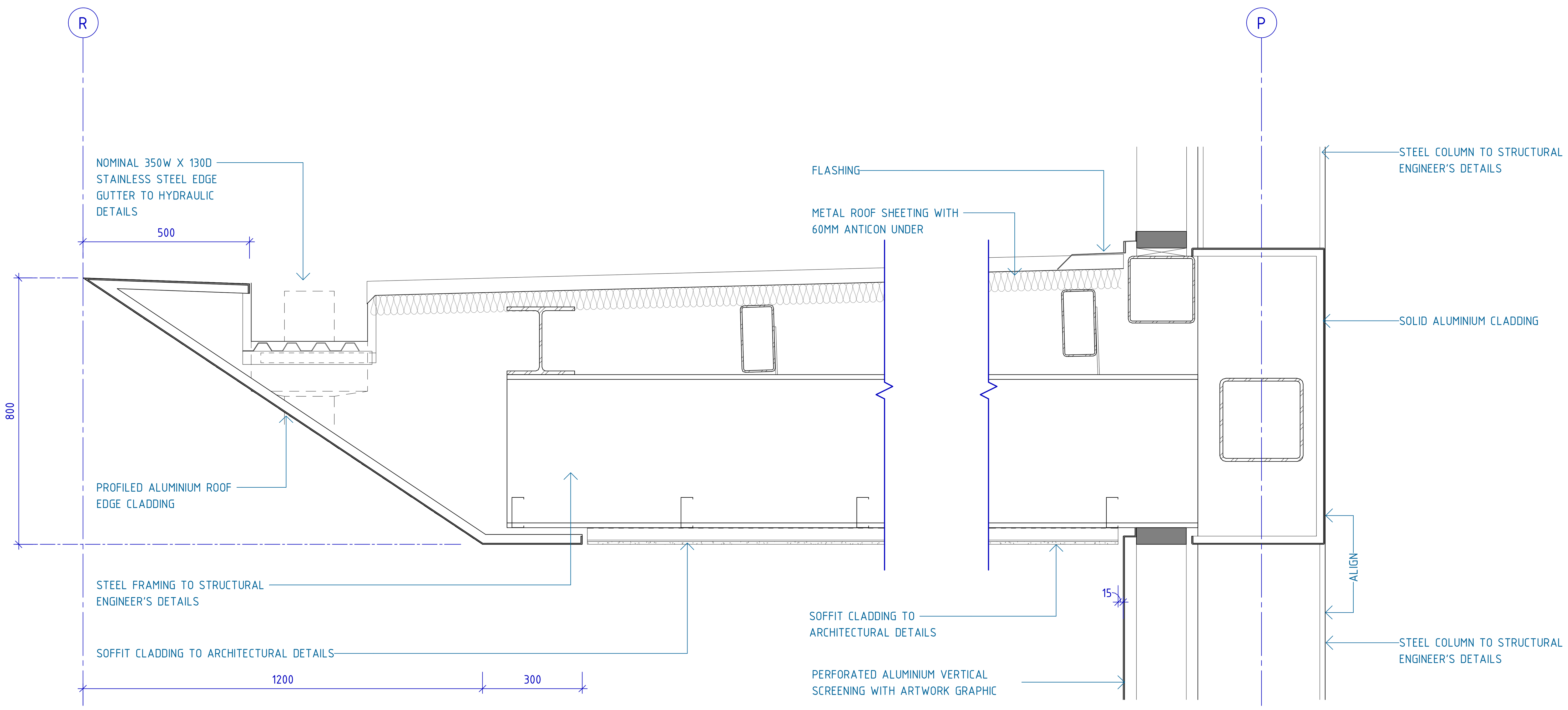
CAD DRAWING PATHNAME BIM 360://160729_Metronet Morley Ellenbrook Line/25-B-286-AR0001.rvt



1 SECTION - VT BUILDING FACADE SECTION DETAIL
SCALE 1 : 50



3 SECTION - VT BUILDING ROOF EDGE DEATIL
SCALE 1 : 10



2 SECTION - VT BUILDING CANOPY DETAIL
SCALE 1 : 10

PRELIMINARY ONLY
NOT FOR CONSTRUCTION

REFERENCE DESIGN

REV	DATE	AMENDMENT	DSN	DRN	CHK	APP
A	08.11.21	REFERENCE DESIGN	SK	NG	DO	
A01	30.09.21	ISSUED FOR RD-IDC	SK	NG	DO	

ORIG SIZE A1 — 0 10 20 30 40 50 100mm AT ORIGINAL PLOT SIZE

MELCONNX

REFERENCES

SCALE As indicated (@ A1)

DATUM
HORIZONTAL: PCG2020
VERTICAL: AHD71

DESIGNED	S. KINGWELL
DRAWN	N. GRIME
CHECKED	D. O'BRIEN
APPROVED	Approver
DATE	08.11.21

Government of Western Australia
Public Transport Authority

MORLEY ELLENBROOK LINE

NORANDA STATION - ARCHITECTURAL DETAILS
VT BUILDING DETAILS - SHEET 1

PTA Drawing No: 25-A-286-AR0120 Rev: A

CAD DRAWING PATHNAME BIM 360://160729_Metronet Morley Ellenbrook Line/25-B-286-AR0001.rvt

REV	DATE	AMENDMENT	DSN	DRN	CHK	APP
A	21-08-02	FIRST ISSUE				

ORIG SIZE A1

0 10 20 30 40 50 100mm
AT ORIGINAL PLOT SIZE

MEL CONNX

REFERENCES

SCALE 1:2000

DATUM
HORIZONTAL: PCG2020
VERTICAL: AHD71

DESIGNED
DRAWN Z. FARMER
CHECKED G. LOCKARD
APPROVED
DATE

Government of Western Australia
Public Transport Authority

Noranda Existing Civil Layout

PTA Drawing No: MEL-MLCX-CI-SKT-00012 Rev: A

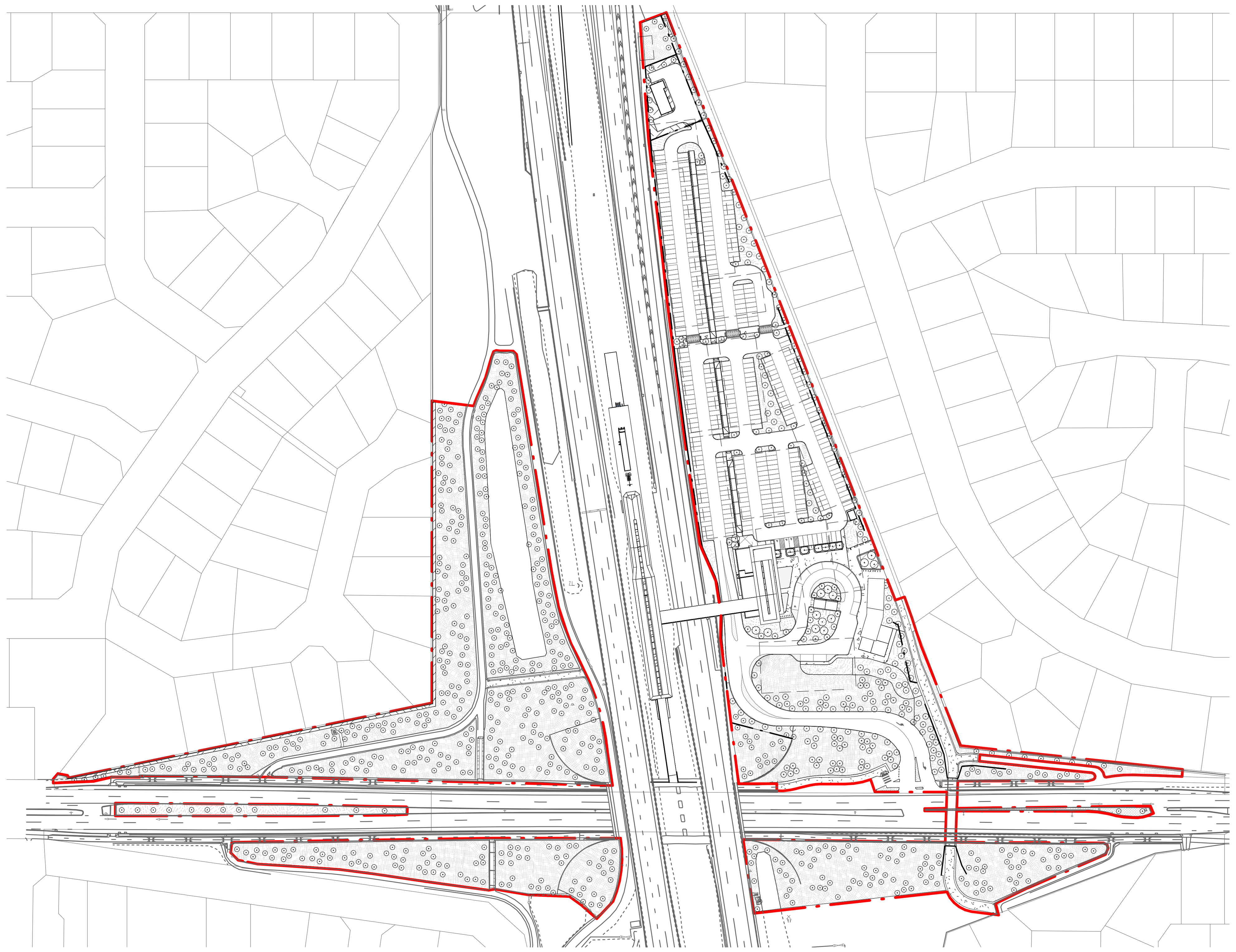
CAD DRAWING PATHNAME H:\0500 Design, Engineering & Technical\0502 Digital Engineering\5 Team Working Folders\ZF\20210802 Feature Survey Update\20210707 -MLCX - Existing Precinct Civil Layouts.dwg

Appendix C - Landscape Plans

MORLEY-ELLENBROOK LINE

NORANDA PRECINCT LANDSCAPE WORKS

Tonkin Highway, Noranda, WA 6062



1 25-A-286-LA0001
1 : 2000

SHEET SCHEDULE		
Sheet Number	Sheet Name	Rev.
25-A-286-LA0001	COVER SHEET	A
25-A-286-LA0002	LEGEND & NOTES	A
25-A-286-LA0006	SCHEDULES	A
25-A-286-LA0010	LANDSCAPE SITE PLAN	A
25-A-286-LA0050	GRADING PLAN	
25-A-286-LA0051	GRADING PLAN	
25-A-286-LA0052	GRADING PLAN	
25-A-286-LA0053	GRADING PLAN	
25-A-286-LA0054	GRADING PLAN	
25-A-286-LA0055	GRADING PLAN	
25-A-286-LA0065	GENERAL ARRANGEMENT & FINISHES PLAN	A
25-A-286-LA0066	GENERAL ARRANGEMENT & FINISHES PLAN	A
25-A-286-LA0067	GENERAL ARRANGEMENT & FINISHES PLAN	A
25-A-286-LA0068	GENERAL ARRANGEMENT & FINISHES PLAN	A
25-A-286-LA0069	GENERAL ARRANGEMENT & FINISHES PLAN	A
25-A-286-LA0070	GENERAL ARRANGEMENT & FINISHES PLAN	A
25-A-286-LA0080	PLANTING PLAN	
25-A-286-LA0081	PLANTING PLAN	
25-A-286-LA0082	PLANTING PLAN	
25-A-286-LA0083	PLANTING PLAN	
25-A-286-LA0084	PLANTING PLAN	
25-A-286-LA0085	PLANTING PLAN	
25-A-286-LA0125	LANDSCAPE DETAILS - HARDSCAPE	A
25-A-286-LA0126	LANDSCAPE DETAILS - FURNITURE	
25-A-286-LA0127	LANDSCAPE DETAILS - FURNITURE	
25-A-286-LA0128	LANDSCAPE DETAILS - SOFTSCAPE	A
25-A-286-LA0129	LANDSCAPE DETAILS - SOFTSCAPE	A

PRELIMINARY ONLY
NOT FOR CONSTRUCTION

Model Rev:A10 Issued:12.11.21

REV	DATE	AMENDMENT	DSN	DRN	CHK	APP
A	12/11/21	Issue for 100% RD	TCL	EL	SL	SL
A04	04/11/21	Issue for RD	TCL	EL	SL	SL
A03	30/09/21	Issue for IDC	TCL	EL	SL	SL
A02	02/09/21	Issue for IDC	TCL	EL	SL	SL
A01	04/08/21	Issue for 50% RD	TCL	EL	SL	SL

ORIG SIZE A1

0 10 20 30 40 50 100mm
AT ORIGINAL PLOT SIZE

CAD DRAWING PATHNAME S:\JOB-LIVE\M2012\08 Doc\08-08 CAD\NORANDA\RVT\25-B-286-LA0001.rvt

MEL connx

REFERENCES

SCALE 1 : 2000 (@ A1)

DATUM
HORIZONTAL: PCG2020
VERTICAL: AHD71

DESIGNED UDLA & TCL
DRAWN Enoch Liew
CHECKED Scott Lang
APPROVED Manoj Aravind
DATE 12/11/21

Government of Western Australia
Public Transport Authority

MORLEY ELLENBROOK LINE

NORANDA STATION - LANDSCAPING
COVER SHEET

PTA Drawing No: 25-A-286-LA0001 Rev: A

LEGEND

P2-21B	P2-21B In-situ Standard Grey Concrete Pavement, Broom Finished Refer Engineer's Documentation and Material Schedule.
P3-01A	P3-01A 3 Tone Exposed Aggregate Flagstone Concrete Unit Pavement Refer Engineer's Documentation and Material Schedule.
P3-02B	P3-04A 3 Tone Exposed Aggregate Flagstone Concrete Unit Pavement Refer Engineer's Documentation and Material Schedule.
P6-01A	P6-01A Asphalt, Red Refer PTA Specification and Material Schedule.
P4-01A	P4-01A Integrated Tactile Indicator Paving Unit, Dots Refer Detail and Material Schedule.
P4-02A	P4-02A TIntegrated Tactile Indicator Paving Unit, Stripes Refer Detail and Material Schedule.
P7-01A	P7-01A Cement Stablised Granitic Gravel Refer Detail and Material Schedule.
W2-00A	W2-00A Concrete Wall, 450mm Wide, Honed Refer Detail and Material Schedule.
W4-00A	W4-00A Concrete Wall, 150mm Wide, Honed Refer Detail and Material Schedule.
	Landscape Works Boundary.
	Cadastral Boundary.
	Fenceline Refer Civil Engineers' Documentation.
	Overhead Architecture Canopy Refer Architecture Documentation.

F1-01A	F1-01A Bike Hoop Refer Material Schedule
F2-01A	F2-01A Dual Bin Enclosure Refer Material Schedule.
F3-01A	F3-01A Drinking Fountain with 'Dog Watering Bowl' Refer Material Schedule.
F4-01A	F4-01A Bench Seat Refer Material Schedule.
F5-01A	F5-01A Maintenance Pillar - Dual Use Multiple GPO / Water Outlet Refer Material Schedule.
F7-01A	F7-01A Core Drilled SS Bollard Refer Material Schedule.
F7-01B	F7-01B Removable SS Bollard Refer Material Schedule.
	Existing Street Light Pole
	LU01 Light Unit 01 - Pole-top Light Refer Material Schedule and Public Realm Decorative Lighting Strategy.
E4-01A	20-100mm Laterite Gravel Anti-Scour Edge Refer Material Schedule and Civil Engineer's Documentation
E5-01A	Standard Softscape Maintenance Edge (sub-surface, concealed. between pavement and softscape) Refer Material Schedule.
RL 47000	Spot Height (mm) Refer Grading Plans.

G1-00A	G1-00A High Quality Amenity Planting Refer Detail and Planting Schedule.
G2-00A	G2-00A Standard Amenity Planting Refer Detail and Planting Schedule.
G3-00A	G3-00A Basic Amenity Planting Refer Detail and Planting Schedule.
G4-00A	G4-00A Basin Refer Detail and Planting Schedule.
G7-00A	G7-00A Tubestock Revegetation Refer Detail and Planting Schedule.
G8-00A	G8-00A Mulch Only Refer Detail and Planting Schedule.
LAWN	Irrigated Lawn Refer Detail and Material Schedule.

	T1-00A 1500L Tree Refer Detail and Planting Schedule.
	T2-00A 500L Tree Refer Detail and Planting Schedule.
	T3-00A 200L Tree Refer Detail and Planting Schedule.
	T4-00A 100L Tree Refer Detail and Planting Schedule.
	T5-00A 45L Tree Refer Detail and Planting Schedule.

NOTES:

1. DRAWINGS SHALL BE READ IN CONJUNCTION WITH ALL RELEVANT DOCUMENTATION (INCLUDING THAT OF DISCIPLINES INTERFACING WITH LANDSCAPE WORKS) PRIOR TO COMMENCEMENT OF WORKS. RELEVANT DOCUMENTATION SHALL INCLUDE BUT IS NOT LIMITED TO:
   - THE CONTRACT;
   - RELEVANT LEGISLATION, STANDARDS AND CODES OF PRACTICE;
   - LANDSCAPE AND IRRIGATION DRAWINGS, TECHNICAL SPECIFICATONS, SCHEDULES AND REPORTS;
   - ARCHITECTURAL DRAWINGS, TECHNICAL SPECIFICATONS, SCHEDULES AND REPORTS;
   - STRUCTURAL, CIVIL, SERVICES ENGINEERING DRAWINGS, TECHNICAL SPECIFICATONS, SCHEDULES AND REPORTS;
   - INSTRUCTIONS, CONSULTANT ADVICE NOTES AND ANY OTHER CONTRACTUAL NOTIFICATIONS FROM THE MANAGING CONTRACTOR;
   - REPORTS AND STUDIES, INCLUDING ENVIRONMENTAL, ARBORICULTURAL, GEOTECHNICAL, BUSHFIRE, HERITAGE, ETC;
   - BILLS OF QUANTITIES (WHERE PROVIDED);
   - ANY OTHER INFORMATION DEEMED PERTINENT BY THE MANAGING CONTRACTOR.
2. THESE DRAWINGS HAVE BEEN BASED ON A COMPILATION OF INFORMATION AND BASE DATA (INCLUDING DRAWINGS AND MODELS PROVIDED BY OTHER DISCIPLINES) AVAILABLE AT THE TIME OF PRODUCTION. THE LANDSCAPE DESIGN AND DOCUMENTATION IS RELIANT ON THE ACCURACY AND COMPLETENESS OF INFORMATION PROVIDED BY OTHERS. NO RESPONSIBILITY IS TAKEN FOR THE QUALITY OR COMPLETENESS OF INFORMATION FROM OTHERS ON WHICH THE LANDSCAPE DESIGN IS RELIANT.
3. ANOMALIES, OMISSIONS, ERRORS OR DISCREPENCIES IN THE PROJECT DOCUMENTATION ARE TO BE REFERRED TO THE MANAGING CONTRACTOR AND RELEVANT DISCIPLINE SRE'S IMMEDIATELY UPON DISCOVERY FOR DETERMINATION OF RESOLUTION AND SUBSEQUENT INSTRUCTION PRIOR TO CONTINUATION OF WORKS.
4. THE CONTRACTOR AND SUB-CONTRACTORS SHALL VERIFY ALL DIMENSIONS, SET-OUT, LEVELS, EXISTING AND PROPOSED INTERFACING WORKS (INCLUDING SERVICES AND SUB-SURFACE WORKS) PRIOR TO COMMENCEMENT ON SITE, PREPARATION OF DETAIL/SHOP DRAWINGS, AND FABRICATION OF CONSTRUCTION / BUILDING COMPONENTS
5. SET-OUT OF ALL WORKS SHALL BE UNDERTAKEN BY LICENSED SURVERYOR UTILISING 'ISSUE FOR CONSTRUCTION' DIGITAL FILES. LEVELS TO BE VERIFIED AGAINST THE 'ISSUE FOR CONSTRUCTION' DRAWINGS.
6. ALL DIMENSIONS ARE IN MM. DO NOT SCALE OFF DRAWINGS.
7. THE CONTRACTOR IS TO PROVIDE SHOP DRAWINGS (CAD DRAFTED TO SCALE WITH ADEQUATE NOTES AND DIMENSIONS FOR REVIEW AND FABRICATION) TO THE MANAGING CONTRACTOR FOR REVIEW PRIOR TO FABRICATION. FIXING AND FASTENING SELECTIONS ARE TO BE CONFIRMED VIA THE SHOP DRAWING PROCESS IN ACCORDANCE WITH THE AESTHETIC AND STRUCTURAL REQUIREMENTS OF THE DESIGN DOCUMENTATION.
8. WHERE STRUCTURAL FIXINGS AND CONNECTIONS AND / OR THEIR SET-OUT HAVE NOT BEEN NOMINATED IN THE DOCUMENTATION, THE CONTRACTOR IS TO VERIFY SUITABLE SELECTIONS AND SET-OUT WITH THE MANAGING CONTRACTOR PRIOR TO FABRICATION.
9. CONSTRUCTION WORKS SHALL ONLY BE UNDERTAKEN ON RECEIPT OF 'ISSUE FOR CONSTRUCTION' DOCUMENTATION.
10. TREES IDENTIFIED FOR RETENTION IN THE DOCUMENTS SHALL BE PROTECTED FOR THE DURATION OF CONSTRUCTION WORKS IN ACCORDANCE WITH TREE PROTECTION SPECIFICATIONS. *[NB. TREE SPECIFICATIONS ARE SUBJECT TO DEVELOPMENT AND CONFIRMATION IN THE NEXT DESIGN STAGE].*
11. ALL PAVED SURFACES ARE TO BE CONSTRUCTED IN COMPLIANCE WITH PROJECT 'DESIGN FOR DISABLED ACCESS' (DDA) REQUIREMENTS AND AS1428. DISCREPENCIES IN THE DOCUMENTATION PERTAINING TO PAVEMENT DESIGN AND DDA REQUIREMENTS ARE TO BE REFERRED TO THE MANAGING CONTRACTOR FOR RESOLUTION.
12. ALL SURFACES SHALL BE FREE-DRAINING. THE CONTRACTOR SHALL ENSURE SURFACES GRADES FALL AWAY FROM BUILDINGS, STRUCTURES, FURNITURE, KERB RAMPS AND PATHS OF TRAVEL.
13. SET-OUT AND SELECTION OF LIGHT FITTINGS ARE A WORK IN PROGRESS AND ARE NOT YET CAPTURED IN THE LANDSCAPE DOCUMENTATION FOR REFERENCE DESIGN. LIGHTING DETAILS WILL BE CONFIRMED IN THE NEXT PHASE OF DESIGN. IN THE INTERIM, PLEASE REFER TO PRELIMINARY LIGHTING STRATEGIES RD_LA_SK035 / RD_LA_SK038 FOR LIGHTING INTENT.
14. UNIT PAVING HEADER COURSES ARE NOT SHOWN DISTINCTLY ON FINISHES PLANS, REFER MATERIAL SCHEDULE FOR REQUIREMENTS.
15. REFER TO CIVIL ENGINEERS' DRAWINGS FOR ALL SURFACE LEVELS.
16. REFER TO CIVIL ENGINEERS' DRAWINGS FOR ALL KERBS, ROAD PAVEMENTS, KERB RAMPS AND ASSOCIATED TACTILE INDICATOR PAVING.
17. ALL FURNITURE IS PROPRIETARY SELECTION TO SUPPLIERS' DETAIL, REFER MATERIAL SCHEDULE FOR SELECTIONS.

PRELIMINARY ONLY
NOT FOR CONSTRUCTION

Model Rev:A10 Issued:12.11.21

REV	DATE	AMENDMENT	DSN	DRN	CHK	APP
A	12/11/21	Issue for 100% RD	TCL	EL	SL	SL
A04	04/11/21	Issue for RD	TCL	EL	SL	SL
A03	30/09/21	Issue for IDC	TCL	EL	SL	SL
A02	02/09/21	Issue for IDC	TCL	EL	SL	SL
A01	04/08/21	Issue for 50% RD	TCL	EL	SL	SL

ORIG SIZE A1

0 10 20 30 40 50 100mm
AT ORIGINAL PLOT SIZE

CAD DRAWING PATHNAME S:\JOB-LIVE\M2012\08 Doc\08-08 CAD\NORANDA\RVT\25-B-286-LA0001.rvt

MEL connX

REFERENCES

SCALE 1 : 100 (@ A1)

DATUM
HORIZONTAL: PCG2020
VERTICAL: AHD71

DESIGNED UDLA & TCL
DRAWN Enoch Liew
CHECKED Scott Lang
APPROVED Manoj Aravind
DATE 12/11/21

Government of Western Australia
Public Transport Authority

MORLEY ELLENBROOK LINE

NORANDA STATION - LANDSCAPING
LEGEND & NOTES

PTA Drawing No: 25-A-286-LA0002 Rev: A

PLANTING SCHEDULE

GARDEN BEDS: G1-00A, G2-00A, G3-00A

SYM	BOTANICAL NAME	POT SIZE	TOTAL
Abd	Anigozanthos 'Bush Diamond'	200mm	TBA
Abf	Anigozanthos 'Bush Fire'	200mm	TBA
Abg	Anigozanthos 'Bush Gold'	200mm	TBA
Abp	Anigozanthos 'Bush Pearl'	200mm	TBA
Abv	Anigozanthos 'Bush Volcano'	200mm	TBA
Acu	Acacia cultriformis 'Cascade'	200mm	TBA
Ala	Acacia lasiocarpa 'Glow Wattle'	200mm	TBA
All	Anigozanthos Landscape Lilac'	200mm	TBA
Ama	Anigozanthos manglesii 'Royal Cheer'	200mm	TBA
Aor	Anigozanthos 'Orange Cross'	200mm	TBA
Asa	Acacia saligna 'Springtime Cascade'	200mm	TBA
Avi	Anigozanthos viridis 'Green Dragon'	200mm	TBA
Bas	Banksia ashbyii Dwarf Form	200mm	TBA
Bbl	Banksia blechnifolia	200mm	TBA
Bni	Banksia nivea	200mm	TBA
Bpe	Banksia petiolaris	200mm	TBA
Bre	Banksia repens	200mm	TBA
Bsp	Banksia spinulosa Cherry Candles	200mm	TBA
Cap	Chrysocephalum apiculatum 'Desert Flame'	200mm	TBA
Cca	Conostylis candicans	200mm	TBA
Ccr	Conospermum crassinervium	200mm	TBA
Cse	Conostylis setosa	200mm	TBA
Cvi	Carpobrotus virescens 'Aussie Rambler'	200mm	TBA
Dcl	Dianella 'Clarity Blue'	200mm	TBA
Dol	Darwinia oldfieldii	200mm	TBA
Dpi	Darwinia pinifolia	200mm	TBA
Ebl	Eremophila 'Blue Horizon'	200mm	TBA
Gju	Grevillea juniperina Gold Cluster	200mm	TBA
Gwi	Grevillea 'Winter Delight'	200mm	TBA
Hbu	Hakea Burrendong Beauty	200mm	TBA
Hco	Hardenbergia comptoniana	200mm	TBA
Hpu	Hemiandra pungens 'Alba'	200mm	TBA
Hsp	Haemodorum spicatum	200mm	TBA
Kpr	Kennedia prostrata	200mm	TBA
Lbr	Leucophyta brownii 'Silver Nugget'	200mm	TBA
Lca	Lepidosperma calcicola	200mm	TBA
Lev	Lomandra 'Evergreen Baby'	200mm	TBA
Lfl	Lomandra filiformus 'Savanna Blue'	200mm	TBA
Lfo	Lechenaultia formosa	200mm	TBA
Mpa	Myoporum parvifolium 'Fine Green'	200mm	TBA
Mpa	Lomandra filiformus Savanna Blue	200mm	TBA
Pfe	Pimelea ferruginea 'Pink Solitaire'	200mm	TBA
Poc	Patersonia occidentalis	200mm	TBA
Tmu	Thysanotus multiflorus	200mm	TBA
Tre	Templetonia retusa prostrate	200mm	TBA
Vmi	Verticordia mitchelliana	200mm	TBA
		Total	TBA

GARDEN BED: G4-00A

SYM	BOTANICAL NAME	POT SIZE	TOTAL
Asc	Astartea scoparia	Tubestock	TBA
Bju	Baumea juncea	Tubestock	TBA
Bru	Baumea rubignosa	Tubestock	TBA
Cfa	Carez fascicularis	Tubestock	TBA
Cgy	Cyperus gymnocaulos	Tubestock	TBA
Chi	Calothamnus hirsutus	Tubestock	TBA
Cqu	Calothamnus quadrifidus Little Ripper	Tubestock	TBA
Cst	Conospermum stoechadis	Tubestock	TBA
Fno	Ficinia nodosa	Tubestock	TBA
Gqu	Grevillea quercifolia	Tubestock	TBA
Hpr	Hakea prostrata	Tubestock	TBA
Jkr	Juncus kraussii	Tubestock	TBA
Jsu	Juncus subsecundus	Tubestock	TBA
Lca	Lepidosperma calcicola	Tubestock	TBA
Lgl	Lepidosperma gladiatum	Tubestock	TBA
Lsq	Lepidosperma squamatum	Tubestock	TBA
Min	Melaleuca incanca	Tubestock	TBA
Mla	Melaleuca lateritia	Tubestock	TBA
Mpa	Melaleuca pauciflora	Tubestock	TBA
Msc	Melaleuca scabra	Tubestock	TBA
Msc	Meeboldina scariosa	Tubestock	TBA
Mse	Melaleuca seriata	Tubestock	TBA
Mth	Melaleuca thymifolia White Lace	Tubestock	TBA
Mty	Melaleuca thymoides	Tubestock	TBA
		Total	TBA

GARDEN BED: G7-00A

SYM	BOTANICAL NAME	POT SIZE	TOTAL
Ala	Acacia lasiocarpa Glow Wattle	Tubestock	TBA
Asa	Acacia saligna Springtime Cascade	Tubestock	TBA
Ama	Anigozanthos manglesii	Tubestock	TBA
Bbl	Banksia blechnifolia	Tubestock	TBA
Bni	Banksia nivea	Tubestock	TBA
Bre	Banksia repens	Tubestock	TBA
Cvi	Carporbrotus virescens	Tubestock	TBA
Ccr	Chorizema cordatum	Tubestock	TBA
Cac	Conostylis aculeata	Tubestock	TBA
Cco	Conostylis candicans	Tubestock	TBA
Cse	Conostylis setosa	Tubestock	TBA
Dre	Dianella revoluta	Tubestock	TBA
Ega	Eremophila glabra	Tubestock	TBA
Gqu	Grevillea quercifolia	Tubestock	TBA
Hco	Hardenbergia comptoniana	Tubestock	TBA
Hpu	Hemiandra pungens	Tubestock	TBA
Kco	Kennedia coccinea	Tubestock	TBA
Kpr	Kennedia prostrata	Tubestock	TBA
Mco	Melaleuca conothamnoides	Tubestock	TBA
Mhe	Melaleuca heugelii Prostrate	Tubestock	TBA
Mse	Melaleuca seriata	Tubestock	TBA
Mth	Melaleuca thymifolia White Lace	Tubestock	TBA
Mtr	Melaleuca trichophylla	Tubestock	TBA
Mpa	Myoporum parvifolium Fine Leaf	Tubestock	TBA
Oax	Olearia axilaris Little Smokie	Tubestock	TBA
Poc	Pattersonia occidentalis	Tubestock	TBA
Tmu	Thysanotus multiflorus	Tubestock	TBA
		Total	TBA

TREES

SYM	BOTANICAL NAME	POT SIZE	TOTAL
Bag	Banksia grandis	TBA	TBA
Baa	Banksia ashbyii	TBA	TBA
Bac	Banksia coccinea	TBA	TBA
Bin	Banksia integrifolia	TBA	TBA
Bal	Banksia littoralis	TBA	TBA
Bam	Banksia menziesii	TBA	TBA
Bap	Banksia priornotes	TBA	TBA
Coc	Corymbia calophylla	TBA	TBA
Eux	Eucalyptus caesia Gungurru Gungurru	TBA	TBA
Eue	Eucalyptus erythrocorys	TBA	TBA
Eua	Eucalyptus erythronema	TBA	TBA
Euf	Eucalyptus forrestiana	TBA	TBA
Eug	Eucalyptus gomphocephala	TBA	TBA
Eum	Eucalyptus macrocarpa	TBA	TBA
Euo	Eucalyptus orbifolia	TBA	TBA
Eur	Eucalyptus rudis	TBA	TBA
Eus	Eucalyptus sepulcralis	TBA	TBA
Euy	Eucalyptus synandra	TBA	TBA
Eut	Eucalyptus todtiana	TBA	TBA
Euo	Eucalyptus torquata	TBA	TBA
Euw	Eucalyptus wandoo	TBA	TBA
Eub	Eucalyptus websteriana	TBA	TBA
Hab	Hakea bucculenta	TBA	TBA
Haf	Hakea francisiana	TBA	TBA
Hal	Hakea laurina	TBA	TBA
Hap	Hakea petiolaris	TBA	TBA
Mec	Melaleuca cuticularis	TBA	TBA
Mel	Melaleuca leucadendra	TBA	TBA
Mep	Melaleuca preissiana	TBA	TBA
Meq	Melaleuca quinquenervia	TBA	TBA
Mer	Melaleuca rhaphiophylla	TBA	TBA
		Total	TBA

PALMS

SYM	BOTANICAL NAME	POT SIZE	TOTAL
Ara	Archontophoenix Alexandrae	TBA	TBA
Arc	Archontophoenix Cunninghamiana	TBA	TBA
Lia	Livistona Australia	TBA	TBA
Ror	Roystonea Regia	TBA	TBA
		Total	TBA

PRELIMINARY ONLY
NOT FOR CONSTRUCTION

Model Rev:A10 Issued:12.11.21

REV	DATE	AMENDMENT	DSN	DRN	CHK	APP
A	12/11/21	Issue for 100% RD	TCL	EL	SL	SL
A04	04/11/21	Issue for RD	TCL	EL	SL	SL

ORIG SIZE A1 — 0 10 20 30 40 50 100mm AT ORIGINAL PLOT SIZE

MEL connx

REFERENCES

SCALE (@ A1)

DATUM
HORIZONTAL: PCG2020
VERTICAL: AHD71

DESIGNED UDLA & TCL
DRAWN Enoch Liew
CHECKED Scott Lang
APPROVED Manoj Aravind
DATE 12/11/21

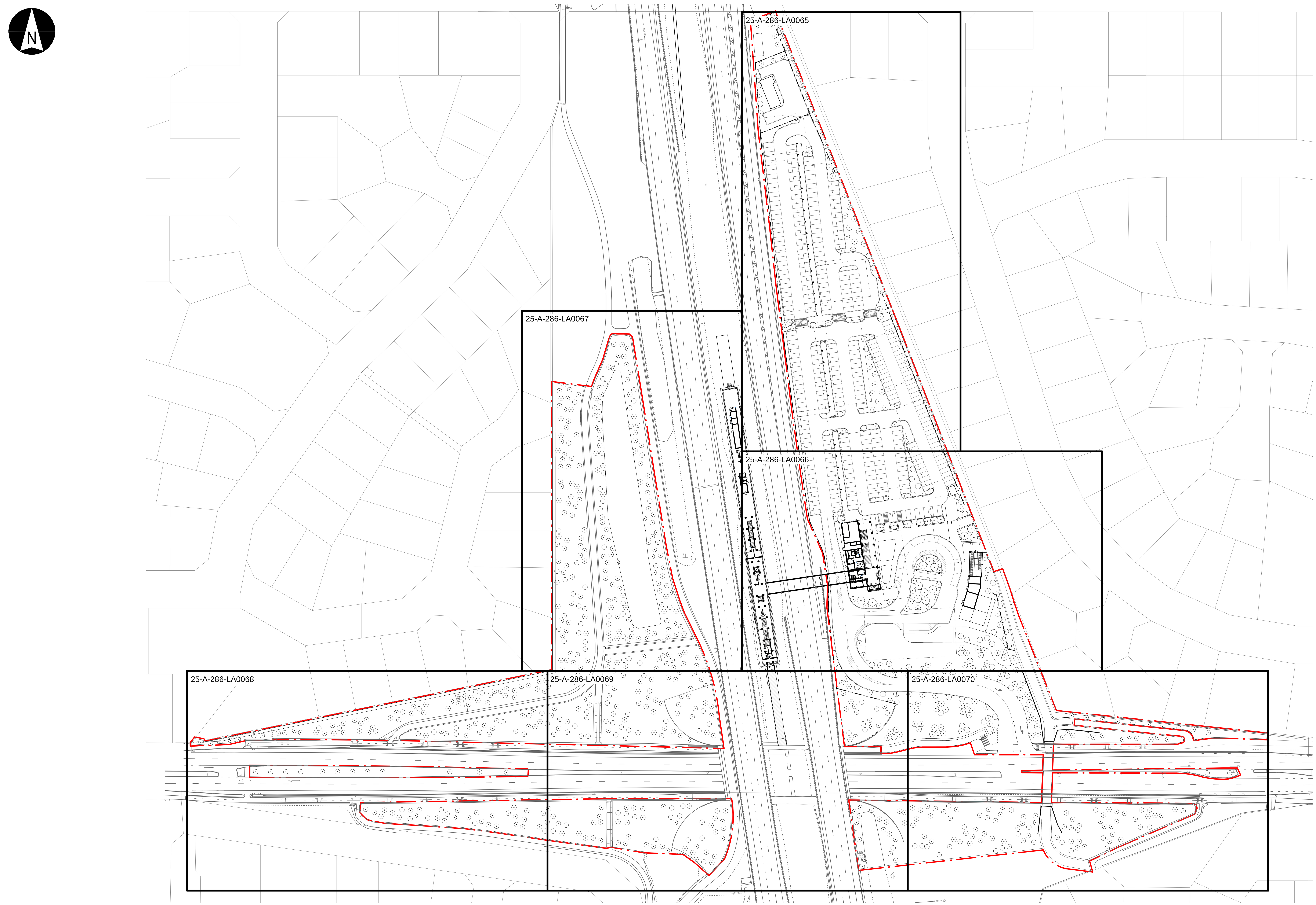
Government of Western Australia
Public Transport Authority

MORLEY ELLENBROOK LINE

NORANDA STATION - LANDSCAPING SCHEDULES

PTA Drawing No: 25-A-286-LA0006 Rev: A

CAD DRAWING PATHNAME S:\JOB-LIVE\M2012\08 Doc\08-08 CAD\NORANDA\RVT\25-B-286-LA0001.rvt



PRELIMINARY ONLY

NOT FOR CONSTRUCTION

1 25-A-286-LA0010

1 : 1000

Model Rev:A10 Issued:12.11.21

REV	DATE	AMENDMENT	DSN	DRN	CHK	APP
A	12/11/21	Issue for 100% RD	TCL	EL	SL	SL
A04	04/11/21	Issue for RD	TCL	EL	SL	SL
A03	30/09/21	Issue for IDC	TCL	EL	SL	SL
A02	02/09/21	Issue for IDC	TCL	EL	SL	SL
A01	04/08/21	Issue for 50% RD	TCL	EL	SL	SL

ORIG SIZE A1

0 10 20 30 40 50 100mm
AT ORIGINAL PLOT SIZE

CAD DRAWING PATHNAME S:\JOB-LIVE\M2012\08 Doc\08-08 CAD\NORANDA\RVT\25-B-286-LA0001.rvt

MEL CONNX

REFERENCES

SCALE 1 : 1000 (@ A1)

DATUM
HORIZONTAL: PCG2020
VERTICAL: AHD71

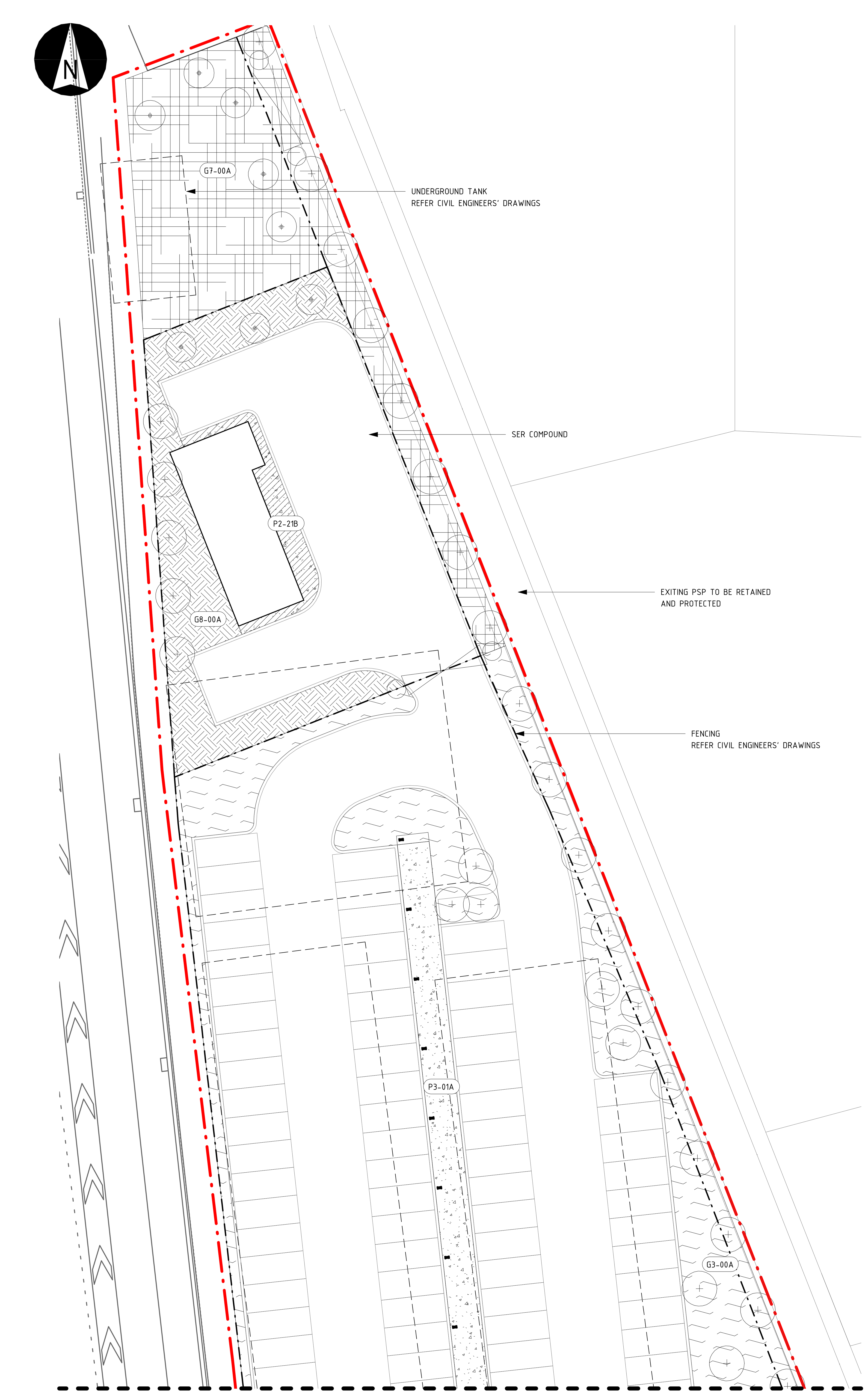
DESIGNED UDLA & TCL
DRAWN Enoch Liew
CHECKED Scott Lang
APPROVED Manoj Aravind
DATE 12/11/21

Government of Western Australia Public Transport Authority

MORLEY ELLENBROOK LINE

NORANDA STATION - LANDSCAPING
LANDSCAPE SITE PLAN

PTA Drawing No: 25-A-286-LA0010 Rev: A



1 25-A-286-LA0065a
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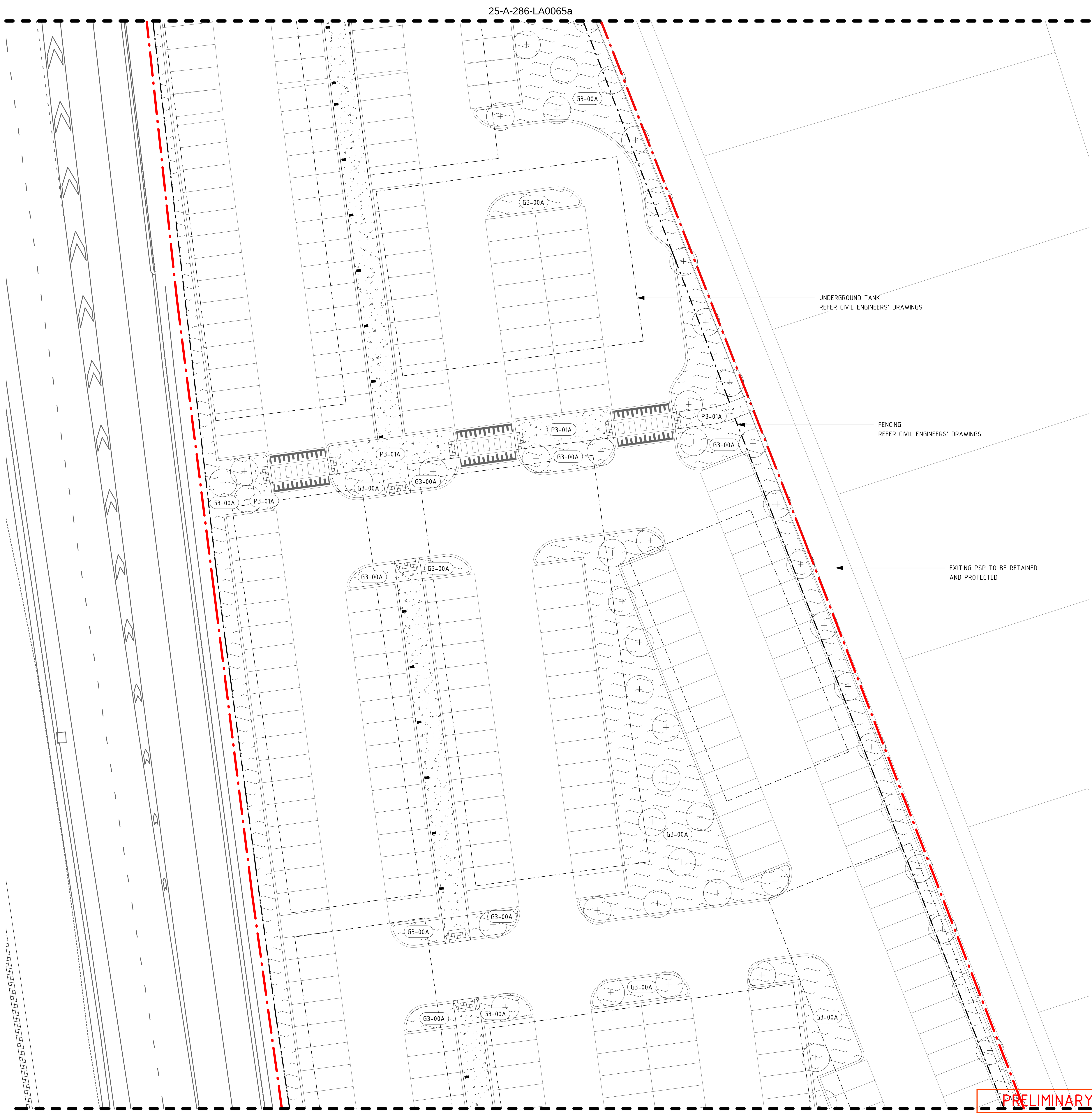

2 25-A-286-LA0065b
1 : 250

PRELIMINARY ONLY
NOT FOR CONSTRUCTION

Model Rev:A10 Issued:12.11.21

REV	DATE	AMENDMENT	DSN	DRN	CHK	APP
A	12/11/21	Issue for 100% RD	TCL	EL	SL	SL
A04	04/11/21	Issue for RD	TCL	EL	SL	SL
A03	30/09/21	Issue for IDC	TCL	EL	SL	SL
A02	02/09/21	Issue for IDC	TCL	EL	SL	SL
A01	04/08/21	Issue for 50% RD	TCL	EL	SL	SL

ORIG SIZE A1
0 10 20 30 40 50 100mm
AT ORIGINAL PLOT SIZE

MEL CONNX

REFERENCES

SCALE	1 : 250 (@ A1)
DATUM	
HORIZONTAL:	PCG2020
VERTICAL:	AHD71
DESIGNED	UDLA & TCL
DRAWN	Enoch Liew
CHECKED	Scott Lang
APPROVED	Manoj Aravind
DATE	12/11/21

Government of Western Australia
Public Transport Authority

MORLEY ELLENBROOK LINE

NORANDA STATION - LANDSCAPING
GENERAL ARRANGEMENT & FINISHES PLAN

PTA Drawing No: 25-A-286-LA0065 Rev: A

CAD DRAWING PATHNAME S:\JOB-LIVE\M2012\08 Doc\08-08 CAD\NORANDA\RVT\25-B-286-LA0001.rvt

1 25-A-286-LA0066
1 : 250

Model Rev:A10 Issued:12.11.21

REV	DATE	AMENDMENT	DSN	DRN	CHK	APP
A	12/11/21	Issue for 100% RD	TCL	EL	SL	SL
A04	04/11/21	Issue for RD	TCL	EL	SL	SL
A03	30/09/21	Issue for IDC	TCL	EL	SL	SL
A02	02/09/21	Issue for IDC	TCL	EL	SL	SL
A01	04/08/21	Issue for 50% RD	TCL	EL	SL	SL

ORIG SIZE A1 — 0 10 20 30 40 50 100mm AT ORIGINAL PLOT SIZE

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MEL connx

REFERENCES

SCALE 1 : 250 (@ A1)

DATUM
HORIZONTAL: PCG2020
VERTICAL: AHD71

DESIGNED UDLA & TCL
DRAWN Enoch Liew
CHECKED Scott Lang
APPROVED Manoj Aravind
DATE 12/11/21

Government of Western Australia Public Transport Authority

MORLEY ELLENBROOK LINE

NORANDA STATION - LANDSCAPING
GENERAL ARRANGEMENT & FINISHES PLAN

PTA Drawing No: 25-A-286-LA0066 Rev: A

CAD DRAWING PATHNAME S:\JOB-LIVE\M2012\08 Doc\08-08 CAD\NORANDA\RVT\25-B-286-LA0001.rvt

PRELIMINARY ONLY
NOT FOR CONSTRUCTION

1 25-A-286-LA0067
1 : 250

Model Rev:A10 Issued:12.11.21

REV	DATE	AMENDMENT	DSN	DRN	CHK	APP
A	12/11/21	Issue for 100% RD	TCL	EL	SL	SL
A04	04/11/21	Issue for RD	TCL	EL	SL	SL
A03	30/09/21	Issue for IDC	TCL	EL	SL	SL
A02	02/09/21	Issue for IDC	TCL	EL	SL	SL
A01	04/08/21	Issue for 50% RD	TCL	EL	SL	SL

ORIG SIZE A1
0 10 20 30 40 50 100mm
AT ORIGINAL PLOT SIZE

CAD DRAWING PATHNAME S:\JOB-LIVE\M2012\08 Doc\08-08 CAD\NORANDA\RVT\25-B-286-LA0001.rvt

MEL connX

REFERENCES

SCALE 1 : 250 (@ A1)

DATUM
HORIZONTAL: PCG2020
VERTICAL: AHD71

DESIGNED UDLA & TCL
DRAWN Enoch Liew
CHECKED Scott Lang
APPROVED Manoj Aravind
DATE 12/11/21

Government of Western Australia Public Transport Authority

MORLEY ELLENBROOK LINE

NORANDA STATION - LANDSCAPING
GENERAL ARRANGEMENT & FINISHES PLAN

PTA Drawing No: 25-A-286-LA0067 Rev: A

PRELIMINARY ONLY
NOT FOR CONSTRUCTION

1 25-A-286-LA0068
1 : 250

Model Rev:A10 Issued:12.11.21

REV	DATE	AMENDMENT	DSN	DRN	CHK	APP
A	12/11/21	Issue for 100% RD	TCL	EL	SL	SL
A04	04/11/21	Issue for RD	TCL	EL	SL	SL
A03	30/09/21	Issue for IDC	TCL	EL	SL	SL
A02	02/09/21	Issue for IDC	TCL	EL	SL	SL
A01	04/08/21	Issue for 50% RD	TCL	EL	SL	SL

ORIG SIZE A1
0 10 20 30 40 50 100mm
AT ORIGINAL PLOT SIZE

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CAD DRAWING PATHNAME S:\JOB-LIVE\M2012\08 Doc\08-08 CAD\NORANDA\RVT\25-B-286-LA0001.rvt

MEL CONNX

REFERENCES

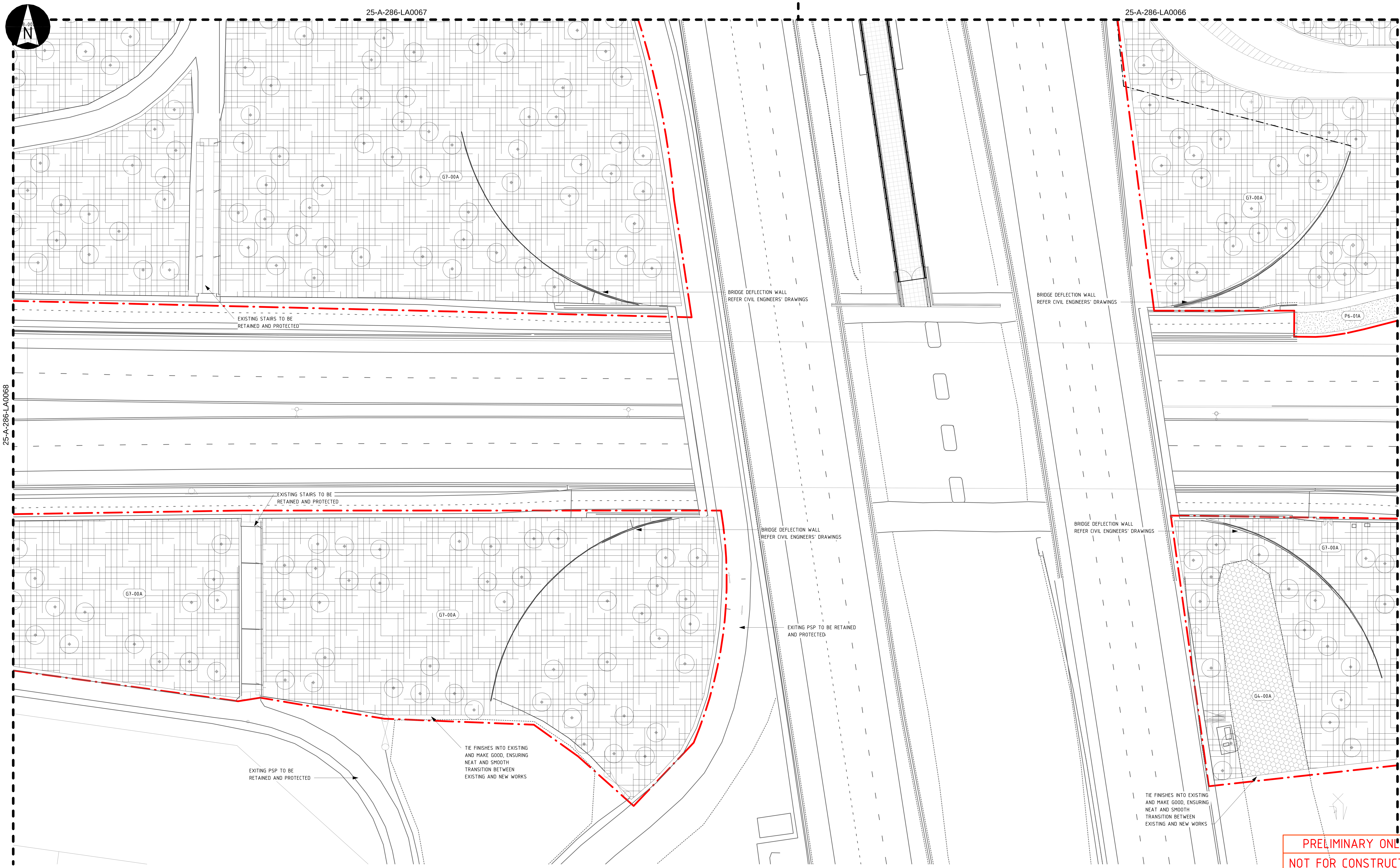
SCALE	1 : 250 (@ A1)
DATUM	
HORIZONTAL:	PCG2020
VERTICAL:	AHD71
DESIGNED	UDLA & TCL
DRAWN	Enoch Liew
CHECKED	Scott Lang
APPROVED	Manoj Aravind
DATE	12/11/21

Government of Western Australia
Public Transport Authority

MORLEY ELLENBROOK LINE

NORANDA STATION - LANDSCAPING
GENERAL ARRANGEMENT & FINISHES PLAN

PTA Drawing No: 25-A-286-LA0068 Rev: A



1 25-A-286-LA0069
1 : 250

PRELIMINARY ONLY
NOT FOR CONSTRUCTION

Model Rev:A10 Issued:12.11.21

REV	DATE	AMENDMENT	DSN	DRN	CHK	APP
A	12/11/21	Issue for 100% RD	TCL	EL	SL	SL
A04	04/11/21	Issue for RD	TCL	EL	SL	SL
A03	30/09/21	Issue for IDC	TCL	EL	SL	SL
A02	02/09/21	Issue for IDC	TCL	EL	SL	SL
A01	04/08/21	Issue for 50% RD	TCL	EL	SL	SL

ORIG SIZE A1
0 10 20 30 40 50 100mm
AT ORIGINAL PLOT SIZE

CAD DRAWING PATHNAME S:\JOB-LIVE\M2012\08 Doc\08-08 CAD\NORANDA\RVT\25-B-286-LA0001.rvt

MEL connx

REFERENCES

SCALE 1 : 250 (@ A1)

DATUM
HORIZONTAL: PCG2020
VERTICAL: AHD71

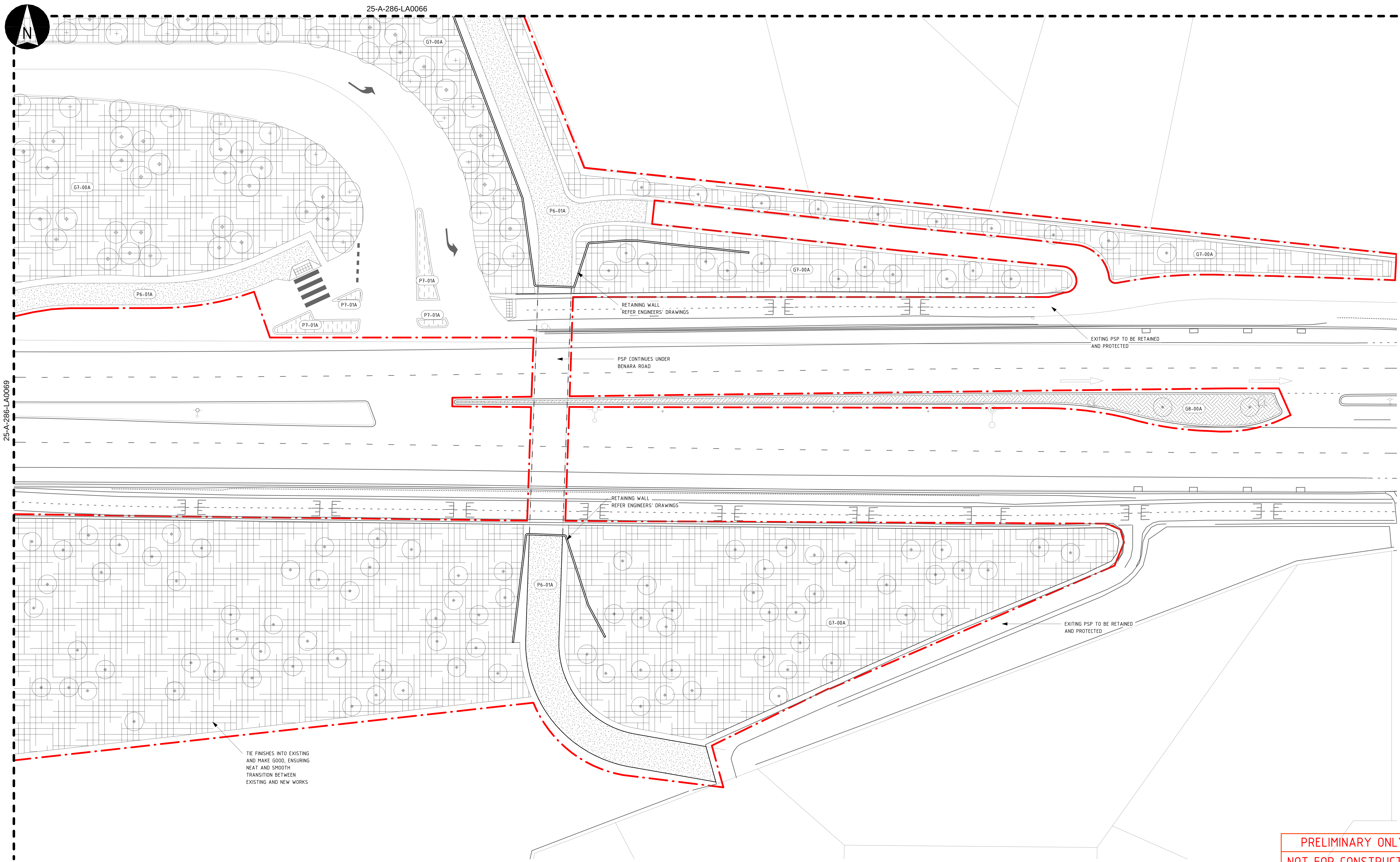
DESIGNED UDLA & TCL
DRAWN Enoch Liew
CHECKED Scott Lang
APPROVED Manoj Aravind
DATE 12/11/21

Government of Western Australia
Public Transport Authority

MORLEY ELLENBROOK LINE

NORANDA STATION - LANDSCAPING
GENERAL ARRANGEMENT & FINISHES PLAN

PTA Drawing No: 25-A-286-LA0069 Rev: A



1 25-A-286-LA0070
1 : 250

PRELIMINARY ONLY
NOT FOR CONSTRUCTION

Model Rev:A10 Issued:12.11.21

REV	DATE	AMENDMENT	DSN	DRN	CHK	APP
A	12/11/21	Issue for 100% RD	TCL	EL	SL	SL
A04	04/11/21	Issue for RD	TCL	EL	SL	SL
A03	30/09/21	Issue for IDC	TCL	EL	SL	SL
A02	02/09/21	Issue for IDC	TCL	EL	SL	SL
A01	04/08/21	Issue for 50% RD	TCL	EL	SL	SL

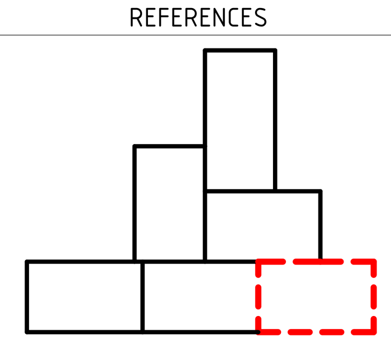
ORIG SIZE A1

0 10 20 30 40 50 100mm
AT ORIGINAL PLOT SIZE

CAD DRAWING PATHNAME S:\JOB-LIVE\M2012\08 Doc\08-08 CAD\NORANDA\RVT\25-B-286-LA0001.rvt

MEL connX

REFERENCES



SCALE 1 : 250 (@ A1)

DATUM
HORIZONTAL: PCG2020
VERTICAL: AHD71

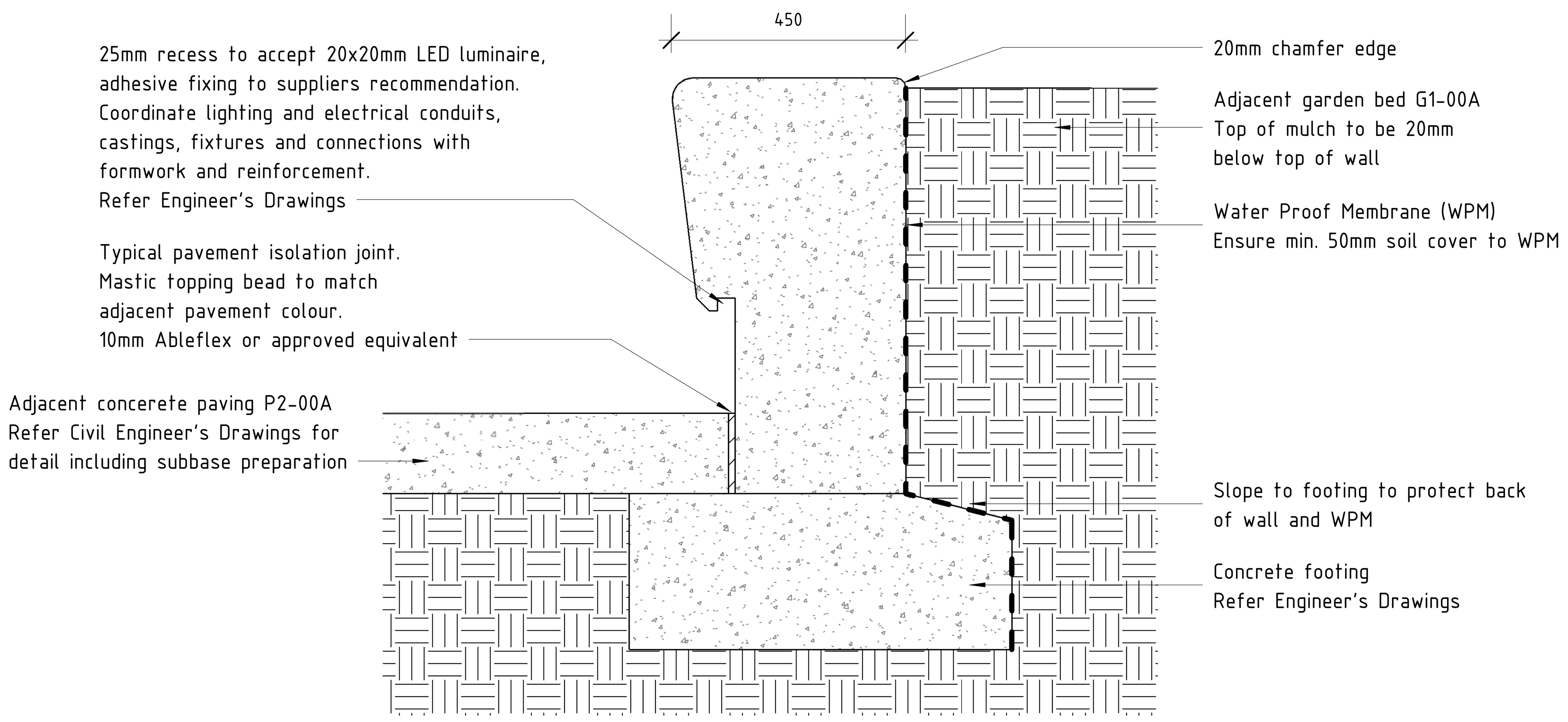
DESIGNED UDLA & TCL
DRAWN Enoch Liew
CHECKED Scott Lang
APPROVED Manoj Aravind
DATE 12/11/21

Government of Western Australia Public Transport Authority

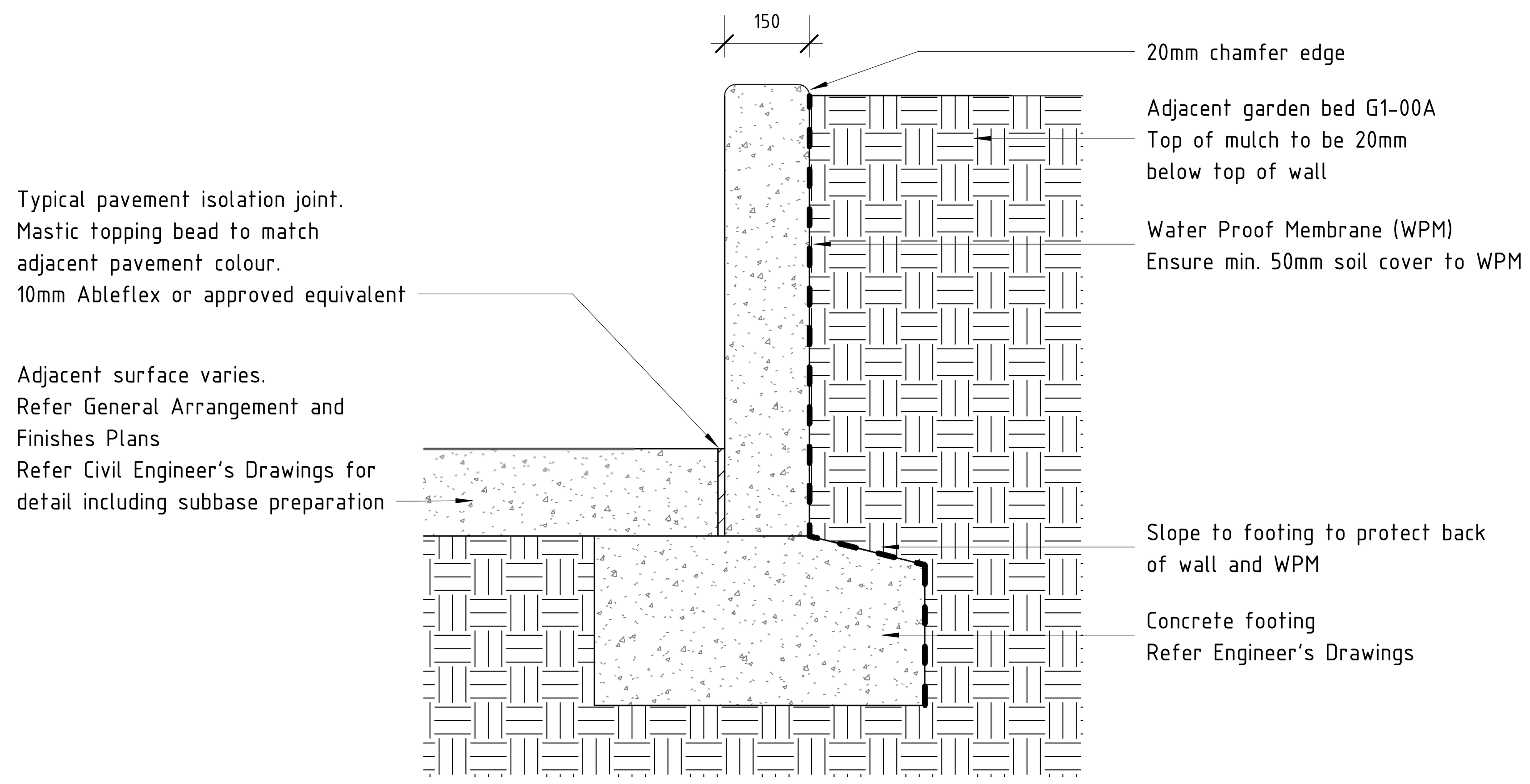
MORLEY ELLENBROOK LINE

NORANDA STATION - LANDSCAPING
GENERAL ARRANGEMENT & FINISHES PLAN

PTA Drawing No: 25-A-286-LA0070 Rev: A



1 W2-00A
1 : 10



2 W4-00A
1 : 10

PRELIMINARY ONLY
NOT FOR CONSTRUCTION

Model Rev:A10 Issued:12.11.21

REV	DATE	AMENDMENT	DSN	DRN	CHK	APP
A	12/11/21	Issue for 100% RD	TCL	EL	SL	SL
A04	04/11/21	Issue for RD	TCL	EL	SL	SL
A03	30/09/21	Issue for IDC	TCL	EL	SL	SL
A02	02/09/21	Issue for IDC	TCL	EL	SL	SL
A01	04/08/21	Issue for 50% RD	TCL	EL	SL	SL

ORIG SIZE A1
0 10 20 30 40 50 100mm
AT ORIGINAL PLOT SIZE

MEL CONNX

REFERENCES

SCALE
1 : 10 (@ A1)

DATUM
HORIZONTAL: PCG2020
VERTICAL: AHD71

DESIGNED UDLA & TCL
DRAWN Enoch Liew
CHECKED Scott Lang
APPROVED Manoj Aravind
DATE 12/11/21

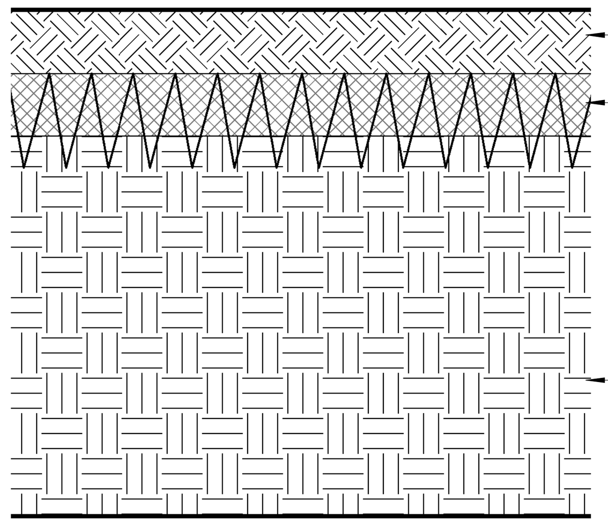
Government of Western Australia Public Transport Authority

MORLEY ELLENBROOK LINE

NORANDA STATION - LANDSCAPING
LANDSCAPE DETAILS - HARDSCAPE

PTA Drawing No: 25-A-286-LA0125 Rev: A

CAD DRAWING PATHNAME S:\JOB-LIVE\M2012\08 Doc\08-08 CAD\NORANDA\RVT\25-B-286-LA0001_details.rvt

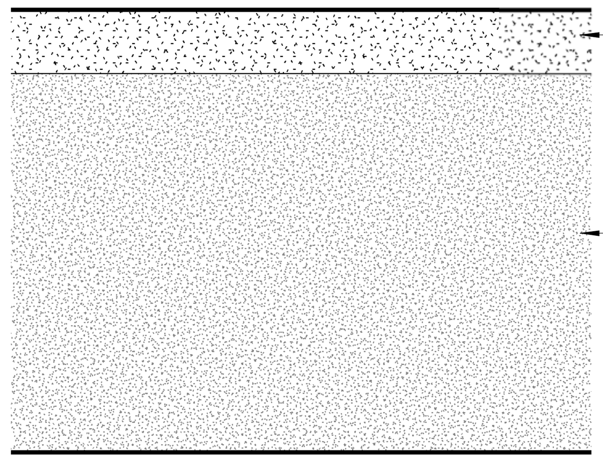


100mm Depth Mulch
As specified

100mm Eclipse Aquamor Soil
Improver or similar approved
cultivated into existing soil to form
300mm depth

Existing Subgrade

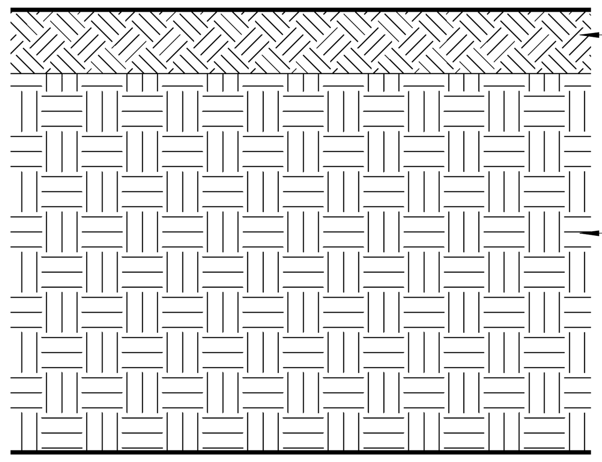
1 G1-00A, G2-00A, G3-00A
1 : 10



100mm Depth Gravel Mulch
As specified

600mm Eclipse Phosphorus
retentive filter media or
approved equivalent

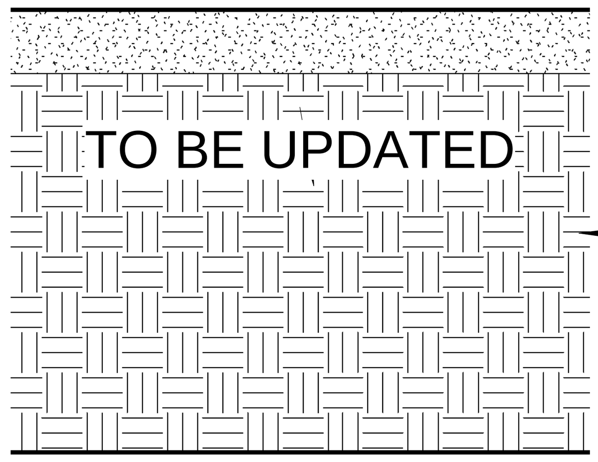
2 G4-00A
1 : 10



100mm Depth Mulch
As specified

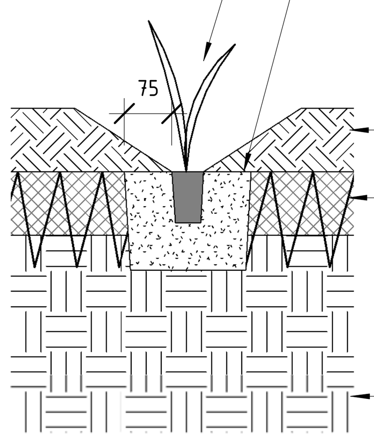
Existing Subgrade

3 G7-00A, G8-00A
1 : 10



Existing Subgrade

4 Lawn
1 : 10



Tubestock

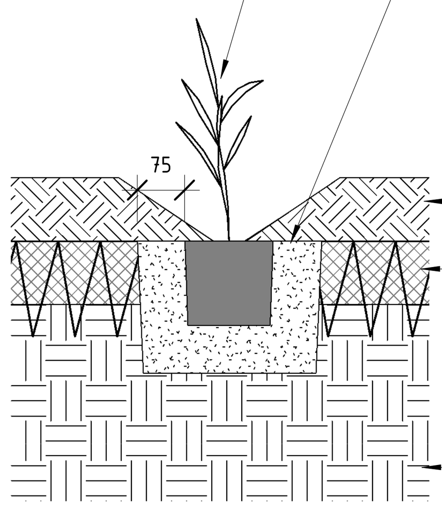
Excavate hole to allow min. 75mm
around root system of plant.
Backfill with cultivated soil,
fertiliser, soil additive.

100mm Depth Mulch
As specified
To be kept clear of stem

100mm Eclipse Aquamor Soil
Improver or similar approved
cultivated into existing soil to
form 300mm depth

Existing Subgrade

5 50mm Tubestock
1 : 10



140mm Plant

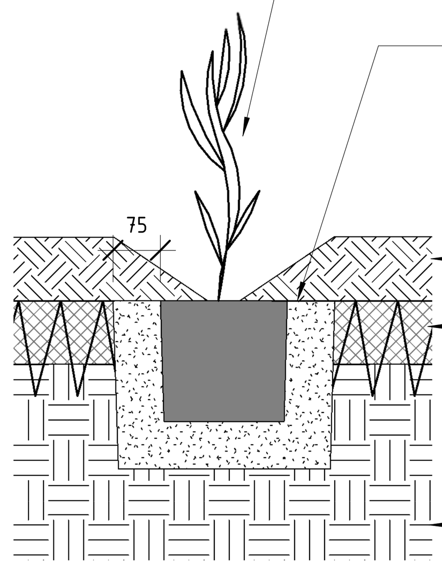
Excavate hole to allow min. 75mm
around root system of plant.
Backfill with cultivated soil,
fertiliser, soil additive.

100mm Depth Mulch
As specified
To be kept clear of stem

100mm Eclipse Aquamor Soil
Improver or similar approved
cultivated into existing soil to
form 300mm depth

Existing Subgrade

6 140mm Pot
1 : 10



200mm Plant

Excavate hole to allow min. 75mm
around root system of plant.
Backfill with cultivated soil,
fertiliser, soil additive.

100mm Depth Mulch
As specified
To be kept clear of stem

100mm Eclipse Aquamor Soil
Improver or similar approved
cultivated into existing soil to
form 300mm depth

Existing Subgrade

7 200mm Pot
1 : 10

PRELIMINARY ONLY
NOT FOR CONSTRUCTION

Model Rev:A10 Issued:12.11.21

REV	DATE	AMENDMENT	DSN	DRN	CHK	APP
A	12/11/21	Issue for 100% RD	TCL	EL	SL	SL
A04	04/11/21	Issue for RD	TCL	EL	SL	SL
A03	30/09/21	Issue for IDC	TCL	EL	SL	SL
A02	02/09/21	Issue for IDC	TCL	EL	SL	SL
A01	04/08/21	Issue for 50% RD	TCL	EL	SL	SL

ORIG SIZE A1

0 10 20 30 40 50 100mm
AT ORIGINAL PLOT SIZE

CAD DRAWING PATHNAME S:\JOB-LIVE\M2012\08 Doc\08-08 CAD\NORANDA\RVT\25-B-286-LA0001_details.rvt

MEL CONNX

REFERENCES

SCALE
1 : 10 (@ A1)

DATUM
HORIZONTAL: PCG2020
VERTICAL: AHD71

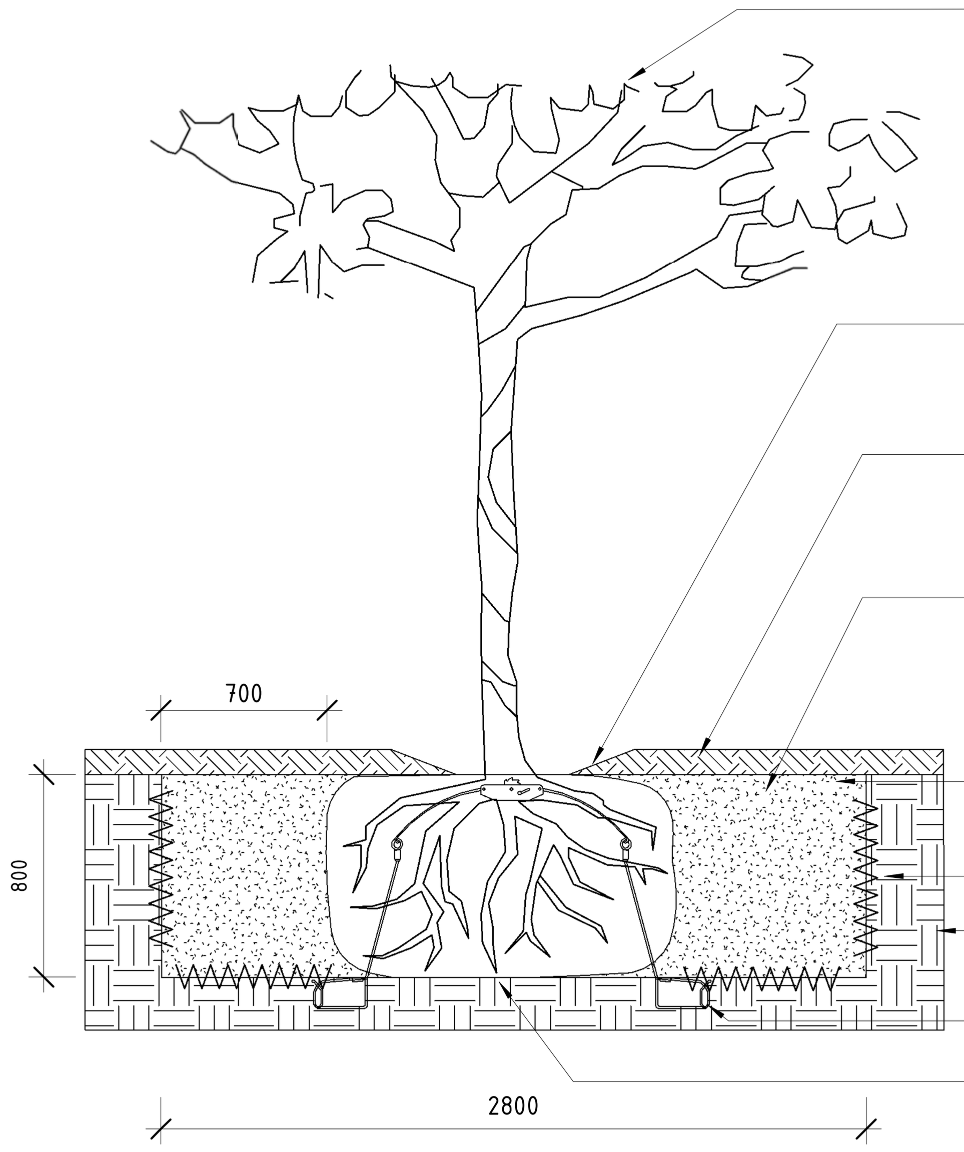
DESIGNED UDLA & TCL
DRAWN Enoch Liew
CHECKED Scott Lang
APPROVED Manoj Aravind
DATE 12/11/21

Government of Western Australia
Public Transport Authority

MORLEY ELLENBROOK LINE

NORANDA STATION - LANDSCAPING
LANDSCAPE DETAILS - SOFTSCAPE

PTA Drawing No: 25-A-286-LA0128 Rev: A



1500L Tree
To be central to planting hole and vertical
Refer Planting Plans

Ensure mulch is kept away from trunk, form slope in mulch for watering

100mm Depth Mulch
As specified

Excavate planting hole to double width of root ball of plant.
Backfill with cultivated soil, fertiliser, soil additive.

Soil Conditioner 30% of tree container size, cultivated well into existing soil.

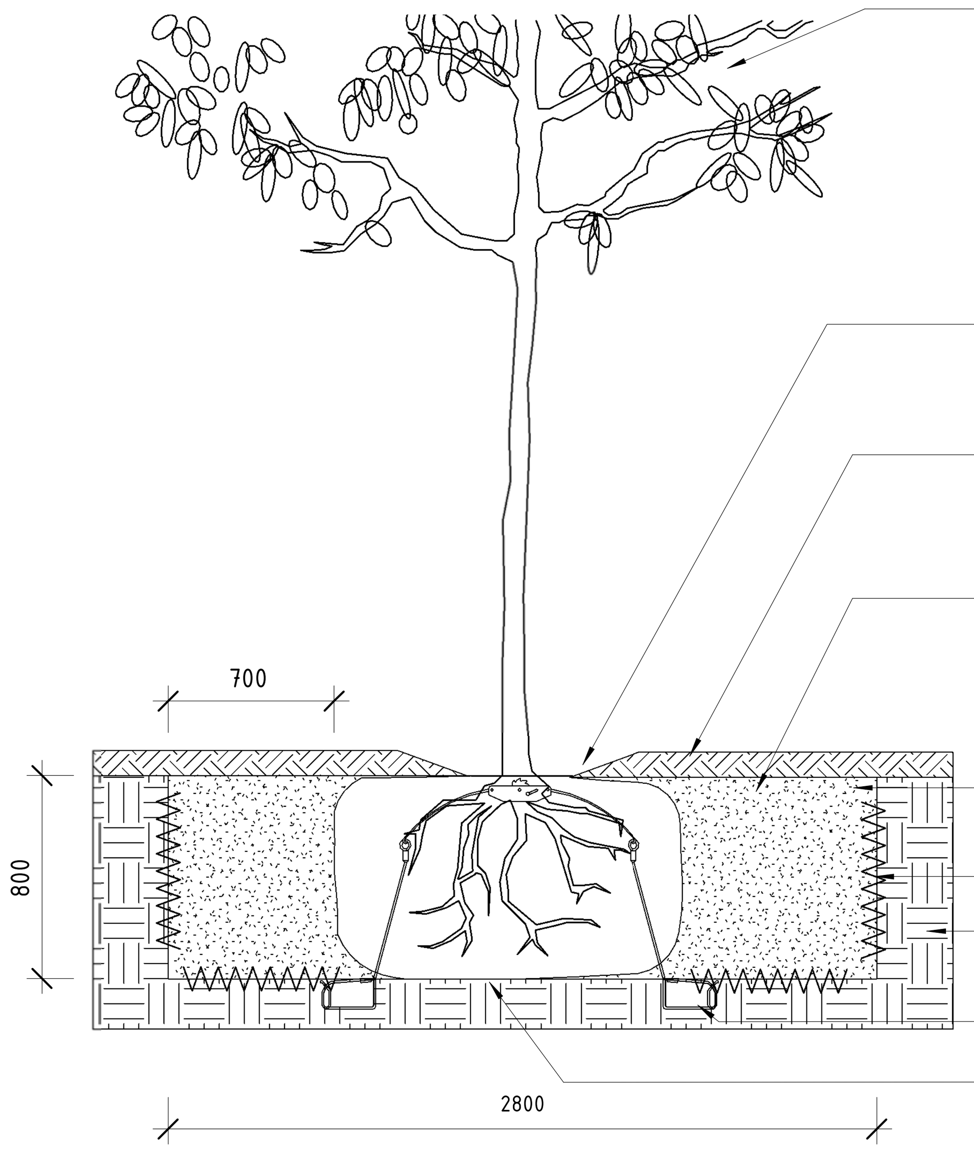
Break up side, base 100mm as shown

Existing Subgrade

Tree Anchors
Install as per manufacturer specification

Existing Subgrade, undisturbed

1 T1-00A
1 : 25



500L Tree
To be central to planting hole and vertical
Refer Planting Plans

Ensure mulch is kept away from trunk, form slope in mulch for watering

100mm Depth Mulch
As specified

Excavate planting hole to double width of root ball of plant.
Backfill with cultivated soil, fertiliser, soil additive.

Soil Conditioner 30% of tree container size, cultivated well into existing soil.

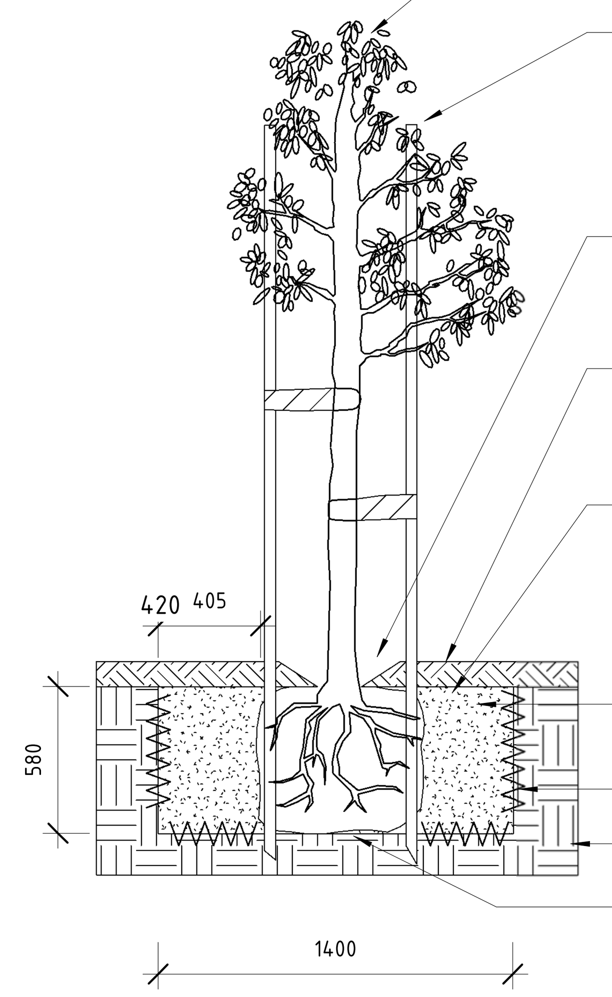
Break up side, base 100mm as shown

Existing Subgrade

Tree Anchors
Install as per manufacturer specification

Existing Subgrade, undisturbed

2 T2-00A
1 : 25



200L Tree
To be central to planting hole and vertical
Refer Planting Plans

2 x 2-3000mm x 50mm x 50mm hardwood stakes painted black, embedded 600mm deep, 300mm away from trunk.
Tie tree to stakes with 2 rubber or plastic ties

Ensure mulch is kept away from trunk, form slope in mulch for watering

100mm Depth Mulch
As specified

Excavate planting hole to double width of root ball of plant.
Backfill with cultivated soil, fertiliser, soil additive.

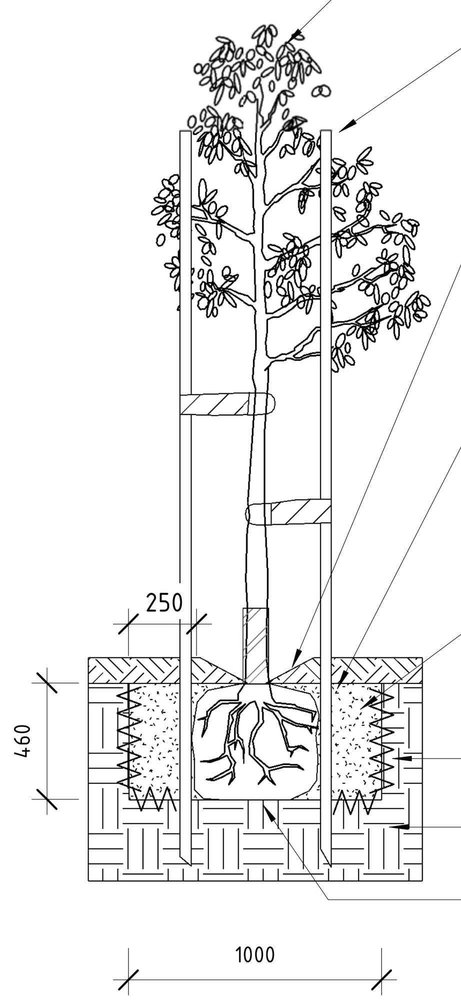
Soil Conditioner 30% of tree container size, cultivated well into existing soil.

Break up side, base 100mm as shown

Existing Subgrade

Existing Subgrade, undisturbed

3 T3-00A
1 : 25



100L Tree
To be central to planting hole and vertical
Refer Planting Plans

2 x 2-3000mm x 50mm x 50mm hardwood stakes painted black, embedded 600mm deep, 300mm away from trunk.
Tie tree to stakes with 2 rubber ties or approved equivalent

100mm Depth Mulch as specified.
Ensure mulch is kept away from trunk, form slope in mulch for watering.

Excavate planting hole to double width of root ball of plant.
Backfill with cultivated soil, fertiliser, soil additive.

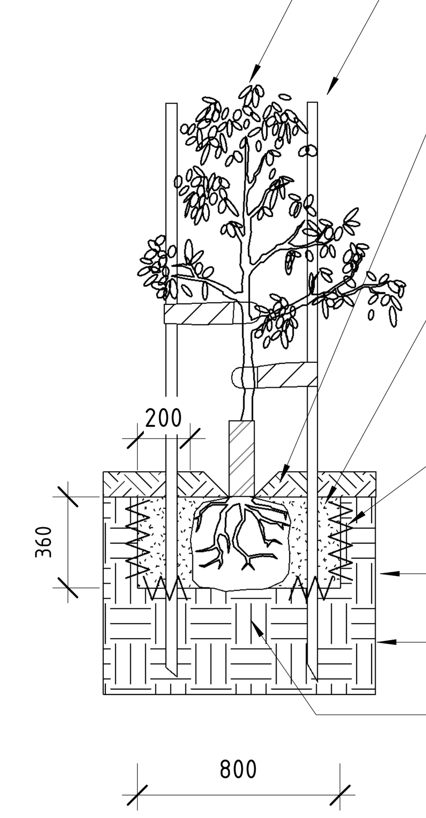
Soil Conditioner 30% of tree container size, cultivated well into existing soil.

Break up side, base 100mm as shown

Existing Subgrade

Existing Subgrade, undisturbed

4 T4-00A
1 : 25



45L Tree
To be central to planting hole and vertical
Refer Planting Plans.

2 x 2-3000mm x 50mm x 50mm hardwood stakes painted black, embedded 600mm deep, 300mm away from trunk.
Tie tree to stakes with 2 rubber ties or approved equivalent.

100mm Depth Mulch as specified.
Ensure mulch is kept away from trunk, form slope in mulch for watering

Excavate planting hole to double width of root ball of plant.
Backfill with cultivated soil, fertiliser, soil additive.

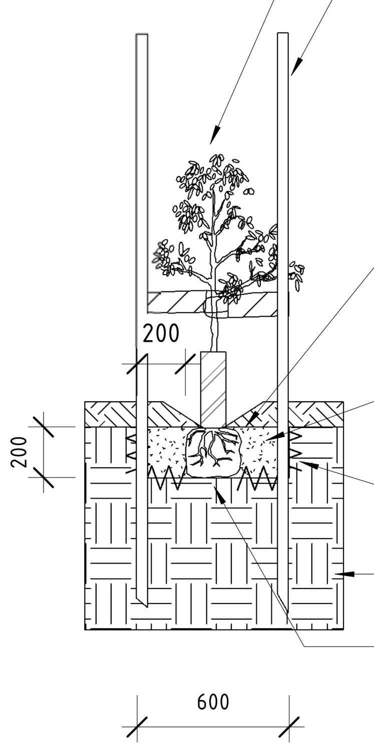
Soil Conditioner 30% of tree container size, cultivated well into existing soil.

Break up side, base 100mm as shown

Existing Subgrade

Existing Subgrade, undisturbed

5 T5-00A
1 : 25



5L Tree
To be central to planting hole and vertical
Refer Planting Plans.

2 x 1.8-2400mm x 50mm x 50mm hardwood stakes painted black, embedded 600mm deep, 300mm away from trunk.
Tie tree to stakes with 2 rubber ties or approved equivalent.

Excavate planting hole to double width of root ball of plant.
Backfill with cultivated soil, fertiliser, soil additive.

Soil Conditioner 30% of tree container size, cultivated well into existing soil.

Break up side, base 100mm as shown

Existing Subgrade

Existing Subgrade, undisturbed

6 T6-00A
1 : 25

PRELIMINARY ONLY
NOT FOR CONSTRUCTION

Model Rev:A10 Issued:12.11.21

REV	DATE	AMENDMENT	DSN	DRN	CHK	APP
A	12/11/21	Issue for 100% RD	TCL	EL	SL	SL
A04	04/11/21	Issue for RD	TCL	EL	SL	SL
A03	30/09/21	Issue for IDC	TCL	EL	SL	SL
A02	02/09/21	Issue for IDC	TCL	EL	SL	SL
A01	04/08/21	Issue for 50% RD	TCL	EL	SL	SL

ORIG SIZE A1
0 10 20 30 40 50 100mm
AT ORIGINAL PLOT SIZE

REFERENCES

SCALE 1 : 25 (@ A1)

DATUM
HORIZONTAL: PCG2020
VERTICAL: AHD71

DESIGNED UDLA & TCL
DRAWN Enoch Liew
CHECKED Scott Lang
APPROVED Manoj Aravind
DATE 12/11/21

Government of Western Australia Public Transport Authority

MORLEY ELLENBROOK LINE

NORANDA STATION - LANDSCAPING
LANDSCAPE DETAILS - SOFTSCAPE

PTA Drawing No: 25-A-286-LA0129 Rev: A

CAD DRAWING PATHNAME S:\JOB-LIVE\M2012\08 Doc\08-08 CAD\NORANDA\RVT\25-B-286-LA0001_details.rvt

MORLEY ELLENBROOK LINE (MEL) - STATION & PRECINCT - ARCHITECTURAL MASTER MATERIALS SCHEDULE

DOC NO:	**MEL-MLCX-AR-SCH-00007**						**13/08/2021**
STATION:	**NORANDA STATION**						**REV - B02**
CODE	ITEM	LOCATION	DESCRIPTION		IMAGE	NOTES	SWTC
ACCESSORIES (AC)							
AC:01	Not in Use						
AC:02	Accessible Grab Rail - Right / Left Hand	DDA Accessible Toilets - All stations	Manufacturer: Description: Model: Size: Finish:	Britex or equivalent Vandal Resistant SS Backrest w 90deg RHS Grab Rail Set BTX-BRC-R90_VR 870x700 140 Deg Grab Rail Satin Stainless Steel			
AC:03	Accessible Grab Rail - Straight	DDA Accessible Toilets - All stations	Manufacturer: Description: Model: Size: Finish:	Britex or equivalent 450mm SS Grab Rail Straight Concealed BTR-01-038 450mm L Satin Stainless Steel			
AC:04	Ambulant Grab Rail - Right / Left Hand	Ambulant Toilets - All stations	Manufacturer: Description: Model: Size: Finish:	Britex or equivalent SS 90deg Ambulant Grab Rail BTR-01-058 450 x 450 Satin Stainless Steel			
AC:05	Toilet Roll Holder	All public and staff toilets - All stations	Manufacturer: Description: Model: Size: Finish:	Britex or equivalent SS Jumbo Roll Toilet Tissue Dispenser BTX-06-046 273 x 273 x 120 304 Satin Stainless Steel			
AC:06	Clothes Hook	All staff toilets - All stations	Manufacturer: Description: Model: Size: Finish:	Britex or equivalent SS Double Robe Hook BTX-10-035 100 x 52 x 52 Satin Stainless Steel			
AC:07	Paper Towel Dispenser	All public and staff toilets - All stations	Manufacturer: Description: Model: Size: Finish:	Britex or equivalent Recessed Paper Towel Dispenser w 19L Waste Receptacle BTX-03-012 1397 x 333 x 115 Satin Stainless Steel			
AC:08	Shower Curtain Track	All shower areas: - All stations	Manufacturer: Description: Model: Size: Finish:	Argent or equivalent Shower Curtain Track Aluminium Kit RBA4177-1668 Polished Steel			

MORLEY ELLENBROOK LINE (MEL) - STATION & PRECINCT - ARCHITECTURAL MASTER MATERIALS SCHEDULE

DOC NO: **MEL-MLCX-AR-SCH-00007** **13/08/2021**

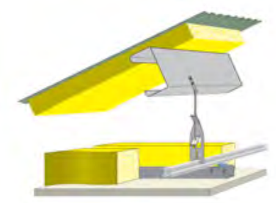
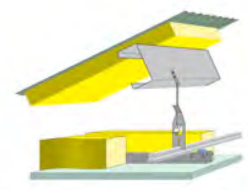
STATION: **NORANDA STATION** **REV - B02**

CODE	ITEM	LOCATION	DESCRIPTION		IMAGE	NOTES	SWTC
AC:09	Soap Dish Holder	All shower areas: - All stations	Manufacturer: Description: Model: Size: Finish:	Britex or equivalent Recessed HD Soap Dish SS BTX-05-017 188 x 152 x 63 Satin Stainless Steel			
AC:10	DDA Shower Seat	All shower areas: - All stations	Manufacturer: Description: Model: Size: Finish:	Britex or equivalent Accessible Folding Shower Seat with Support Legs BTX-11-014 960 x 410 x476 H. White Compact Laminate			
AC:11	Locker	Staff crib rooms: - All stations	Manufacturer: Description: Model: Size: Finish:	TBC			
AC:12	Baby change table	Parenting Room - All stations	Manufacturer: Description: Model: Size: Finish:	Britex or equivalent Stainless Steel Baby Change Tables BTX-09-013 Recessed mounted 940 x 590. Stainless steel with HDPE interior			
CLADDING (CD)							
CD:01	Aluminium Cladding - Standing seam steel wall cladding with concealed fixing	Cladding to external façade: - Malaga - Morley - Noranda - Whiteman Park Services Buildings	Material: Thickness: Finish: Fixing: Product: Manufacturer: Panel size:	Aluminium sheet cladding 3mm Colourbond. Colour: TBC Concealed clip fixings to structural tophats or studs fixed to block wall, to Manufacturer's requirements. LONGLINE 305 or similar approved Thickness: 0.70BMT Lysaght 2400 x 1150mm		Attributes: - Fire resistant, deemed non-combustible to AS1530.1 - High durability - anti-scratch, impact resistant - UV Stable - Graffiti resistant Sustainability: - TBC	
CD:02	Compressed Fibre Cement Cladding - Façade	Cladding to internal façade of station accommodation: - Malaga - Morley - Noranda - Whiteman Park	Material: Thickness: Finish: Fixing: Product: Manufacturer: Panel size:	Compressed fibre cement board. TBC Flush finish, painted Direct fixing to wall studs with sarking membrane ExoTec or equivalent BlueChip Group or equivalent 2400 x 1200mm			
CD:03	Fibre Cement Sheet Capping	Capping to all exposed steel structural columns: - All stations	Material: Thickness: Finish: Fixing: Product: Manufacturer: Panel size:	Pre-finished Fibre Cemenet panel 12mm PVDF Fluoropolymer coating system Colour: TBC Exposed colour matched screws or rivets fixed to welded angles to steel columns, to Manufacturer's requirements. Ultrapearl or similar approved BlueChip Group or equivalent 2400 x 1150mm		Attributes: - Fire resistant, deemed non-combustible to AS1530.1 - High durability - anti-scratch, impact resistant - Low Maintenance - UV Stable - Graffiti resistant Sustainability: - TBC	

MORLEY ELLENBROOK LINE (MEL) - STATION & PRECINCT - ARCHITECTURAL MASTER MATERIALS SCHEDULE

DOC NO: MEL-MLCX-AR-SCH-00007 — 13/08/2021

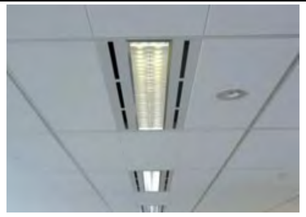
STATION: NORANDA STATION — REV - B02

CODE	ITEM	LOCATION	DESCRIPTION		IMAGE	NOTES	SWTC
CD:04	Not in Use						
CEILINGS & SOFFITS (CL)							
CL:01	Plasterboard ceiling	General ceilings to station accommodation: - All stations	Material: Thickness: Finish: Fixing: Product: Manufacturer: Panel size:	Standard gypsum plasterboard ceiling 13mm thk Flushed finish, painted PA:02 Rondo or similar furring channel suspension system Gyprock or equivalent CSR or equivalent 2400 X 1200mm		Flush access panels where required.	
CL:02	Moisture Resistant Plasterboard ceiling	Ceilings to wet areas: - Public and Staff Bathrooms: - All stations	Material: Thickness: Finish: Fixing: Product: Manufacturer: Panel size:	Moisture resistant gypsum plasterboard ceiling 13mm thk Flushed finish, painted PA:02 Rondo or similar furring channel suspension system Gyprock Aquachek or equivalent CSR or equivalent 2400 X 1200mm		Flush access panels where required.	
CL:03	Fire rated self-supporting ceiling system	Electrical and Services rooms: - All stations	Material: FRL: Finish: Fixing: Product: Manufacturer: Panel size:	Fyrchek FR plasterboard FRL 120/120/120 from both sides Painted PA:02. Fixed to 150 steel joists, as per system requirements Gyprock Fyrchek or equivalent CSR or equivalent 2400 x 1200mm		Joints and gaps to be fully sealed with FR sealant to achieve required FRL.	
CL:04	Profiled Colorbond steel cladding	Ceiling below pedestrian bridge at entrance building: - Malaga - Noranda	Material: Thickness: Finish: Fixing: Product: Manufacturer: Panel size:	Ribbed steel sheet metal cladding with low fluted profile. Nom. 0.42BMT, 4mm profile Colourbond coated, Colour: Basalt grey Face fixed with Tek screws with washers to sub framing Panel Rib or equivalent Lysaght or equivalent Custom L x 850mm W		Attributes: - Fire resistant, deemed non-combustible to AS1530.1 - Colorbond - high durability - Low maintenance - UV resistant Sustainability: - Recyclable	
CL:05	Fire rated suspended ceiling system	Ceiling to Store & Cleaners Rooms below Staircases: - All stations	Material: FRL: Finish: Fixing: Product: Manufacturer: Panel size:	Fyrchek FR plasterboard FRL 120/120/120 from below Painted PA:02, if visible. Fixed to furring channels, as per system requirements Gyprock Fyrchek or equivalent CSR or equivalent 2400 x 1200mm		Joints and gaps to be fully sealed with FR sealant to achieve required FRL.	

MORLEY ELLENBROOK LINE (MEL) - STATION & PRECINCT - ARCHITECTURAL MASTER MATERIALS SCHEDULE

DOC NO: **MEL-MLCX-AR-SCH-00007** **13/08/2021**

STATION: **NORANDA STATION** **REV - B02**

CODE	ITEM	LOCATION	DESCRIPTION		IMAGE	NOTES	SWTC
CL:06	Timber-look Cladding	Soffits to Station roofs, Entrance buildings and bus canopies: - All stations	Material: Thickness: Finish: Fixing: Product: Manufacturer: Panel size:	Timber-look Cladding TBC TBC Standard fixing system to tophats & sarking behind TBC TBC TBC			
CL:07	Suspended grid ceiling	To Staff rooms - All stations	Material: Size: Finish: Suspension: Product: Manufacturer:	Mineral fibre ceiling panels 1200 mm L x 300mm W x 19mm or similar Pre-finished smooth non-directional white finish Suprafine XL grid Ultima Plank - bevelled tegulr edge or equivalent Armstrong Ceilings or equivalent			
CL:08	Timber-look battens	Station Concourse Soffits	Material: Thickness: Finish: Fixing: Product: Manufacturer: Panel size:	Timber-look Cladding TBC TBC TBC TBC TBC TBC			
CONCRETE ENGINEERING (CE) - FINISHES ONLY							
CE:01	Prefabricated formwork concrete staircases	Concrete Staircases - All stations	Material: Thickness: Finish: Tread: Product: Manufacturer: Size:	Precast concrete staircase with permanent steel formwork As per Manufacturer's requirements Painted and galvanized Tiled with stair nosings to AS1428.1 Fast Tread or equivalent FTI Group or equivalent As per drawings		To comply with Luminance Contrast requirement of AS1428.1 for treads and risers.	
CE:02	Concrete Roof Slab	TBC	Material: Thickness: Finish: Fixing: Product:	TBC			
CE:03	Precast Concrete	Viaduct Structures - Whiteman Park Station	Material: Thickness: Finish: Fixing: Product:	TBC			
CASEWORK (CW)							
CW:01	Kitchenette	Staff & Driver's Crib - All stations	Material: Finish: Product: Manufacturer: Size: Colour:				

MORLEY ELLENBROOK LINE (MEL) - STATION & PRECINCT - ARCHITECTURAL MASTER MATERIALS SCHEDULE

DOC NO:	**MEL-MLCX-AR-SCH-00007**					**13/08/2021**	
STATION:	**NORANDA STATION**					**REV - B02**	
CODE	ITEM	LOCATION	DESCRIPTION		IMAGE	NOTES	SWTC
CW:02	Work Station	Staff Crib - All stations	Material: Thickness: Finish: Fixing: Product: Manufacturer: Panel size:	TBC			
CW:03	L-Shape Workstation	CSO - All stations	Material: Thickness: Finish: Fixing: Product: Manufacturer: Panel size:	TBC			
DOORS (DR)							
DR:01	Security roller grille	Concourse Secure Line Gate - All stations	Material: Thickness: Finish: Operation: Locking: Product: Manufacturer:	Steel roller grille shutter - heavy duty commercial for external applications 16mm dia.x 1.2mm galv steel tubes sleeved with 20mm dia x 1.2mm aluminium tube at 90mm ctrs, linked with 3mm steel links at 208mm ctrs in brick pattern. Anodized aluminium Motorized or chain operated with overhead roller drum & guides Motor locked or shootbolt mechanism Steel Roller Grille Airport Doors or equivalent Max. 8m W x 4.2m H		Attributes: - Heavy duty - Maximum vision and ventilation - Motorized operation Sustainability: - recyclable	
DR:02	Single Doors - Non FR	Standard doors to operational rooms (non-Fire Rated): - All stations	Material: FRL: Thickness: Frame: Finish: Acoustics: Locking: Product: Manufacturer: Size:	Flush panel solid-core timber doors n/a TBC Aluminium door frames TBC To Acoustic requirements To Security requirements Pyropanel non-FR doors or equivalent Pyropanel or equivalent As per drawings and AS1428.1 requirements		To comply with Luminance Contrast requirement of AS1428.1.	
DR:03	Single Doors - Glazed	Glazed door to CSO's: - All stations	Material: Glass: Thickness: Frame: Finish: Acoustics: Locking: Product: Manufacturer: Size:	Steel frame door with full glazed panel. Clear Grade A safety glass with protective film to AS1288 & SWTC requirements TBC Aluminium door frames TBC To Acoustic requirements To Security requirements TBC TBC As per drawings and AS1428.1 requirements		To comply with Luminance Contrast requirement of AS1428.1.	

MORLEY ELLENBROOK LINE (MEL) - STATION & PRECINCT - ARCHITECTURAL MASTER MATERIALS SCHEDULE

DOC NO:	**MEL-MLCX-AR-SCH-00007**		**13/08/2021**
STATION:	**NORANDA STATION**		**REV - B02**

CODE	ITEM	LOCATION	DESCRIPTION		IMAGE	NOTES	SWTC
DR:04	Single Doors - FR	Fire rated doors to electrical & store rooms: - All stations	Material: FRL: Thickness: Frame: Finish: Acoustics: Locking: Product: Manufacturer: Size:	Flush panel solid-core timber doors To suit wall FRL requirements TBC Pressed steel door frames (FR) TBC To Acoustic requirements To Security requirements Pyropanel FR doors or equivalent Pyropanel or equivalent As per drawings and AS1428.1 requirements		To comply with Luminance Contrast requirement of AS1428.1.	
DR:05	Louvered Doors	Louvered doors to mechanical rooms: - All stations	Material: FRL: Thickness: Frame: Finish: Acoustics: Locking: Product: Manufacturer: Size:	Aluminium doors with louvered panels n/a TBC Aluminium door frames TBC To Acoustic requirements To Security requirements TBC TBC As per drawings and AS1428.1 requirements		To comply with Luminance Contrast requirement of AS1428.1.	
DR:06	Double Doors - Non FR	Standard doors to operational rooms (non-Fire Rated) - All stations	Material: FRL: Thickness: Frame: Finish: Acoustics: Locking: Product: Manufacturer: Size:	Flush panel solid-core timber doors n/a TBC Aluminium door frames TBC To Acoustic requirements To Security requirements Pyropanel non-FR doors or equivalent Pyropanel or equivalent As per drawings and AS1428.1 requirements		To comply with Luminance Contrast requirement of AS1428.1.	
DR:07	Roller shutter with vision panels	Kiosks - All stations	Material: FRL Thickness: Finish: Operation: Locking: Product: Manufacturer: Size:	Fire rated interlocking steel slat roller shutter 2 hours FRL to Fire Engineer's requirements 75mm H x 18mm D x 1.0mm thk roll-formed steel slats. Powder coated Steel Motorized with overhead roller drum & guides Motor locked or shootbolt mechanism 2HR Fire Shutter Airport Doors or equivalent Max. 8.0m W x 5.0m H		Attributes: - Certified integrity for 2hr fire rated - Controlled descent mechanism Sustainability: - Recyclable	
DR:08	Fire Hydrant Cabinet Doors	Concourse areas - All stations	Material: FRL: Thickness: Frame: Finish: Acoustics: Locking: Product: Manufacturer: Size:	Flush panel solid-core timber or metal doors n/a TBC Aluminium door frames TBC n/a To Security requirements Pyropanel non-FR doors or equivalent Pyropanel or equivalent As per drawings and AS1428.1 requirements		DFES signage to be provided for ease of identification of Hydrant cabinets.	
EQUIPMENT (EQ)							

DOC NO:	MEL-MLCX-AR-SCH-00007						13/08/2021
STATION:	NORANDA STATION						REV - B02
CODE	ITEM	LOCATION	DESCRIPTION		IMAGE	NOTES	SWTC
EQ:01	Lighting poles - Mid-hinge type	Platform level - All stations	Material: Finish: Locking: Product: Manufacturer: Size:	Mid-hinged (breakback) lighting poles in CHS or tapered octagonal profile to Electrical Engineer's specifications. Powder coated Tamper & vandal resistant fixings & locks. Mid Hinged Poles & Columns G&S Industries or equivalent To Lighting & Electrical Engineer's requirements.			
EQ:02	Public telephone	Concourse unpaid zone: - All stations	Product: Manufacturer: Finish: Numbers:	TBC TBC Stainless steel To PTA SWTC requirements		At least one accessible telephone shall be an accessible type as prescribed in AS1428.2 1992 Clause 30.1. The accessible telephone shall be fitted with volume control and an in-built hearing aid coupler and identified with the international symbol for deafness.	
EQ:03	Bike Racks	Bicycle storage racks - All stations	Material: Finish: Product: Manufacturer: Size:	Tow-tier bicycle racking system Powder coated Easy-lift bicycle rack or equivalent VelopA or equivalent To suit bicycle numbers required			
EQ:04	Drink fountains	Concourse area: - All stations	Material: Finish: Product: Manufacturer: Size:	Stainless steel Satin 304 stainless steel finish Dado Round Double Drinking Fountain Britexor equivalent 1000 x 490		Dual mounting heights. AS1428 Compliant.	
EQ:05	Hand dryers	Staff & UAT Toilets - all stations	Material: Finish: Product: Manufacturer: Size:	Stainless steel Linished No.4 finish Airblade V Dyson or equivalent TBC		Not what has been specified in the Room Data Sheet.	
EQ:06	Hand dryers	Staff & UAT Toilets - all stations	Material: Finish: Product: Manufacturer: Size:	Stainless steel Linished No.4 finish Airblade V Dyson or equivalent TBC			
EQ:07	Fridge	Staff & Driver's Crib - All Stations	Material: Finish: Product: Manufacturer: Size:	TBC TBC TBC TBC TBC			

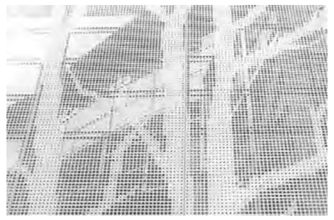
MORLEY ELLENBROOK LINE (MEL) - STATION & PRECINCT - ARCHITECTURAL MASTER MATERIALS SCHEDULE

DOC NO: MEL-MLCX-AR-SCH-00007 | 13/08/2021

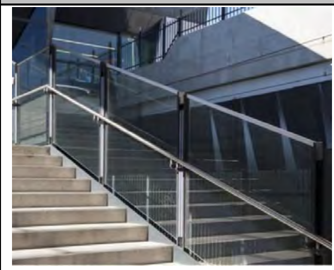
STATION: NORANDA STATION | REV - B02

CODE	ITEM	LOCATION	DESCRIPTION		IMAGE	NOTES	SWTC
EQ:08	Microwave	Staff & Driver's Crib - All Stations	Material: Finish: Product: Manufacturer: Size:	TBC TBC TBC TBC TBC			
EQ:09	Television	Staff Crib - All stations	Material: Finish: Product: Manufacturer: Size:	TBC TBC TBC TBC TBC			
EQ:10	Computer	Staff Crib & Office - All stations	Material: Finish: Product: Manufacturer: Size:	TBC TBC TBC TBC TBC			
EQ:11	Ticket Machine	Concourse area: - All stations	Material: Thickness: Finish: Fixing: Product: Manufacturer: Panel size:	TBC			
EQ:12	ATM Machine	Concourse area: - All stations	Material: Thickness: Finish: Fixing: Product: Manufacturer: Panel size:	TBC			
FURNITURE (FN)							
FN:01	Dining Table	Staff Crib - All stations	Material: Finish: Product: Manufacturer: Size: Colour:				
FN:02	Dining Chairs	Staff Crib - All stations	Material: Finish: Product: Manufacturer: Size: Colour:				

MORLEY ELLENBROOK LINE (MEL) - STATION & PRECINCT - ARCHITECTURAL MASTER MATERIALS SCHEDULE

DOC NO:	**MEL-MLCX-AR-SCH-00007**					**13/08/2021**	
STATION:	**NORANDA STATION**					**REV - B02**	
CODE	ITEM	LOCATION	DESCRIPTION		IMAGE	NOTES	SWTC
FN:03	Work Table	Staff Crib - All stations	Material: Finish: Product: Manufacturer: Size: Colour:	 600(w) x 1500(l) 			
FN:04	Office Chairs	Staff Crib - All stations	Material: Finish: Product: Manufacturer: Size: Colour:				
FLOOR COVERINGS (FC)							
FC:01	Anti-static Sheet vinyl flooring	Staff Crib / Transit Guard Booth - CSO: - All stations	Material: Finish: Product: Manufacturer: Size: Colour:	Slip resistant Vinyl sheets flooring with matching skirting. P4 / R11 Slip resistance, Anti-static to services rooms Safeguard R12 or sim. equivalent. Armstrong Flooring or equivalent 2m x 20m x 2.00mm gauge sheet Slate		Vinyl flooring to suit specific area of use. To comply with DDA accessibility requirements.	
FABRICATED METALWORK (FM)							
FM:01	Perforated Aluminium Vertical Screening with Artwork Graphic by Artist	Concourse edge screening & Entrance building: - Noranda Platform level screening: - Whiteman Park	Material: Thickness: Finish: Pattern: Product: Manufacturer: Size: Colour:	Perforated solid aluminium panel. 3 - 4mm thick Anodized or Interpon D2525 powder coating Graphic perforations (<5mm diameter for safety). Pic Perf or equivalent Locker Group or equivalent 2440mm x 1220mm std TBC			
FM:02	Angled perforated vertical screening with Artwork Graphic by Artist	Concourse level, including Entrance Building bridge screening: - Malaga	Material: Thickness: Finish: Pattern: Product: Manufacturer: Size: Colour:	Perforated solid aluminium panel. 3 - 4mm thick Anodized or Interpon D2525 powder coating Standard perforations (<5mm diameter for safety). To be flat panels fixed to angled frames to create a 3D effect. Perforated Locker Group or equivalent 2440mm x 1220mm std; full height of opening TBC			
FM:03	Metal Screening	Barriers that are located adjoining vertical drops - All stations	Material: Thickness: Finish: Pattern: Product: Manufacturer: Size: Colour:	Perforated solid aluminium panel. 3 - 4mm thick Anodized or Interpon D2525 powder coating Standard perforations (<5mm diameter for safety). Perforated Locker Group or equivalent 2440mm x 1220mm std; 2400mm height TBC			

MORLEY ELLENBROOK LINE (MEL) - STATION & PRECINCT - ARCHITECTURAL MASTER MATERIALS SCHEDULE

DOC NO:	MEL-MLCX-AR-SCH-00007						13/08/2021
STATION:	NORANDA STATION						REV - B02
CODE	ITEM	LOCATION	DESCRIPTION		IMAGE	NOTES	SWTC
FM:04	Glass balustrades with stainless steel stanchions & LED handrails	Concourse voids, staircases and lift areas: - Malaga - Morley - Noranda - Whiteman Park	Material: Thickness: Finish: Protection: Handrail: Product: Manufacturer:	Grade A clear laminated safety glass sealed to 900 H Grade 316 stainless steel plate stanchions at 1200 - 1500 ctrs. Glass: TBC Stanchions: Nom. 8mm thk. No.4 /Linished /Hairline finish 3M Anti-Graffiti film AG-6 to inside face of glass. Nom. 42 dia. stainless steel with LED lighting Forrest range or equivalent Lumorail or equivalent			
FM:05	Handrails - with LED lighting	DDA Accessible areas: - All stations	Material: Fixing: Size: Finish: Product: Manufacturer:	Side mounted stainless steel handrails with LED lighting Bracket mounted to walls, posts and screening frames. Nom. 42mm dia. stainless steel circular rail Satin finish with 300mm section of yellow high visibility paint to ends. Forrest range Lumorail or equivalent			
FM:06	Not in Use						
FM:07	Weather protection glazed screens	Platforms, bust waiting areas - All stations	Material: Glass: Size: Finish: Product:	Steel RHS framing with glazed screen infill GL:03 As per drawings Linished No.4 Custom			
FM:08	Perforated Metal Cladding	Side of viaduct structure. - Whiteman Park					
FIRE PROTECTION (FP)							
FP:01	Fire Protection - Structural Steelwork	Structural steelwork - All stations	Material: Thickness: Finish: Product: Manufacturer:	Vermiculite Gypsum Based wet mix spray or Intumescent Paint To meet required FRL n/a CAFCO or equivalent, to Structural Engineer's specifications Promat or equivalent			
FP:02	Fire collars	Penetrations through suspended slabs: - Morley - Malaga - Noranda - Whiteman Park	Material: FRL: Product: Manufacturer:	Penetration Seals for Pipes As per floor FRL requirements Promaseal Retrofit Collar or equivalent PROMAT or equivalent			
GLAZING (GL)							

MORLEY ELLENBROOK LINE (MEL) - STATION & PRECINCT - ARCHITECTURAL MASTER MATERIALS SCHEDULE

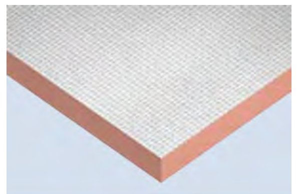
DOC NO: **MEL-MLCX-AR-SCH-00007** **13/08/2021**

STATION: **NORANDA STATION** **REV - B02**

CODE	ITEM	LOCATION	DESCRIPTION		IMAGE	NOTES	SWTC
GL:01	Laminated Safety Glass - Glazed Windows and Doors	CSO, Offices and Rooms: - All stations	Material: Thickness: Colour: Framing: Fixing: ESD: Product: Glass Manufacturer: Panel size: Protection:	Clear laminated Grade A safety glass Nom. 17.52thk. TBC by Structural Engineer & to AS1288. Clear Aluminium - anodized Gasket or sealant within glazing pockets All Glazed Elements SHGC: 0.80 to ESD requirements. Laminated safety glass Cooling Brothers or equivalent Nom. 1200 - 1500mm W. 3M Anti-Graffiti film AG-6 to public face of glass.		All glass protected from graffiti by using an anti-graffiti film of 0.6mm, applied on the side that is prone to public reach.	
GL:02	Fritted Laminated Safety Glass - Skylights	Station and Platform roof skylights - All stations	Material: Thickness: Colour: Framing: Fixing: ESD: Product: Glass Manufacturer: Panel size:	Clear laminated Grade A safety glass Nom. 17.52thk. TBC by Structural Engineer & to AS1288 for trafficability. Clear with 75% solid white dot-matrix ceramic frit pattern. Aluminium - anodized Gasket or structural silicone sealant. All Glazed Elements to ESD and NCC Section J requirements. Laminated safety glass Cooling Brothers or equivalent Nom. 1200 - 1500mm W.			
GL:03	Laminated Safety Glass - Glazed Screens	Protective glass shelters & screens - All platforms Concourse edge - Malaga - Morley	Material: Thickness: Colour: Framing: Fixing: ESD: Product: Glass Manufacturer: Panel size: Protection:	Clear laminated Grade A safety glass Nom. 17.52thk. TBC by Structural Engineer & to AS1288. Clear Aluminium - anodized Gasket or sealant within glazing pockets n/a Laminated safety glass Cooling Brothers or equivalent Nom. 1200-1500mm W. x 2400mmH 3M Anti-Graffiti film AG-6 to public face of glass.			
GL:04	Laminated safety Glass - Lift Enclosure	Glass lifts - Morley - Malaga - Noranda - Whiteman Park	Material: Thickness: Colour: Framing: Fixing: ESD: Product: Glass Manufacturer: Panel size: Protection:	Clear laminated Grade A safety glass Nom. 17.52thk. TBC by Structural Engineer & to AS1288. Clear Stainless steel - Linished No.4 finish Gasket or sealant within glazing pockets All Glazed Elements SHGC: 0.80 to ESD requirements. Laminated safety glass Cooling Brothers or equivalent Nom. 1200 - 1500mm W. 3M Anti-Graffiti film AG-6 to public face of glass.			
INSULATION (IN)							

MORLEY ELLENBROOK LINE (MEL) - STATION & PRECINCT - ARCHITECTURAL MASTER MATERIALS SCHEDULE

DOC NO:	**MEL-MLCX-AR-SCH-00007**		**13/08/2021**
STATION:	**NORANDA STATION**		**REV - B02**

CODE	ITEM	LOCATION	DESCRIPTION		IMAGE	NOTES	SWTC
IN:01	Roof thermal insulation	Station & Accommodation roofs: - All stations	Material: Thickness: Fixing: ESD: Product: Manufacturer:	Rockwool Anticon insulation with HD Thermofoil or equivalent Nom. 60mm, TBC by ESD Engineer With Safebridge HP roof insulation system on mesh R-Value TBC by ESD Engineer Bradford or equivalent CSR or equivalent			
IN:02	Bulk Ceiling insulation	Ceilings: - All stations	Material: Thickness: Fixing: ESD: Acoustics: Product: Manufacturer:	Rockwool Anticon insulation with HD Thermofoil or equivalent Nom. 60mm, TBC by ESD Engineer With Safebridge HP roof insulation system on mesh R-Value TBC by ESD Engineer Rw TBC by Acoustic Engineer Bradford or equivalent CSR or equivalent			
IN:03	Wall and partition insulation	Accommodation building: - All stations	Material: Thickness: Fixing: ESD: Acoustics: Product: Manufacturer:	Rockwool Acoustigard insulation 11kg or equivalent Nom. 75 thk - TBC by ESD Engineer Laid within drywall partition between studs R-Value TBC by ESD Engineer Rw TBC by Acoustic Engineer Bradford or equivalent CSR or equivalent			
IN:04	Rigid Under slab Insulation	Elevated Concourse - Malaga - Morley - Noranda - Whiteman Park	Material: Thickness: Fixing: ESD: Acoustics: Product: Manufacturer:	Kooltherm K10 FM rigid insulation board w foil face or equivalent Nom. 75 thk - TBC by ESD Engineer Mushroom head fixing pins to underside of slab R-Value TBC by ESD Engineer n/a Kooltherm K10 FM Soffit Board or equivalent Kingspan or equivalent			
LOUVRES (LV)							
LV:01	Ventilation Louvers - Rain Defence	Mechanical rooms, electrical rooms, etc: - All stations	Material: Finish: Product: Manufacturer: Size:	Two stage aluminium louvers within aluminium framing Aluminium, anodized RSH-5700 Storm Resistant Louvre with 50mm blade pitch. Louvre performance TBC to Mechanical Engr's requirements CS Louvers or equivalent 1200mm W panels, as per drawing			
LV:02	Ventilation Louvers - Non rain defence	Protected mechanical rooms - All stations	Material: Finish: Product: Manufacturer: Size:	Single stage aluminium louvers within aluminium framing Aluminium, anodized Louvre with 50mm blade pitch. Louvre performance TBC to Mechanical Engr's requirements CS Louvers or equivalent 1200mm W panels, as per drawing			

MORLEY ELLENBROOK LINE (MEL) - STATION & PRECINCT - ARCHITECTURAL MASTER MATERIALS SCHEDULE

DOC NO: MEL-MLCX-AR-SCH-00007 — 13/08/2021

STATION: NORANDA STATION — REV - B02

CODE	ITEM	LOCATION	DESCRIPTION		IMAGE	NOTES	SWTC
MASONRY (MA)							
MA:01a	Brick Wall	Entrance building - Noranda Station - Whiteman Park Service Building - Ellenbrook Station	Material: Finish: Mortar: Colour: Product: Manufacturer: Size: Protection:	Clay face brick commons Smooth face Class M3 and M4, Concave mortar joints Estilo Nero Azul (Dark Charcoal). Spanish Collection or equivalent Midland Brick or equivalent 230mm x 110mm x 76mm Clear anti-graffiti coating			
MA:01b	Brick Wall	Accommodation buildings - Ellenbrook Station Ancillary buildings - linewide precincts	Material: Finish: Mortar: Colour: Product: Manufacturer: Size: Protection:	Clay face brick commons Smooth face Class M3 and M4, Concave mortar joints Restoration Red Coach or equivalent Midland Reds or equivalent Midland Brick or equivalent 230mm x 110mm x 76mm Clear anti-graffiti coating			
METALWORK (MW)							
MW:01	Folded Metal Shroud	Concourse and Platform Skylight - All stations	Material: Thickness: Finish: Product: Manufacturer:	Folded solid aluminium sheet to conceal structural beams to skylight. 3mm PVDF Fluoropolymer coated finish to match other cladding elements. Mondoclad or equivalent TBC			Note: **Lower section of portal to be reinforced with backing board up to height of 1500mm for protection against impact damage.**
MW:02	Door and Wall opening portals	Concourse - All stations	Material: Thickness: Finish: Product: Manufacturer:	Nom. 510 x 50mm wide folded solid aluminium sheet to form portal around door frames and recessed concourse openings. 3mm PVDF Fluoropolymer coated finish to match door frames and other cladding elements. Mondoclad or equivalent TBC			
MW:03	Balustrade	Fare Gates		Proprietary framed glass balustrade system with base mounted glazing channel			
MW:04	Bench Seating	Platform seating - All stations and precinct	Material: Thickness: Finish: Product: Manufacturer:	Stainless Steel Seats as Per PTA standard design			Seats located in positions where the arrival of services can be observed, without affecting the general flow of pedestrians. Seats should not allow visitors access to higher levels (i.e. adjoining stair voids) If the perforated sheeting is to be used as a seat base there should be no low level framing to the front or rear of the unit (cleaning access). Materiality: Stainless-steel
MW:05	Bins	Precinct, platform and concourse levels - All stations	Material: Thickness: Finish: Product: Manufacturer:	Stainless Steel Bins as Per PTA standard design			The bin lid is locked in place to prevent removal of the liner. Materiality: Perforated, stainless steel outer and liner

MORLEY ELLENBROOK LINE (MEL) - STATION & PRECINCT - ARCHITECTURAL MASTER MATERIALS SCHEDULE

DOC NO: **MEL-MLCX-AR-SCH-00007** **13/08/2021**

STATION: **NORANDA STATION** **REV - B02**

CODE	ITEM	LOCATION	DESCRIPTION		IMAGE	NOTES	SWTC
MW:06	Service/ Refuge zones	Refuge zone railings - All stations	Material: Thickness: Finish: Product: Manufacturer:	Steel - hot dip galvanised safety fence			
MW:07	Steel staircase and railing	Platform level - All stations	Material: Thickness: Finish: Product: Manufacturer:	Mild steel - hot dip galvanised stair, grating and balustrade Nom 40 dia. rail Hot dipped galvanized finish Access Products or equivalent Webforge or equivalent			
MW:08	Not in Use						
MW:09	Not in Use						
MW:10	Safety Stair nosing	Concourse & Entrance Building Staircases - Malaga - Morley - Noranda - Whiteman Park	Material: Size: Finish: Product: Manufacturer:	Aluminium ribbed safety stair nosing 50mm Anodized, with 4 carborundum strips and safety yellow strip, R13 anti-slip rating. ProStep 5 or equivalent CTA Australia or equivalent		In compliance with Luminance Contrast requirement of AS1428.1.	
MW:11	Stainless steel mirror	Public toilets: - All stations	Material: Size: Finish: Product: Manufacturer:	Anti-vandal Polished stainless steel mirror 1000 x 450, High-polished No. 8 mirror finish Security Stainless Mirror or equivalent Anti-Vandal, anti-ligature, Disabled Compliant Britex -SMIR or equivalent			
PAINT (PA)							
PA:01	Paint to Metalwork	All stations and bus interchanges	Type: Product: Manufacturer: Colour:	Dulux high performance paint Weathermax HBR or equivalent Dulux or equivalent Black			
PA:02	Paint to Plasterboard Ceilings	All stations	Type: Product: Manufacturer: Colour:	Flat acrylic to plasterboard ceilings & bulkheads Dulux Porter's Ceiling Flat or equivalent Dulux or equivalent White			
PA:03	Anti Graffiti Coating	All stations	Type: Product: Manufacturer: Colour:	Anti graffiti coating SurfaceShield HD Clear or equivalent Dulux or equivalent TBC			

MORLEY ELLENBROOK LINE (MEL) - STATION & PRECINCT - ARCHITECTURAL MASTER MATERIALS SCHEDULE

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STATION: NORANDA STATION — REV - B02

CODE	ITEM	LOCATION	DESCRIPTION		IMAGE	NOTES	SWTC
PA:04	Paint to Interior Walls	All stations	Type: Product: Manufacturer: Colour:	Low Sheen acrylic to plasterboard Dulux Wash and Wear Low Sheen or equivalent Dulux or equivalent TBC			
PA:05	Paint to Exterior Walls	All stations	Type: Product: Manufacturer: Colour:	TBC TBC Dulux or equivalent TBC			
PA:06	Paint to Concrete	All stations	Type: Product: Manufacturer: Colour:	TBC TBC Dulux or equivalent TBC			
PA:07	Contrasting colour finish	All stations	Type: Product: Manufacturer: Colour:	TBC TBC Dulux or equivalent TBC			
PA:08	Bike Shelter paint	All stations	Type: Product: Manufacturer: Colour:	TBC TBC Dulux or equivalent TBC			
PA:09	Paint to Plasterboard Ceilings - Wet Areas	All stations	Type: Product: Manufacturer: Colour:	Flat acrylic to plasterboard ceilings & bulkheads Dulux Porter's Ceiling Flat or equivalent Dulux or equivalent White			
PARTITIONS & DRYWALLING (PD)							
PD:01	Standard partition	Accommodation building - All stations	Material: Height: Product: Manufacturer: Finish:	2x13mm Plasterboard lining both sides on 76 stud Full height / Ceiling Height Gyprock or equivalent CSR or equivalent Flushed and painted PA:XX			
PD:02	Lining	Accommodation building - All stations	Material: Height: Product: Manufacturer: Finish:	2x13mm Plasterboard lining one side only (risers/ducts) Full height / Ceiling Height Gyprock or equivalent CSR or equivalent Flushed and painted PA:XX			
PD:03	Fire rated partition - FRL120/120/120 both sides	Accommodation building - All stations	Material: FRL: Height: Product: Manufacturer: Finish:	2x16mm Fyrchek lining both sides on 76 stud FRL 120/120/120 Full height Fyrchek / MR Fyrchek or equivalent (MR where abutting Wet Areas) CSR or equivalent Flushed and painted PA:XX			
PD:04	Fire rated lining - FRL120/120/120 one side - Full height	Accommodation building - All stations	Material: FRL: Height: Product: Manufacturer: Finish:	3x16mm Fyrchek lining on 76 stud (risers/ducts/enclosed rooms) FRL 120/120/120 from one side only Full height lining Fyrchek or equivalent CSR or equivalent Flushed and painted PA:XX			

MORLEY ELLENBROOK LINE (MEL) - STATION & PRECINCT - ARCHITECTURAL MASTER MATERIALS SCHEDULE

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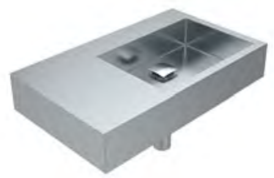
STATION: NORANDA STATION | **REV - B02**

CODE	ITEM	LOCATION	DESCRIPTION		IMAGE	NOTES	SWTC
PD:05	Fire rated partition - FRL-/90/90 both sides - Full height	Accommodation building - All stations	Material: FRL: Height: Product: Manufacturer: Finish:	16mm Fyrchek both sides on 76 stud (kiosk) FRL -/90/90 Full height Fyrchek or equivalent CSR or equivalent Flushed and painted PA:XX			
PD:06	Fire rated lining - FRL-/90/90 one side - Full height	Accommodation building - All stations	Material: FRL: Height: Product: Manufacturer: Finish:	3x13mm Fyrchek on 76 stud (kiosk at external wall) FRL -/90/90 from one side only, Full height lining Fyrchek or equivalent CSR or equivalent Flushed and painted PA:XX			
PD:07	Glazed partition	Lift Enclosure	Material: Glass:	Framed glazed partitions fixed to lift steel enclosure, with stainless steel trims GL:04			
PD:08	Brick Veneer Wall	Accommodation building - Ellenbrook	Material: Height: Product: Manufacturer: Finish:	110 Face brick w 2x13mm Plasterboard lining on one side of 76 studs Full height Gyprock or equivalent CSR or equivalent Flushed and painted PA:XX			
PD:09	Fire rated Brick Veneer Wall - FRL-/90/90	Accommodation building - Ellenbrook	Material: FRL: Height: Product: Manufacturer: Finish:	110 Face brick with 2x13mm Fyrchek lining on one side of 76 studs FRL -/90/90 Full height Fyrchek or equivalent CSR or equivalent Flushed and painted PA:XX			
PLUMBING SERVICES FIXTURES (PF)							
PF:01	Toilet Suite	Public Toilets - All stations	Manufacturer: Type: Model: Size: Finish:	Britex or equivalent Wall Mounted toilet suite PWM or equivalent 515mm x 350mm 304 Satin Stainless Finish		4Star WELS rating & Watermark Certified. Concealed cistern Automatic flush sensor Ultra Vandal resistant. Since this will be installed in the ambulant toilet, need to note: To be installed in compliance with AS1428.1	
PF:02	Vanity Basin	Public Toilets - All stations	Manufacturer: Type: Model: Size: Finish:	Britex or equivalent Wall Mounted Hand Basin or equivalent HBS or equivalent 500mm x 425mm 304 Satin Stainless Finish		Vandal resistant	
PF:03	Vanity Basin Mixer	Public Toilets - All stations	Manufacturer: Type: Model: Size: Finish:	Britex or equivalent Eco TIMED Flow Pillar Tap TW-9101 or equivalent 500mm x 425mm Stainless Finish		Vandal resistant	

MORLEY ELLENBROOK LINE (MEL) - STATION & PRECINCT - ARCHITECTURAL MASTER MATERIALS SCHEDULE

DOC NO:	**MEL-MLCX-AR-SCH-00007**						**13/08/2021**
STATION:	**NORANDA STATION**						**REV - B02**
CODE	ITEM	LOCATION	DESCRIPTION		IMAGE	NOTES	SWTC
PF:04	Toilet Suite	Staff Toilets - All stations	Manufacturer: Type: Model: Size: Finish:	Argent or equivalent Vista Hygienic Flush Wall Hung Toilet 8991001S4B or equivalent 540mm x 370mm White ceramic			
PF:05	Vanity Basin	Staff Toilets - All stations	Manufacturer: Type: Model: Size: Finish:	Britex or equivalent 850 Ceramic Furniture Wash Basin 0 One Tap Hole BSW-FWB850-1 or equivalent 850mm x 480mm White Ceramic			
PF:06	Vanity Basin Mixer	Staff Toilets - All stations	Manufacturer: Type: Model: Size: Finish:	Britex or equivalent Hob Mounted Mixer Tap - Fixed Spout TW-MIX-01 or equivalent n/a Bright Chrome			
PF:07	UAT Toilet Suite	UAT & UAT Staff Toilets - All stations	Manufacturer: Type: Model: Size: Finish:	Britex or equivalent Accessible Toilet Suite PTSD or equivalent 800mm x 355mm 304 Satin Stainless Finish		4Star WELS rating & Watermark Certified. Ultra Vandal resistant AS1428 Compliant Automatic flush sensor	Is this also for UAT Staff?
PF:08	UAT Basin	UAT & UAT Staff Toilets - All stations	Manufacturer: Type: Model: Size: Finish:	Britex or equivalent Accessible Bellagio Basin w Integrated Side Shelf or equivalent HBBEL-DS or equivalent 500mm x 425mm 304 Satin Stainless Finish		Vandal resistant	
PF:09	UAT Basin Mixer	UAT & UAT Staff Toilets - All stations	Manufacturer: Type: Model: Size: Finish:	Britex or equivalent Eco Timed Flow Pillar Tap TW-9101 or equivalent 500mm x 425mm Stainless Finish		Vandal resistant	
PF:10	UAT Shower Mixer	UAT & UAT Staff Toilets - All stations	Manufacturer: Type: Model: Size: Finish:	Britex or equivalent Accessible Lever Activated Shower Mixer TW-MIX-22 or equivalent with 150mm accessible handle Bright Chrome		Vandal resistant	
PF:11	Urinals	Staff Toilets - All stations	Manufacturer: Type: Model: Size: Finish:	Britex or equivalent Ceramic Wall Mounted Urinal Pod BSW-UP or equivalent 270mm x 340mm White ceramic			

MORLEY ELLENBROOK LINE (MEL) - STATION & PRECINCT - ARCHITECTURAL MASTER MATERIALS SCHEDULE

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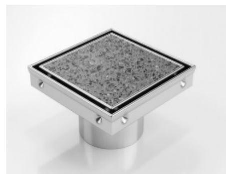
STATION: NORANDA STATION — **REV - B02**

CODE	ITEM	LOCATION	DESCRIPTION		IMAGE	NOTES	SWTC
PF:12	UAT Shower Rail & Hand Shower	UAT & UAT Staff Toilets - All stations	Manufacturer: Type: Model: Size: Finish:	Britex or equivalent Adjustable Height Hand Held Shower Set w Grab Rail BTR-01-062 or equivalent 500mm x 425mm Stainless Steel			
PF:13	Floor Waste - General	All wet areas & showers - All stations	Manufacturer: Type: Model: Size: Finish:	Storm Tech or equivalent Tile Insert Drain SQ100Ti20-80 or equivalent 130 x 130 Stainless Steel			
PF:14	Ambulant Toilet	Public & Staff Toilets - All stations	Manufacturer: Type: Model: Size: Finish:	Britex or equivalent Centurion Ambulant Pan PCAM or equivalent 650mm x 355mm 304 Satin Stainless Finish		4Star WELS rating & Watermark Certified. Vandal resistant AS1428 Compliant Automatic flush sensor	
PF:15	Urinals	Male Public & Staff Toilets - All stations	Manufacturer: Type: Model: Size: Finish:	Britex or equivalent Barren Waterless Urinal UBW or equivalent 360mm x 395mm 304 Satin Stainless Finish		Fully waterless urinal (no water connection) Vandal resistant	
PF:16	Kitchen Sink	Staff Crib / Tea Prep - All stations	Manufacturer: Type: Model: Size: Finish:	Britex or equivalent Laboratory Sink CAFE or equivalent 500mm x 900mm 304 Satin Stainless Finish			
PF:17	Kitchen Mixer	Staff Crib / Tea Prep - All stations	Manufacturer: Type: Model: Size: Finish:	Britex or equivalent Hob Mounted Mixer Tap - Swivel Spout TW-MIX-02 or equivalent n/a Bright Chrome			
PF:18	Cleaner's trough	Cleaner's Room - All stations	Manufacturer: Type: Model: Size: Finish:	Britex or equivalent Floor Mounted Cleaner's Sink CSF or equivalent 600mm x 590mm 316 Stainless Finish		With sand filter	
PAVING (PV)							

MORLEY ELLENBROOK LINE (MEL) - STATION & PRECINCT - ARCHITECTURAL MASTER MATERIALS SCHEDULE

DOC NO: MEL-MLCX-AR-SCH-00007 | **13/08/2021**

STATION: NORANDA STATION | **REV - B02**

CODE	ITEM	LOCATION	DESCRIPTION	IMAGE	NOTES	SWTC
PV:01	Clay pavers	Platform level - All stations	Material: Solid clay segmented paver in Herringbone configuration. Size: 230 x 114 x 60 .Finish: Finish: Kiln 9 (grain to run length of face). No sealer. Product: Heavy Duty 60 or equivalent Manufacturer: Midland Brick or equivalent Colour: Red trafficable type Lay on 1:6 cement/sand screed. Slip rating: Slip resistant CoF >0.4 wet.		1:100 minimum cross fall away from track	
PV:02	Safety Tactile TGSI Pavers - platform edge	Platform level - All stations	Material: Warning Integrated TGSI concrete paver Size: 400 x 400 x 60 and 300 x 300 x 60 (bus stands) Finish: Tactile ground surface indicators Product: TBC Manufacturer: TBC Colour: Yellow/ Black/ Grey/ Red Slip rating: Non-slip, P5 rating to AS3661.1		To comply with Luminance Contrast requirement of AS1428.1.	
PV:03	Safety Yellow Edge Paving - platform edge conditions	Platform level - All stations	Material: Engineered high strength concrete paver Size: 400 x 100 x 60 Finish: Non-slip Product: TBC Manufacturer: TBC Colour: Yellow Slip rating: Non-slip, P5 rating to AS3661.1		To comply with Luminance Contrast requirement of AS1428.1.	
ROOFING (RO)						
RO:01	Roof sheeting - Flat Pan	Main Station Roof & Bus Area canopies: - All stations	Material: Roof sheeting Size: TBC Fixing: TBC Finish: Colorbond Colour: Nom. Basalt Product: TBC Manufacturer: TBC Insulation: TBC		All flashing and cappings to match roofing colour.	
RO:02	Profiled aluminium roof edge cladding	Main Station Roof & Bus Area canopies: - All stations	Material: Precoated solid aluminium cladding Thickness: 3mm thk Fixing: Mechanical cassette fixing to tophats on sub framing Finish: TBC Colour: To match roof sheeting Product: Mondoclad or equivalent Manufacturer: HVG Facades or equivalent Insulation: n/a			
RO:03	Gutters	Main Station Roof & Bus Area canopies: - All stations	Material: Marine grade Aluminium Size: To Hydraulic Engineer's requirements Thickness: TBC Fixing: Supported on metal gutter boards and straps, with allowance for trafficability. Finish: Powder coated Insulation: Anti drumming membrane			
RO:04	Rainwater Downpipe Shrouds	Where exposed/ not able to be concealed within cladding	Material: TBC Thickness: TBC Finish: TBC			

MORLEY ELLENBROOK LINE (MEL) - STATION & PRECINCT - ARCHITECTURAL MASTER MATERIALS SCHEDULE

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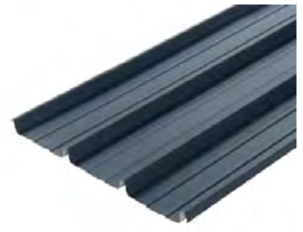
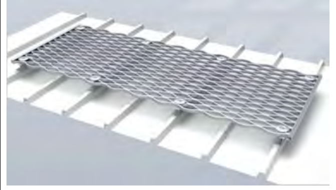
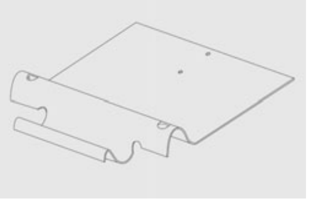
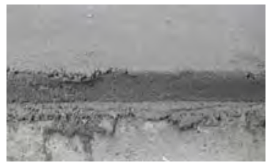
STATION: NORANDA STATION | **REV - B02**

CODE	ITEM	LOCATION	DESCRIPTION		IMAGE	NOTES	SWTC
RO:05	Roof sheeting - Standard	Accommodation roof - All stations	Material: Size: Fixing: Finish: Colour: Product: Manufacturer: Insulation:	Profiled steel roof sheeting Nom. 700mm wide, 0.48-0.55BMT Concealed clip fixings, trafficable Colorbond Surfmist Klip-Lok 700 Hi-Strength or equivalent Lysaght or equivalent Refer to Insulation section, IN:XX With Safebridge HP roof insulation system on mesh		All flashing and cappings to match roofing colour.	
SAFETY & ACCESS SYSTEM (SA)							
SA:01	Static line System (Previously Stairs & Ramps)	High level accessible areas for maintenance to Roofs, canopies; - All stations	Type: Fixing: Finish: Colour: Product: Manufacturer:	Static Line system to Specialist's design To all Standards and Code requirements Powder coated To match roof colour. X-clerate Horizontal Static Line or equivalent SafeMaster or equivalent			
SA:02	Roof access walkway	High level accessible areas for maintenance to Roofs, canopies; - All stations	Type: Size: Fixing: Finish: Colour: Product: Manufacturer:	Aluminium access walkway grating 600mm W To all Standards and Code requirements Powder coated To match roof colour. Slipnot or equivalent SafeMaster or equivalent			
SA:03	Ladder Hook	High level accessible areas for maintenance to Roofs, canopies; - All stations	Type: Size: Fixing: Finish: Colour: Product: Manufacturer:	Aluminium access walkway grating TBC To all Standards and Code requirements Powder coated To match roof colour. Ladder Brackets SafeMaster or equivalent			
STEEL ENGINEERING (SE) - FINISHES ONLY							
SE:01	Structural Steel - Non-visible	Concealed structural steelwork - non visible to public & staff areas - All stations	Material:	Protective finish of structural steel to Structural Engineer's specifications.			
SE:02	Exposed structural & secondary steel - Semi visible	Structural & secondary steel - visible to staff areas - All stations	Material: Finish:	Protective finish of structural steel to Structural Engineer's specifications. To be primed and painted, PA:XX			

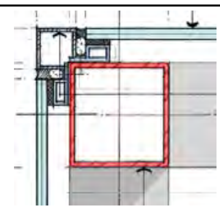
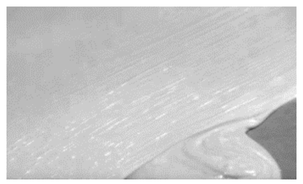
MORLEY ELLENBROOK LINE (MEL) - STATION & PRECINCT - ARCHITECTURAL MASTER MATERIALS SCHEDULE

DOC NO: MEL-MLCX-AR-SCH-00007 — 13/08/2021

STATION: NORANDA STATION — REV - B02

CODE	ITEM	LOCATION	DESCRIPTION		IMAGE	NOTES	SWTC
SE:03	Structural Steel Columns	All structural steel columns - All station buildings	Material: Finish:	Protective finish of structural steel to Structural Engineer's specifications. TBC			
SIGNAGE & GRAPHICS (SN)							
SN:xx	Station Signage	All PTA Station Signage - All stations & precinct	REFER TO PTA SIGNAGE GUIDE				
TILING (TL)							
TL:01	Vitrified tiles.	All stations - Concourse level - Fully enclosed areas (Refer PV:04 for Open Areas)	Material: Size: Finish: Product: Manufacturer: Colours: Slip rating:	Vitrified tiles. TBC Charcoal epoxy grout Granito 'Optima' Eureka 'Boulevard' or equivalent Granito or equivalent Light grey, Steel grey, Black, Alabaster, Charcoal. R12			
TL:02	Vitrified tile floor finish	Public and Staff Bathrooms - all stations	Material: Size: Finish: Product: Manufacturer: Colour: Slip rating:	non-slip vitrified tiles. 200x200 Charcoal epoxy grout Granito: 'Optima' or equivalent Granito or equivalent Light Grey, Steel Grey, Black R12		Of dark grout to minimise any residual impact of graffiti of suitable coefficient to prevent slip hazards when wet	
TL:03	Vitrified tile wall finish	Public and Staff Bathrooms - all stations	Material: Size: Finish: Product: Manufacturer: Colours: Slip rating:	Ceramic tiles 200x200 mm Gloss finish to Staff bathrooms only. Charcoal epoxy grout. Tiles should be butt jointed and cover strips of stainless steel should be added to external angles. TBC TBC ultra-white plain, Ultra-white ripple R12		Full height from floor to ceiling (including cubicles) in public bathrooms. Floor height to minimum 2700mm in Staff bathrooms	
TOPPING & SCREEDS (TP)							
TP:01	Screed to Slab	Concourse floor slab - All stations	Material: Application: Product: Manufacturer:	Sand cement screed - premixed To manufacturer's requirements, provide reinforcement mesh of screeds over 40mm thk. Ardex A36 Abascreed or equivalent ARDEX Australia or equivalent			

MORLEY ELLENBROOK LINE (MEL) - STATION & PRECINCT - ARCHITECTURAL MASTER MATERIALS SCHEDULE

DOC NO:	MEL-MLCX-AR-SCH-00007						13/08/2021
STATION:	**NORANDA STATION**						**REV - B02**
CODE	**ITEM**	**LOCATION**	**DESCRIPTION**		**IMAGE**	**NOTES**	**SWTC**
TP:02	Screed to Toilets	Toilets and Wet Areas - All stations	Material: Application: Product: Manufacturer:	Rapid Set Screed Cement To manufacturer's requirements, provide reinforcement mesh of screeds over 40mm thk. Ardex A38 or equivalent ARDEX Australia or equivalent			
TRIM (TR)							
TR:01	Skirtings	Accommodation building - CSO, Staff Crib, etc - All stations	Material: Size: Finish: Product: Manufacturer:	Stainless steel skirting 150mm H Linished No. 4 finish, flush with wall lining. TBC TBC			Skirting material shall resist the following, without noticeable change in surface appearance: i. vandalism; ii. heavy impacts; and iii. abrasion from cleaning methods and maintenance systems. The materials and finishes for skirting in public areas shall be selected from the following range: 316 stainless steel; and / or Material to match floor finish.
TR:02	Lift Enclosure - Corner & Door Trims	DDA Lifts - Malaga - Morley - Noranda - Whiteman Park	Material: Size: Finish: Product: Manufacturer:	Stainless steel corner & door trims To lift details Linished No. 4 finish, flush with glazing. TBC TBC			
WINDOWS (WD)							
WD:01	Windows	Station accommodation building - All stations	Material: Size: Finish: Colour: Glass: Product: Manufacturer: ESD:	Extruded aluminium framing As per drawings Anodized finish TBC Clear laminated glass, **GL:01** 419 SG Flushline system (Single Glazed) or equivalent Capral or equivalent In compliance with ESD Engineer's requirements for NCC Section J 2019.			
WATERPROOFING (WP)							
WP:01	To external floor slab	Elevated Concourse - Malaga - Morley - Noranda - Whiteman Park	Material: Finish: Product: Manufacturer:	Liquid Applied Water Based Epoxy Membrane Undertile to external areas WPM300 (HydrEpoxy 300) or equivalent Two component water based epoxy polyamide membrane. ARDEX Australia or equivalent			
WP:02	To wet areas	Toilets, showers, Changerooms - All stations	Material: Finish: Product: Manufacturer:	Liquid applied Undertile PU Acrylic Hybrid Membrane Under tile to Wet Areas WPM155 Rapid or equivalent Water-based polyurethane acrylic hi-performance membrane ARDEX Australia or equivalent			

Appendix D - Acoustic Report

METRONET Stage 1: Morley-Ellenbrook Line

Noranda Station Acoustic Design Report

MEL-MLCX-AR-RPT-00032

Rev	Date	Purpose of Issue	Prepared	Reviewed	Approved
A	19/11/2021	Issued for Review	A Deivasigamani	L Zoontjens	Manoj Aravind

Document Details	
Project	METRONET Stage1: Morley-Ellenbrook Line
Client	Public Transport Authority
PTA Contract Number	PTA200001
Laing O'Rourke Project No.	K97

Document revision history

Rev	Date	Purpose of Issue	Sections revised	Reason for updates
A	19/11/2021	Issued for Review	First issue	First issue

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Tables

Figures

1. Executive Summary

This document discusses noise and vibration levels expected with operation of the proposed Noranda Station and the extent to which those levels comply with applicable statutory and project requirements.

On the basis of the assessment undertaken it is concluded that:

- Overall environmental rail noise levels, when assessed at nearby potential noise sensitive premises are expected to comply with applicable state noise regulations and planning policy. Rail vibration levels are expected to be compliant with recommended levels.
- Road transport noise from car parking areas and local vehicle traffic will increase significantly in the area from current conditions, but are expected to remain compliant with relevant state policies.
- Car parking areas will need to avoid the use of speed humps, loose laid road coverings or large smooth painted concrete surfaces to minimise vehicle noise emissions.
- Design of the station plant and facilities such as mechanical services, public address and crowding areas to meet applicable environmental noise regulations may be achieved through conventional / industry standard design approaches and therefore is not anticipated to require specialist design input.
- Noise ingress from Tonkin Highway is estimated to be significant with a potential to have high internal noise levels to station habitable rooms assuming a standard façade construction. As such, screening elements/walls are recommended to be adopted along the platform to sufficiently shield platform buildings from highway noise.

Acknowledgement of Country

MELconnx acknowledges the Whadjuk People of the Noongar Nation as the Traditional Custodians of the land and waters on which the Morley-Ellenbrook Line Project is located. We pay our respect to their Elders, both past and present and thank them for their continuing connection to the country, culture and community.

2. Project overview

2.1 METRONET Vision and Objectives

As Perth's single largest investment in public transport, METRONET will transform the way people commute and connect. It will create jobs and business opportunities and stimulate local communities and economic development to assist communities to thrive. The METRONET vision is for a well-connected Perth with more transport, housing and employment choices.

In delivering METRONET, the WA Government has considered peoples' requirements for work, living and recreation within future urban centres with a train station at the heart.

The objectives are to:

- Support economic growth with better connected businesses and greater access to jobs
- Deliver infrastructure that promotes easy and accessible travel and lifestyle options
- Create communities that have a sense of belonging and support Perth's growth and prosperity
- Plan for Perth's future growth by making the best use of our resources and funding
- Lead a cultural shift in the way government, private sector and industry work together to achieve integrated land use and transport solutions for the future of Perth.

2.2 Morley-Ellenbrook Line overview

As Perth grows, so does the need for rail infrastructure and METRONET is a critical element of the State Government's infrastructure agenda. The Morley-Ellenbrook Line (MEL) Project will improve connectivity between the north east metropolitan area and the rest of the city and unlock economic development in these local community areas.

Figure 1: Morley-Ellenbrook Line © METRONET

The Public Transport Authority (PTA) is the lead agency delivering the MEL Project, with Main Roads WA (MRWA) undertaking some enabling works.

2.2.1 Project features

Transport infrastructure works for the Project include:

- A 21km rail line spurring from the Midland Line east of Bayswater Station, travelling north in the Tonkin Highway median, east through land north of Marshall Road and north on the western side of New Lord Street into Ellenbrook
- Stations at Morley, Noranda, Malaga, Whiteman Park and Ellenbrook with future-proofing for a station at Bennett Springs East
- Parking and bus interchanges/facilities at stations
- Significant grade separations at key road crossings
- Underpasses to allow the rail line to enter and exit the Tonkin Highway median
- Principal shared paths for walking and cycling access along the rail line
- Track and associated infrastructure to connect to the existing Midland Line
- Road and bridge reconfiguration works
- Integration across the packages of works and other nearby projects.

2.2.2 General scope of works

The Project's general scope of works includes the design and delivery of rail infrastructure and ancillary works to support operational passenger rail between Bayswater and Ellenbrook, including stations with inter-modal bus and rail with parking and associated road works at Bayswater, Morley, Noranda, Malaga, Whiteman Park and Ellenbrook stations.

The Project activities include all investigation, design, approvals, construction, testing and commissioning, Entry Into Service (EIS), training and operational readiness required to incorporate the new railway to Ellenbrook, and tie into the existing network including the associated road, utilities and other required works to interface with adjacent works and contracts. This will include bulk earthworks and retaining structures, grade separations, roads and drainage.

The design and delivery of the main works package for the Project is broken into three distinct stages:

- Alliance Development Stage
- Project Alliance Reference Design Stage
- Project Alliance Delivery Stage (Detailed Design through to Project close-out).

Figure 2: Architect's Impression of Noranda Station concept © MELConnx

2.2.3 Key Project Objectives, Key Compliance Objectives and Critical Success Factors

The PTA and MELconnx's single Non-Owner Participant (NOP) Laing O'Rourke Construction Australia Pty Ltd, have formed an integrated, collaborative Project Alliance to successfully deliver rail infrastructure that reflects our absolute commitment to achieving the Project Objectives and delivering positive outcomes for the State.

The following image demonstrates how we have mapped each Key Project Objective in the Project Alliance Agreement (PAA) against the Critical Success Factors to achieve best-for-project outcomes, underpinned by the Key Compliance Objectives.

Key Project Objectives	Critical Success Factors for Successful Project Delivery (abbreviated)
Implementation of a robust, cooperative team culture.	• Development of a culture that results in all Participants developing behavioural values and driving principles to achieve Alliance goals and project objectives • Longevity and stability of key Alliance personnel i.e. Alliance Manager, ALT and AMT.
Timely delivery of Works to achieve project milestones in accordance with agreed program.	• Development of a final proposal with a sufficiently developed design and accurate TOC • Subsequent cash flow management and financial forecasting, scheduling and value-earned calculation and determination • Implementation of PTA mandated systems i.e. TeamBinder, Primavera P6, TILOS and a finance system accepting the PTA's cost breakdown structure • Timely completion of design, construction and commissioning through to practical completion • Timely progress towards construction milestones and completion of close-out to achieve final asset acceptance compliance.
Inclusion of processes that embrace/promote open tendering and promotion of work package development that encourages/ enables second and third tier tendering. **Compliance with WAIPs.**	• For professional service providers, implement a proven and mature supply-chain engagement process, including tender review, contract award and project integration. Ensure that it offers opportunity and security of payment relative to services delivered in an effort to achieve best-for-project outcomes • For material suppliers and other subcontract service providers, implement a proven and mature supply-chain engagement process, including tender review, contract award and project integration that offers opportunity and security of payment relative to service delivered • Proven and mature supply-chain engagement process for labour hire services, compliant with industrial and safety laws, maintained employee standards/conditions and security of employee payments • Ability to develop contracts and terms and conditions in the spirit of the Alliance values and principles , appropriate and commensurate with the size, complexity and value of packages in accordance with industry best practice.
Optimisation of operational and whole of life costs.	• Sustainability considerations and outcomes for the whole of life of the works.
Ensuring appropriate consultation/integration with stakeholders and community.	• Constant and effective engagement with relevant stakeholders, particularly utilities/services, Main Roads, third party asset owners and relevant unions • Effective management of PTA interfaces and PTA contractors • Constant/effective engagement with the PTA in design reviews, work planning and possessions/shutdowns.
Providing passengers with safe and secure services and facilities.	• Compliance with ONSR requirements • Completed rail line, stations and bus transfer infrastructure are able to deal successfully with the movement of people, including the disabled.
Minimising disruption to current and anticipated rail operations.	• Minimise impact on public transport services disruption • Liaison and interaction with PTA rail operations personnel tasked with determining network closures, to confirm available network shutdowns and implement contingency plans • Effective management of interfaces with others in heavily constrained areas • Effective management/staging of works to reflect staged/constrained site access • Effective management of existing rail infrastructure asset protection.
Recognising the State's desired industrial relations objectives.	• Develop a project-specific Industrial Relations Management Plan based on a proven and successful industrial relations approach that delivers a collaborative worksite, genuine collective agreement, making good faith in negotiations and dispute resolution, and respect for trade union rights of entry.

Key Compliance Objectives (abbreviated)				
Compliance with all Statutory requirements and State Government policy requirements for construction work.	Compliance with the SWTC.	Protecting and minimising disruption to all existing facilities, infrastructure, properties or public utility services.	Meeting all obligations to impacted stakeholders and demonstrating genuine sensitivity.	Compliance with all environmental conditions and minimise adverse environmental impact.

Figure 3: Key Project Objectives, Critical Success Factors and Key Compliance Objectives

2.3 Alliance vision and delivery approach

The MEL Project will be delivered under an alliance contract to support the management of project and stakeholder interfaces and to mitigate project risks. A collaborative alliance approach will see the Works carried out in a cooperative, coordinated and efficient manner in compliance with the Alliance Principles.

MELconnx understands that the successful delivery of the Project is critically linked to meeting the PTA's Key Project Objectives. These objectives have shaped our vision for the Project that is around delivering a high-quality product and creating exceptional value-for-money. We are committed to a no-blame culture and to the prompt and mutual resolution of any issues that may arise.

During the AD Stage, representatives from both the PTA and MELconnx participated in an interactive workshop to begin the process of developing a suitable Alliance Vision for the Project (refer Figure 4 below for workshop outcomes).

Figure 4: AD Stage Alliance Vision Development Outcomes (developed with the PTA)

The Alliance Foundation workshop was held on 11/11/2020 and the results of this workshop generated the basis for the Vision, Purpose, Values and Behaviours Commitment Statements represented here.

Figure 5: MELconnx Alliance Vision, Purpose and Values

2.4 Purpose of the Report

Noranda Station is proposed as a key station where all trains will slow down and stop at the station (no non-stop 'through' traffic as part of normal services).

The project will also involve the construction of car parks, car drop off points and pedestrian facilities, the operation of which may involve a change in noise levels at nearby residential and other sensitive locations.

This document discusses expected noise and vibration emissions with operation of the proposed Noranda Train Station and the extent to which those levels comply with applicable statutory and project requirements.

This Design Report identifies any interdependencies between each Design Package and how those dependencies have been accommodated within the document. The Design Report describes the relationship between each of the Package(s) engineering lifecycle and the assurance gates throughout the Project.

2.5 Changes Since Previous Design Submission

2.5.1 Alliance Development Stage to Reference Design Stage

Not applicable at this Design Stage.

2.5.2 Reference Design to Interim Detailed Design

Not applicable at this Design Stage.

2.5.3 Interim Detailed Design to Final Detailed Design

Not applicable at this Design Stage.

2.5.4 IFC Design Finalisation

Not applicable at this Design Stage.

3. Design Description

3.1 Scope of this Design Package

The scope of this Design Package is outlined as follows.

- A schedule of recommended controls where required to be considered and reviewed for design optimisation and design/statutory planning approval within the packages is described in Section 3.3.

3.2 Design Description

The following subsections discuss the key project noise and vibration issues assessed in further detail.

3.2.1 Rail operations

Treatments to the railway sections involved at Noranda Station are considered not required. Speeds in the immediate vicinity of the station are low for rolling noise levels to be above State Planning Policy 5.4 Road and Rail Noise (SPP5.4) targets that may be assessable at nearby development.

Note that compliance with SPP5.4 does not prevent community complaint. Subjectively, residents in the area may notice noise from low speed rail movements and the braking system air release as trains depart. Train air conditioning systems may also be noticeable on unusually hot days. These noise emissions are modelled to be within SPP5.4 targets.

Given the expected speeds in the immediate vicinity of the station, vibration levels are predicted to be within recommended criteria applicable at anticipated future development sites nearby.

3.2.2 Station and associated infrastructure

Asphaltic or bitumen-based road and vehicle parking surfaces should be used instead of smooth concrete or heavily painted surfaces which can result in strong sound reflections and/or tyre squeal under cornering.

Speed bumps or sudden changes in road level (e.g. loose gutters, expansion control joints) should be avoided. Traffic can however be managed via gradual gradient pedestrian crossings (such as wombat crossings) if required.

The project results in inclusion of new bus bays along Benara Road, which is strictly not assessable under the State Planning Policy 5.4. Nevertheless, considering the traffic flow Benara Road, it is anticipated that new bus bays would not have significant noise contributions to the overall noise levels.

From Section 5.2 it can be seen that noise impacts at adjacent development areas from road vehicles can be managed to levels compliant with applicable criteria.

On the basis of a screening assessment of proposed public address systems (Section 4.8.1) and likely crowd noise (Section 4.8.3), compliance with relevant assigned noise levels is expected.

The station is expected to comply with SWTC requirements with regards to internal reverberation levels provided on the basis of hard diffusive internal walls and the open 'sawtooth' style ceiling and roof system which provides significant access to open air.

Refer to Appendix A for recommended treatments to specific building elements in order to meet SWTC requirements around acoustic separation and reverberation.

3.2.3 Noise from Tonkin Highway

A full height screen is expected on each side of the platform, similar to Stirling and Glendalough stations. The length of the screen would not be the same length of the platform, but in proportion of the platform staff building. The main reason it is considered needed is due to staff offices or crib rooms / amenities located at platform level. This screen may also assist towards improving comfort / safety for passengers requiring assistance.

Tempered glass or off-the-shelf acrylic / PLEXIGLAS SoundStop or equivalent would suit from an acoustic perspective, formed in near air-tight continuous sections. Deep framing sections should be on the inside / towards the platform.

Figure 6 Example of screen installed at Sterling Station platform sections (Source: Google Earth)

3.2.4 Electrical transformer noise

The transformer located just south of the proposed kiss and ride is approximately 25 metres from the existing residential uses to the east of station precinct. Based on expected loading and sound power levels for transformers, along with the existing noise walls, it is expected that noise emissions will be compliant with applicable noise regulations.

3.2.5 Mechanical noise

A basic screening assessment has been undertaken considering the minimum distance to potential noise sensitive development and the proposed mechanical plant and equipment. Given the equipment comprises small enclosed fan coil units and domestic level air conditioning outdoor condensers, compliance with applicable noise regulations is expected.

3.2.6 Local road traffic and new roundabouts

Local road vehicle traffic noise may vary due to the introduction of the proposed train station but is not assessable within the criteria outlined.

3.3 Relationship with other Design Packages

The relationship and/or reliance of this design package on other MEL design packages is derived from the N2 Matrix and is outlined in the Table below.

Relationship with other Design Packages	Description/Title	Interface Elements	Integration Strategy
E018	Line wide - Permanent Way and Stabling & Track – Transit Space & Structure /Ballast Interface	Trackform Rail web dampers Under ballast matting	Confirm trackform Review rail web damper options
E016	LW Urban Design - Urban Design - Architecture	Noise walls	Confirm spatial inputs and coordinate implementation of recommended treatments
E017	Linewide Urban Design - Landscape	Noise walls	Confirm spatial inputs and coordinate implementation of recommended treatments
E004	Noranda Precinct – Urban Design – Architecture	Noise walls	Confirm spatial inputs and coordinate implementation of recommended treatments
E077	Noranda Precinct Civil - Fencing and Gates, Retaining Walls & Minor Structures, Noise Walls	Noise walls	Confirm spatial inputs and coordinate implementation of recommended treatments
E080	Noranda Station – Electrical - Lighting & LV & Comms & Security	Electrical plant noise emissions	Confirm inputs and coordinate implementation of any recommended treatments
E083	Noranda Station – Mechanical and BMSC	Mechanical plant noise emissions	Confirm inputs and coordinate implementation of any recommended treatments

3.4 External Interfaces

The relationship and/or reliance of this design package on external interfaces and details of integration strategies are outlined in the Table below.

Item	External Party	Interface Elements	Integration Strategy
	N/A		

4. Design Inputs

4.1 Project Design Requirements

The following design inputs, loads combinations, standards and other key design inputs have been used in preparation of this report;

4.1.1 Environmental noise regulations

Refer to Section 4.5.1 below.

4.1.2 SWTC Requirements

Refer to Section 4.5.

4.1.3 Operational Scenarios

Normal operations are expected to result in 74 train movements per day (6am to 10pm) and 16 movements per night (10pm to 6am) at the Noranda Station.

The “PTA Concept Train Operating Plan” described as being within Book 5 of the SWTC could not be accessed and has been requested in CFRI063. In lieu of this information, these volumes are used from the Reference Design.

4.1.4 Stations and Infrastructure

Stations and infrastructure have been assessed on the basis of supplied drawings to date. We note that the design of each station utilises natural ventilation strategies, with significant openings at roof level throughout the station.

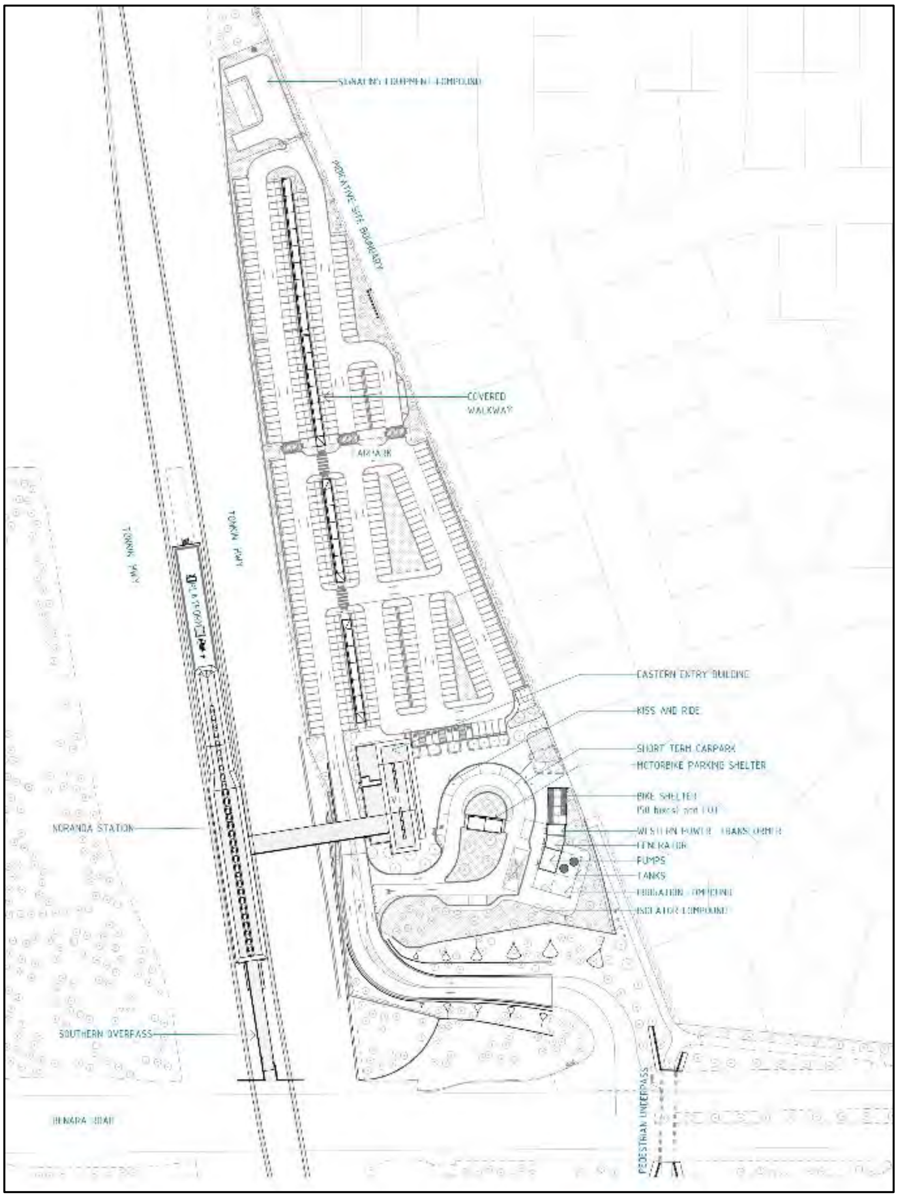


Figure 7: Extract of architectural overview plan 25-A-286-AR0010_A02 indicating site locality.

4.1.5 Electrical transformers

From the supplied drawings, it can be seen that the transformers associated with the station are approximately 40 metres from existing residential development (East of the precinct). By inspection of the likely transformer sound power level / loading and the proposed screening elements, along with the existing noise walls, compliance with the relevant assigned noise levels is expected.

4.1.6 Fire pumps

From the supplied drawings, it can be seen that the fire pump within the station precinct is approximately 20 metres from the existing development (East of the precinct). By inspection of the likely pump sound power level / loading and the proposed screening elements, compliance with the relevant assigned noise levels is expected during regular maintenance with the installation of appropriate pump room / enclosure.

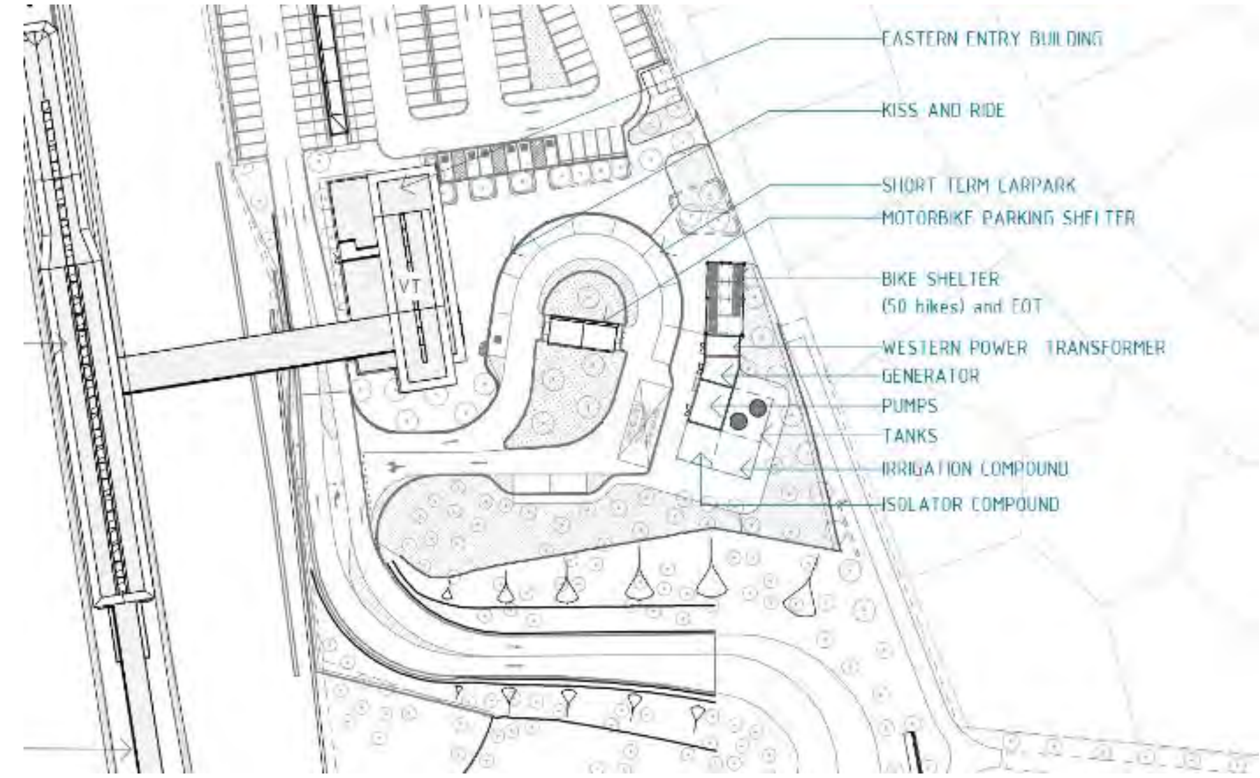


Figure 8: Extract of architectural plan 25-A-286-AR0010_A02

4.1.7 Mechanical outdoor plant

Drawings 25-A-286-ME0008 to -ME0013 indicate that the outdoor mechanical plant comprise condenser units. Based on rooms served, each would have capacities the order of 6 kW or less (similar to domestic residential air conditioning systems). These units, assessed in cumulative terms, are considered compliant with the assigned noise levels defined in Section 4.5.1 at the nearest noise sensitive premises.

4.2 Design Software Used for this Package

Computer software used to develop this package is outlined in the Table below.

Reference	Supplier	Usage
MS Office 2013	Microsoft Inc. (with proprietary SLR code)	Calculation of in-car noise levels Calculation of 3D receiver distances Calculation of 1D vibration propagation Consolidation and presentation of results 1D propagation / noise analyses
SoundPLAN v8.1	SoundPLAN GmbH	Calculation of site wide airborne noise emissions according to prescribed standards

4.3 Applicable Codes and Standards

Applicable standards, codes and guidelines to this design package (at time of project commencement) including identification of specific provisions, criteria and classifications are provided in the Table below.

Reference	Description/Title	Compliance (Specific Provisions, Criteria and Classifications)
Australian and Other Standards and Guidelines		
CR NOI TSI	Technical specification for interoperability relating to the subsystem ‘rolling stock – noise’ of the trans-European conventional rail system, adopted by the Commission Decision 2011/229/EU, April 2011	Referenced for typical wheel-rail roughness assumptions
SPP5.4	State Planning Policy No. 5.4 Road and Rail Noise 2019	Compliance criteria
EPNR	Western Australia Environmental Protection (Noise) Regulations 1997	Compliance criteria
AS 2670.1	Evaluation of human exposure to whole-body vibration - General requirements	Reference for assessment method
AS 2670.2	Evaluation of human exposure to whole-body vibration - Continuous and shock-induced vibration in buildings (1 to 80 Hz)	Referenced for criteria comparison
ISO GUIDE 98-3	Uncertainty of measurement — Part 3:Guide to the expression of uncertainty in measurement (GUM:1995)	Referenced for uncertainty estimation
ISO 2631-1:1997	Mechanical vibration and shock - Evaluation of human exposure to whole-body vibration - Part 1: General requirements.	Reference for assessment method
AS ISO 2631.2:2014	Mechanical vibration and shock - Evaluation of human exposure to whole-body vibration - Vibration in buildings (1 Hz to 80 Hz).	Compliant
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc, 2011 ASHRAE Handbook - Heating, Ventilating, and Air-Conditioning APPLICATIONS - SI Edition, Atlanta GA http://www.ashrae.org	Referenced for typical HVAC installation and operations
FTA	C.E. Hanson, D.A. Towers, and L.D. Meister 2006, Transit Noise and Vibration Impact Assessment, Office of Planning and Environment, Federal Transit Administration, Report FTA-VA-90-1003-06, Washington DC	Referenced for vibration assessment method
Nord2000	Jonasson HG, Storeheier S. Nord 2000. New Nordic prediction method for rail traffic noise [Internet]. 2001. (SP Rapport).	Rail noise modelling algorithm adopted
Green Star	Green Star Design and As-built Requirements for Railway Stations (v1.1)	Partially compliant (within the scope of this report)
ISCA	Infrastructure Sustainability Council of Australia (ISv2.0) Design and As Built	General reference
PTA Standards and Specifications		

4.4 Reference Information

The project specific reference information and reports that have been used as inputs into the development of the detailed design are included in the table below.

Document Ref.	Description/Title	Revision
25-A-286-EC0151	MEL - MLCX – NORANDA STATION - COMMUNICATIONS - EASE ACOUSTIC MODEL - SHEET 01	A
25-A-286-EC0152	MEL - MLCX - NORANDA STATION - COMMUNICATIONS - EASE ACOUSTIC MODEL - SHEET 02	A

Document Ref.	Description/Title	Revision
GCOR-LOR-LW-00096	Track Inputs for Noise Modelling	02-Jun-2021 13:10 AWST
GCOR-LOR-PW-00193	Design data for SLR noise modelling	07-May-2021 19:02 AWST
GCOR-LOR-PW-00166	MELconnx CAD issue to SLR	30-Apr-2021 09:42 AWST
GCOR-LOR-LW-00047	Latest WIP rail strings	19-Apr-2021 11:51 AWST
GCOR-LOR-PW-00128	Update to Health Safety Environmental Management System	06-Apr-2021 15:56 AWST
GCOR-LOR-PW-00071	Aerial Imagry (sic)	01-Apr-2021 15:48 AWST
GCOR-LOR-PW-00067	Project AD Design Information On ASite	23-Feb-2021 11:16 AWST
(TBA)	<Architectural and Civil Drawing packages>	
	Baseline Noise and Vibration Measurements (SLR Consulting)	(in preparation)
25-A-286-AR0051	MEL - MLCX - NORANDA STATION - ARCHITECTURAL - GENERAL ARRANGEMENT FLOOR PLAN - VERTICAL TRANSPORT BUILDING - ROOF	A01
25-A-286-AR0086	MEL - MLCX - NORANDA STATION - ARCHITECTURAL - VERTICAL TRANSPORT BUILDING ELEVATION - SHEET 1	A01
25-A-286-AR0082	MEL - MLCX - NORANDA STATION - ARCHITECTURAL - GENERAL ARRANGEMENT - LONG ELEVATION - SHEET 3	A02
25-A-286-AR0070	MEL - MLCX - NORANDA STATION - ARCHITECTURAL - REFLECTED CEILING PLAN - PLATFORM LEVEL - SHEET 1	A02
25-A-286-AR0048	MEL - MLCX - NORANDA STATION - ARCHITECTURAL - GENERAL ARRANGEMENT FLOOR PLAN - ROOF LEVEL - SHEET 3	A02
25-A-286-AR0047	MEL - MLCX - NORANDA STATION - ARCHITECTURAL - GENERAL ARRANGEMENT FLOOR PLAN - ROOF LEVEL - SHEET 2	A02
25-A-286-AR0044	MEL - MLCX - NORANDA STATION - ARCHITECTURAL - GENERAL ARRANGEMENT FLOOR PLAN - CONCOURSE LEVEL - SHEET 2	A02
25-A-286-AR0043	MEL - MLCX - NORANDA STATION - ARCHITECTURAL - GENERAL ARRANGEMENT FLOOR PLAN - CONCOURSE LEVEL - SHEET 1	A02
25-A-286-AR0025	MEL - MLCX - NORANDA STATION - ARCHITECTURAL - OVERALL ELEVATIONS - STATION ELEVATIONS - SHEET 2	A01
25-A-286-AR0071	MEL - MLCX - NORANDA STATION - ARCHITECTURAL - REFLECTED CEILING PLAN - PLATFORM LEVEL - SHEET 2	A01
25-A-286-AR0072	MEL - MLCX - NORANDA STATION - ARCHITECTURAL - REFLECTED CEILING PLAN - PLATFORM LEVEL - SHEET 3	A01
25-A-286-AR0074	MEL - MLCX - NORANDA STATION - ARCHITECTURAL - REFLECTED CEILING PLAN - CONCOURSE LEVEL - SHEET 2	A01
25-A-286-AR0075	MEL - MLCX - NORANDA STATION - ARCHITECTURAL - REFLECTED CEILING PLAN - VERTICAL TRANSPORT BUILDING - GROUND FLOOR	A01
25-A-286-AR0085	MEL - MLCX - NORANDA STATION - ARCHITECTURAL - SHORT ELEVATION - SHEET 2	A01
25-A-286-AR0087	MEL - MLCX - NORANDA STATION - ARCHITECTURAL - GENERAL ARRANGEMENT - LONG SECTION - SHEET 1	A01

Document Ref.	Description/Title	Revision
25-A-286-AR0088	MEL - MLCX - NORANDA STATION - ARCHITECTURAL - GENERAL ARRANGEMENT - LONG SECTION - SHEET 2	A01
25-A-286-AR0040	MEL - MLCX - NORANDA STATION - ARCHITECTURAL - GENERAL ARRANGEMENT FLOOR PLAN - PLATFORM LEVEL - SHEET 1	A02
25-A-286-AR0045	MEL - MLCX - NORANDA STATION - ARCHITECTURAL - GENERAL ARRANGEMENT FLOOR PLAN - CONCOURSE LEVEL - SHEET 3	A02
25-A-286-AR0049	MEL - MLCX - NORANDA STATION - ARCHITECTURAL - GENERAL ARRANGEMENT FLOOR PLAN - VERTICAL TRANSPORT BUILDING - GROUND FLOOR	A01
25-A-286-AR0050	MEL - MLCX - NORANDA STATION - ARCHITECTURAL - GENERAL ARRANGEMENT FLOOR PLAN - VERTICAL TRANSPORT BUILDING - CONCOURSE	A01
25-A-286-AR0076	MEL - MLCX - NORANDA STATION - ARCHITECTURAL - REFLECTED CEILING PLAN - VERTICAL TRANSPORT BUILDING - CONCOURSE	A01
25-A-286-AR0084	MEL - MLCX - NORANDA STATION - ARCHITECTURAL - SHORT ELEVATION - SHEET 1	A01
25-A-286-AR0080	MEL - MLCX - NORANDA STATION - ARCHITECTURAL - GENERAL ARRANGEMENT - LONG ELEVATION - SHEET 1	A02
25-A-286-AR0073	MEL - MLCX - NORANDA STATION - ARCHITECTURAL - REFLECTED CEILING PLAN - CONCOURSE LEVEL - SHEET 1	A02
25-A-286-AR0046	MEL - MLCX - NORANDA STATION - ARCHITECTURAL - GENERAL ARRANGEMENT FLOOR PLAN - ROOF LEVEL - SHEET 1	A02
25-A-286-AR0017	MEL - MLCX - NORANDA STATION - ARCHITECTURAL - STATION OVERALL PLAN - ROOF	A02
25-A-286-AR0041	MEL - MLCX - NORANDA STATION - ARCHITECTURAL - GENERAL ARRANGEMENT FLOOR PLAN - PLATFORM LEVEL - SHEET 2	A02
25-A-286-AR0042	MEL - MLCX - NORANDA STATION - ARCHITECTURAL - GENERAL ARRANGEMENT FLOOR PLAN - PLATFORM LEVEL - SHEET 3	A02
25-A-286-AR0016	MEL - MLCX - NORANDA STATION - ARCHITECTURAL - STATION OVERALL PLAN - CONCOURSE LEVEL	A02
25-A-286-AR0015	MEL - MLCX - NORANDA STATION - ARCHITECTURAL - STATION OVERALL PLAN - PLATFORM LEVEL	A02
25-A-286-AR0002	MEL - MLCX - NORANDA STATION - ARCHITECTURAL - DRAWING LIST - SHEET 01	A02
25-A-286-AR0001	MEL - MLCX - ARCHITECTURAL - NORANDA STATION - COVER PAGE	A01
25-A-286-AR0120	MEL - MLCX - NORANDA STATION - ARCHITECTURAL - DETAILS - VT BUILDING DETAILS - SHEET 1	A01
25-A-286-AR0089	MEL - MLCX - NORANDA STATION - ARCHITECTURAL - GENERAL ARRANGEMENT - SHORT SECTION - SHEET 1	A01
25-A-286-AR0010	MEL - MLCX - NORANDA STATION - ARCHITECTURAL - OVERALL PLANS - LOCATION PLAN	A02
25-A-286-AR0090	MEL - MLCX - NORANDA STATION - ARCHITECTURAL - GENERAL ARRANGEMENT - SHORT SECTION - SHEET 2	A01
25-A-286-AR0026	MEL - MLCX - NORANDA STATION - ARCHITECTURAL - OVERALL SECTIONS - SHEET 1	A02
25-A-286-AR0081	MEL - MLCX - NORANDA STATION - ARCHITECTURAL - GENERAL ARRANGEMENT - LONG ELEVATION - SHEET 2	A01

Document Ref.	Description/Title	Revision
25-A-286-AR0012	MEL - MLCX - NORANDA STATION - ARCHITECTURAL - OVERALL PLANS - LIMIT OF WORKS PLAN	A01
25-A-286-AR0024	MEL - MLCX - NORANDA STATION - ARCHITECTURAL - OVERALL ELEVATIONS - STATION ELEVATIONS - SHEET 1	A01
25-A-286-AR0027	MEL - MLCX - NORANDA STATION - ARCHITECTURAL - OVERALL SECTIONS	A01
25-A-286-CI0078	MEL - MLCX - NORANDA STATION - CIVIL - PAVEMENT AND KERBING - DETAIL - SHEET 1	A01
25-A-286-CI0086	MEL - MLCX - NORANDA STATION - STRUCTURAL - MINOR STRUCTURES - PLAN	A01
25-A-286-CI0093	MEL - MLCX - NORANDA STATION - STRUCTURAL - VEHICLE TRACKING PLAN	A01
25-A-286-CI0011	MEL - MLCX - NORANDA STATION - CIVIL - DRAINAGE AND FINISHED SURFACE - PLAN	A01
25-A-286-CI0012	MEL - MLCX - NORANDA STATION - CIVIL - DRAINAGE AND FINISHED SURFACE - PLAN - SHEET 1	A01
25-A-286-CI0039	MEL - MLCX - NORANDA STATION - CIVIL - GENERAL ARRANGEMENT - PLAN	A01
25-A-286-CI0001	MEL - MLCX - NORANDA STATION - CIVIL - COVER SHEET AND DRAWING INDEX	A01
25-A-286-CI0073	MEL - MLCX - NORANDA STATION - CIVIL - PAVEMENT AND KERBING - PLAN	A01
25-A-286-CI0002	MEL - MLCX - NORANDA STATION - CIVIL - BULK EARTHWORKS - PLAN	A01
25-A-286-CI0013	MEL - MLCX - NORANDA STATION - CIVIL - DRAINAGE AND FINISHED SURFACE - PLAN - SHEET 2	A01
25-A-286-CI0046	MEL - MLCX - NORANDA STATION - CIVIL - COMBINED PROPOSED UTILITIES - PLAN	A01
25-A-286-ME0009	MEL - MLCX - NORANDA STATION - PLATFORM - MECHANICAL - ZONE 1 - LAYOUT	A01
25-A-286-ME0011	MEL - MLCX - NORANDA STATION - PLATFORM - MECHANICAL - ZONE 3 - LAYOUT	A01
25-A-286-ME0017	MEL - MLCX - NORANDA STATION - MECHANICAL - SECTIONS	A01
25-A-286-ME0002	MEL - MLCX - NORANDA STATION - MECHANICAL - LEGEND	A01
25-A-286-ME0013	MEL - MLCX - NORANDA STATION - VT BUILDING & KISS AND RIDE - MECHANICAL - LAYOUT	A01
25-A-286-ME0001	MEL - MLCX - NORANDA STATION - MECHANICAL - COVER SHEET	A01
25-A-286-ME0014	MEL - MLCX - NORANDA STATION - MECHANICAL - SCHEMATIC DIAGRAM	A01
25-A-286-ME0010	MEL - MLCX - NORANDA STATION - PLATFORM - MECHANICAL - ZONE 2 - LAYOUT	A01
25-A-286-ME0005	MEL - MLCX - NORANDA STATION - MECHANICAL - SITE PLAN	A01
25-A-286-PL0025	MEL - MLCX - NORANDA STATION - HYDRAULICS - DETAILS	A01
25-A-286-PL0012	MEL - MLCX - NORANDA STATION - PLATFORM - HYDRAULICS - DRAINAGE - PLAN - ZONE 2	A01
25-A-286-PL0013	MEL - MLCX - NORANDA STATION - PLATFORM - HYDRAULICS - DRAINAGE - PLAN - ZONE 3	A01

Document Ref.	Description/Title	Revision
25-A-286-PL0014	MEL - MLCX - NORANDA STATION - CONCOURSE - HYDRAULICS - DRAINAGE - PLAN - ZONE 1	A01
25-A-286-PL0001	MEL - MLCX - NORANDA STATION - HYDRAULICS - COVER SHEET AND DRAWING INDEX	A01
25-A-286-PL0002	MEL - MLCX - NORANDA STATION - HYDRAULICS - LEGEND	A01
25-A-286-PL0003	MEL - MLCX - NORANDA STATION - HYDRAULICS - SITE PLAN	A01
25-A-286-PL0004	MEL - MLCX - NORANDA STATION - PLATFORM - HYDRAULICS - WATER AND WET FIRE - PLAN - ZONE 1	A01
25-A-286-PL0005	MEL - MLCX - NORANDA STATION - PLATFORM - HYDRAULICS - WATER AND WET FIRE - PLAN - ZONE 2	A01
25-A-286-PL0006	MEL - MLCX - NORANDA STATION - PLATFORM - HYDRAULICS - WATER AND WET FIRE - PLAN - ZONE 3	A01
25-A-286-PL0007	MEL - MLCX - NORANDA STATION - CONCOURSE - HYDRAULICS - WATER AND WET FIRE - PLAN - ZONE 1	A01
25-A-286-PL0008	MEL - MLCX - NORANDA STATION - VT BUILDING & KISS AND RIDE - HYDRAULICS - WATER AND WET FIRE - PLAN - GROUND	A01
25-A-286-PL0009	MEL - MLCX - NORANDA STATION - VT BUILDING & KISS AND RIDE - HYDRAULICS - WATER AND WET FIRE - PLAN - FIRST FLOOR	A01
25-A-286-PL0010	MEL - MLCX - NORANDA STATION - WALKWAY - HYDRAULICS - WATER AND WET FIRE - PLAN - FIRST FLOOR	A01
25-A-286-PL0011	MEL - MLCX - NORANDA STATION - PLATFORM - HYDRAULICS - DRAINAGE - PLAN - ZONE 1	A01
25-A-286-PL0015	MEL - MLCX - NORANDA STATION - CONCOURSE - HYDRAULICS - DRAINAGE - PLAN - ZONE 2	A01
25-A-286-PL0016	MEL - MLCX - NORANDA STATION - STATION ROOF - HYDRAULICS - DRAINAGE - PLAN - ZONE 1	A01
25-A-286-PL0017	MEL - MLCX - NORANDA STATION - STATION ROOF - HYDRAULICS - DRAINAGE - PLAN - ZONE 2	A01
25-A-286-PL0018	MEL - MLCX - NORANDA STATION - VT BUILDING & KISS AND RIDE - HYDRAULICS - DRAINAGE - PLAN - GROUND	A01
25-A-286-PL0019	MEL - MLCX - NORANDA STATION - VT BUILDING & KISS AND RIDE - HYDRAULICS - DRAINAGE - PLAN - FIRST FLOOR	A01
25-A-286-PL0020	MEL - MLCX - NORANDA STATION - VT BUILDING & KISS AND RIDE - HYDRAULICS - DRAINAGE - PLAN - ROOF	A01
25-A-286-PL0021	MEL - MLCX - NORANDA STATION - CANOPIES - HYDRAULICS - DRAINAGE - PLAN - ZONE 1	A01
25-A-286-PL0022	MEL - MLCX - NORANDA STATION - CANOPIES - HYDRAULICS - DRAINAGE - PLAN - ZONE 2	A01
25-A-286-PL0023	MEL - MLCX - NORANDA STATION - CANOPIES - HYDRAULICS - DRAINAGE - PLAN - ZONE 3	A01
25-A-286-PL0024	MEL - MLCX - NORANDA STATION - WALKWAY - HYDRAULICS - PLAN - ROOF	A01
25-A-286-PL0026	MEL - MLCX - NORANDA STATION - HYDRAULICS - FIRE HYDRANT PLANT DETAIL	A01

4.5 Design Criteria

The design criteria utilised in the development of this report are outlined below.

4.5.1 Permanent Way

SWTC 13.6.1-3 states that

The Alliance must design and construct the operating passenger railway and any associated noise mitigation controls to meet the requirements of "State Planning Policy No. 5.4 Road and Rail Noise (SPP 5.4)" (WAPC, 2019).

The Alliance must design and construct the operating passenger railway to ensure that the LAmax applicable to the 95th percentile train passby event is 80 dB or less at buildings with a noise sensitive use located on noise sensitive premises.

The table below outlines the adopted noise objective levels in regard to airborne noise during road and rail operations. Noise mitigation must be provided where the noise level is above these targets

Table 1 Adopted rail noise criteria

Metric	Application	Value(s)	Notes
Period average noise levels	Major upgrade of existing railway *Applied where emissions from MID and FAL lines are considered significant (Bayswater area)*	$L_{Aeq,day}$ 60 dB $L_{Aeq,night}$ 55 dB	SPP5.4
	New railway *(All other locations)*	$L_{Aeq,day}$ 55 dB $L_{Aeq,night}$ 50 dB	
Maximum noise levels	Line wide	L_{Amax} 80 dB	95th percentile. SWTC

These objectives are assessed outdoors, 1 metre from the main building on a lot associated with a noise sensitive usage. Consistent with SPP5.4, the criteria are assessed

- Only at premises that are occupied or designed for occupation or use for residential purposes (including dwellings, residential buildings or short-stay accommodation), caravan parks, camping grounds, educational establishments, child care premises, hospital, nursing home, corrective institution; or place of worship (Note that this excludes recreational parks, commercial and industrial premises along the alignment – results will be determined for these locations, but mitigation would not be recommended); and
- at all floor levels where identified from surveys, noting that sufficient mitigation (in the context of the targets) may not reasonable or practicable at higher floors.

4.5.2 Stations and Associated Infrastructure

Section 13.7 of Book 5 of the SWTC details the noise and vibration Technical Criteria requirements for the design and operation of the station and associated infrastructure, and includes the following statements:

The Alliance must address noise and vibration impacts associated with station noise impacts, inclusive of any new road infrastructure to service the stations, to surrounding sensitive receivers, occupational health and amenity for PTA staff and patrons.

[..] Noise and Vibration Criteria for Impacts to Surrounding Sensitive Premises at Stations and associated infrastructure (eg. car parks, plant rooms etc.) must be designed to comply with the requirements of the Environmental Protection (Noise) Regulations 1997 (WA).

[..] The Alliance shall determine the noise criteria for impacts from Station entry roads and grade separations and design roads and any associated noise mitigation controls to meet the requirements of Western Australia State Planning Policy No 5.4, Road and Rail Noise 2019.

4.5.2.1 Environmental Noise Regulations

Environmental noise emissions (excluding trains and some emissions from road vehicles) from various premises to nearby noise receiving premises are covered by legislation in the form of the *Western Australia Environmental Protection (Noise) Regulations 1997,* which operate under the *Environmental Protection Act 1986*. For this project, these regulations apply to stations and ancillary operational equipment, and specifically do not apply to narrow gauge trains.

To achieve compliance, received noise levels at nearby premises including noise sensitive premises (for example, residential, commercial and industrial premises) are not to exceed specified noise limits in the form of assigned noise levels. The Act gives state authorities powers to order financial penalties and closure of plant that are in excess of assigned noise levels through a formal investigation process. There are methods within the Regulations by which assets found to be producing excessive noise be managed on an ongoing basis in consultation with the Department of Water and Environment Regulation (DWER), say through noise management plans and/or alternative criteria, however at its core of any such agreement is that the proponent will exercise all reasonable and practicable measures to minimise noise.

The assigned noise levels, as shown in Table 2, vary for each noise sensitive receiver, as they are determined from consideration of Influencing Factors (IF) which takes into account the amount of commercial, industrial and road transport infrastructure within specific distances to the receiving noise sensitive premises.

Table 2 Table of Assigned Noise Levels, dB

Part of premises receiving noise	Time of day	L_{A10}	L_{A1}	L_{Amax}
Noise Sensitive premises at locations within 15 metres of a building directly associated with a noise sensitive use	0700 to 1900 hours Monday to Saturday	45 + IF	55 + IF	65 + IF
	0900 to 1900 hours Sunday and public holidays	40 + IF	50 + IF	65 + IF
	1900 to 2200 hours all days	40 + IF	50 + IF	55 + IF
	2200 hours on any day to 0700 Monday to Saturday and 0900 hours Sunday and public holidays	35 + IF	45 + IF	55 + IF
Noise Sensitive premises at locations further than 15 metres from a building directly associated with a noise sensitive use.	All hours	60	75	80
Commercial premises	All hours	60	75	80
Industrial and utility premises	All hours	65	80	90

For Noranda station, the closest sensitive receivers are located immediately east of the station. An IF of 10 dB is applied in accordance with the Regulations based on:

- Presence of major road within 100m of the receiver (transport factor of 6 dB); and
- Presence of industrial use due to the proposed Noranda station precinct (industrial factor of 4 dB).

Regulation 7 of the *Environmental Protection (Noise) Regulations 1997* requires that, if noise emitted from any premises when received at any other premises cannot reasonably be free of intrusive characteristics of tonality, modulation and impulsiveness, then a series of adjustments must be added to the emitted levels (measured or calculated) and the adjusted level must comply with the assigned level. The adjustments are detailed in Table 3 and are further defined in Regulation 9(1) of the *Environmental Protection (Noise) Regulations 1997*.

Note that the following adjustments (Table 3) generally apply to fixed plant and infrastructure only.

Table 3 Table of adjustments for intrusive characteristics

Application	Where tone(s) are present	Where modulation is present	Where impulsiveness is present
Adjustment where noise emission is not music (These adjustments are cumulative to a maximum of 15 dB)	+5dB	+5dB	+10dB

Tones are defined in Regulation 9(1) as being present where the difference between the A weighted sound pressure level in any one third octave band and the arithmetic average of the A-weighted sound pressure levels in the two adjacent one third octave bands is greater than 3dB in terms of $L_{Aeq,T}$ where the time period T is greater than 10% of the representative assessment period, or greater than 8dB at any time when the sound pressure levels are determined as LAS levels.

Modulation is defined as a variation in the emission of noise that —

- is more than 3 dB L_{AF} or is more than 3 dB L_{AF} in any one third octave band;

- is present for at least 10% of the representative assessment period; and
- is regular, cyclic and audible.

Impulsiveness is defined as present where the difference between L_{Apeak} and L_{ASmax} is more than 15dB when determined for a single representative event.

During the assessment process the above adjustments have been applied to relevant noise sources, taking into account specific intrusive characteristics of these noise sources based on SLR's in-house noise database. It is unlikely that modulation or impulsiveness characteristics would apply to PTA fixed assets being typically electrical power transformers or air handling plant

4.5.2.2 Ambient Noise Levels within Passenger Station Areas

Section 13.7.1 of the SWTC defines acceptable noise levels via the following table, as defined in AS 1055.1:1997 and assessed according to AS/NZS 2107:2000. In accordance with the SWTC it is proposed to follow this the 2000 version of AS/NZS 2107 and not the more recent 2016 version.

Table 4 Ambient noise level criteria

Area	Scenario	Minimum acceptable noise level (dB)	Maximum acceptable noise level (dB)
Ticket sales area	Building services and plant	-	L_{Aeq} 45
General office areas	Building services and plant	-	L_{Aeq} 45
Staff crib rooms	Building services and plant	-	L_{Aeq} 45
Public waiting areas, kiosks	Building services and plant	-	L_{Aeq} 45
Toilets and amenities	Building services and plant	L_{Aeq} 45	L_{Aeq} 55
Parking and waste storage areas	Building services and plant	-	L_{Aeq} 65
Platforms, at any position within 1.5m of platform edge or centreline (whichever is closer to track), and more than 8 metres from Portals	Stationary trains, auxiliary equipment operating as normal	-	L_{Aeq} 70
	Moving trains	-	L_{ASmax} 80
	Building services and plant (ventilation, escalators, etc.)	-	L_{Aeq} 55
	Emergency smoke fan systems	-	L_{Aeq} 85
Plantrooms	Building services and plant	-	L_{Aeq} 85
All other areas	All	-	Table 1, AS/NZS 2107:2000 'Satisfactory' values plus 5dB

Section 13.7.1 of the SWTC also states that

For enclosed rooms containing plant, equipment and electrical power Assets, noise levels must be assessed at no less than 1 metre from any item of equipment; and noise levels from mechanical ventilation systems serving the room must not exceed L_{Aeq} 65dB.

The criteria listed above in this section do not apply to systems or components operating in emergency mode. In this situation, noise generated by the systems or their components must comply with AS 1670.4 and AS 1668.1, and not exceed levels that affect speech intelligibility in egress paths, evacuation assembly areas, or operational or emergency control rooms or areas.

4.5.2.3 Noise and Vibration Ingress into Passenger Station Areas

Generally, from SWTC Book 4:

- 13.2-1 The Alliance must design station entry roads, grade separations and roads works and any associated noise mitigation controls to meet the requirements of "State Planning Policy No. 5.4 Road and Rail Noise (SPP 5.4)" (WAPC, 2019).

- [..] 13.5-3 The Alliance must consider the cumulative noise impact from road traffic and the operating passenger railway when designing and constructing any noise mitigation measures along Tonkin Highway.
- [..] 13.7-2 The Alliance must address noise and vibration impacts associated with station noise impacts, inclusive of any new road infrastructure to service the stations, to surrounding sensitive receivers, occupational health and amenity for PTA staff and patrons.

These all point to the same thing, ambient noise on the platform and occupiable spaces. SWTC 13.7.1 is most specific, stating the Alliance "shall design station areas to comply with" an internal target of L_{Aeq} 45 dB, inline with the reference standards.

Section 13.7.2 of the SWTC states that the Alliance shall also comply with the following requirements:

Floor vibration levels within publicly accessible areas from plant, equipment or external sources not exceed $L_{V, RMS,1s}$ *112dB.*

4.5.2.4 Reverberation within Passenger Station Areas

Section 13.7.3 of the SWTC states that the Alliance shall comply with the following requirements:

Within platform areas, the spatial average reverberation time (RT60) values for the full octave bands with centre frequencies 500Hz and 1kHz not exceed 1.3 seconds for the scenario where 100 patrons are present, or 1.6 seconds when empty.

At all other areas, spatial average reverberation time (RT60) values for the full octave bands with centre frequencies 500Hz and 1 kHz be in accordance with AS/NZS 2107:2000 given the usage of each space.

4.5.2.5 Public Address Systems within Passenger Station Areas

Section 13.7.4 of the SWTC states that:

The Alliance must ensure that the PA systems achieve the minimum sound level and speech intelligibility requirements of clause 4.3.4 and 4.3.6 of AS 1670.4 for all representative locations, environmental conditions and passenger levels

External noise ingress from adjacent road traffic sources must be assessed and considered when designing and constructing all stations to ensure that the public address systems within passenger station Areas achieve the minimum sound level and speech intelligibility requirements of clause 4.3.4 and 4.3.6 of AS 1670.4 for all representative locations, environmental conditions and passenger levels.

4.5.2.6 Acoustic Sound Insulation within Passenger Station Areas

Section 13.7.5 of the SWTC states that:

Airborne sound insulation targets are given in terms of the weighted level difference, Dw between two spaces. The Alliance must ensure that design complies with the following general in-situ airborne sound insulation targets:

- *Dw ≥ 35dB between normally occupied enclosed spaces.*
- *Dw ≥ 28dB between normally occupied spaces where the common partition includes a door.*

The following table presents criteria that supersede these general requirements for specific occupied spaces.

Where two different space types are adjacent to one another, the Alliance must ensure that the more onerous target applies.

Table 5 Vibration criteria (SWTC Book 5 Table 31: Airborne Sound Insulation Requirements)

	Space Type / Occupancy	Minimum Weighted Sound Level Difference, Dw, dB
Between normally occupied back of house offices and crib rooms	Generally	40
	Where the common partition at the interface includes a door	30
	Generally	42

	Space Type / Occupancy	Minimum Weighted Sound Level Difference, Dw, dB
Toilets and amenities to nearby public areas	Where the common partition at the interface includes a door	25
	Where the common partition at the interface has no door	16

SWTC 13.7.5 also states that

Where receiving spaces are not fully enclosed, the closest point of assessment must be at least 4 metres from the nearest door or window or the nearest scheduled seating position, whichever is closest.

Noise from hydraulic services associated with toilet amenities (e.g. flushing) must not be audible in any other publicly accessible area.

Noise from hand dryers within toilets and amenities should not be audible at any position more than 2 metres from the entrance, and must not be audible at any commercial retail or patron seating areas.

4.6 Design Life

Not applicable.

4.7 Durability Requirements

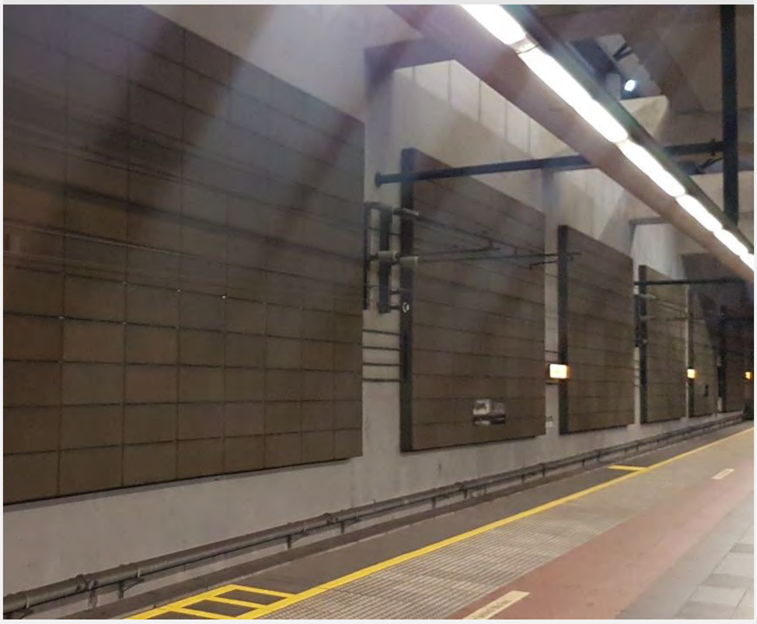
Not applicable.

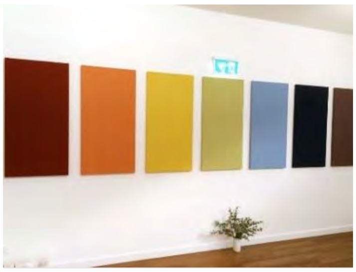
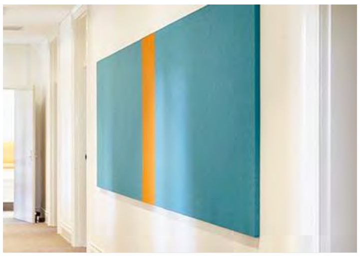
4.8 Specialist Technical Inputs

4.8.1 Reverberation

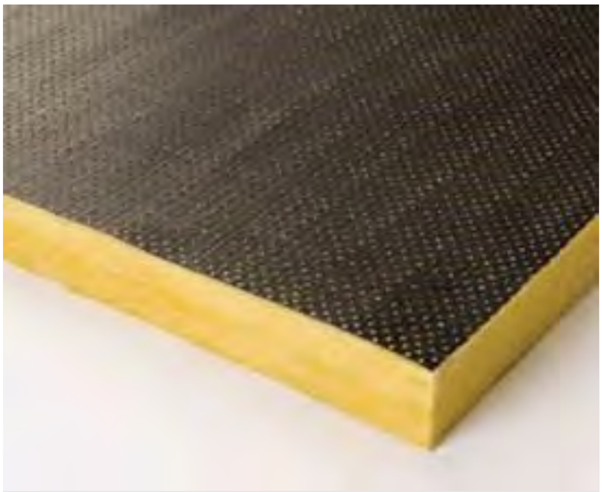
Reverberation times must be controlled within occupiable spaces in accordance with Section 4.5.2.4. Based on criteria from this section, reverberation times within the concourse area are recommended to be reduced as far as is practicable.

The markups in Appendix A refer to absorptive finishes within identified primary spaces. The following table provides various examples of such products. The selected product should be of Class A or B according to EN ISO 11654, or minimum a_w 0.80 (Noise Reduction Coefficient NRC 0.80).

Name	Image (Source), link	Description
Quietstone Standard **or** **Pyrotek Reapor**		Porous recycled glass material designed primarily for direct fixing to walls and ceilings. Non-toxic, non-flammable and not affected by moisture. Non fibrous material. Can be cleaned with a high pressure hose. Classified Class A according to EN ISO 11654 (50 mm+) Used in various Perth train stations already (Elizabeth Quay, Joondalup etc.) Main downside is risk of friable silica dust when broken / handled.

Name	Image (Source), link	Description
Acoufelt	    https://acoufelt.com/products/panels/	Can be self-adhesive backed (Direct fix) or mechanically fixed Can be ordered with hi resolution image print Low resistance to damage EN ISO 11654 Class C (α_w 0.70-0.75) or better 25 to 100 mm thick polyester with fabric facing Non-toxic, Non-allergenic,Non-irritant
Pyrotek Echohush	  https://www.pyroteknc.com/products/echohush/echohush-board/	EN ISO 11654 Class C (α_w 0.70-0.75) or better 25 to 100 mm thick polyester with fabric facing Direct fix installation Recyclable, various colour options Can be used to pin / Velcro items on Non-toxic, Non-allergenic, Non-irritant
CSR Martini DECO Quiet Panel	  http://www.csrmartini.com.au/products/decorative-acoustic-products	Effectively equivalent to Pyrotek Echohush
Stratocell Whisper FR	 http://www.soundblock.com.au/sound-absorbers/stratocell-whisper	EN ISO 11654 Class C (α_w 0.70-0.75) or better 25 to 100 mm thick Polyethylene foam (unpainted) Lightweight and easily cut into shapes, affix to walls or hang

Name	Image (Source), link	Description
Asona Triton	 http://www.asona.co.nz/	EN ISO 11654 Class B (α_w 0.80-0.85) 25 to 100 mm thick glass fibre with fabric facing Direct fix installation Recyclable, various colour options
Renhurst RenAcoustic Baffles	 http://renhurst.com/renacoustic-baffles/	EN ISO 11654 Class C (α_w 0.70-0.75) or better Rigid fibreglass core and a fine textured fleece Lightweight with various suspension options
Himmel Ecophon Solo Panels	  https://www.himmel.com.au/product-listing/2016/07/13/ecophon-solo-panels	Suspended colour panels Likely limited extent due to ceiling fan / air movement needs Glass fibre reinforced for rigidity
Stratocell Whisper	 www.soundblock.com.au/sound-absorbers/stratocell-whisper	Claimed to be resilient to water and humidity Flame retardant and/or Group 1 fire rating. Claimed self-extinguishing material (Class B2) to DIN 4101 series Light weight and non-corrosive. Easy to fix and fasten, pinned or glued Sheet size is 2400 x 1200 x 50mm thick Classified Class A according to EN ISO 11654

Name	Image (Source), link	Description
32-48 kg/m^3 glasswool or mineral fibre faced with glass fabric	 www.bradfordinsulation.com.au/	Manufactured by spinning molten glass, containing up to 80% recycled material, into fine fibres which are then bonded together using a thermosetting resin. Typical density of 48 to 60 kg/m^3. Non-flammable, non-toxic material which is not affected by moisture. Typically installed in perforated sheet metal enclosures with an additional spun bonded cloth film to protect from dust and moisture. Industrial product with relatively long product life.

With the control of reverberation, it is anticipated that the PA intelligibility requirements can be achieved through careful speaker system design within the concourse, as discussed in the following subsection.

4.8.2 Noise ingress from Tonkin Highway to Platform areas

A standard façade detail for occupied spaces within station buildings may achieve approximately a 20 dB difference between outdoor highway noise and internal noise levels. There are various options to further improve this performance but it will reduce the ability for those inside to hear what may occur outside the office or interact with the public.

As for outdoor noise levels, the monitoring report MEL-MLCX-EN-RPT-00031 documents monitoring at Stirling Station to be LAeq 78 dB on the open ends of the platform. Accounting for substantially more trucks on Tonkin in the future, the same report estimates Morley and Noranda station platform levels to be around LAeq 80 dB.

With that reduction of 20 dB from the building, it is anticipated that internal noise levels would be 15 dB above the 45 dB target.

To achieve a 15 dB reduction in heavy vehicle noise, a large freestanding wall will not suffice or be efficient, particularly where there are reflections from roof elements above or walls nearby considering the elevation of truck engine exhausts. Like the station examples given in Section 3.2.3, the screens would need to extend to any roof elements nearby, and be of sufficient extent on each side of the staff building on the platform.

4.8.3 Fire pumps

The electric fire pump within the station precinct is located approximately 20 m from the nearest residential use. A nominal electric pump size of 1000 kW rating at 900 rpm is assumed for the assessment (L_{wA} 100 dB). It is assumed that pump would operate in an emergency, or during regular maintenance. Such maintenance would occur typically once a month during the day periods.

Based on this size and location, it is anticipated that compliance can be achieved by enclosing the pump within a semi-enclosed plant room, as indicated in the figure below. The north and east side of the room, along with the roof/lid is recommended to be completely solid (i.e. no holes or gaps). The south and west walls can remain open if required for ventilation purposes.

If a redundant diesel pump is required, it should also be placed within the same enclosure along with suitable mufflers to exhausts.

The solid partitions (walls and roof) are modelled as airtight with a minimum surface density of 12 kg/m^2.

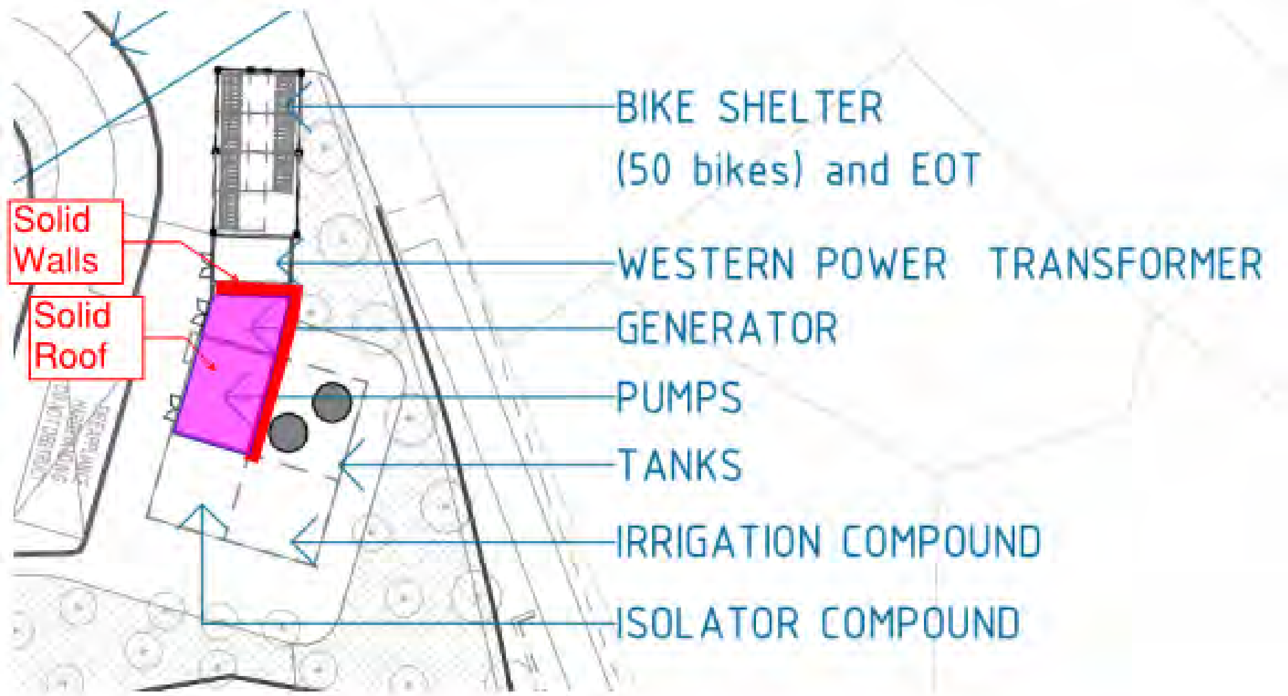


Figure 9: Proposed plantroom enclosure for fire pump with solid north and east partitions

4.8.4 Public Address (PA) Systems

The public address system will need to be designed to be sufficiently audible (involving both sound level and speech intelligibility) to meet relevant provisions of Australia Standard 1670.4, Fire Detection, Warning, Control and Intercom Systems - System Design, Installation and Commissioning - Sound Systems and Intercom Systems for Emergency Purposes (AS 1670.4) such that patrons can be advised in case of emergencies.

By inspection of each station arrangement and distancing to the nearest residential receivers (screening assessment), it can be seen that there is a range of sound levels which can meet both the minimum sound level limit requirements of AS 1670.4 and the maximum noise level limits listed.

An active PA system which regulates speaker volume depending on actual ambient sound level conditions to maintain intelligibility is recommended for the Noranda Station.

The PA system is currently designed by the communications designer, and the detailed results of compliance will be published as the project progresses.

4.8.5 Crowd / Patron Noise

Average crowd and patron noise levels in the context of the design criteria and other environmental noise sources are considered insignificant.

The arrangement of the station has passenger waiting areas on the platform and entry areas at distances over 50 metres from potential sensitive premises and/or generously spaced open environments.

Providing this level of distance separation and low crowd densities is expected to ensure that any sustained crowd / patron noise levels (conversations, walking) as individually L_{Aeq} 60 dB @ 1 metre and therefore below L_{Aeq} 30 dB @ 40 metres will be at a cumulative level that is inaudible at nearby residential locations against other background environmental noise.

4.8.6 Vehicle Car Parking

EU Parking Area Noise 2007[1] guidelines have been used to provide an indicative level of noise emissions on surrounding areas.

- Vehicle movement rate for P&R facilities over 10 km (under 20 km) from CBD. A vehicle entering or exiting a parking bay is one movement, so the same vehicle arriving and departing on the same day completes two movements.
  - 0.30 per hour per parking bay (6 am to 10 pm).
  - 0.06 per hour per parking bay (10 pm to 6 am).
- Random fill across all parking lots.[2]
- Impulse correction K_I 4 dB.
- L_{w0} 63 dB (standardised vehicle sound power level).

4.8.7 Kiss and Ride

Car movements have been modelled using Nord2000 methodologies with the following parameters:

- Movements of up to 40 vehicles per hour during the day, and up to 10 vehicles per hour during the night has been assumed for the assessment.
- Changes in level from arriving / idling / departure at stations (as assessed at nearest noise sensitive location) have been determined insignificant and not modelled. Publicly accessible road sections beyond the loop or its intersections are not included.
- Ground class F (compacted dense ground).
- Category 1 vehicles approximately L_{AE} 78 dB at 7.5m and 40 km/hr.
- Traffic case F (40 km/hr max).
- Asphalt concrete surface, any increases in noise level due to gradients was included on the basis of the ground topography provided.

4.8.8 Mechanical outdoor plant

The supplied drawings indicate that the outdoor mechanical plant comprise condenser units. Based on rooms served, each would have capacities the order of 6 kW or less (similar to domestic residential air conditioning systems). These units, assessed in cumulative terms, are considered compliant with internal noise criteria and the assigned noise levels defined in Section 4.5.1 at the nearest noise sensitive premises.

4.8.9 Electrical transformers

From the supplied drawings, it can be seen that the transformers associated with the station are approximately 25 metres from nearest residential property to the east of the site. By inspection of the likely transformer sound power level / loading and the proposed screening elements, compliance with the relevant assigned noise levels is expected.

---

[1] Bayer, Landesamt für Umwelt 2007, Parking Area Noise - Recommendations for the Calculation of Sound Emissions of Parking Areas, Motorcar Centers and Bus Stations as well as of Multi-Storey Car Parks and Underground Car Parks, Bayerisches Landesamt für Umwelt, Parkplatzlämstudie 6, Aufl., August 2007.

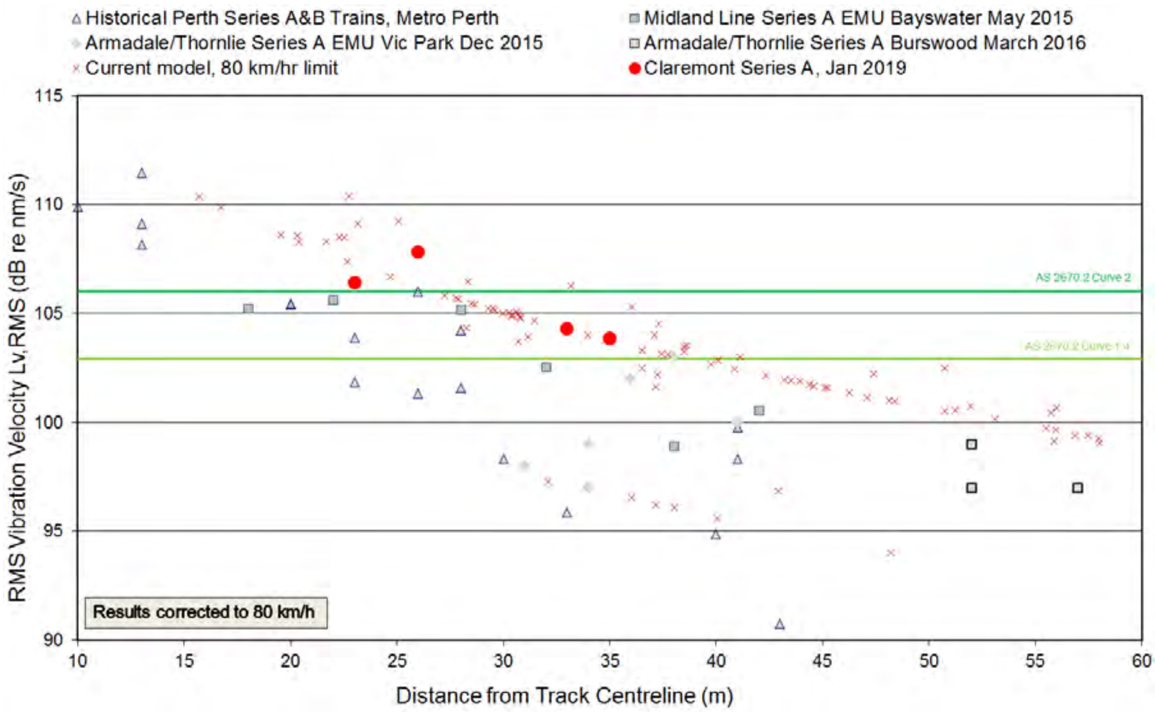
[2] Random fill assumed in the absence of a specific car parking traffic analysis. Fill patterns in practice may vary due to proximity to train station, and presence of ticketed parking and/or reserved parking.

4.8.10 Vibration source levels

Vibration emissions from the site will be mainly controlled by rail traffic. Road vehicles will also contribute where speed humps, loose panels (e.g. gutter or pit covers) or sudden variations in road surface are introduced.

This assessment acknowledges that typical rail vibration levels in the immediate area will decrease from corresponding decreases in rail speeds when all trains pass through Noranda Station (rather than pass through the area at or near the track section limit).

On a number of previous projects in Perth, ground vibration measurements have been carried out by SLR adjacent to surface rail track carrying passenger trains at a variety of distances from the rail centreline at each site.



Adjusting for speeds around 40 km/hr, which would be the highest speed that could be expected in the vicinity of the station, typical vibration levels will comply with Curve 1.4 (Residential) at approximately 30m from the nearest track centreline. Curve 2 will be complied with at approximately 20m from the nearest track centreline. For reduced speeds associated with stopping trains, rail vibration levels applicable to station areas are also considered to meet the $L_{v, RMS,1s}$ 112dB requirement referenced in Section 4.5.2.3.

Actual results will vary from these estimates according to rail condition, in situ soil and terrain profiles; however even after allowing for such variation, vibration levels are expected to be compliant.

On the basis of the above, the project provisions for vibration mitigation may be limited to avoiding road speed humps and loose coverings for buses and heavy vehicle traffic if applicable. Where traffic speed control is required, gradual gradient pedestrian crossings (such as wombat crossings) can be implemented which is not expected to introduce noticeable noise and/or vibration increase.

4.9 Constructability Requirements

Not applicable.

4.10 Environmental & Sustainability Design Criteria

Should this station be considered in regards to Credit 14 under Green Star Design and As-built Requirements for Railway Stations (v1.1), there are four (4) points available under Acoustic Comfort. These relate to:

- 14.1 Internal Noise Levels
- 14.2 Reverberation

- 14.3 Audibility
- 14.4 Hearing Loop Coverage

The SWTC requirements for Station internal noise levels (Section 4.5.3.1) and reverberation (Section 4.5.3.3) is expected to achieve the design credits under 14.1 and 14.2 of the Green Star requirements. As-built credits are achievable via compliant post-construction measurements.

The credits for Audibility and Hearing Loop Coverage (14.3 and 14.4) are not within the scope of this Report.

The noise and vibration design requirements under ISCA are applicable line wide and are covered within the Operational Noise and Vibration Design Report (MEL-MLCX-EN-RPT-00032).

4.11 Future Proofing

Not applicable.

4.12 Value Engineering

Not applicable.

4.13 Third Party Operational Stakeholders

Not applicable.

4.14 Design Input from Stakeholders and Community Involvement Process

Not applicable.

4.15 Design Risks, Assumptions, Issues, Dependencies, Opportunities, and Constraints (RAIDOC)

Detailed of design risks, assumptions, issues, dependencies, opportunities and constraints are outlined below.

4.15.1 Design Risk Register

Design risks related to this design package are detailed in the Table below;

ID	Description	Status	Evidence of Validation
	Not applicable at this design stage		

4.15.2 Design Assumptions

Design assumptions related to this design package are detailed in the Table below;

ID	Description	Status	Evidence of Validation
	Rough / diffusive wall finishes. If walls are hard reflective, then wall extents may need to be revised.		
	Existing residential walls and noise walls relevant to the report outcomes are acoustically sound, continuous / without gaps.		
	Car parking and vehicle trafficable areas avoid the use of loose laid road coverings, e.g. openable drains and grates are positively secured with mechanical fasteners.		
	Car parking and vehicle trafficable areas avoid the use of smooth concrete surfaces, e.g. concrete surfaces are brush finished or otherwise rough such that tyres do not squeak under heavy steering.		

	Cumulative mechanical external plant noise emissions do not exceed L_{WA} 92 dB during the day and L_{WA} 83 dB at night, which is considered to be a conservative estimate of commercial split systems servicing existing outdoor train stations in Perth (up to the order of 60 kW installed capacity outdoors). This includes the effects of screening panels and station buildings.		

4.15.3 Design Issues

Design issues related to this design package are detailed in the Table below;

ID	Description	Status	Evidence of Validation
	Not applicable at this design stage		

4.15.4 Design Dependencies

Design dependencies related to this design package are detailed in the Table below;

ID	Description	Status	Evidence of Validation
	Noting Rail Systems Australia appears to have already constructed EASE models for Noranda Station (25-A-286-EC0151 and 25-A-286-EC0152), responsibility for production of Speech Transmissibility Index (STI) contours and design of loudspeaker arrangements to be submitted as part of the various Station packages will rest with Rail Systems Australia.		

4.15.5 Design Opportunities

Design opportunities related to this design package are detailed in the Table below;

ID	Description	Status	Evidence of Validation
	Not applicable at this design stage		

4.15.6 Design Constraints

Design constraints related to this design package are detailed in the Table below;

ID	Description	Status	Evidence of Validation
	Not applicable at this design stage		

4.16 Requests for Information (RFI)

Requests for information submitted in relation to this design package are outlined in the Table below. Copies of the RFIs are provided in Appendix W of this report.

RFI	Description/Title	Response
062 **CRFI-SLR-PW-00001**	Noise and Vibration - Baseline Measurements	Closed
063	Noise and Vibration Assessments - Data Input Log / Requests	Closed

CRFI-SLR-PW-00002		
068 **CRFI-SLR-PW-00003**	Conversion of federated model 25-B-00-0001.4.0.IFI to AutoCAD	Closed

5. Design Outputs

5.1 Deliverables List

Not applicable.

5.2 Drawings and Models

5.2.1 Mechanical plant noise levels

Forecast internal noise levels on the basis of nominated mechanical arrangements and specifications are provided for selected spaces as follows:

Description of Area / Room	Space Type Definition	Target sound level, L_{Aeq}, dB	Estimated range, L_{Aeq}, dB
25-A-286-AR0040 DRIVER WC	Toilets and amenities	45 to 55	40 to 50
25-A-286-AR0040 STAFF OFFICE	General office areas	45	<40
25-A-286-AR0040 DRIVER CRIB	Staff crib rooms	45	<40
25-A-286-AR0049 VERTICAL TRANSPORT STAFF CRIB	Staff crib rooms	45	<40
25-A-286-AR00459VERTICAL TRANSPORT WC	Toilets and amenities	45 to 55	40 to 50
PLATFORM	Platforms	70	60 to 65
25-A-286-AR0040/49 VERTICAL TRANSPORT / CONCOURSE	Public waiting areas	45	40 to 50

Figure 10 presents the forecast noise levels in the vicinity of the station as a result of mechanical noise.

Figure 10: Forecast distribution in airborne noise from mechanical noise for comparison with L_{A10} criteria

5.2.2 Rail movements

Figure 11 and Figure 12 present forecast noise levels from rail operations in the vicinity of the station.

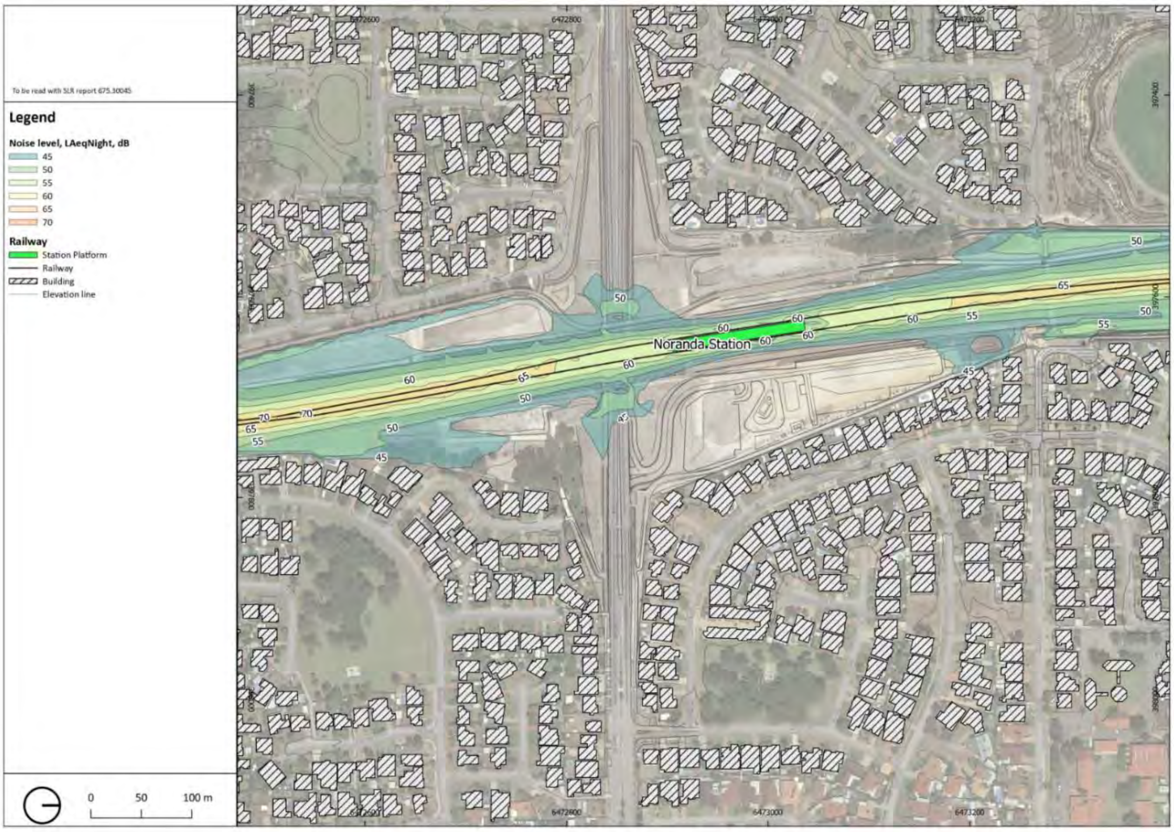


Figure 11: Forecast distribution in airborne noise from rail operations for comparison with L_{Aeq} night criteria

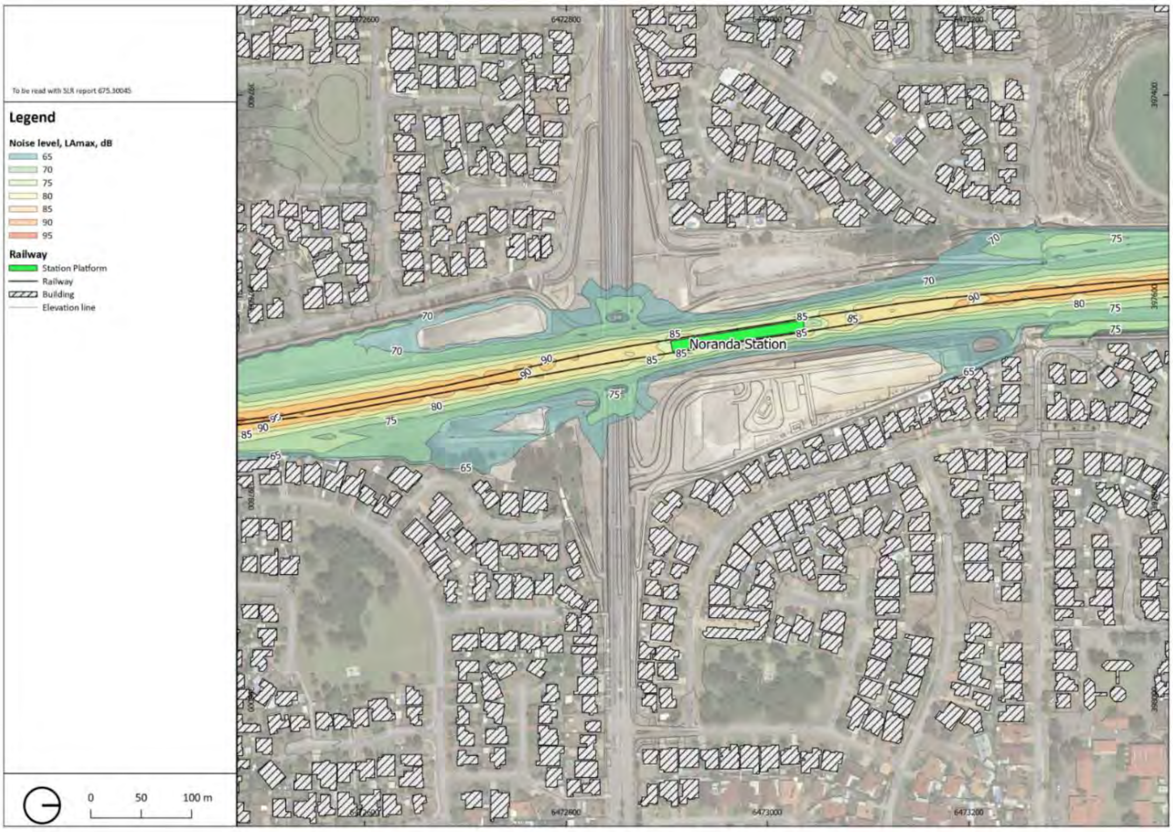


Figure 12: Forecast distribution in airborne noise from rail operations for comparison with L_{Amax} criteria

5.2.3 Car parking activities

Figure 13 presents forecast noise levels in the vicinity of the station as a result of modelled car parking / drop off facilities according to Section 4.

Figure 13: Forecast distribution in airborne noise from station car parking areas for comparison with L_{Aeq} day criteria

It can be seen that the predicted levels from car parking activities at the station are within the targets outlined in Section 4.5.2 to the nearest receivers.

5.3 Specifications

Not applicable at this design stage.

5.4 Standard Reference Drawings

Not applicable.

5.5 System Coordination Drawings and Models

Not applicable.

5.6 Type Approvals

Not applicable.

5.7 Calculations

5.7.1 Noise Propagation Effects

5.7.1.1 Path Attenuation Factors

Outside the rail reserve, the environmental factors relevant to noise propagation were modelled as follows:

- Topography dataset of existing conditions for the assessment area was sourced from Landgate and adapted to the provided alignment in 3D dwg format.
- Given the relatively short propagation distances, weather conditions for each time period were considered neutral, with 20°C ambient temperature and no prevailing wind or temperature gradient effects.
- Existing noise barrier and fence heights and locations were reviewed with necessary corrections being made to reflect their realistic existing conditions. The modelling was then carried out on the basis that these fences and barriers are acoustically solid, i.e. they perform as effective noise barriers, being of suitable construction to sufficiently reduce noise transmission.

5.7.1.2 Air Attenuation and Diffraction

The propagation of railway noise from source to nearby sensitive areas has been estimated using industry standard numerical code that has been validated through field measurements.

- 'N2k': The Nord2000 Rail prediction method is an update to the Kilde formulation based on advancements in the late 1990s. The main benefit comes from the fact that the N2k methodology calculates in terms of one-third octave bands, rather than a single number to represent all frequencies. This is critical in regards to the design of noise walls, because their effectiveness is strongly frequency dependent – the difference in noise reduction at higher frequencies is vastly different compared to low frequencies.
- The ISO 9613 Industrial Prediction Model has been used for predicting noise from stationary assets with noise sources including sirens and bells. Various weather conditions can be taken into account in this modelling algorithm.

Stationary noise sources are modelled according to the parameters outlined in the following Table.

Parameter	Day period	Night period
Wind speed	Nil (ISO 9613, C_{met} = 0dB)	Nil (ISO 9613, C_{met} = 0dB)
Temperature inversion lapse rate	Nil (ISO 9613)	Nil (ISO 9613)
Temperature	20°C	15°C
Relative humidity	50%	50%
Mean barometric pressure	1013hPa	1013hPa

These sources are generally those assessed under the Regulations, such as crowd noise, public address systems, fixed mechanical plant and idling buses not on public roads.

5.7.1.3 Ground absorption

The table below summarises the ground absorption rates modelled.

Parameter	Value	Comments
Default	0	Hard ground
Rail reserve generally	0	Hard ground
Undeveloped sites, loose soil	0	Conservatively assuming future development / sealed surfaces
Significant road and sealed concrete surfaces	0	Conservatively 100% hard reflective
Established parks and reserves	0.6	60% sound absorptive

5.8 Schedules

Not applicable.

6. Competence for Design

Not applicable at this Design Stage.

7. Design Reviews and Certification

7.1 Interdisciplinary Design Check (IDC) Review

Not applicable at this Design Stage.

7.2 IDC Certificate

Not applicable at this Design Stage.

7.3 Design Verification

Not applicable at this Design Stage.

7.4 Independent Verification

Not applicable at this Design Stage.

7.5 BCA

Not applicable at this Design Stage.

7.6 DDA

Not applicable at this Design Stage.

7.7 PTA Design Submission Reviews.

Not applicable at this Design Stage.

8. Design Compliance

The demonstration of compliance with the requirements of the Project Definition Documents, including any non-conformances of concessions is summarised on the following sections.

8.1 Standards & Guidelines

See Section 4.3.

8.2 SWTC

Not applicable at this Design Stage.

8.3 Planning & Environmental Approvals

Not applicable at this Design Stage.

8.4 Third Party Requirements

Not applicable at this Design Stage.

8.5 Deviation Register

Not applicable at this Design Stage.

8.6 Non-Compliances Register

Not applicable at this Design Stage.

9. External Interface Work Packages

9.1 Project Interface Control Plan

Not applicable at this Design Stage.

10. Effects of the Works

Not applicable.

11. Safety in Design

11.1 Overview

Not applicable.

11.2 Systems Safety Assurance Plan.

Not applicable.

11.3 Compliance with Safety Assurance Plan

Not applicable.

11.4 Safety Analysis

Not applicable.

11.5 Safety Argument

Not applicable.

11.6 Hazard Analysis

Not applicable.

11.7 Satisfaction of Safety Integrity Level Targets

11.8 Satisfaction of GSN Requirements

Not applicable.

11.9 Management of Safety Requirements

Not applicable.

11.10 Transfer of Residual Risks and Safety Related Operational Conditions

Not applicable.

11.11 Safety Assurance Statement

Not applicable.

12. Systems Engineering

12.1 Sub-system Allocation

Not applicable.

12.2 Requirements Management

Not applicable.

12.3 Engineering Assurance Summary

Not applicable.

13. Sustainability in Design

Not applicable.

14. Testing & Commissioning Requirements

Not applicable.

14.1 ITP's

Not applicable.

14.2 Hold Points

Not applicable.

14.3 Witness Points

Not applicable.

15. Human Factors

Not applicable.

16. Reliability, Availability and Maintainability (RAM)

16.1 General RAM Provisions

Not applicable.

16.2 RAM Targets

Not applicable.

17. Construction Methodology

17.1 Construction Methods

Not applicable.

17.2 Operational Staging

Not applicable.

17.3 Works in Track Occupancies

Not applicable.

18. Asset Maintenance Strategy

Not applicable.

18.1 RTO Assets

18.2 Other Assets

Not applicable.

19. Asset Operations Strategy

The following operational strategy has been assumed in this design package:

19.1 Normal Modes of Operations

19.2 Degraded Modes of Operations

20. Decommissioning Strategy

Not applicable.

20.1 Capability to Modify

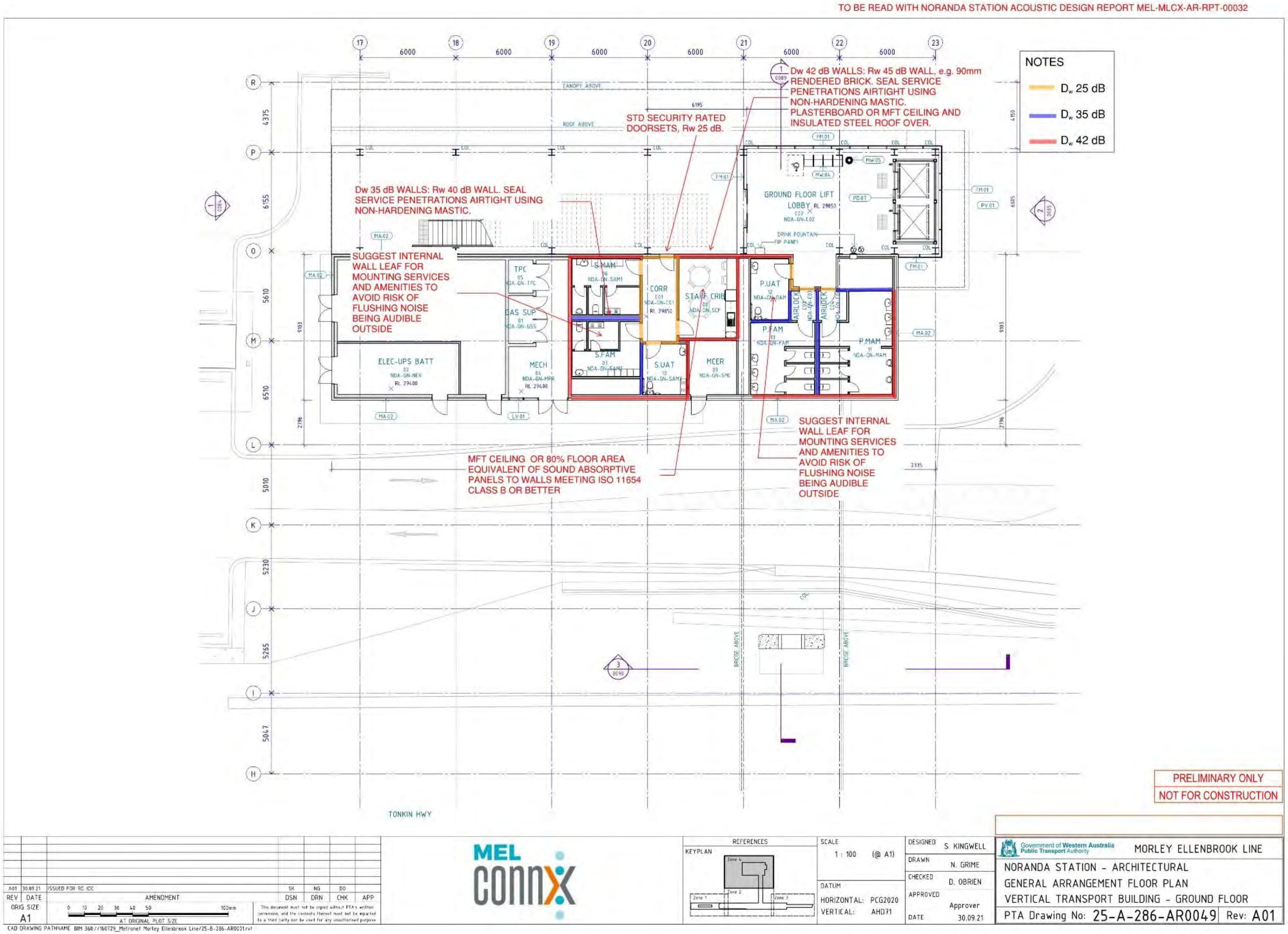
20.2 Decommissioning Strategy

21. Project Actions Register

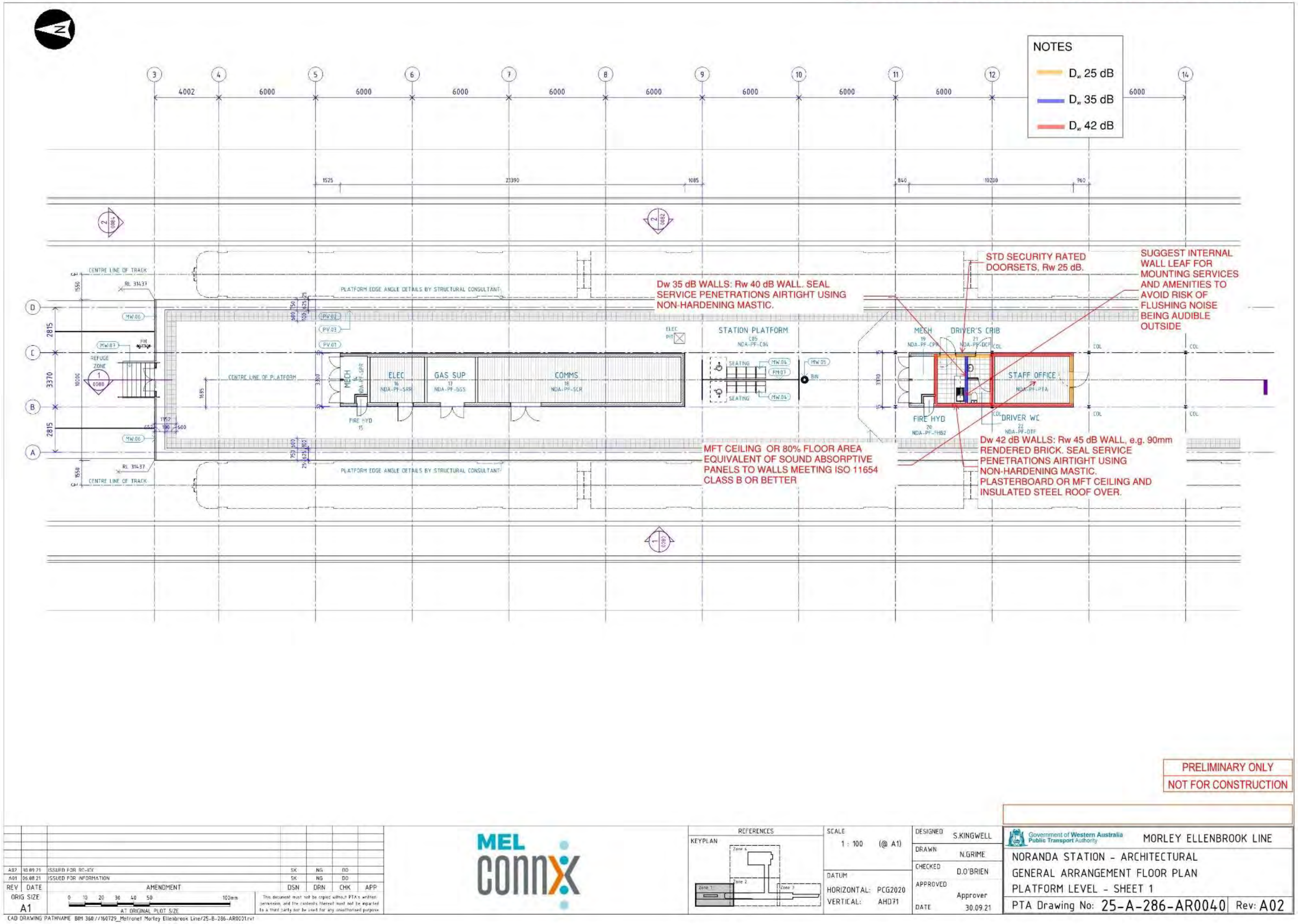
A list of outstanding issues and assumptions that may affect the design are outlined in the Table below.

ID	Outstanding Issues	Potential Effect	Status
	Final arrangement of loudspeakers / PA systems	Increased noise emissions	

Appendix A: Drawing and Model List


TO BE READ WITH NORANDA STATION ACOUSTIC DESIGN REPORT MEL-MLCX-AR-RPT-00032
NOTES
Dw 25 dB
Dw 35 dB
Dw 42 dB
Dw 42 dB WALLS: Rw 45 dB WALL, e.g. 90mm RENDERED BRICK. SEAL SERVICE PENETRATIONS AIRTIGHT USING NON-HARDENING MASTIC. PLASTERBOARD OR MFT CEILING AND INSULATED STEEL ROOF OVER.
STD SECURITY RATED DOORSETS, Rw 25 dB.
Dw 35 dB WALLS: Rw 40 dB WALL. SEAL SERVICE PENETRATIONS AIRTIGHT USING NON-HARDENING MASTIC.
SUGGEST INTERNAL WALL LEAF FOR MOUNTING SERVICES AND AMENITIES TO AVOID RISK OF FLUSHING NOISE BEING AUDIBLE OUTSIDE
MFT CEILING OR 80% FLOOR AREA EQUIVALENT OF SOUND ABSORPTIVE PANELS TO WALLS MEETING ISO 11654 CLASS B OR BETTER
SUGGEST INTERNAL WALL LEAF FOR MOUNTING SERVICES AND AMENITIES TO AVOID RISK OF FLUSHING NOISE BEING AUDIBLE OUTSIDE
GROUND FLOOR LIFT LOBBY
ELEC-UPS BATT
MECH
TPC
GAS SUP
S.MAM
S.FAM
CORR
STAFF CRIB
S.UAT
MCER
P.UAT
P.FAM
P.MAM
AIRLOCK
TONKIN HWY
PRELIMINARY ONLY
NOT FOR CONSTRUCTION
MEL connx
DESIGNED S. KINGWELL
DRAWN N. GRIME
CHECKED D. OBRIEN
APPROVED Approver
DATE 30.09.21
SCALE 1 : 100 (@ A1)
HORIZONTAL: PCG2020
VERTICAL: AHD71
A01 30.09.21 ISSUED FOR RC IDC
Government of Western Australia Public Transport Authority
MORLEY ELLENBROOK LINE
NORANDA STATION - ARCHITECTURAL
GENERAL ARRANGEMENT FLOOR PLAN
VERTICAL TRANSPORT BUILDING - GROUND FLOOR
PTA Drawing No: 25-A-286-AR0049 Rev: A01

TO BE READ WITH NORANDA STATION ACOUSTIC DESIGN REPORT MEL-MLCX-AR-RPT-00032



Appendix B: Specifications

Not applicable at this design stage

Appendix C: Standard Drawings

Not applicable at this design stage

Appendix D: Engineering Change Approvals

Not applicable at this design stage

Appendix E: Calculations

Job No.	Job Title			
675.30045	MEL D			
Date Created	By	Date Revised	Rev	Sheet
15 Sep 2021	LZ	15 Sep 2021	0	3
Date Reviewed	By	Review Type	Review Status	

Noranda Station Mechanical Noise Emissions - Screening Calc (ISO9613)

Item / Description		Rating/Broadband/Input Rating	dB	dB(A)	31.5	63	125	250	500	1k	2k	4k	8k
Source levels / inputs													
Empirical Air-Cooled Condenser Lw	Conservative power level	60.0 kW		92.0 (A)		96	96	93	90	86	83	80	72
Day reduced duty				0.0									
Evening emission level, total				92.0 (A)		96	96	93	90	86	83	80	72
Separation distance from station centre		70.0 m											
Air temp		20.0											
Environmental losses	For distances r >> source dimension ds												
Point Source Propagation Loss		70.0 m	3.0 dB		-44.8	-44.8	-44.8	-44.8	-44.8	-44.8	-44.8	-44.8	-44.8
Atmospheric Attenuation - Theory: ISO		70 m	20 °C	RH 70%		0.0	0.0	-0.1	-0.2	-0.4	-0.6	-1.6	-5.4
Ground Attenuation, Theory: ISO 9613.2, Source Zone Ground 50% Soft Ground, M		70.0 m	1.0 m	1.5 m		3.0	1.0	-4.1	-3.7	0.5	1.5	1.5	1.5
Assume no barriers, wall reflection or screening effects													
Received level outdoors, night	LAeq			46 (A)		54.0	52.0	43.9	41.1	41.2	38.9	34.9	23.2
Residential night time target (EPNR)	6 dB transport factor			**51 (A)**									
Excess on target (level of compliance)				(4.8)									
	Forecast level of compliance is more than design uncertainty												

Figure E14: Mechanical plant noise emissions screening calc, Noranda, day period strutt

Job No.	Job Title			
675.30045	MEL D			
Date Created	By	Date Revised	Rev	Sheet
06 Oct 2021	AD	06 Oct 2021	2	1
Date Reviewed	By	Review Type	Review Status	

Noranda Station Mechanical Noise Emissions - Screening Calc (ISO9613)

Item / Description		Rating/Broadband/Input Rating	dB	dB(A)	31.5	63	125	250	500	1k	2k	4k	8k
Source levels / inputs													
Empirical Air-Cooled Condenser Lw	Conservative power level	60.0 kW		92.0 (A)		96	96	93	90	86	83	80	72
Evening reduced duty				-9.0									
Evening emission level, total				83.0 (A)		87	87	84	81	77	74	71	63
Separation distance from station centre		70.0 m											
Air temp		20.0											
Environmental losses	For distances r >> source dimension ds												
Point Source Propagation Loss		70.0 m	3.0 dB		-44.8	-44.8	-44.8	-44.8	-44.8	-44.8	-44.8	-44.8	-44.8
Atmospheric Attenuation - Theory: ISO		70 m	20 °C	RH 70%		0.0	0.0	-0.1	-0.2	-0.4	-0.6	-1.6	-5.4
Ground Attenuation, Theory: ISO 9613.2, Source Zone Ground 50% Soft Ground, M		70.0 m	1.0 m	1.5 m		3.0	1.0	-4.1	-3.7	0.5	1.5	1.5	1.5
Assume no barriers, wall reflection or screening effects													
Received level outdoors, night	LAeq			37 (A)		45.0	43.0	34.9	32.1	32.2	29.9	25.9	14.2
Residential night time target (EPNR)	6 dB transport factor			**41 (A)**									
Excess on target (level of compliance)				(3.8)									
	Forecast level of compliance is more than design uncertainty												

Figure E15: Mechanical plant noise emissions screening calc, Noranda, night period

strutt

Job No.	Job Title			
Date Created	By	Date Revised	Rev	Sheet
30 Sep 2021	AD	06 Oct 2021	1	3
Date Reviewed	By	Review Type	Review Status	

Noranda Station staff crib

Item / Description	Area, m²	X/Y/Z	Rating	Absorption Coefficient 31.5	63	125	250	500	1k	2k	4k	8k	Total Sabines, m² 31.5	63	125	250	500	1k	2k	4k	8k
Library - Type: Absorption, Source: Local, IC Floor - Vinyl or linoleum concrete	28.2		NRC 0.03			0.02	0.02	0.03	0.04	0.04	0.05				1	1	1	1	1	1	
Library - Type: Absorption, Source: Local, IC Ceiling - 9-mm plasterboard on batter	5.6		NRC 0.11			0.30	0.20	0.15	0.05	0.05	0.05				2	1	1	0	0	0	
Library - Type: Absorption, Source: Local, IC Walls - Painted plaster	51.9		NRC 0.02			0.02	0.02	0.02	0.02	0.02	0.02				1	1	1	1	1	1	
Library - Type: Absorption, Source: Local, IC Glazing (6mm)	4.0		NRC 0.04			0.10	0.06	0.04	0.03	0.02	0.02				0	0	0	0	0	0	
Library - Type: Absorption, Source: Local, IC Solid timber door	1.9		NRC 0.08			0.14	0.10	0.06	0.08	0.10	0.10				0	0	0	0	0	0	
Treatment																					
Library - Type: Absorption, Source: Local, IC Ceiling - 13-mm mineral tile, suspend	22.6		NRC 0.76			0.75	0.70	0.65	0.85	0.85	0.80				17	16	15	19	19	18	

Item / Description	No. Items	X/Y/Z	Rating	Sabines Per Item, m² 31.5	63	125	250	500	1k	2k	4k	8k	Total Sabines, m² 31.5	63	125	250	500	1k	2k	4k	8k

Item / Description		Input	$T_{60,LF}$	$T_{60,MF}$	Sabines / Reverberation Time 31.5	63	125	250	500	1k	2k	4k	8k
Room		5 m	6 m	3 m									
Room Constant, m²		2 m	114 m²	76 m³	0	0	26	23	21	27	28	28	6
Total Sabines, m²		148 Hz			0	0	21	19	18	22	22	23	6
Average absorption coefficient					0	0	0	0	0	0	0	0	0
Air Attenuation dB/m		343.0 m/s	20.0°C	RH 50%	0.000	0.000	0.000	0.000	-0.001	-0.002	-0.008	-0.025	-0.081
Prediction Method Comparison													
Sabine		BR 99%	0.62 s	0.62 s			0.59	0.65	0.69	0.56	0.55	0.54	
Eyring		BR 99%	0.56 s	0.57 s			0.53	0.59	0.64	0.50	0.49	0.48	
Fitzroy (Eyring)		BR 99%	0.56 s	0.57 s			0.53	0.59	0.64	0.50	0.49	0.48	
Result	Shape, Target	Speech		0.60 s									
Zhang		BR 99%	0.58 s	0.58 s			0.55	0.61	0.65	0.51	0.51	0.50	
Design Target	Minimum	BR 91%	0.44 s	0.48 s	0.30	0.30	0.39	0.48	0.48	0.48	0.48	0.39	0.30
Design Target	Maximum	BR 100%	0.72 s	0.72 s	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72

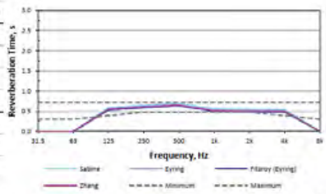


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Figure 16: Reverberation estimation, Noranda Vertical Transport Building Staff Crib

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Job No.	Job Title			
Date Created	By	Date Revised	Rev	Sheet
30 Sep 2021	AD	06 Oct 2021	1	4
Date Reviewed	By	Review Type		Review Status

Noranda Station Office

Item / Description	Area, m²	X/Y/Z	Rating	Absorption Coefficient, Octave Band Centre Frequency, Hz: 31.5	63	125	250	500	1k	2k	4k	8k	Total Sabines, m², Octave Band Centre Frequency, Hz: 31.5	63	125	250	500	1k	2k	4k	8k
Library - Type: Absorption, Source: Local, IC Floor - Vinyl or linoleum concrete	20.4		NRC 0.03			0.02	0.02	0.03	0.04	0.04	0.05				0	0	1	1	1	1	
Library - Type: Absorption, Source: Local, IC Ceiling - 9-mm plasterboard on batter	4.1		NRC 0.11			0.30	0.20	0.15	0.05	0.05	0.05				1	1	1	0	0	0	
Library - Type: Absorption, Source: Local, IC Walls - Painted plaster	47.8		NRC 0.02			0.02	0.02	0.02	0.02	0.02	0.02				1	1	1	1	1	1	
Library - Type: Absorption, Source: Local, IC Solid timber door	1.9		NRC 0.08			0.14	0.10	0.06	0.08	0.10	0.10				0	0	0	0	0	0	
Treatment																					
Library - Type: Absorption, Source: Local, IC Ceiling - 13-mm mineral tile, suspend	16.3		NRC 0.76			0.75	0.70	0.65	0.85	0.85	0.80				12	11	11	14	14	13	

Item / Description	No. Items	X/Y/Z	Rating	Sabines Per Item, m²: 31.5	63	125	250	500	1k	2k	4k	8k	Total Sabines, m²: 31.5	63	125	250	500	1k	2k	4k	8k

Item / Description		Input	$T_{60,LF}$	$T_{60,MF}$	Sabines / Reverberation Time: 31.5	63	125	250	500	1k	2k	4k	8k
Room		6 m	4 m	3 m									
Room Constant, m²		2 m	90 m²	55 m³	0	0	18	16	15	20	20	20	4
Total Sabines, m²		174 Hz			0	0	15	14	13	16	16	17	4
Average absorption coefficient					0	0	0	0	0	0	0	0	0
Air Attenuation dB/m		343.0 m/s	20.0°C	RH 50%	0.000	0.000	0.000	0.000	-0.001	-0.002	-0.008	-0.025	-0.081
Prediction Method Comparison													
Sabine		BR 100%	0.62 s	0.62 s			0.59	0.64	0.69	0.55	0.54	0.53	
Eyring		BR 100%	0.56 s	0.57 s			0.54	0.59	0.64	0.50	0.49	0.48	
Fitzroy (Eyring)		BR 100%	0.56 s	0.57 s			0.54	0.59	0.64	0.50	0.49	0.48	
Result	Shape, Target	Speech		0.60 s									
Zhang		BR 100%	0.58 s	0.58 s			0.55	0.61	0.65	0.51	0.50	0.50	
Design Target	Minimum	BR 91%	0.44 s	0.48 s	0.30	0.30	0.39	0.48	0.48	0.48	0.48	0.39	0.30
Design Target	Maximum	BR 100%	0.72 s	0.72 s	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72

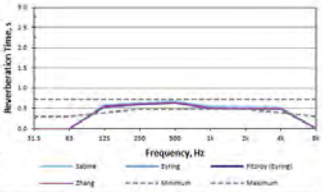

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Figure E17: Reverberation times for Noranda Platform Staff Office

Appendix E – Transport Impact Assessment

Morley-Ellenbrook Line

Noranda Station Transport Impact Assessment

MEL-MLCX-MO-RPT-00009

Rev	Date	Purpose of Issue	Prepared	Reviewed	Approved
B	17/11/2021	Issued for Review	Joshua Bandi Timothy Dawson	Scott Arbon (JAJV SRE)	Manoj Aravind (SEM)

Document Details	
Project	Morley-Ellenbrook Line
Client	Public Transport Authority
PTA Contract Number	PTA200001
Laing O'Rourke Project No.	K97

Document revision history

Rev	Date	Purpose of Issue	Sections revised	Reason for updates
A	01/10/2021	Issued for review	N/A	N/A
B	17/11/2021	Issued for review	1,2,3,4,5,6	Comments from stakeholders

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Glossary

Phrase	Meaning	Notes
ACROD	*Australian Council for Rehabilitation of Disabled*	*ACROD bays are specifically designated bays for those with disabilities who qualify for the ACROD parking program*
DA	*Development Application*	*The required statutory application for individual developments on a parcel of land that go beyond the remit of a simple building application to the local government*
DOS	*Degree of saturation*	*A percentage measure of demand/capacity for an intersection, approach or lane*
DOT	*Department of Transport*	*The WA state government department responsible for implementing transport policies*
DPLH	*Department of Planning, Lands and Heritage*	*The WA state government department responsible for land-use planning*
KnR	*Kiss and Ride*	*Pick-up/drop-off facility for the train station*
LOS	*Level of service*	*A categorisation of the delay vehicles experience at a particular intersection, approach or lane*
MEL	*Morley-Ellenbrook Line*	*The proposed train line connecting from Bayswater to Ellenbrook as a spur line from the existing Midland line*
MRWA	*Main Roads Western Australia*	*Authority responsible for implementing Western Australia's policies on road access and main roads*
PCU	*Passenger Car Unit*	*A unit to measure the equivalent number of passenger cars represented by vehicles larger than a passenger car*
PDO	*Property Damage Only*	*A crash that causes damage only to property (built form or vehicles for example), with no harm caused to people*
PDP	*Project Definition Phase*	*The concept design phase of the Morley Ellenbrook Line*
PnR	*Park and Ride*	*All-day parking facility for the train station*
PUDO	*Pick-up/drop-off*	*Pick-up/drop-off parking bays typically have a maximum 5 minute parking time*
PSP	*Principal Shared Path*	*A wide (>3 metre) shared path, usually with lighting and priority or signalised crossings at road crossings*
PTA	*Public Transport Authority*	*Authority responsible for public transport in Western Australia.*
SCATS	*Sydney Coordinated Adaptive Traffic System*	*The control system used for all traffic lights within Western Australia*
STEM	*Strategic Transport Evaluation Model*	*The Department of Transport's multi-modal strategic transport model, used to forecast and assess transport demands in the Perth Metropolitan area*
SWTC	*Scope of Works and Technical Criteria*	*The documentation outlining the scope and criteria for the design and construction of the MEL project*
TIA	*Transport/Traffic Impact Assessment*	*An assessment report of the impact that a development or subdivision has on the surrounding transport network*
WAPC	*Western Australian Planning Commission*	*The section of the DPLH responsible for assessing statutory planning applications such as Development Applications*

Summary

As Perth grows, so does the need for rail infrastructure and METRONET is a critical element of the State Government's infrastructure agenda. The Morley-Ellenbrook Line (MEL) Project will improve connectivity between the north east metropolitan area and the rest of the city and unlock economic development in these local community areas.

Noranda Station will add to the 'liveability' of the surrounding suburbs of Beechboro, Kiara and Noranda, while offering local residents another transport choice when travelling to and from the Perth CBD and the north-eastern suburbs. Noranda Station will also alleviate pressure on station patronage at Malaga and Morley.

In accordance with the *WAPC Transport Impact Assessment Guidelines*, this report provides an overview of the Transport Impact for the proposed Noranda Station, comprising an assessment of the site's existing and future transport context, including changes to the network, integration with surrounding land uses, and an analysis of the development's traffic impact. This station is assessed to generate over 100 vehicles per hour during the peak hour, and as such is classified as 'high impact' under the guidelines, necessitating a Transport Impact Assessment.

At opening day (proposed by year 2026). Noranda Station is proposed to consist of:

- One island platform
- A 394 bay Park and Ride (PnR) facility comprising:
  - 357 standard all-day bays
  - 21 standard short-term bays
  - 2 EV charging bays
  - 7 ACROD bays
  - 2 service vehicle/loading bays
  - 4 open staff parking bays
  - 1 taxi bay
- A 6 bay Kiss and Ride (KnR) facility comprising:
  - 5 standard pick-up/ drop-off (PUDO) bays
  - 1 ACROD bay
- 10 sheltered motorcycle bays
- Secure bicycle storage shelter, with storage for approximately 53 bicycles and space proofing of an additional 117 bicycles
- 10 U-rail bicycle stands within the station precinct.

Noranda Station is proposed to be located within the MRS Primary Regional Road reservation, with the station platform located in the median of Tonkin Highway, immediately north of Benara Road. The station precinct is proposed within the road reservation on the eastern side of the Tonkin Highway, and accessed via Benara Road.

The Noranda Station site is contained within a MRS Primary Regional Road Reserve (Tonkin Highway). Surrounding existing land uses around the proposed site are primarily low-density single residential development. As an established residential area, some pedestrian and cycle infrastructure already exists, providing access to the proposed Noranda Station, including a Principal Shared Path (PSP) on the western side of Tonkin Highway, shared paths to both sides of Benara Road and the eastern side of Tonkin Highway, and an overpass directly to the north of the proposed station. Bus services are not proposed to access Noranda Station, with no interchange facilities proposed within the station precinct. The nearest current public transport routes are Transperth bus service 345, which travels along Beechboro Road North, approximately 600 metres to the east of the site; and Transperth bus service 346 which travels on Emberson Road and Benara Road approximately 600 metres west of the site.

Given the existing site is largely residential, the introduction of a transit node connecting the surrounding area to high capacity public transport creates the need for additional transport infrastructure upgrades. In order to facilitate safe and efficient access to support the station, a number of upgrades to the existing active and public transport and road network services is required.

The proposed station precinct design will introduce modifications and new infrastructure to the surrounding transport network to facilitate access for all modes. This includes an underpass beneath Benara Road to the east of the site, an overpass from the Benara Road bridge to the Station building, provision of secure bicycle parking adjacent to the station forecourt, new bus stops and an associated bus service which traverses the Benara Road bridge, and PnR / KnR facility with associated access from Benara Road.

Table S1: Generated traffic demand – PnR and KnR facilities

	PnR demand (veh/ %)		KnR demand (veh/ %)		Total (veh)	
Peak	Inbound	Outbound	Inbound	Outbound	Inbound	Outbound
AM peak hour	*220 (55%)*	*0*	*112 (28%)*	*112 (28%)*	*332*	*112*
PM peak hour	*0*	*164 (41%)*	*88 (22%)*	*88 (22%)*	*88*	*252*

Table S2: PnR and KnR traffic distribution

	Distribution of Inbound traffic		Distribution of Outbound traffic	
Associated STEM year	From West	From East	To the West (via U-turn on Benara Rd)	To the East
2026 - 2031	*80%*	*20%*	*80%*	*20%*
2031 onwards	*75%*	*25%*	*75%*	*25%*

The trips generated by the station and the surrounding development have been estimated respectively based on benchmarking exercises of existing stations and STEM all-day link volume growth as provided by METRONET. Table S1 and S2 summarise the estimated trips generated by the station PnR/ KnR facilities and development.

An assessment of the impacts of the generated trips on the surrounding road network has been based on the combined traffic generated by the PnR / KnR facilities and background traffic growth in the area using SIDRA intersection software. This includes an assessment of the new station access, and a U-Turn facility located along Benara Road east of the proposed station access (to facilitate outbound trips to the west) for both the future do-nothing and project case scenarios with the additional station generated traffic.

This analysis concluded that the Noranda Station access located along Benara Road will operate with good performance (LOS C or better) up to and including 10-years post opening of the station.

By 2036, this access road is forecast to perform with a DoS of 44.5% and 44.9% during the AM and PM peak periods respectively.

The U-Turn facility located approximately 350 metres east of the station access along Benara Road is expected to experience high delays attributed to the significant background traffic growth forecast for the opposing westbound through movement. The high delays were observed in both the Future Do-Nothing and Project Case scenarios

Within the future project case scenarios, this U-Turn facility is expected to perform within capacity (below 85% DoS) and with queues that are contained within the available storage capacity up to and including the opening +5 years scenarios.

However, the U-Turn facility is expected to perform overcapacity (above 100% DoS) and with queues that extend beyond the pocket length by 2036. This is in addition to the significant delays forecast for this movement highlighted by the LOS F.

Main Roads WA modelling (CRFI240/JAJV RFI-00191) of the Benara Road corridor has suggested that station traffic has minimal impact on the performance of the Benara Road/ Beechboro Road intersection, with residual capacity available at the intersection up to the +10 year scenario at which point capacity is reached. Station traffic will be able to utilise this adjacent intersection as an alternative should queueing extend beyond the storage of the U-Turn facility prior to the intersection reaching capacity. It is recommended that the performance of this U-Turn facility be closely monitored to ensure adequate performance up to and including the opening +10 years scenarios for both the AM and PM peak periods.

1 Introduction and background

1.1 Overview

Acknowledgement of Country

MELConnx acknowledges the Whadjuk People of the Noongar Nation as the Traditional Custodians of the land and waters on which the Morley-Ellenbrook Line Project is located. We pay our respects to their Elders, both past and present and thank them for their continuing connection to the country, culture and community

1.1.1 METRONET vision and objectives

As Perth's single largest investment in public transport, METRONET will transform the way people commute and connect. It will create jobs and business opportunities and stimulate local communities and economic development to assist communities to thrive. The METRONET vision is for a well-connected Perth with more transport, housing, and employment choices.

In delivering METRONET, the WA Government has considered peoples' requirements for work, living and recreation within future urban centres, with a train station at the heart.

The objectives are to:

- Support economic growth with better connected businesses and greater access to jobs
- Deliver infrastructure that promotes easy and accessible travel and lifestyle options
- Create communities that have a sense of belonging and support Perth's growth and prosperity
- Plan for Perth's future growth by making the best use of our resources and funding
- Lead a cultural shift in the way government, private sector, and industry work together to achieve integrated land use and transport solutions for the future of Perth.

1.1.2 Morley-Ellenbrook Line overview

As Perth grows, so does the need for rail infrastructure and METRONET is a critical element of the State Government's infrastructure agenda. The Morley-Ellenbrook Line (MEL) Project will improve connectivity between the north-east metropolitan area and the rest of the city, and will unlock economic development in these local community areas.

The Public Transport Authority (PTA) is the lead agency delivering the MEL Project, with Main Roads WA (MRWA) undertaking some enabling works.

1.1.2.1 Project features

Transport infrastructure works for the Project include:

- A 21km rail line spurring from the Midland Line east of Bayswater Station, travelling north in the Tonkin Highway median, east through land north of Marshall Road and north on the western side of New Lord Street into Ellenbrook
- Stations at Morley, Noranda, Malaga, Whiteman Park and Ellenbrook with future-proofing for a station at Bennett Springs East
- Parking and bus interchanges/ facilities at stations
- Significant grade separations at key road crossings
- Underpasses to allow the rail line to enter and exit the Tonkin Highway median
- Principal Shared Paths (PSP) for walking and cycling access the length of the rail line
- Track and associated infrastructure to connect to the existing Midland Line
- Road and bridge reconfiguration works
- Integration across the packages of works and other nearby projects.

1.1.2.2 General scope of works

The Project's general scope of works includes the design and delivery of rail infrastructure and ancillary works to support operational passenger rail between Bayswater and Ellenbrook, including stations with inter-modal bus and rail with parking and associated road works at Bayswater, Morley, Noranda, Malaga, Whiteman Park and Ellenbrook stations.

Figure 1: Morley-Ellenbrook Line © METRONET

The Project activities include all investigation, design, approvals, construction, testing and commissioning, Entry Into Service (EIS), training and operational readiness required to incorporate the new railway to Ellenbrook, and tie into the existing network including the associated road, utilities and other required works to interface with adjacent works and contracts. This will include bulk earthworks and retaining, structures, grade separations, roads and drainage.

The design and delivery of the main works package for the Project is broken into three distinct stages:

- Alliance Development Stage
- Project Alliance Reference Design Stage
- Project Alliance Delivery Stage (Detailed Design through to Project close-out).

Figure 2: Architect's Impression of Ellenbrook Station © MELconnx

1.1.2.3 Key project objectives, key compliance objectives and critical success factors

The PTA and MELConnx's single Non-Owner Participant (NOP) Laing O'Rourke Construction Australia Pty Ltd, have formed an integrated, collaborative Project Alliance to successfully deliver rail infrastructure that reflects our absolute commitment to achieving the Project Objectives and delivering positive outcomes for the State.

The following image demonstrates how we have mapped each Key Project Objective in the Project Alliance Agreement (PAA) against the Critical Success Factors to achieve best-for-project outcomes, underpinned by the Key Compliance Objectives.

Key Project Objectives	Critical Success Factors for Successful Project Delivery (abbreviated)
Implementation of a robust, cooperative team culture.	• Development of a culture that results in all Participants developing behavioural values and driving principles to achieve Alliance goals and project objectives • Longevity and stability of key Alliance personnel i.e. Alliance Manager, ALT and AMT.
Timely delivery of Works to achieve project milestones in accordance with agreed program.	• Development of a final proposal with a sufficiently developed design and accurate TOC • Subsequent cash flow management and financial forecasting, scheduling and value-earned calculation and determination • Implementation of PTA mandated systems i.e. TeamBinder, Primavera P6, TILOS and a finance system accepting the PTA's cost breakdown structure • Timely completion of design, construction and commissioning through to practical completion • Timely progress towards construction milestones and completion of close-out to achieve final asset acceptance compliance.
Inclusion of processes that embrace/promote open tendering and promotion of work package development that encourages/ enables second and third tier tendering. Compliance with WAIPs.	• For professional service providers, implement a proven and mature supply-chain engagement process, including tender review, contract award and project integration. Ensure that it offers opportunity and security of payment relative to services delivered in an effort to achieve best-for-project outcomes • For material suppliers and other subcontract service providers, implement a proven and mature supply-chain engagement process, including tender review, contract award and project integration that offers opportunity and security of payment relative to service delivered • Proven and mature supply-chain engagement process for labour hire services, compliant with industrial and safety laws, maintained employee standards/conditions and security of employee payments • Ability to develop contracts and terms and conditions in the spirit of the Alliance values and principles , appropriate and commensurate with the size, complexity and value of packages in accordance with industry best practice.
Optimisation of operational and whole of life costs.	• Sustainability considerations and outcomes for the whole of life of the works.
Ensuring appropriate consultation/integration with stakeholders and community.	• Constant and effective engagement with relevant stakeholders, particularly utilities/services, Main Roads, third party asset owners and relevant unions • Effective management of PTA interfaces and PTA contractors • Constant/effective engagement with the PTA in design reviews, work planning and possessions/shutdowns.
Providing passengers with safe and secure services and facilities.	• Compliance with ONSR requirements • Completed rail line, stations and bus transfer infrastructure are able to deal successfully with the movement of people, including the disabled.
Minimising disruption to current and anticipated rail operations.	• Minimise impact on public transport services disruption • Liaison and interaction with PTA rail operations personnel tasked with determining network closures, to confirm available network shutdowns and implement contingency plans • Effective management of interfaces with others in heavily constrained areas • Effective management/staging of works to reflect staged/constrained site access • Effective management of existing rail infrastructure asset protection.
Recognising the State's desired industrial relations objectives.	• Develop a project-specific Industrial Relations Management Plan based on a proven and successful industrial relations approach that delivers a collaborative worksite, genuine collective agreement, making good faith in negotiations and dispute resolution, and respect for trade union rights of entry.

Key Compliance Objectives (abbreviated)				
Compliance with all Statutory requirements and State Government policy requirements for construction work.	Compliance with the SWTC.	Protecting and minimising disruption to all existing facilities, infrastructure, properties or public utility services.	Meeting all obligations to impacted stakeholders and demonstrating genuine sensitivity.	Compliance with all environmental conditions and minimise adverse environmental impact.

Figure 3: Key Project objectives, Critical Success Factors and Key Compliance Objectives

1.1.3 Alliance vision and delivery approach

The MEL Project will be delivered under an alliance contract to support the management of project and stakeholder interfaces and to mitigate project risks. A collaborative alliance approach will see the Works carried out in a cooperative, coordinated, and efficient manner in compliance with the Alliance Principles.

MELConnx understands that the successful delivery of the Project is critically linked to meeting the PTA's Key Project Objectives. These objectives have shaped our vision for the Project that is around delivering a high-quality product and creating exceptional value-for-money. We are committed to a no-blame culture and to the prompt and mutual resolution of any issues that may arise.

During the AD Stage, representatives from both the PTA and MELConnx participated in an interactive workshop to begin the process of developing a suitable Alliance Vision for the Project (refer Figure 4 below for workshop outcomes).

Figure 4: AD Stage Alliance Vision Development Outcomes (developed with the PTA)

The Alliance Foundation workshop was held on 11/11/2020 and the results of this workshop generated the basis for the Vision, Purpose, Values and Behaviours Commitment Statements represented here.

Figure 5: MELConnx Alliance Vision, Purpose and Values

1.2 Introduction

This report provides an overview of the Transport Impact Assessment for the proposed Noranda Station situated on the Morley-Ellenbrook Line. The sections following comprise an assessment of the site's existing and future transport context, covering changes to the network, integration with surrounding land uses and an analysis of the development's traffic impact.

1.3 Development proposal

Noranda Station has been identified by METRONET and key stakeholders as a significant transit hub connecting the Noranda area by mass transit to Bayswater, and to the Perth CBD and wider public transport network via the Midland Line. The station will provide an important point of transport access for a locality which is surrounded by existing low to medium-density residential catchments.

Noranda Station is proposed to be located directly north of Benara Road within the Tonkin Highway median. The concourse level of the station building will be above the island platform with above grade access to car parking and active transport infrastructure on the eastern side of Tonkin Highway. The Morley-Ellenbrook rail line travels approximately north-south within the Tonkin Highway median.

At opening day (proposed by year 2026). Noranda Station is proposed to consist of:

- One island platform
- A 394 bay Park and Ride (PnR) facility comprising:
    - o 357 standard all-day bays
    - o 21 standard short-term bays
    - o 2 EV charging bays
    - o 7 ACROD bays
    - o 2 service vehicle/loading bays
    - o 4 open staff parking bays
    - o 1 taxi bay
- A 6 bay Kiss and Ride (KnR) facility comprising:
    - o 5 standard pick-up/ drop-off (PUDO) bays
    - o 1 ACROD bay
- 10 sheltered motorcycle bays
- Secure bicycle storage shelter, with storage for approximately 53 bicycles and space proofing of an additional 117 bicycles
- 10 U-rail bicycle stands within the station precinct.

Figure 6 shows the proposed general layout of Noranda Station.

1.4 Key issues

The existing residential catchment is currently only serviced by bus routes, with the closest train station being Bayswater Station – approximately 6 kilometres away by road (approximately 15 minutes travel time by car and 40 minutes by bus during the peak periods). As an established residential area, the existing site currently has fair accessibility for pedestrians and cyclists, however Tonkin Highway and Benara Road are significant barriers for these modes. Sight lines due to proximity to the Benara Road bridge present issues for vehicle access and public transport services proposed to service Benara Road as part of the future provisions of the station. The sight lines also limit crossing opportunities for pedestrians and cyclists.

1.5 Background information/ previous studies

A number of studies have been undertaken within the surrounding station precinct and along the wider Morley-Ellenbrook Line, including the following:

- City of Bayswater Local Housing Strategy (2012)
- Perth & Peel @ 3.5 million – Central Sub-Regional Planning Framework (2018)
- MEL Engineering and Land Use Planning study (2018)
- MEL Project Definition Phase (2019-20)
- MEL TSAP Stage 1 Traffic Modelling Study (2020-21)
- MEL PDP Transport Planning Report (2020)

Figure 6: Noranda Station overall location plan

2 Existing context

To understand the transport impact of the proposed Noranda Station, it is important to understand the existing operation and condition of the surrounding active, public and private transport network. The precinct and station catchment are part of an established residential area which has undergone little recent change, in addition to relatively low intensity neighbourhood services including schools, public open space, and Beechboro Central Shopping Centre. The walkable catchment of Noranda Station includes areas within both the City of Bayswater (CoB) and the City of Swan (CoS).

This section of the report examines the following contextual aspects of the site in relation to its existing surrounding land uses, provisions for pedestrians, cyclists, buses and vehicles, road network and crash history.

2.1 Site uses

The Noranda Station site is contained within a MRS Primary Regional Road Reserve (Tonkin Highway). Benara Road does not provide access to Tonkin Highway and therefore the existing land use does not generate vehicle trips.

2.2 Surrounding land uses

As seen in Figure 7, the subject site is located within the City of Bayswater, in the suburbs of Noranda and Morley. The surrounding urban area is primarily zoned *Medium and High Density Residential* under CoB Town Planning Scheme No. 24 (TPS24). The Medium and High Density Residential zoning incorporates density codes R25, R30, R40, R50, R60, R80, R100 and RAC-3, however the land immediately surrounding the station is zoned between R25 – R40 and is a mix of single residential and grouped dwellings.

To the north-east of the proposed Noranda Station, the land within City of Swan is zoned *Residential* under CoS Local Planning Scheme no. 17 (LPS17) and is predominantly dual-coded R20/35 with a similar residential mix to the land within City of Bayswater.

The station catchment includes two schools: Noranda Primary School, a government K-6 school within City of Bayswater zoned *Public Purpose*, and; John Septimus Roe Anglican Community School, a non-government Pre K-12 school within the City of Swan zoned *Private Clubs / Institutions*.

Beechboro Central Shopping Centre is situated at the corner of Benara Road and Beechboro Road North, approximately 650m east of the proposed Noranda Station. This area is a proposed “urban village” under the City of Bayswater Local Housing Strategy 2012, however significant urban change has not yet resulted from this strategy.

Figure 7: Surrounding land use locale map

2.3 Active transport provisions

A high-level summary of the existing pedestrian and cycling infrastructure surrounding the future station is provided in Figure 9.

Currently, there is a reasonably significant footpath network surrounding the station. There is an existing Principal Shared Path (PSP) running north-south on the western side of Tonkin Highway which connects with the PSP running on the eastern side of the Tonkin Highway north of Benara Road and the shared paths running east-west along Benara Road.

Footpaths, where provided, are generally only on one side of the constructed roads within the residential areas surrounding the proposed site.

The Department of Transport's (DOT) Long Term Cycle Network Strategy (Figure 8) has designated future cycling routes planned within the proposed study area. These identify Benara Road and Beechboro Road North as Secondary Routes, along with Local Routes provisioned to provide east-west and north-south connections in the immediate vicinity of the proposed site.

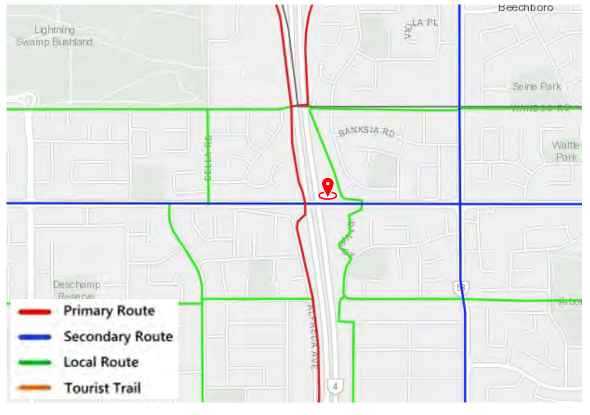


Figure 8: DoT Long Term Cycle Network Plan

2.4 Public transport provisions

A high-level summary of the existing public transport provisions surrounding the future station is provided in Figure 9.

The proposed Noranda Station has no existing direct public transport links. The surrounding area however is served currently by two bus services, the 345 and 346 services traversing through the Benara Road/ Emberson Road and Benara Road/ Beechboro Road North intersections.

- Route 345 – between Morley Bus Station and Bennett Springs Drive, typically with headways between 10-30 minute during the peak periods.
- Route 346 – between Morley Bus Station and Widgee Road, typically with 30 minute headways during the peak periods

2.5 Vehicle provisions

2.5.1 Road network

The functional road hierarchy of key roads surrounding the site are summarised below and shown in Figure 10.

Benara Road

Is a four-lane Distributor A road running east-west directly south of the site. It traverses Tonkin Highway above grade and travels from Camboon Road in the west to West Swan Road in the east, servicing the suburbs of Noranda, Morley, Beechboro, Kiara, Lockridge and Caversham. It currently carries approximately 14,000 vehicles per day (Main Roads WA Traffic Map, 2021) with a posted speed limit of 70kph.

Beechboro Road North

Is a four-lane Distributor A road running north-south directly east of the site. Its southern terminus is a cul-de-sac at Tonkin Highway and it terminates in an interchange with Tonkin Highway in the north, where it continues to the north-west as Hepburn Avenue after traversing Reid Highway above-grade. It travels through the suburbs of Bayswater, Embleton, Morley, Beechboro, Bennett Springs and Whiteman. The posted speed limit is 60kph and carries approximately 18,000 vehicles per day (Main Roads WA Traffic Map, 2021).

Emberson Road

Is a two-lane Distributor B road running north-south directly west of the site. It provides connection between Benara Road and Morley Drive. It carries approximately 5,000 vehicles per day (Main Roads WA Traffic Map, 2018) with a posted speed limit of 60kph.

Figure 9: Existing active and public transport provisions

2.6 Existing intersections surrounding the site

The following existing intersections surrounding the site have been identified as potentially impacted by development traffic.

Benara Road/ Beechboro Road North is a four-way at-grade signalised intersection directly east of the proposed site. The existing intersection currently has two through lanes and turning pockets provided on all approaches,

Benara Road/ Emberson Road is a priority controlled (give-way) T-junction directly west of the proposed site. The existing intersection currently has two through lanes along Benara Road with a right turn pocket to access Emberson Road.

Benara Road/ Mahogany Road is a priority controlled (give-way) T-junction directly east of the proposed site. The existing intersection currently has two through lanes along Beanra Road with a right turn pocket to access Mahogany Road.

2.7 Crash data

Historical crash data (last five years, 2016-2020) has been presented in Figure 10, in the form of a heatmap, and tabulated in Table 1 and Table 2.

The data highlights that a high amount of crashes have occurred at the intersections adjacent to the proposed site. A significant majority (87%) of the crashes over both intersections were from rear ends or right angle collisions and were likely a result of speeds along Benara Road which has a posted speed limit of 70kph.

The crash severity in the study area was typically low, with only 3 hospitalisations and 7 medical crashes across the five years. A vast proportion (78%) of crashes were Property Damage Only (PDO).

Table 1: Crash types at surrounding intersections and midblock locations

Crash type	Benara Road/ Beechboro Road North	Benara Road/ Emberson Road	Benara Road/ Mahogany Road
Rear end	24	0	0
Head on	0	0	0
Sideswipe	2	0	0
Right angle/ right turn thru	10	5	1
Non-collision/ other	1	1	1
Hit object	1	0	0
Total	***38***	***6***	***2***

Table 2: Crash severity at surrounding intersections and midblock locations

Crash type	Benara Road/ Beechboro Road North	Benara Road/ Emberson Road	Benara Road/ Mahogany Road
Fatal	0	0	0
Hospitalisation	1	1	1
Medical	6	1	0
PDO Major	20	3	0
PDO Minor	11	1	1
Total	***38***	***6***	***2***

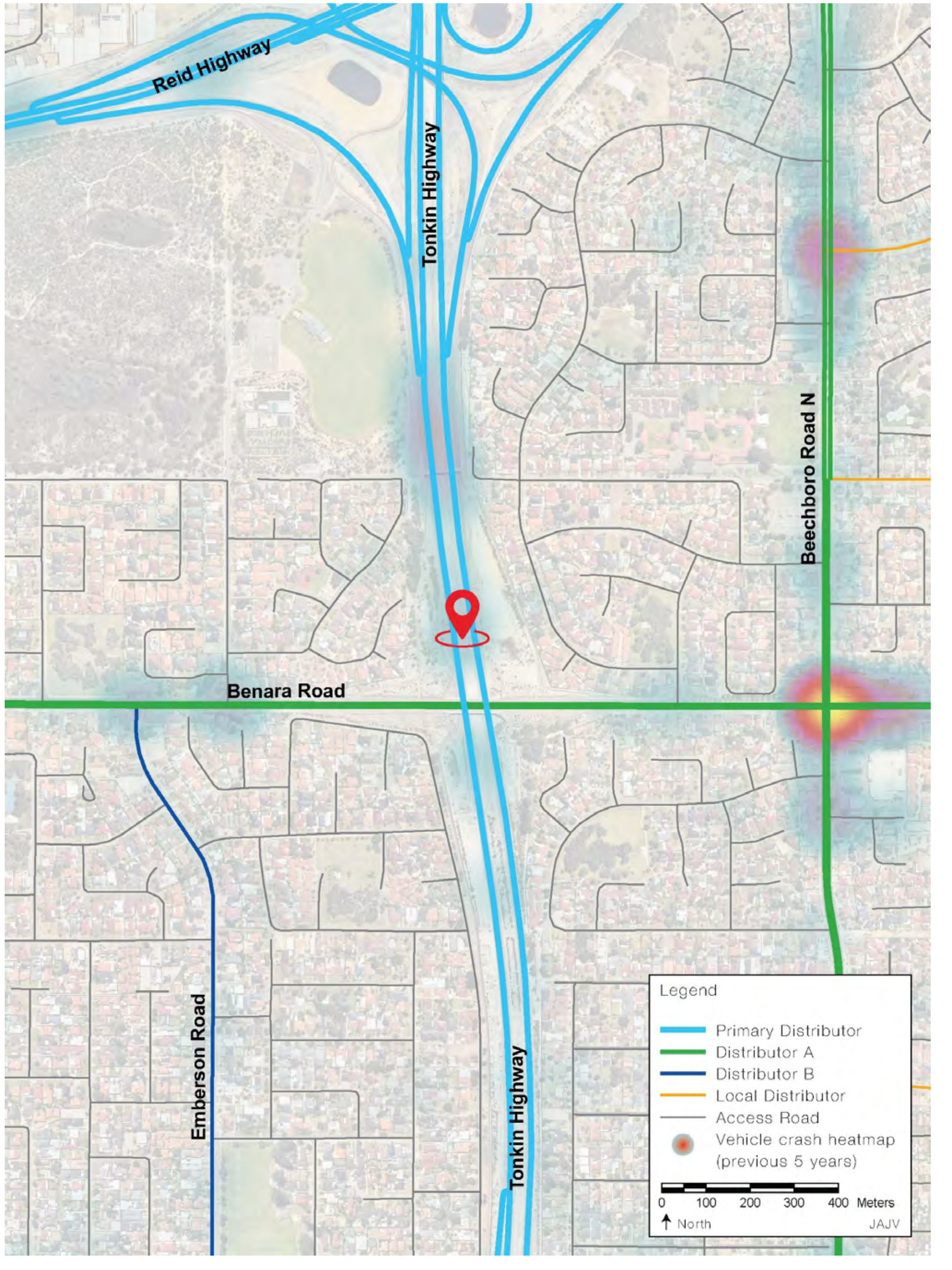


Figure 10: Functional existing road hierarchy and crash data

3 Proposal

The Noranda Station platform is proposed to be located at grade within the Tonkin Highway median. The station precinct is proposed to be located at grade on the eastern side of the Tonkin Highway, within the Primary Regional Road Reserve. The station precinct will comprise of the following at-grade features:

- A concourse level (Welcome Area)
- 394 bay PnR and 6 bay KnR to the east of the new station
- 10 sheltered motorcycle bays
- Secure bicycle storage shelter, with storage for approximately 53 bicycles and future proofing of an additional 117 bicycles
- 10 U-rail bicycle stands within the station precinct.

The delivery of the station will be accompanied by the opening of MEL which will provide a heavy rail transit connection for residents of the North Eastern Suburbs to the Perth CBD and other major activity centres across the Perth Metropolitan Area via the wider public transport network.

STEM has forecast the station to have a total boarding of 1200, 2000 and 2800 patrons for the year 2026, 2031 and 2041 respectively.

Figure 11 shows a summary of active and public transport infrastructure upgrades to be delivered as part of the Noranda Station development.

3.1 Precinct vision and land use integration

The 21km MEL will give people living and working in Perth's north-eastern suburbs more transport choice. It provides increased accessibility to Perth's north-eastern suburbs and unlocks new opportunities for urban development.

Current development in Noranda, Morley and Beechboro, immediately surrounding the proposed Noranda Station is primarily residential – ranging from low (R20) to medium density (R40). A proposed "urban village" development is outlined in City of Bayswater's Local Housing Strategy (2012), centred on Beechboro Central Shopping Centre, however significant urban change within the precinct has not yet occurred.

Noranda Station will add to the liveability of the surrounding suburbs while offering local residents another transport choice when travelling to and from the Perth CBD and the north-eastern suburbs. The high level of regional accessibility provided by MEL creates the potential for increased residential development and land use opportunities in the area.

Figure 11: Proposed development and transport infrastructure upgrades

3.2 Proposed access arrangement

3.2.1 Proposed pedestrian and cycling infrastructure

Station precincts have been designed to prioritise safe and easy movement for pedestrians throughout the area. The following improvements are proposed to facilitate pedestrian and cycle access into the proposed station precinct (refer to Section 4 for expanded commentary and figures):

- Pedestrian and cycle underpass below Benara Road and east of Tonkin Highway to connect the station precinct to the residential catchment area south of the proposed site. This underpass will be in accordance to design standards with sufficient width and surveillance provided.
- Pedestrian overpass providing a connection from the road bridge on Benara Road located over Tonkin Highway, to the concourse level of the Station. Security gates will be provided to restrict access from Benara Road to the southern pedestrian overpass.
- An additional PSP east of the proposed site which will connect the two existing PSPs running north-south along Tonkin Highway.
- Provisions for approximately 53 bicycle parking bays. These will utilise Transperth's existing secure cycle storage system, requiring registration and use of a SmartRider card for access.
- 10 bicycle 'u' rails within the station precinct.

3.2.2 Proposed public transport provisions

The introduction of Noranda Station and MEL will provide a significant increase to public transport provision in the area. The station will provide improved connectivity for the residential catchment areas surrounding the proposed sites to the CBD and provide greater urban mobility for the north-east Urban Growth Corridor via Heavy Rail Transit.

Five rail services per hour (in each direction) are anticipated to operate during peak periods. During the inter-peak periods, four services per hour (in each direction) are anticipated to operate, with approximately two services per hour in the evening hours (in each direction). The hours of operation for the MEL line and this station are planned to align with existing operations across the Transperth rail network.

Although no bus interchange has been included as part of the Noranda Station precinct, bus services have been proposed to service the surrounding area. This includes the proposed bus route labelled N3 servicing east-west along Benara Road. This service is anticipated to operate on 20 minute headways during both the AM and PM peak periods.

3.2.3 Proposed vehicle access and parking

The station design has been undertaken to allow for station access for commuter and service vehicles.

The incorporation of the proposed access point along Benara Road to and from Noranda Station will result in changes to the layout of the Benara Road road corridor. This includes the addition of a new priority controlled intersection on Benara Road providing access into and out of Noranda Station. This access point does not provide for right turn movements egressing the station, with traffic heading westbound along Benara Road required to utilise the U-Turn facility east of the proposed site.

The proposed layout surrounding the Noranda Station site is depicted in Figure 12.

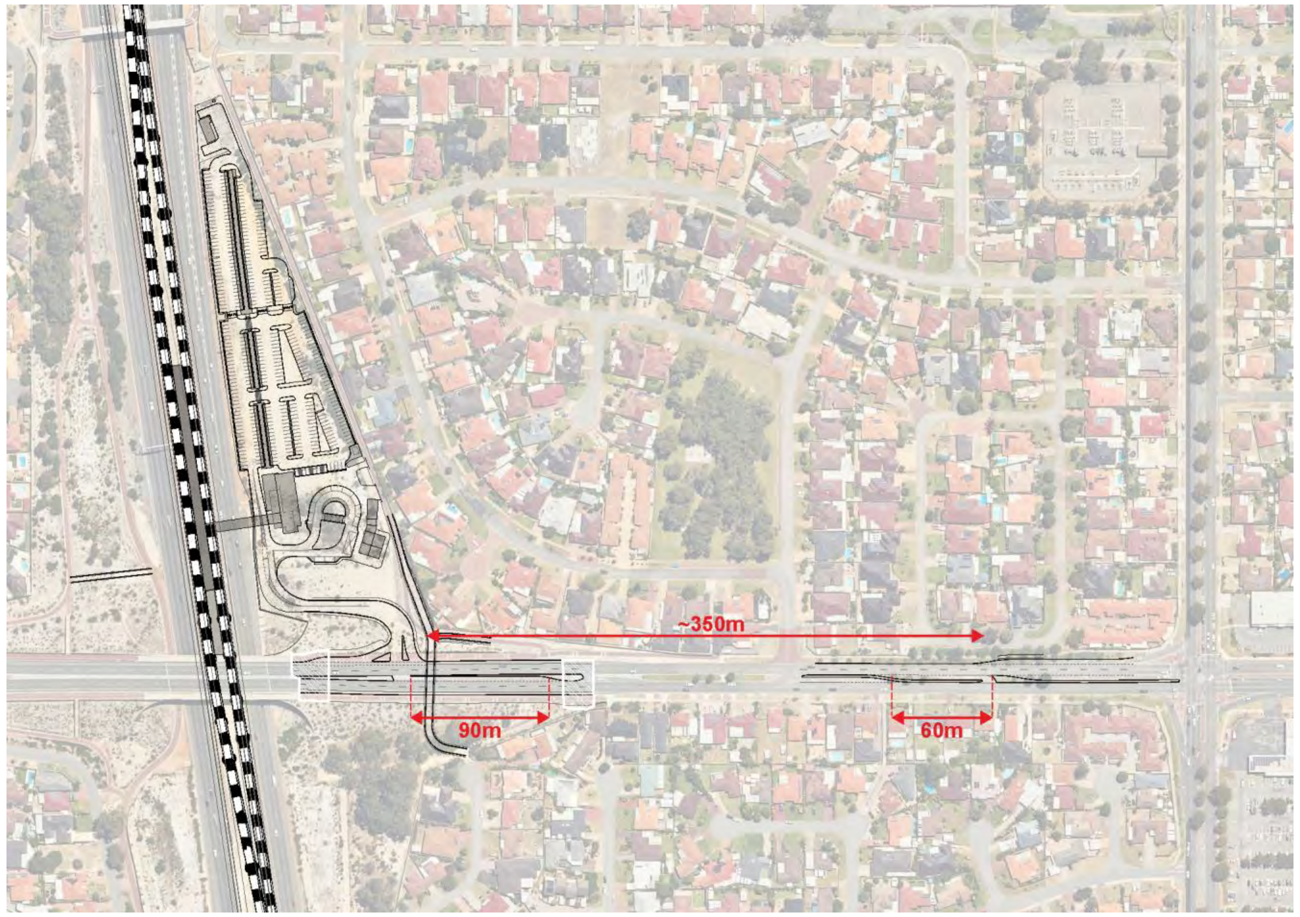


Figure 12: Proposed road network upgrades

4 Access strategy

4.1 Pedestrian and cyclist access

The pedestrian and cyclist catchment surrounding the Noranda Station development is expected to be serviced by connections both internal to the station precinct and the wider network. Active transport access is primarily serviced by the introduction of a pedestrian and cycle underpass link located below Benara Road east of Tonkin Highway. This link connects the station precinct with the surrounding residential catchment areas south-east of the proposed site.

Users of this underpass will be able to access the proposed bike shelters completely segregated from vehicular traffic and without having to cross a road. This path is then proposed to connect to the Station welcome place and down onto the island platform.

An additional enclosed southern pedestrian overpass has been proposed to provide a secondary access onto the station concourse. This pedestrian overpass will provide a connection from the road bridge on Benara Road located over Tonkin Highway, to the concourse level of the Station. Security gates will be provided to restrict access from Benara Road to the southern pedestrian overpass.

Figure 13 shows the key connections surrounding the site.

4.2 Public transport access

The public transport network proposed to service the Noranda Station area precinct and the surrounding area is illustrated in Figure 13. The precinct will be primarily serviced by the MEL passenger rail service that will operate northbound towards Malaga and southbound towards Morley.

There will also be a feeder bus service (N3) which will provide improved connectivity for the wider residential areas surrounding Noranda Station. However, this service does not enter the station precinct. Public transport users will instead access the station through the pedestrian and cycle access plan detailed in Section 4.1.

4.3 Vehicular access

Based on the proposed access arrangement and modification of existing roads as described in Section 3.2, Figure 14 illustrates the proposed inbound and outbound routes from various origin and destination points surrounding the station precinct. As shown, access and egress to the station PnR and KnR facilities will be facilitated by the proposed priority controlled access along Benara Road.

During the AM peak period, inbound vehicles will access the station via this proposed access located east of Tonkin Highway. This access offers connectivity from both the eastbound and westbound directions through a left in and right in access point. The modelling exercise has shown that no significant queueing issues will be expected at this access point during either peak period.

In the PM peak, all egressing vehicles are required to head eastbound out of the station precinct. Vehicles heading west of the proposed site are required to complete a U-Turn movement approximately 350 metres east of Noranda Station.

4.3.1 Parking and parking management

A 394 bay PnR facility is proposed at Noranda Station to support patronage to the MEL passenger rail service. These bays (with the exception of the short-term bays) will be available for all-day parking for station passengers. This will be controlled through the existing SmartParker service, which requires those using the facility to have a registered SmartRider pass associated with their vehicle, and pay a small parking fee – currently $2.

In addition to this, a 6 bay KnR has been provisioned for Noranda Station. These bays will be restricted as 5-minute pick-up/drop-off bays only. Both the PnR and KnR facilities will be managed, controlled and enforced by Transperth operations.

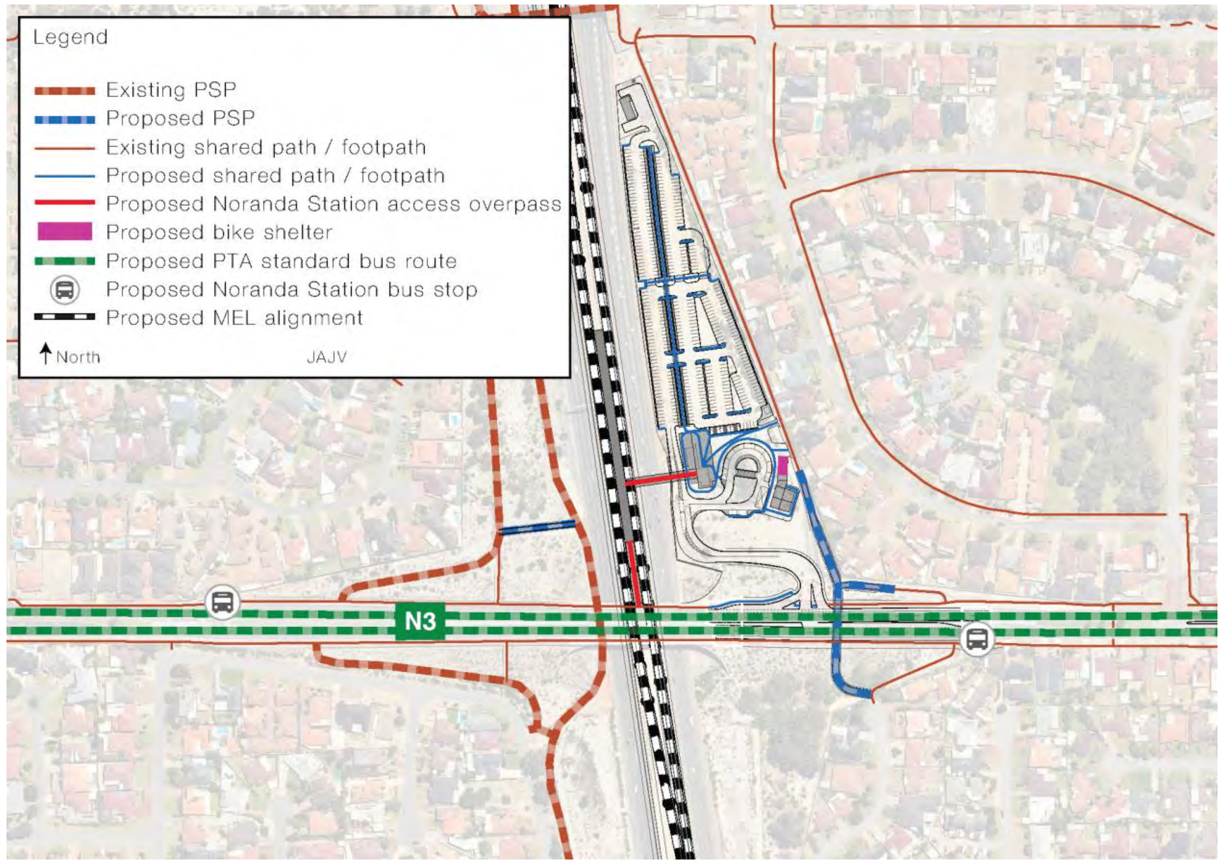


Figure 13: Pedestrian and cycling connections surrounding the development

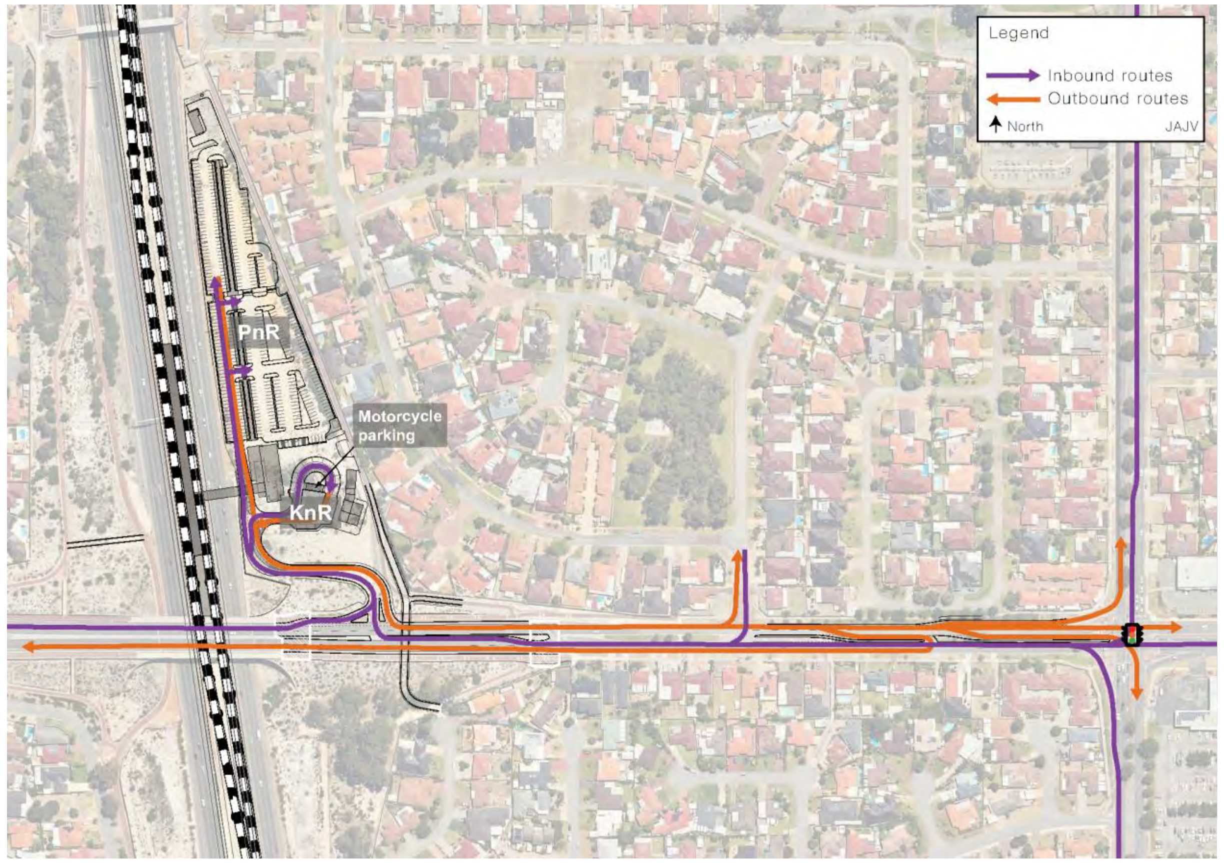


Figure 14: Primary inbound and outbound routes for the PnR and KnR facilities

5 Traffic impact analysis

A local assessment of the surrounding network performance has been undertaken to assess the planned configuration of the future network with the proposed station access arrangements for each precinct. This analysis has included the consideration of active travel modes and safety within the intersections assessed.

5.1 Assumptions and parameters

5.1.1 Proposed site plan

Traffic modelling for Noranda has been undertaken based on the proposed station configuration, as described in previous sections and shown in Figure 15 on the following page, and the likely impacts station generated traffic will have on the surrounding road network.

Safety provisions have been considered as part of the design of the access intersection into the station. The station access has been designed to be a priority controlled T-junction intersection with only left in / right in and left out movements.

5.1.2 Assessment years

The scenarios that have been investigated for the transport assessment on the proposed surrounding road network have included the following:

- 2019 AM/ PM peaks – Base modelling year

Future Do-Nothing and Project cases

- 2026 AM/ PM peaks – Opening year of Noranda Station
- 2031 AM/ PM peaks – Opening of Noranda Station +5 years
- 2036 AM/ PM peaks – Opening of Noranda Station +10 years.

5.1.3 Background future trip growth

Background traffic demands have been based on STEM link volumes on an all-day level. These all-day STEM link volumes have been provided for the following years:

- 2016 (Base)
- 2021
- 2026
- 2031
- 2041.

Based on the all-day STEM link volumes the Main Roads WA Urban Road Planning approach has been utilised to assess peak hour forecast volumes from all-day STEM forecasts. The step-by-step process used to determine the background traffic growth for each relevant year is detailed as follows:

1. Compare the all-day STEM 2016 and 2021 outputs using linear growth to create an all-day STEM 2020 demand (on a link level), adopted from STEM (MULFS v1.6.1)
2. Compare calculated all-day STEM 2020 to the all-day observed traffic volumes obtained from the video survey (on a link level) to identify the all-day flow differences for each link volume to obtain the calibrated STEM adjustment factor
3. Apply the calibrated STEM adjustment factor to the provided all-day STEM demands (on a link level). This creates an all-day project demand (on a link level)
4. Apply the identified peak one-hour factors (on a link level) based on 2020 video survey* to the all-day project demands to create link volume AM and PM peak hour project demands

*Base modelling was completed utilising existing counts retrieved for December 2019. As part of the forecast assessment, these counts were considered more reflective of 2020 conditions, hereafter referred to as 2020 video survey counts.

A proportion of the background traffic travelling eastbound along Benara Road was assumed to utilise the U-turn facility to access the residential dwellings south of Benara Road. This demand was based on the number of residential houses located along Benara Road, with 1 trip assumed for each residential dwelling during both peaks. Based on this assumption, it was found that the residential dwellings contributed to 14 U-Turn movements during both peak periods modelled.

Following consultation with the METRONET team, the traffic forecasts for the Noranda Station precinct were endorsed on the 1st October 2020. These final demand forecasts have been provided within **Appendix A.**

5.2 Trip generation and distribution

5.2.1 PnR/ KnR traffic generation and distribution

The anticipated PnR and KnR traffic has been calculated based on the benchmarking of existing stations.

Surveyed information collected for Stirling Station on the 4th April 2011 between 5:00am – 10:00pm has been sourced as a comparison. This station profile was utilised to understand the anticipated peak hour demand attributed to the Noranda Station Park n Ride and Kiss n Ride due to the similar number of bays assumed at both stations and the similar distance to the Perth CBD in comparison to the relevant profiles available.

The profile indicates that PnR demand rapidly increases in the morning, remains relatively unchanged between 8am and 2pm, and drops significantly in the evening between 3pm – 6pm. The findings of the benchmarked station profile analysis are described as follows:

- During the morning peak hour, the PnR facility is indicated to fill by approximately 55% of total capacity
- During the evening peak hour, the PnR facility is indicated to empty by approximately 41% of total capacity.

As conservative assumption, the PnR peak inbound and outbound movements will coincide with the commuter peak and the facility will operate at capacity from opening day.

For KnR traffic, the profile for the benchmarked station has been utilised for the number of KnR traffic movements within each 15-minute time period between 5am-10pm.

Analysis of the KnR morning and evening peaks have been calculated as a function of the benchmarked station PnR capacity. The findings of this analysis have been shown below.

- During the morning peak hour, the total trips within the KnR is indicated to represent approximately 28% of the Park n Ride capacity.
- During the evening peak hour, the total trips within the KnR is indicated to represent approximately 22% of the Park n Ride capacity.

Based on the benchmarked profile analysis, the additional PnR and KnR traffic for Noranda Station is shown within Table 3. This demand is assumed to be consistent for all future modelling scenarios.

The traffic attributed to the station PnR and KnR facility has then been distributed based on all-day STEM Turning Volume Diagrams (TVDs) supplied by METRONET on 3rd August 2020. This allows an understanding of where inbound and outbound traffic come from and go to within the peak period. This assumed station traffic distributions are shown within Table 4.

Table 3: Generated traffic demand – PnR and KnR facilities

	PnR demand (veh/ %)		KnR demand (veh/ %)		Total (veh)	
Peak	Inbound	Outbound	Inbound	Outbound	Inbound	Outbound
AM peak hour	*220 (55%)*	*0*	*112 (28%)*	*112 (28%)*	*332*	*112*
PM peak hour	*0*	*164 (41%)*	*88 (22%)*	*88 (22%)*	*88*	*252*

Table 4: PnR and KnR traffic distribution

	Distribution of Inbound traffic		Distribution of Outbound traffic	
Associated STEM year	From West	From East	To the West (via U-turn on Benara Rd)	To the East
2026 - 2031	*80%*	*20%*	*80%*	*20%*
2031 onwards	*75%*	*25%*	*75%*	*25%*

5.2.2 Public transport traffic

The bus forecasts provided have been updated from past assumptions outlined within the PDP planning stage for MEL, however, the final routes, services, and frequencies are still yet to be confirmed. The anticipated bus routes within the Noranda Station road network as used in this analysis have been shown previously in Figure 11 on Page 10. The accompanying services and headways noted within Figure 11 have been summarised in Table 5.

5.2.3 Traffic flows

The distribution of vehicle classifications travelling along Benara Road on an All-Day level is shown within Table 6.

These vehicle class percentages, along with the respective vehicle class passenger car equivalent (PCU) conversion factors outlined within the Main Roads WA Operational Modelling Guidelines have been used within the SIDRA modelling for each peak period scenario.

Peak period turning movement volumes within the road network for all future modelled scenarios have been summarised within **Appendix B.**

Table 5: Forecasted public transport – peak AM/ PM headway (mins)

Route number	Route	AM Peak Headway (minutes)		PM Peak Headway (minutes)	
		Inbound	Outbound	Inbound	Outbound
N3	*McGilvray Avenue to Waldek Rd along Benara Road via Noranda Station*	*20*	*20*	*20*	*20*

Table 6: Vehicle classification proportions – All Day

	Vehicle classification (%) w/o buses											
Class	1	2	3	4	5	6	7	8	9	10	11	12
Class %	96.2%	0.6%	2.9%	0.1%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Group %	96.2%	3.7%				0.1%				0.0%	0.0%	0.0%

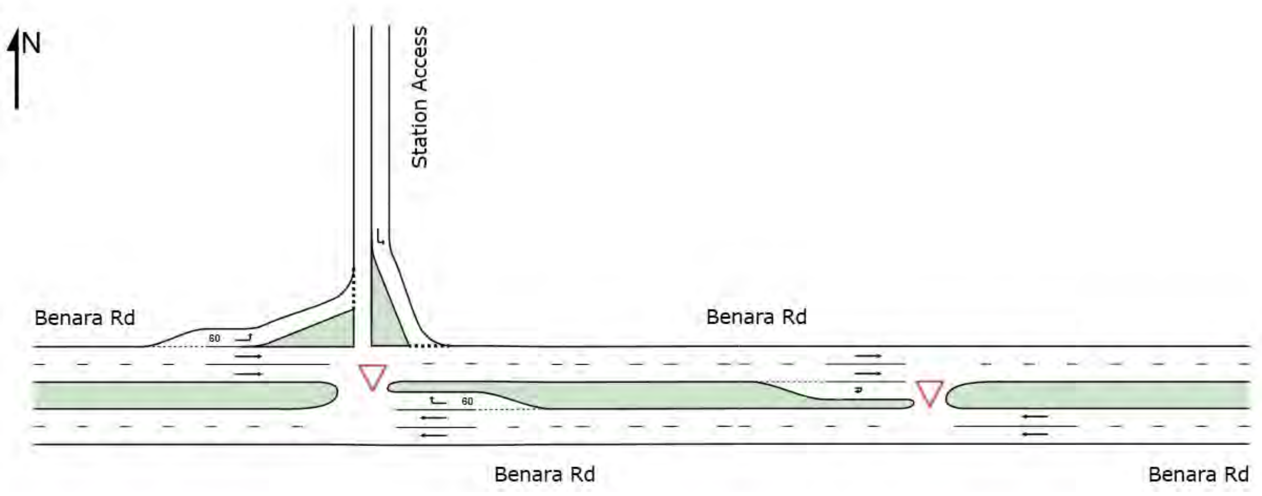


Figure 15: Project case modelled layout – Noranda Station

5.3 Key modelling findings

Based on the traffic generation and distribution exercise summarised in the section so far, static traffic modelling through the use of SIDRA Intersections (version 9.0) has been used to analyse the operational performance at the Benara Road U-Turn Facility east of the proposed site and at the Benara Road/ Station Access during the project case scenarios.

A detailed summary of the project case scenario results as well as the SIDRA network layout has been provided within **Appendix C** with the SIDRA movement summaries output provided within **Appendix D**.

5.3.1 Base year (2019) and Future Do-Nothing scenarios

In order to evaluate the traffic impacts that the development will have on the surrounding network, an initial assessment of the baseline performance has been undertaken.

For the baseline modelling exercise, the Noranda Station precinct comprises of the U-Turn facility located along Benara Road east of the proposed site.

The project-case model is anticipated to expand this network with the inclusion of the priority-controlled station access west of the U-Turn facility.

Modelling has been undertaken using traffic count surveys provided by METRONET and undertaken by Austraffic over a 24-hour period on the 3rd and 5th December 2019.

Within the base and future do-nothing modelling shown within Table 7 below, the U-Turn facility is shown to perform within the appropriate capacity constraints (below 100% DoS) up to and including the year 2036.

The westbound through movement is indicated to be critical during the AM peak with a DoS of 45.1% with the eastbound through movement indicated to be critical during the PM peak with a DoS of 37.4% during the PM peak.

Delay is expected for the U-Turn movements from 2031 particularly during the AM peak attributed to the significant background traffic growth forecast for the opposing westbound through movement.

However, this is not expected to cause queueing constraints with queueing expected to be contained within the U-Turn facility pocket during all scenarios.

Table 7: Base modelling and Future Do-Nothing Scenario results – Benara Road U-Turn Facility

	Benara Road U-Turn Facility	Base Year (2019)		2026 Future Do-Nothing		2031 Future Do-Nothing		2036 Future Do-Nothing	
	Peak	**AM**	**PM**	**AM**	**PM**	**AM**	**PM**	**AM**	**PM**
	Worst approach (DoS)	East	East	East	West	East	West	East	West
Criteria	*Overall Intersection LOS*	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**
	Worst movement LOS	**LOS C**	**LOS B**	**LOS C**	**LOS B**	**LOS D**	**LOS C**	**LOS F**	**LOS C**
	Overall average delay (s)	0.2	0.2	0.3	0.2	0.3	0.2	0.5	0.2
	Worst approach delay (s)	0.5	0.2	0.6	0.3	0.7	0.3	1.1	0.3
	Worst DoS (%)	23.3	19.7	30.3	26.3	35.6	31.0	45.1	37.4
	Worst queue results (vehs)	0.1	0.1	0.2	0.1	0.3	0.2	0.6	0.2

5.3.2 Project Case - Opening year (2026)

The station access along Benara Road operates with an average LOS B or better and a DoS below 50% during both peak periods of the opening year of the station (2026) indicating good performance as shown in Table 8.

Delay for the U-Turn movement east of the station access is expected to be high by the opening year of the station, indicated to perform with a LOS E during the AM peak. This is attributed to the significant background traffic growth forecast for the opposing westbound flows which causes significant delays for the egressing station traffic heading towards the western catchment of the study area.

Despite the high delays, the U-Turn facility is indicated to still perform within capacity (below 80% DoS) and with queues that are contained within the provisioned pocket storage.

5.3.3 Project Case - Opening +5 years (2031)

The station access will continue operating with good performance 5 years post opening of the station with an average intersection LOS B or better and a DoS below 50% during both peak periods as shown in Table 9.

Performance at the U-Turn facility east of the station continues to operate within capacity (below 85% DoS) and with queueing contained within the storage capacity despite the observed high delay (indicated to perform with a LOS F).

5.3.4 Project Case - Opening +10 years (2036)

The Noranda Station access along Benara Road continues to operate with good performance (LOS B or better) during both peak periods 10-years post station opening.

The east approach at the station access is critical during the AM peak operating with a DoS of 44.5% with the north approach being critical and operating with a DoS 44.9% during the PM peak attributed to the station traffic egressing the station during the evening.

By 2036, the U-Turn facility is forecast to perform overcapacity (above 100% DoS) and with queueing that extends beyond the provisioned queue storage for the U-turn movements. This is due to the high background growth rate and subsequent opposing demand.

Additional LinSig and microsimulation modelling has been conducted by Main Roads WA along the Benara Road corridor as per CRFI240/JAJV RFI-00191 (Appendix C). The modelling has suggested that station traffic has minimal impact on the performance of the Benara Road/ Beechboro Road intersection, with residual capacity available at the intersection up to the +10 year scenario at which point capacity is reached. Station traffic will be able to utilise this adjacent intersection as an alternative should queueing extend beyond the storage of the U-Turn facility prior to the intersection reaching capacity. It is recommended that the performance of this U-Turn facility be closely monitored to ensure adequate performance up to and including the opening +10 years scenarios for both the AM and PM peak periods.

Table 8: Future modelling results – Noranda Station road network (2026 opening year)

	Intersection	Benara Road/ Station Access		Benara Road/ U-Turn Facility	
	Peak	AM	PM	AM	PM
	Worst approach (DoS)	East	North	West	West
Criteria	*Overall Intersection LOS*	NA	NA	NA	NA
	Worst movement LOS	LOS A	LOS B	LOS E	LOS C
	Overall average delay (s)	1.4	1.5	2.2	2.5
	Worst approach delay (s)	6.9	9.0	6.0	4.1
	Worst DoS (%)	30.6	33.4	57.2	59.2
	Worst queue results (vehs)	0.8	1.6	2.6	3.8

Table 9: Future modelling results – Noranda Station road network (2031)

	Intersection	Benara Road/ Station Access		Benara Road/ U-Turn Facility	
	Peak	AM	PM	AM	PM
	Worst approach (DoS)	East	North	West	West
Criteria	*Overall Intersection LOS*	NA	NA	NA	NA
	Worst movement LOS	LOS A	LOS B	LOS F	LOS D
	Overall average delay (s)	1.4	1.5	4.7	2.8
	Worst approach delay (s)	7.1	10.1	13.1	4.7
	Worst DoS (%)	36.0	37.2	83.8	69.8
	Worst queue results (vehs)	0.8	1.8	4.6	4.7

Table 10: Future modelling results – Noranda Station road network (2036)

	Intersection	Benara Road/ Station Access		Benara Road/ U-Turn Facility	
	Peak	AM	PM	AM	PM
	Worst approach (DoS)	East	North	West	West
Criteria	*Overall Intersection LOS*	NA	NA	NA	NA
	Worst movement LOS	LOS B	LOS C	LOS F	LOS F
	Overall average delay (s)	1.2	1.5	33.5	12.6
	Worst approach delay (s)	7.6	12.4	98.5	21.8
	Worst DoS (%)	44.5	44.9	186.3	107.7
	Worst queue results (vehs)	0.8	2.3	34.4	19.6

5.3.5 Summary of findings

Based on the analysis completed, the Noranda Station access located along Benara Road will operate with good performance (LOS C or better) up to and including 10-years post opening of the station.

By 2036, this access road is forecast to perform without any queue constraints and with a DoS of 44.5% and 44.9% during the AM and PM peak periods respectively.

Similar to the Future Do-Nothing scenarios, the U-Turn facility located approximately 350 metres east of the station access along Benara Road is expected to experience high delays attributed to the significant background traffic growth forecast for the opposing westbound through movement.

Within the future project case scenarios, this U-Turn facility is expected to perform within capacity (below 85% DoS) and with queues that are contained within the available storage capacity up to and including the opening +5 years scenarios.

However, the U-Turn movement is expected to perform overcapacity (above 100% DoS) and with queues that extend beyond the pocket length by 2036. This is in addition to the significant delays forecast for this movement highlighted by the LOS F.

Main Roads WA modelling of the Benara Road corridor has suggested that station traffic has minimal impact on the performance of the Benara Road/ Beechboro Road intersection, with residual capacity available at the intersection up to the +10 year scenario at which point capacity is reached. Station traffic will be able to utilise this adjacent intersection as an alternative should queueing extend beyond the storage of the U-Turn facility prior to the intersection reaching capacity. It is recommended that the performance of this U-Turn facility be closely monitored to ensure adequate performance up to and including the opening +10 years scenarios for both the AM and PM peak periods.

6 Recommendations and summary

The Noranda Station precinct is currently being planned as part of the overall delivery of the MEL passenger rail service proposed to operate between Bayswater and Ellenbrook, with an expected opening year of 2026. This TIA has detailed the associated impacts that the development will have on the surrounding transport network and the expected land uses within and surrounding the vicinity of the site.

The proposed site is planned to be located directly north of Benara Road within the Tonkin Highway median. The concourse level of the station building will be above the island platform with above grade access to car parking and active transport infrastructure on the eastern side of Tonkin Highway.

The station will be accompanied by a 394 bay PnR, a 6 bay KnR facility and a cycling facility for both station and non-station users. Access to the station will be provided along Benara Road east of Tonkin Highway. This will service both the PnR and KnR facilities.

Complementing this vehicle access is a new pedestrian and cycle underpass below Benara Road and east of Tonkin Highway to connect the station precinct to the residential catchment area south of the proposed site.

The Noranda Station site is contained within a MRS Primary Regional Road Reserve (Tonkin Highway). The subject site is located within the City of Bayswater, in the suburbs of Noranda and Morley. The surrounding urban area is primarily zoned *Medium and High Density Residential* under CoB Town Planning Scheme No. 24 (TPS24).

The trips generated by the station and the surrounding development have been estimated respectively based on benchmarking exercises of existing stations and STEM all-day link volume growth as provided by METRONET. The station itself is estimated to generate 444 vehicle trips by the opening year of the station during the AM peak hour and 340 trips during the PM peak hour.

An assessment of the impacts of the generated trips on the surrounding road network has been based on the combined traffic generated by the PnR / KnR facilities and background traffic growth in the area using SIDRA intersection software. This involved an assessment of the U-Turn facility located along Benara Road east of the proposed station access for both the future do-nothing and project case scenarios with the additional station generated traffic. The station access based on the proposed station configuration also formed part of the traffic modelling assessment.

This analysis concluded that the Noranda Station access located along Benara Road will operate with reasonable performance (LOS C or better) up to and including 10-years post opening of the station.

The U-Turn facility located approximately 350 metres east of the station access along Benara Road is expected to experience high delays attributed to the significant background traffic growth forecast for the opposing westbound through movement. This was observed in both the Future Do-Nothing and Project Case scenarios

Within the future project case scenarios, this U-Turn facility is expected to perform within capacity (below 85% DoS) and with queues that are contained within the available storage capacity up to and including the opening +5 years scenarios.

However, the U-Turn movements are expected to perform overcapacity (above 100% DoS) and with queues that extend beyond the pocket length by 2036. This is in addition to the significant delays forecast for this movement highlighted by the LOS F.

Based on the operational analysis and assessment of the access and supporting network, the following recommendations have been developed:

Pedestrian and cyclist access:

- Construction of the cycle infrastructure outlined in Department of Transport's (DOT) Long Term Cycle Network Strategy for the surrounding vicinity of the proposed site should be prioritised. This is to enhance active transport connectivity to and through the station precinct.
- The surrounding roads close to the station in the South-East residential quadrant of the site are observed to not have footpaths which connect to the pedestrian underpass into the station. Although these roads are mainly cul-de-sacs which do not require footpaths, it is recommended that further investigation into the proposed future footpaths surrounding the station is conducted.

Vehicle access and parking:

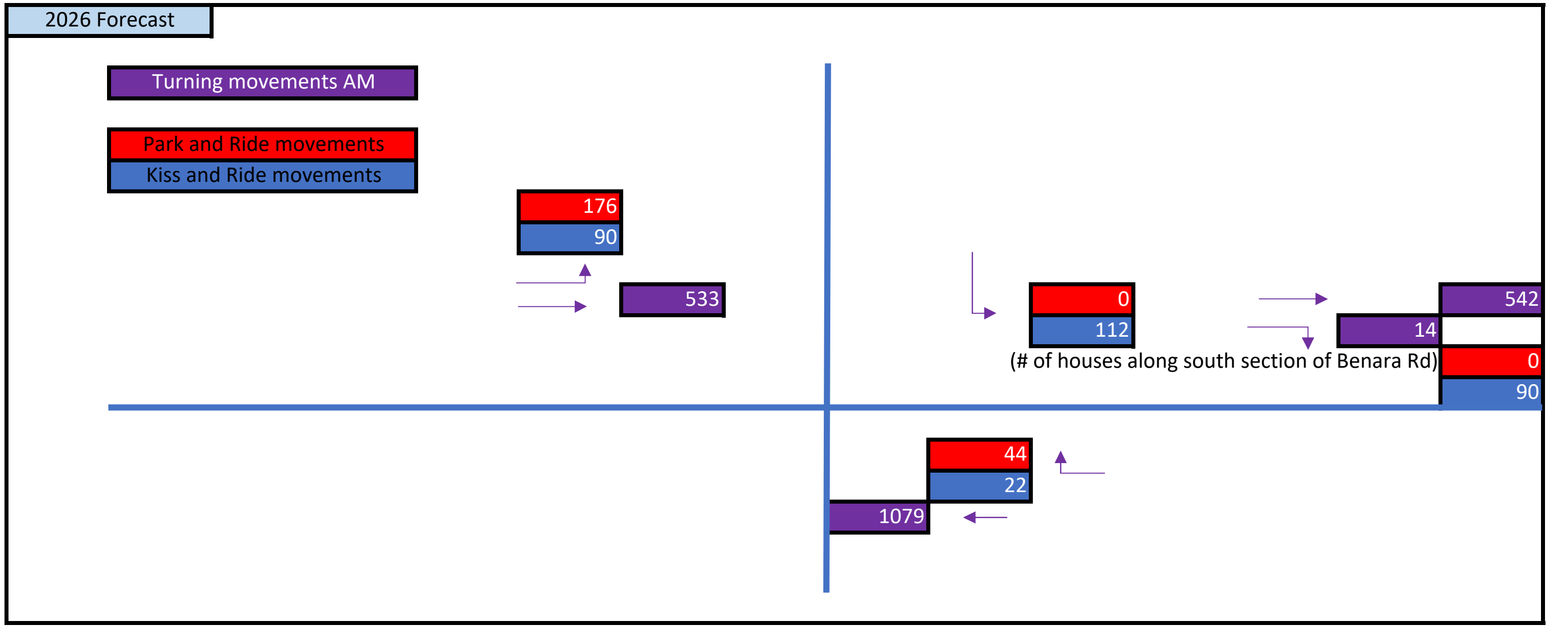
- It is recommended that further investigation of extending the pocket length of the U-Turn facility east of the proposed site is conducted. This could be facilitated by decreasing the length of the right turn pocket lane into Mahogany Road which could allow for an extension of the U-Turn lane.
- Main Roads WA modelling of the Benara Road corridor has suggested that station traffic has minimal impact on the performance of the Benara Road/ Beechboro Road intersection, with residual capacity available at the intersection up to the +10 year scenario at which point capacity is reached. Station traffic will be able to utilise this adjacent intersection as an alternative should queueing extend beyond the storage of the U-Turn facility prior to the intersection reaching capacity. It is recommended that the performance of this U-Turn facility be closely monitored to ensure adequate performance up to and including the opening +10 years scenarios for both the AM and PM peak periods.

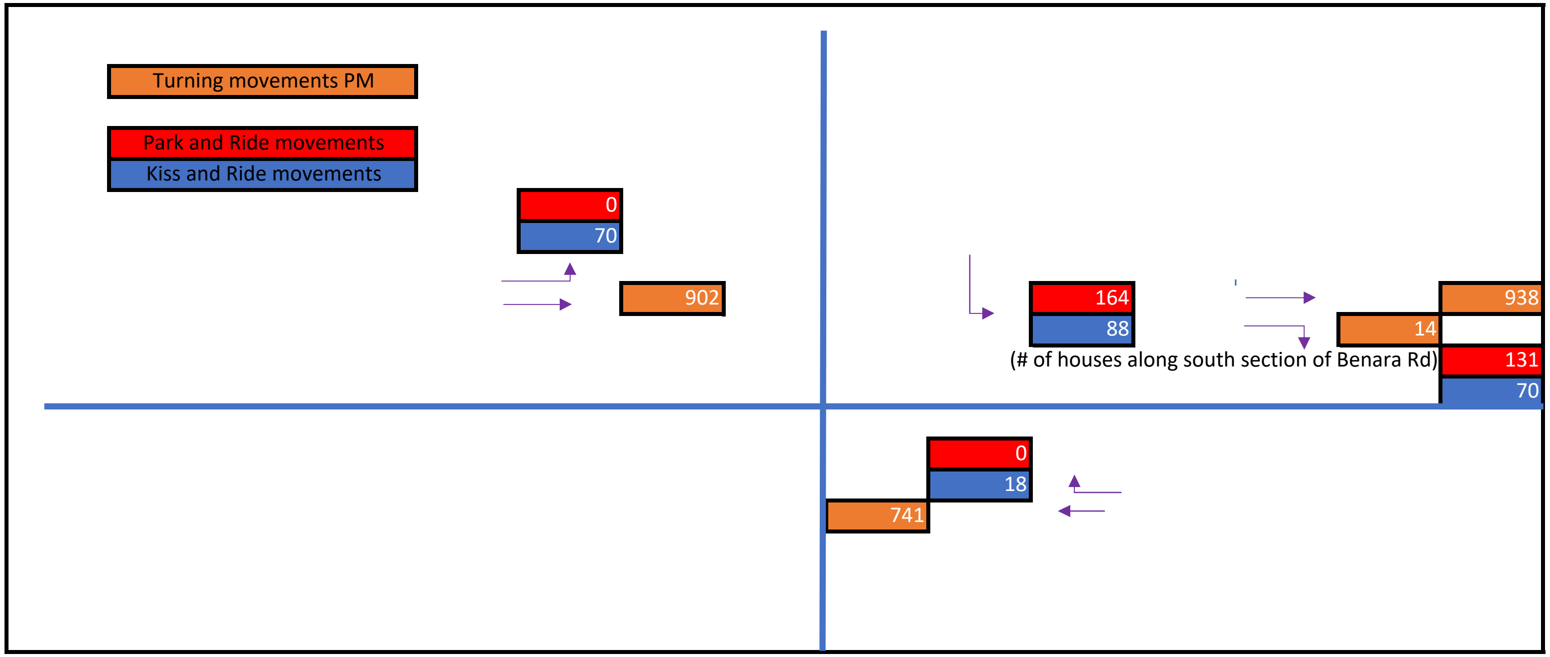
Summary

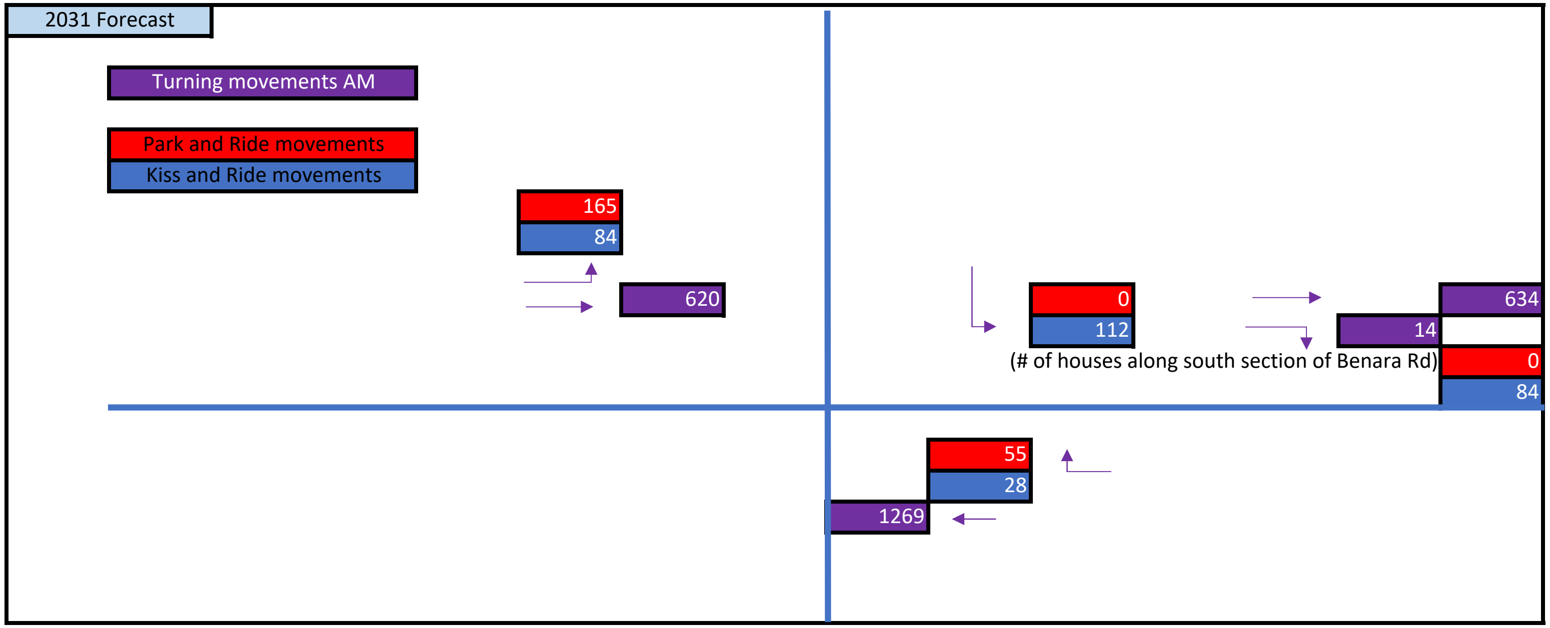
Based on these findings it is recommended that the site requirements and supporting infrastructure within the surrounding road network be implemented prior to opening of the station.

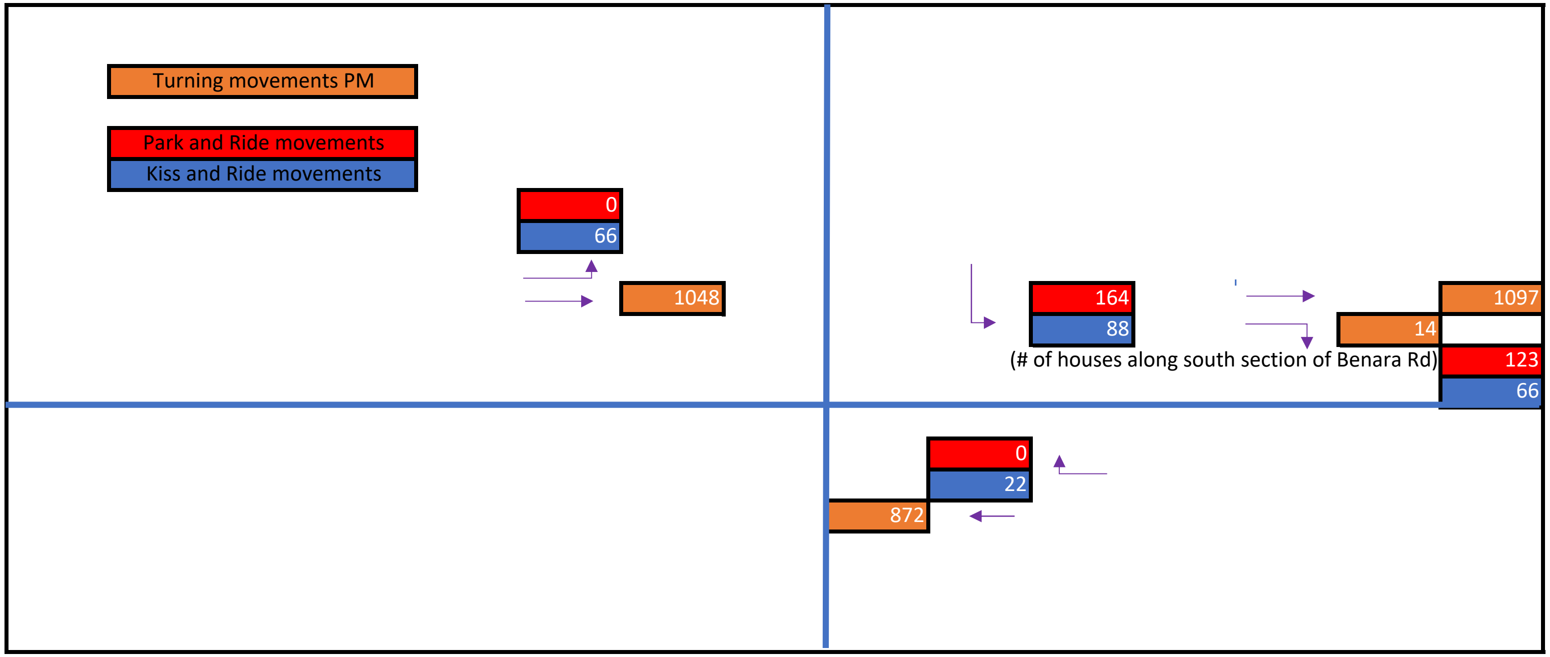
It is shown however, that the station is fit for purpose and well serviced by the proposed surrounding transport network, facilitating safe and adequate access for pedestrians, cyclists and general vehicles.

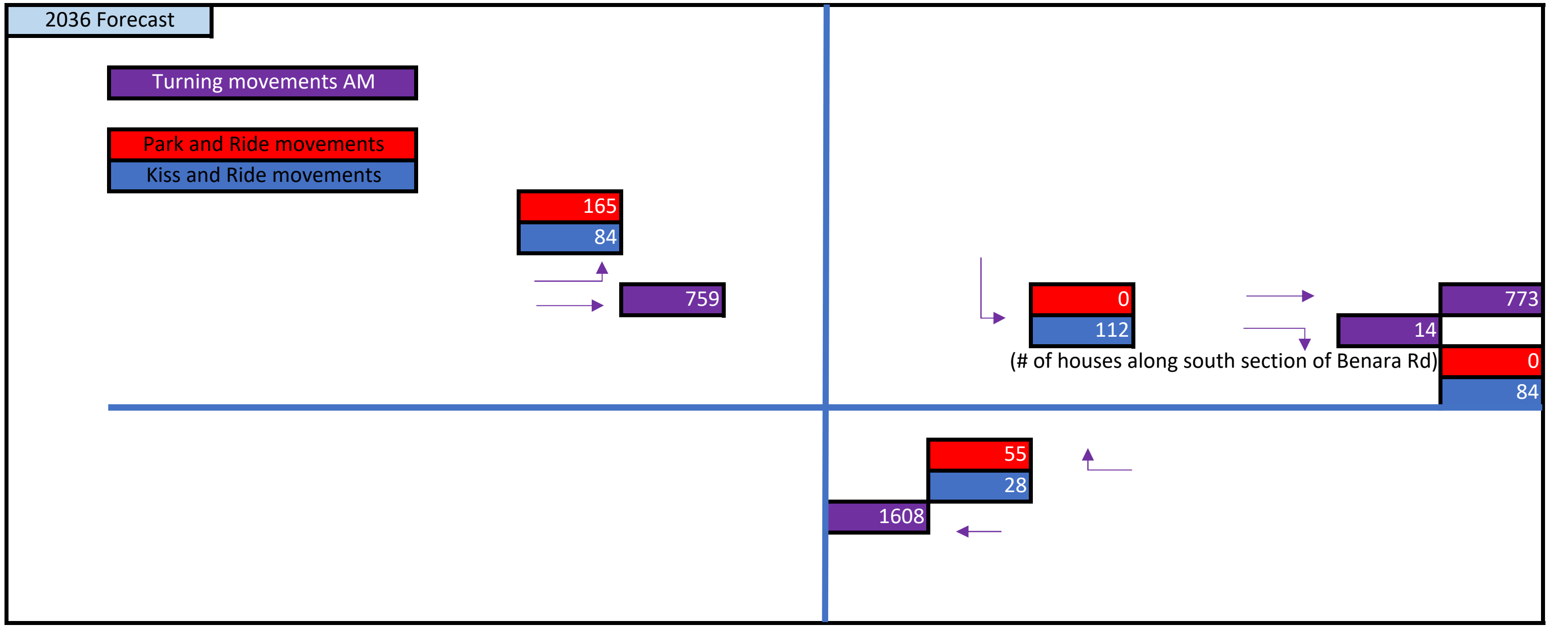
Appendix A – Noranda Station future peak period turning movement volumes

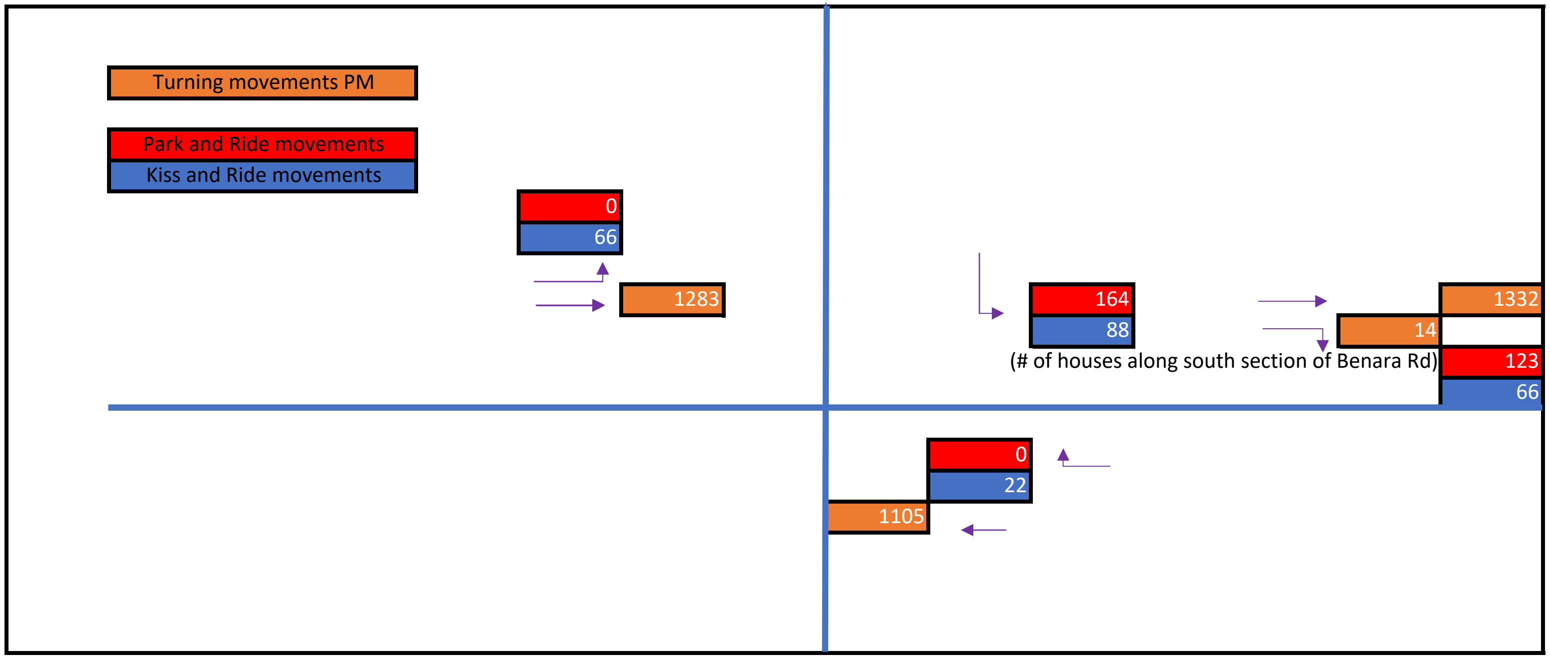

2026 Forecast
Turning movements AM
Park and Ride movements
Kiss and Ride movements
176
90
533
0
112
542
14
(# of houses along south section of Benara Rd)
0
90
44
22
1079


Turning movements PM
Park and Ride movements
Kiss and Ride movements
0
70
902
164
88
938
14
(# of houses along south section of Benara Rd)
131
70
0
18
741


2031 Forecast
Turning movements AM
Park and Ride movements
Kiss and Ride movements
165
84
620
0
112
634
14
(# of houses along south section of Benara Rd)
0
84
55
28
1269


Turning movements PM
Park and Ride movements
Kiss and Ride movements
0
66
1048
164
88
1097
14
(# of houses along south section of Benara Rd)
123
66
0
22
872


2036 Forecast
Turning movements AM
Park and Ride movements
Kiss and Ride movements
165
84
759
0
112
773
14
(# of houses along south section of Benara Rd)
0
84
55
28
1608


Turning movements PM
Park and Ride movements
Kiss and Ride movements
0
66
1283
164
88
1332
14
(# of houses along south section of Benara Rd)
123
66
0
22
1105

Appendix B – SIDRA movement summaries

MOVEMENT SUMMARY

▽ Site: [AM Peak - Benara Rd U-Turn - 2019 - Base (Site Folder: General)]

AM Peak - Benara Rd/ Stn Access
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Benara Rd														
5	T1	831	3.8	875	3.8	0.233	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		831	3.8	875	3.8	0.233	0.1	NA	0.0	0.0	0.00	0.00	0.00	59.9
West: Benara Rd														
11	T1	479	3.8	504	3.8	0.134	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
12u	U	14	0.0	15	0.0	0.043	15.7	LOS C	0.1	0.9	0.68	0.87	0.68	42.3
Approach		493	3.7	519	3.7	0.134	0.5	NA	0.1	0.9	0.02	0.02	0.02	59.3
All Vehicles		1324	3.8	1394	3.8	0.233	0.2	NA	0.1	0.9	0.01	0.01	0.01	59.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: [PM Peak - Benara Rd U-Turn - 2019 - Base (Site Folder: General)]

AM Peak - Benara Rd/ Stn Access
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Benara Rd														
5	T1	469	3.8	494	3.8	0.132	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		469	3.8	494	3.8	0.132	0.0	NA	0.0	0.0	0.00	0.00	0.00	59.9
West: Benara Rd														
11	T1	701	3.8	738	3.8	0.197	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
12u	U	14	0.0	15	0.0	0.025	10.3	LOS B	0.1	0.5	0.44	0.70	0.44	46.4
Approach		715	3.7	753	3.7	0.197	0.2	NA	0.1	0.5	0.01	0.01	0.01	59.6
All Vehicles		1184	3.8	1246	3.8	0.197	0.2	NA	0.1	0.5	0.01	0.01	0.01	59.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: [AM Peak - Benara Rd U-Turn - 2026 - Do Nothing (Site Folder: General)]

AM Peak - Benara Rd/ Stn Access
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Benara Rd														
5	T1	1079	3.8	1136	3.8	0.303	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.8
Approach		1079	3.8	1136	3.8	0.303	0.1	NA	0.0	0.0	0.00	0.00	0.00	59.8
West: Benara Rd														
11	T1	542	3.8	571	3.8	0.152	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
12u	U	14	0.0	15	0.0	0.067	22.4	LOS C	0.2	1.3	0.80	0.94	0.80	38.1
Approach		556	3.7	585	3.7	0.152	0.6	NA	0.2	1.3	0.02	0.02	0.02	59.2
All Vehicles		1635	3.8	1721	3.8	0.303	0.3	NA	0.2	1.3	0.01	0.01	0.01	59.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: [PM Peak - Benara Rd U-Turn - 2026 - Do Nothing (Site Folder: General)]

AM Peak - Benara Rd/ Stn Access
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Benara Rd														
5	T1	741	3.8	780	3.8	0.208	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		741	3.8	780	3.8	0.208	0.1	NA	0.0	0.0	0.00	0.00	0.00	59.9
West: Benara Rd														
11	T1	938	3.8	987	3.8	0.263	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
12u	U	14	0.0	15	0.0	0.037	14.0	LOS B	0.1	0.8	0.63	0.83	0.63	43.5
Approach		952	3.7	1002	3.7	0.263	0.3	NA	0.1	0.8	0.01	0.01	0.01	59.6
All Vehicles		1693	3.8	1782	3.8	0.263	0.2	NA	0.1	0.8	0.01	0.01	0.01	59.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: [AM Peak - Benara Rd U-Turn - 2031 - Do Nothing (Site Folder: General)]

AM Peak - Benara Rd/ Stn Access
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Benara Rd														
5	T1	1269	3.8	1336	3.8	0.356	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.8
Approach		1269	3.8	1336	3.8	0.356	0.1	NA	0.0	0.0	0.00	0.00	0.00	59.8
West: Benara Rd														
11	T1	634	3.8	667	3.8	0.179	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
12u	U	14	0.0	15	0.0	0.099	30.7	LOS D	0.3	2.2	0.87	0.96	0.87	33.9
Approach		648	3.7	682	3.7	0.179	0.7	NA	0.3	2.2	0.02	0.02	0.02	59.1
All Vehicles		1917	3.8	2018	3.8	0.356	0.3	NA	0.3	2.2	0.01	0.01	0.01	59.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: [PM Peak - Benara Rd U-Turn - 2031 - Do Nothing (Site Folder: General)]

AM Peak - Benara Rd/ Stn Access
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance															
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Benara Rd														
5	T1	872	3.8	918	3.8	0.245	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		872	3.8	918	3.8	0.245	0.1	NA	0.0	0.0	0.00	0.00	0.00	59.9
West: Benara Rd														
11	T1	1097	3.8	1155	3.8	0.310	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.8
12u	U	14	0.0	15	0.0	0.046	16.6	LOS C	0.2	1.1	0.71	0.90	0.71	41.7
Approach		1111	3.8	1169	3.8	0.310	0.3	NA	0.2	1.1	0.01	0.01	0.01	59.5
All Vehicles		1983	3.8	2087	3.8	0.310	0.2	NA	0.2	1.1	0.00	0.01	0.00	59.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: [AM Peak - Benara Rd U-Turn - 2036 - Do Nothing (Site Folder: General)]

AM Peak - Benara Rd/ Stn Access
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Benara Rd														
5	T1	1608	3.8	1693	3.8	0.451	0.2	LOS A	0.0	0.0	0.00	0.00	0.00	59.7
Approach		1608	3.8	1693	3.8	0.451	0.2	NA	0.0	0.0	0.00	0.00	0.00	59.7
West: Benara Rd														
11	T1	773	3.8	814	3.8	0.217	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
12u	U	14	0.0	14	0.0	0.210	64.8	LOS F	0.6	4.4	0.95	0.99	1.00	23.4
Approach		787	3.7	828	3.7	0.217	1.1	NA	0.6	4.4	0.02	0.02	0.02	58.6
All Vehicles		2395	3.8	2520	3.8	0.451	0.5	NA	0.6	4.4	0.01	0.01	0.01	59.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: [PM Peak - Benara Rd U-Turn - 2036 - Do Nothing (Site Folder: General)]

AM Peak - Benara Rd/ Stn Access
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Benara Rd														
5	T1	1105	3.8	1163	3.8	0.310	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.8
Approach		1105	3.8	1163	3.8	0.310	0.1	NA	0.0	0.0	0.00	0.00	0.00	59.8
West: Benara Rd														
11	T1	1332	3.8	1402	3.8	0.374	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.8
12u	U	14	0.0	15	0.0	0.070	23.3	LOS C	0.2	1.6	0.81	0.94	0.81	37.6
Approach		1346	3.8	1417	3.8	0.374	0.3	NA	0.2	1.6	0.01	0.01	0.01	59.4
All Vehicles		2451	3.8	2580	3.8	0.374	0.2	NA	0.2	1.6	0.00	0.01	0.00	59.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Queue Model: SIDRA Standard.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: [AM Peak - Benara Rd/ Stn Access - 2026 (Site Folder: General)]

Network: N101 [AM Peak - 2026 (Network Folder: General)]

AM Peak - Benara Rd/ Stn Access
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Benara Rd														
5	T1	1139	4.1	1139	4.1	0.306	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.8
6	R2	69	0.0	69	0.0	0.088	8.4	LOS A	0.3	2.4	0.53	0.74	0.53	49.9
Approach		1208	3.8	1208	3.8	0.306	0.5	NA	0.3	2.4	0.03	0.04	0.03	59.1
North: Station Access														
7	L2	118	0.0	118	0.0	0.117	6.9	LOS A	0.4	3.1	0.37	0.63	0.37	48.9
Approach		118	0.0	118	0.0	0.117	6.9	LOS A	0.4	3.1	0.37	0.63	0.37	48.9
West: Benara Rd														
10	L2	269	0.0	269	0.0	0.174	5.8	LOS A	0.8	5.6	0.17	0.52	0.17	53.7
11	T1	564	4.3	564	4.3	0.151	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		834	2.9	834	2.9	0.174	1.9	LOS A	0.8	5.6	0.06	0.17	0.06	56.7
All Vehicles		2160	3.3	2160	3.3	0.306	1.4	NA	0.8	5.6	0.06	0.12	0.06	57.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: [AM Peak - Benara Rd U-Turn - 2026 (Site Folder: General)]

Network: N101 [AM Peak - 2026 (Network Folder: General)]

AM Peak - Benara Rd/ Stn Access
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Benara Rd														
5	T1	1208	4.1	1208	4.1	0.322	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.8
Approach		1208	4.1	1208	4.1	0.322	0.1	NA	0.0	0.0	0.00	0.00	0.00	59.8
West: Benara Rd														
11	T1	574	4.3	574	4.3	0.155	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
12u	U	109	0.0	109	0.0	0.572	37.2	LOS E	2.6	18.4	0.91	1.10	1.42	22.3
Approach		683	3.6	683	3.6	0.572	6.0	NA	2.6	18.4	0.15	0.18	0.23	53.2
All Vehicles		1892	3.9	1892	3.9	0.572	2.2	NA	2.6	18.4	0.05	0.06	0.08	56.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: [PM Peak - Benara Rd/ Stn Access - 2026 (Site Folder: General)]

Network: N101 [PM Peak - 2026 (Network Folder: General)]

AM Peak - Benara Rd/ Stn Access
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Benara Rd														
5	T1	783	4.2	783	4.2	0.210	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
6	R2	19	0.0	19	0.0	0.041	12.1	LOS B	0.1	1.0	0.69	0.85	0.69	47.2
Approach		802	4.1	802	4.1	0.210	0.3	NA	0.1	1.0	0.02	0.02	0.02	59.5
North: Station Access														
7	L2	265	0.0	265	0.0	0.334	9.0	LOS A	1.6	10.9	0.55	0.83	0.65	46.5
Approach		265	0.0	265	0.0	0.334	9.0	LOS A	1.6	10.9	0.55	0.83	0.65	46.5
West: Benara Rd														
10	L2	74	0.0	74	0.0	0.046	5.7	LOS A	0.2	1.3	0.07	0.53	0.07	54.0
11	T1	953	4.1	953	4.1	0.254	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		1026	3.8	1026	3.8	0.254	0.5	LOS A	0.2	1.3	0.01	0.04	0.01	59.0
All Vehicles		2094	3.4	2094	3.4	0.334	1.5	NA	1.6	10.9	0.08	0.13	0.09	57.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: [PM Peak - Benara Rd U-Turn - 2026 (Site Folder: General)]

Network: N101 [PM Peak - 2026 (Network Folder: General)]

AM Peak - Benara Rd/ Stn Access
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Benara Rd														
5	T1	802	4.2	802	4.2	0.214	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		802	4.2	802	4.2	0.214	0.1	NA	0.0	0.0	0.00	0.00	0.00	59.9
West: Benara Rd														
11	T1	991	4.1	991	4.1	0.266	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.8
12u	U	227	0.0	227	0.0	0.592	21.9	LOS C	3.8	26.5	0.81	1.12	1.42	30.1
Approach		1218	3.3	1218	3.3	0.592	4.1	NA	3.8	26.5	0.15	0.21	0.27	55.0
All Vehicles		2020	3.7	2020	3.7	0.592	2.5	NA	3.8	26.5	0.09	0.13	0.16	56.4

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: [AM Peak - Benara Rd/ Stn Access - 2031 (Site Folder: General)]

Network: N101 [AM Peak - 2031 (Network Folder: General)]

AM Peak - Benara Rd/ Stn Access
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Benara Rd														
5	T1	1339	4.0	1339	4.0	0.360	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.8
6	R2	87	0.0	87	0.0	0.125	9.3	LOS A	0.5	3.3	0.57	0.79	0.57	49.3
Approach		1426	3.8	1426	3.8	0.360	0.6	NA	0.5	3.3	0.04	0.05	0.04	59.0
North: Station Access														
7	L2	118	0.0	118	0.0	0.124	7.1	LOS A	0.5	3.2	0.40	0.65	0.40	48.7
Approach		118	0.0	118	0.0	0.124	7.1	LOS A	0.5	3.2	0.40	0.65	0.40	48.7
West: Benara Rd														
10	L2	262	0.0	262	0.0	0.172	5.9	LOS A	0.8	5.4	0.20	0.53	0.20	53.6
11	T1	656	4.3	656	4.3	0.175	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		918	3.0	918	3.0	0.175	1.7	LOS A	0.8	5.4	0.06	0.15	0.06	56.9
All Vehicles		2462	3.3	2462	3.3	0.360	1.4	NA	0.8	5.4	0.06	0.12	0.06	57.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: [AM Peak - Benara Rd U-Turn - 2031 (Site Folder: General)]

Network: N101 [AM Peak - 2031 (Network Folder: General)]

AM Peak - Benara Rd/ Stn Access
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Benara Rd														
5	T1	1426	4.0	1426	4.0	0.380	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.7
Approach		1426	4.0	1426	4.0	0.380	0.1	NA	0.0	0.0	0.00	0.00	0.00	59.7
West: Benara Rd														
11	T1	671	4.3	671	4.3	0.301	2.1	LOS A	2.7	19.3	0.14	0.00	0.14	57.6
12u	U	103	0.0	103	0.0	0.838	84.5	LOS F	4.6	32.5	0.98	1.29	2.21	12.4
Approach		774	3.7	774	3.7	0.838	13.1	NA	4.6	32.5	0.25	0.17	0.42	47.1
All Vehicles		2200	3.9	2200	3.9	0.838	4.7	NA	4.6	32.5	0.09	0.06	0.15	53.2

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: [PM Peak - Benara Rd/ Stn Access - 2031 (Site Folder: General)]

Network: N101 [PM Peak - 2031 (Network Folder: General)]

AM Peak - Benara Rd/ Stn Access
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Benara Rd														
5	T1	921	4.1	921	4.1	0.248	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
6	R2	23	0.0	23	0.0	0.064	14.6	LOS B	0.2	1.5	0.76	0.90	0.76	45.4
Approach		944	4.0	944	4.0	0.248	0.4	NA	0.2	1.5	0.02	0.02	0.02	59.4
North: Station Access														
7	L2	265	0.0	265	0.0	0.372	10.1	LOS B	1.8	12.6	0.60	0.88	0.76	45.3
Approach		265	0.0	265	0.0	0.372	10.1	LOS B	1.8	12.6	0.60	0.88	0.76	45.3
West: Benara Rd														
10	L2	69	0.0	69	0.0	0.043	5.7	LOS A	0.2	1.2	0.08	0.52	0.08	54.0
11	T1	1106	4.1	1106	4.1	0.295	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.8
Approach		1176	3.8	1176	3.8	0.295	0.4	LOS A	0.2	1.2	0.00	0.03	0.00	59.1
All Vehicles		2385	3.5	2385	3.5	0.372	1.5	NA	1.8	12.6	0.08	0.12	0.09	57.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: [PM Peak - Benara Rd U-Turn - 2031 (Site Folder: General)]

Network: N101 [PM Peak - 2031 (Network Folder: General)]

AM Peak - Benara Rd/ Stn Access
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Benara Rd														
5	T1	944	4.1	944	4.1	0.252	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		944	4.1	944	4.1	0.252	0.1	NA	0.0	0.0	0.00	0.00	0.00	59.9
West: Benara Rd														
11	T1	1158	4.1	1158	4.1	0.311	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.8
12u	U	214	0.0	214	0.0	0.698	30.0	LOS D	4.7	32.6	0.89	1.22	1.81	25.3
Approach		1372	3.4	1372	3.4	0.698	4.7	NA	4.7	32.6	0.14	0.19	0.28	54.4
All Vehicles		2316	3.7	2316	3.7	0.698	2.8	NA	4.7	32.6	0.08	0.11	0.17	56.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

▽ Site: [AM Peak - Benara Rd/ Stn Access - 2036 (Site Folder: General)]

Network: N101 [AM Peak - 2036 (Network Folder: General)]

AM Peak - Benara Rd/ Stn Access
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Benara Rd														
5	T1	1696	4.0	1655	4.1	0.445	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.7
6	R2	87	0.0	85	0.0	0.148	10.7	LOS B	0.5	3.8	0.64	0.85	0.64	48.2
Approach		1783	3.8	1740 N1	3.9	0.445	0.6	NA	0.5	3.8	0.03	0.04	0.03	59.0
North: Station Access														
7	L2	118	0.0	118	0.0	0.135	7.6	LOS A	0.5	3.5	0.45	0.69	0.45	48.1
Approach		118	0.0	118	0.0	0.135	7.6	LOS A	0.5	3.5	0.45	0.69	0.45	48.1
West: Benara Rd														
10	L2	262	0.0	262	0.0	0.172	5.9	LOS A	0.8	5.4	0.19	0.53	0.19	53.6
11	T1	802	4.2	802	4.2	0.214	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.9
Approach		1064	3.1	1064	3.1	0.214	1.5	LOS A	0.8	5.4	0.05	0.13	0.05	57.2
All Vehicles		2965	3.4	2922 N1	3.5	0.445	1.2	NA	0.8	5.4	0.05	0.10	0.05	58.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

Organisation: ARUP AUSTRALIA SERVICES PTY LTD | Licence: NETWORK / Enterprise | Processed: Tuesday, 28 September 2021 1:49:26 PM
Project: \\global.arup.com\australasia\PER\Projects\279000\279640-00 Morley to Ellenbrook\Work\Internal\Design\Transport\Transport Modelling \Noranda\Modelling\Sidra\Noranda Stn_TIA.sip9

MOVEMENT SUMMARY

Site: [AM Peak - Benara Rd U-Turn - 2036 (Site Folder: General)]

Network: N101 [AM Peak - 2036 (Network Folder: General)]

AM Peak - Benara Rd/ Stn Access
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Benara Rd														
5	T1	1783	4.0	1783	4.0	0.476	0.2	LOS A	0.0	0.0	0.00	0.00	0.00	59.6
Approach		1783	4.0	1783	4.0	0.476	0.2	NA	0.0	0.0	0.00	0.00	0.00	59.6
West: Benara Rd														
11	T1	817	4.2	817	4.2	0.405	5.9	LOS A	3.4	24.8	0.07	0.00	0.08	53.9
12u	U	98	0.0	98	0.0	1.863	870.7	LOS F	34.4	240.5	1.00	2.46	7.49	1.4
Approach		915	3.7	915	3.7	1.863	98.5	NA	34.4	240.5	0.17	0.26	0.88	19.3
All Vehicles		2698	3.9	2698	3.9	1.863	33.5	NA	34.4	240.5	0.06	0.09	0.30	30.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: [PM Peak - Benara Rd/ Stn Access - 2036 (Site Folder: General)]

Network: N101 [PM Peak - 2036 (Network Folder: General)]

AM Peak - Benara Rd/ Stn Access
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE [Veh.	Dist]	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m				km/h
East: Benara Rd														
5	T1	1166	4.1	1154	4.1	0.311	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.8
6	R2	23	0.0	23	0.0	0.099	20.6	LOS C	0.3	2.2	0.85	0.94	0.85	41.8
Approach		1189	4.0	1177 N1	4.0	0.311	0.5	NA	0.3	2.2	0.02	0.02	0.02	59.3
North: Station Access														
7	L2	265	0.0	265	0.0	0.449	12.4	LOS B	2.3	15.8	0.69	0.96	1.00	42.9
Approach		265	0.0	265	0.0	0.449	12.4	LOS B	2.3	15.8	0.69	0.96	1.00	42.9
West: Benara Rd														
10	L2	69	0.0	69	0.0	0.043	5.7	LOS A	0.2	1.2	0.08	0.52	0.08	54.0
11	T1	1354	4.0	1354	4.0	0.361	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.8
Approach		1423	3.8	1423	3.8	0.361	0.4	LOS A	0.2	1.2	0.00	0.03	0.00	59.2
All Vehicles		2878	3.5	2865 N1	3.6	0.449	1.5	NA	2.3	15.8	0.07	0.11	0.10	57.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

MOVEMENT SUMMARY

Site: [PM Peak - Benara Rd U-Turn - 2036 (Site Folder: General)]

Network: N101 [PM Peak - 2036 (Network Folder: General)]

AM Peak - Benara Rd/ Stn Access
Site Category: (None)
Give-Way (Two-Way)

Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Benara Rd														
5	T1	1189	4.1	1189	4.1	0.317	0.1	LOS A	0.0	0.0	0.00	0.00	0.00	59.8
Approach		1189	4.1	1189	4.1	0.317	0.1	NA	0.0	0.0	0.00	0.00	0.00	59.8
West: Benara Rd														
11	T1	1405	4.0	1405	4.0	0.564	2.8	LOS A	7.0	50.7	0.21	0.00	0.28	57.0
12u	U	214	0.0	214	0.0	1.077	147.4	LOS F	19.6	137.2	1.00	2.31	6.05	7.7
Approach		1619	3.5	1619	3.5	1.077	21.8	NA	19.6	137.2	0.31	0.30	1.04	41.0
All Vehicles		2808	3.7	2808	3.7	1.077	12.6	NA	19.6	137.2	0.18	0.18	0.60	45.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Appendix C – Main Roads WA Traffic Modelling Information Request

Sholer, Timothy

From:	TSEU Darren (Con) <darren.tseu@mainroads.wa.gov.au>
Sent:	Thursday, 7 October 2021 2:09 PM
To:	Sholer, Timothy
Cc:	SYMCOX Jared (On Leave); JIANG Esta (Con); Aravind, Manoj; Armstrong, Neil; PINTABONA John (NAPM/A); TAN Ivan (TSCDAATM/A)
Subject:	RE: MEL/Noranda & Ellenbrook Station Traffic Modelling Information Request

Hi Tim, thanks for your email and apologies for the delayed response. As requested, please find below a summary of the traffic modelling outcomes for Noranda Station along with projected timeframes for the completion of Ellenbrook Station traffic modelling.

Noranda Station – LinSig modelling

LinSig modelling for the opening year (2024) shows that the intersection is forecast to operate at a DOS just below 80% and LOS D. The 2029 models show the intersection is likely to operate at around 90% DOS and LOS D, while in 2034 the intersection will be at capacity with a forecast DOS of 100% and LOS E to F.

Based on the 2024 queueing results, no lengthening of the Benara Road eastbound turn pockets is necessary to accommodate opening year traffic.

With regards to any potential increase in green time for particular turning movements, it should be noted that SCATS (the computer system operating the traffic signals) will adapt its cycle and phase times (to an extent) in response to traffic flow changes, including any additional traffic resulting from the opening of Noranda Station. Any modifications to existing phase times in addition to this would be an operational matter for MRWA, as this comes under MRWA's normal traffic signal operations.

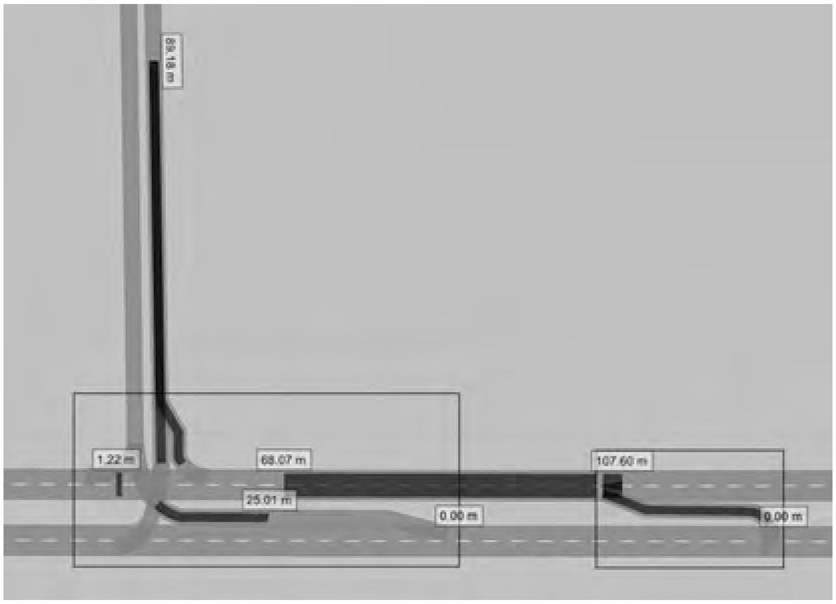
Noranda Station – microsimulation modelling

Based on general observation, PnR vehicles generally exit the station within 5 minutes of train arrival (i.e. 5 minutes between the first and the last car departing the station), therefore creating a bunching effect, especially in the PM peak when the vast majority of customers arrive on Ellenbrook-bound trains. This is an important factor when analysing the U-turn facility on Benara Road.

According to the Ellenbrook Station Development Application, "Five services per hour (in each direction) are anticipated to operate during the peak periods of 7am – 9am and 4pm – 6pm". This suggests that there will only be 5 Ellenbrook-bound trains (coming from the City) arriving at Noranda Station in the PM peak hour. After each Ellenbrook-bound train arrival, approximately one-fifth of the peak hour traffic demand will depart the station within 5 minutes interval. This bunching effect has been taken into account in the Vissim microsimulation modelling for the Opening Year.

The model simulation showed extended queuing at the following location:

- Eastbound->westbound U-turn: maximum queuing reported for "with Station" scenario is ~108 metres, which spills over the short U-turn lane (25 meters) during the PM peak (4:30-5:30pm). The queue often builds up after an Ellenbrook-bound train arrival (only 5 trains per hour in the peak periods).



Above: Maximum Queuing at the U-turn during PM peak 4:30 – 5:30pm ('with station' scenario)

- Compared to the 'without station' scenario, the station (PnR and KnR) is forecast to introduce large amounts of traffic on Benara Road (both eastbound and westbound), especially after a train arrival in the PM peak. As a result, the model reported doubling of queue length on Mahogany Road during 3:15-4:15pm, from 57m in the Base Case scenario to 116m in the 'with Station' scenario.

The station has minimal impact on the performance of Benara Road / Beechboro Road intersection (with less than 80veh/h increase), as the projected station catchment is largely located to the west.

Ellenbrook Station – LinSig and microsimulation modelling
Proposed LinSig models for Ellenbrook Station are expected to commence once the base model audits have been completed (at this stage expected for middle of next week). Microsimulation modelling is also currently being progressed and is interlinked with the LinSig modelling due to the need to optimise traffic signal operations and confirm any required signal phasing changes at Main St / The Parkway. It is estimated that traffic modelling for Ellenbrook Station will be at least four weeks away from completion.

Please note that Ivan is now on leave returning Monday, you may contact either myself or Esta if you have any queries or require additional information before then.

Kind regards,
Darren

Darren Tseu
TRAFFIC SERVICES MODELLER
Network Operations
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e: darren.tseu@mainroads.wa.gov.au
w: www.mainroads.wa.gov.au

From: Sholer, Timothy <TSholer@laingorourke.com.au>
Sent: Tuesday, 28 September 2021 3:15 PM
To: TAN Ivan (RM/A) <ivan.tan@mainroads.wa.gov.au>
Cc: SYMCOX Jared (RM/A) <jared.symcox@mainroads.wa.gov.au>; TSEU Darren (Con) <darren.tseu@mainroads.wa.gov.au>; Jiang, Esta <Esta.Jiang@aecom.com>; Aravind, Manoj <MAravind@laingorourke.com.au>; Armstrong, Neil <NArmstrong@laingorourke.com.au>; PINTABONA John (NAPM/A) <john.pintabona@mainroads.wa.gov.au>
Subject: RE: MEL/Noranda & Ellenbrook Station Traffic Modelling Information Request

CAUTION: This email originated from outside of Main Roads. Do not click links or open attachments unless you recognise the sender and know the content is safe.

Hi Ivan,

Could you please assist with our query below? We understand Maryely is on leave until mid-October, Esta and Darren are across the details of this request.

Regards

Tim Sholer
Design Coordinator
MELconnx

Email: TSholer@laingorourke.com.au
Mob: +61 429 089 127
Project Office: Cnr of Beringarra Av and Metal Circuit, Malaga. WA 6090

METRONET Stage 1: Morley-Ellenbrook Line (MEL Design and Construction Project Contract No. PTA 200001)

From: Sholer, Timothy
Sent: Tuesday, 28 September 2021 3:02 PM
To: Maryely.Rueda@mainroads.wa.gov.au
Cc: SYMCOX Jared (RM/A) <jared.symcox@mainroads.wa.gov.au>; TSEU Darren (Con) <darren.tseu@mainroads.wa.gov.au>; Jiang, Esta <Esta.Jiang@aecom.com>; Manoj Aravind (MAravind@laingorourke.com.au) <MAravind@laingorourke.com.au>; Neil Armstrong (NArmstrong@laingorourke.com.au) <NArmstrong@laingorourke.com.au>
Subject: MEL/Noranda & Ellenbrook Station Traffic Modelling Information Request

HI Maryely,

We require information from Main Road WA from their traffic modelling undertaken along Benara Road to in
o Main Roads WA Base LinSig models for Beechboro Rd N/ Benara Road
o Main Roads WA Future LinSig models for Beechboro Rd N/ Benara Road
o Main Roads WA Base micro-simulation models for Noranda Station
o Main Roads WA Future micro-simulation models for Noranda Station
Reason:
• The Linsig information is required to confirm the requirements outlined - SWTC Book 3A Section 3.3-2-3 requi
proponents shall allow for;
o At Benara Rd and Beechboro Rd North intersection install:
♣ 40m extensions to right and left turning pockets on Benara Rd, West of the intersection
♣ Update to the traffic light controls, (minimum, increasing the Right turn time from the North of the intersecti

Main Roads have completed their own traffic modelling at this intersection. You mentioned that results are a satisfactorily. The results will further inform compliance with our SWTC requirements.

We would also appreciate if you could confirm when similar modelling studies for Ellenbrook Station can be provided to MELconnx?

Regards

Tim Sholer
Design Coordinator
MELconnx

Email: TSholer@laingorourke.com.au
Mob: +61 429 089 127
Project Office: Cnr of Beringarra Av and Metal Circuit, Malaga. WA 6090

METRONET Stage 1: Morley-Ellenbrook Line (MEL Design and Construction Project Contract No. PTA 200001)

Appendix F – Stormwater

Morley-Ellenbrook Line

NORANDA STATION – CIVIL – DESIGN REPORT

MEL-MLCX-CI-RPT-00009

Rev	Date	Purpose of Issue	Prepared	Reviewed	Approved
A	18/11/2021	Reference Design	Tejas Dalal	Miguel Monteiro (JAJV SRE)	Manoj Aravind (SEM)

Document Details	
Project	Morley-Ellenbrook Line
Client	Public Transport Authority
PTA Contract Number	PTA200001
Laing O'Rourke Project No.	K97
MEL JAJV Package Number	8 – Noranda Station
MEL JAJV WBS Number	E075, E076, E077 - Civils - Earthworks, Drainage, Highways, Car Parking, Fencing.

This is to be updated with the full revision history of the document

Document revision history

Rev	Date	Purpose of Issue	Sections revised	Reason for updates
A	18/11/2021	Reference design	All	First issue

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Tables

Figures

1. Executive Summary

This document forms part of the Reference Design for the Morley-Ellenbrook Line (MEL) in relation to the Noranda Station Precinct Civil Engineering Design. The precinct design is intended for space planning purposes to allocate space for the different transport-oriented elements as per the Schedule of Accommodation noted on *SWTC Book 3: Part A- Scope of Works* and ensure there are no conflicts between the different modes of transport and pedestrians. Furthermore, it highlights constraints, risks and opportunities which will inform the IDDR phase of design.

The purpose of this document is to provide a description on the design development of the Civil Engineering elements in response to the proposed station precinct masterplan. This includes precinct geometry, stormwater drainage and earthworks including the following:

- Precinct overall layout geometry, including vehicular access and circulation areas
- Pick-up & Drop-off
- Parking
- Precinct proposed levels and earthworks requirements
- Stormwater drainage strategy and storage requirements
- Primary services containment

The intent is that this Design Report is a live document and will be updated throughout the process of the civil design.

Acknowledgement of Country

MELconnx acknowledges the Whadjuk People of the Noongar Nation as the Traditional Custodians of the land and waters on which the Morley-Ellenbrook Line Project is located. We pay our respect to their Elders, both past and present and thank them for their continuing connection to the country, culture and community.

2. Project overview

2.1 METRONET Vision and Objectives

As Perth's single largest investment in public transport, METRONET will transform the way people commute and connect. It will create jobs and business opportunities and stimulate local communities and economic development to assist communities to thrive. The METRONET vision is for a well-connected Perth with more transport, housing and employment choices.

In delivering METRONET, the WA Government has considered peoples' requirements for work, living and recreation within future urban centres with a train station at the heart.

The objectives are to:

- Support economic growth with better connected businesses and greater access to jobs
- Deliver infrastructure that promotes easy and accessible travel and lifestyle options
- Create communities that have a sense of belonging and support Perth's growth and prosperity
- Plan for Perth's future growth by making the best use of our resources and funding
- Lead a cultural shift in the way government, private sector and industry work together to achieve integrated land use and transport solutions for the future of Perth.

2.2 Morley-Ellenbrook Line overview

As Perth grows, so does the need for rail infrastructure and METRONET is a critical element of the State Government's infrastructure agenda. The Morley-Ellenbrook Line (MEL) Project will improve connectivity between the north east metropolitan area and the rest of the city and unlock economic development in these local community areas.

Figure 1: Morley-Ellenbrook Line © METRONET

The Public Transport Authority (PTA) is the lead agency delivering the MEL Project, with Main Roads WA (MRWA) undertaking some enabling works.

2.2.1 Project features

Transport infrastructure works for the Project include:

- A 21km rail line spurring from the Midland Line east of Bayswater Station, travelling north in the Tonkin Highway median, east through land north of Marshall Road and north on the western side of New Lord Street into Ellenbrook
- Stations at Morley, Noranda, Malaga, Whiteman Park and Ellenbrook with future-proofing for a station at Bennett Springs East
- Parking and bus interchanges/facilities at stations
- Significant grade separations at key road crossings
- Underpasses to allow the rail line to enter and exit the Tonkin Highway median
- Principal shared paths for walking and cycling access along the rail line
- Track and associated infrastructure to connect to the existing Midland Line
- Road and bridge reconfiguration works
- Integration across the packages of works and other nearby projects.

2.2.2 General scope of works

The Project's general scope of works includes the design and delivery of rail infrastructure and ancillary works to support operational passenger rail between Bayswater and Ellenbrook, including stations with inter-modal bus and rail with parking and associated road works at Bayswater, Morley, Noranda, Malaga, Whiteman Park and Ellenbrook stations.

The Project activities include all investigation, design, approvals, construction, testing and commissioning, Entry Into Service (EIS), training and operational readiness required to incorporate the new railway to Ellenbrook, and tie into the existing network including the associated road, utilities and other required works to interface with adjacent works and contracts. This will include bulk earthworks and retaining, structures, grade separations, roads and drainage.

The design and delivery of the main works package for the Project is broken into three distinct stages:

- Alliance Development Stage
- Project Alliance Reference Design Stage
- Project Alliance Delivery Stage (Detailed Design through to Project close-out).

Figure 2: Architect's Impression of Ellenbrook Station © MELconnx

2.2.3 Key Project Objectives, Key Compliance Objectives and Critical Success Factors

The PTA and MELconnx's single Non-Owner Participant (NOP) Laing O'Rourke Construction Australia Pty Ltd, have formed an integrated, collaborative Project Alliance to successfully deliver rail infrastructure that reflects our absolute commitment to achieving the Project Objectives and delivering positive outcomes for the State.

The following image demonstrates how we have mapped each Key Project Objective in the Project Alliance Agreement (PAA) against the Critical Success Factors to achieve best-for-project outcomes, underpinned by the Key Compliance Objectives.

Key Project Objectives	Critical Success Factors for Successful Project Delivery (abbreviated)
Implementation of a robust, cooperative team culture.	• Development of a culture that results in all Participants developing behavioural values and driving principles to achieve Alliance goals and project objectives • Longevity and stability of key Alliance personnel i.e. Alliance Manager, ALT and AMT.
Timely delivery of Works to achieve project milestones in accordance with agreed program.	• Development of a final proposal with a sufficiently developed design and accurate TOC • Subsequent cash flow management and financial forecasting, scheduling and value-earned calculation and determination • Implementation of PTA mandated systems i.e. TeamBinder, Primavera P6, TILOS and a finance system accepting the PTA's cost breakdown structure • Timely completion of design, construction and commissioning through to practical completion • Timely progress towards construction milestones and completion of close-out to achieve final asset acceptance compliance.
Inclusion of processes that embrace/promote open tendering and promotion of work package development that encourages/ enables second and third tier tendering. **Compliance with WAIPs.**	• For professional service providers, implement a proven and mature supply-chain engagement process, including tender review, contract award and project integration. Ensure that it offers opportunity and security of payment relative to services delivered in an effort to achieve best-for-project outcomes • For material suppliers and other subcontract service providers, implement a proven and mature supply-chain engagement process, including tender review, contract award and project integration that offers opportunity and security of payment relative to service delivered • Proven and mature supply-chain engagement process for labour hire services, compliant with industrial and safety laws, maintained employee standards/conditions and security of employee payments • Ability to develop contracts and terms and conditions in the spirit of the Alliance values and principles , appropriate and commensurate with the size, complexity and value of packages in accordance with industry best practice.
Optimisation of operational and whole of life costs.	• Sustainability considerations and outcomes for the whole of life of the works.
Ensuring appropriate consultation/integration with stakeholders and community.	• Constant and effective engagement with relevant stakeholders, particularly utilities/services, Main Roads, third party asset owners and relevant unions • Effective management of PTA interfaces and PTA contractors • Constant/effective engagement with the PTA in design reviews, work planning and possessions/shutdowns.
Providing passengers with safe and secure services and facilities.	• Compliance with ONSR requirements • Completed rail line, stations and bus transfer infrastructure are able to deal successfully with the movement of people, including the disabled.
Minimising disruption to current and anticipated rail operations.	• Minimise impact on public transport services disruption • Liaison and interaction with PTA rail operations personnel tasked with determining network closures, to confirm available network shutdowns and implement contingency plans • Effective management of interfaces with others in heavily constrained areas • Effective management/staging of works to reflect staged/constrained site access • Effective management of existing rail infrastructure asset protection.
Recognising the State's desired industrial relations objectives.	• Develop a project-specific Industrial Relations Management Plan based on a proven and successful industrial relations approach that delivers a collaborative worksite, genuine collective agreement, making good faith in negotiations and dispute resolution, and respect for trade union rights of entry.

Key Compliance Objectives (abbreviated)				
Compliance with all Statutory requirements and State Government policy requirements for construction work.	Compliance with the SWTC.	Protecting and minimising disruption to all existing facilities, infrastructure, properties or public utility services.	Meeting all obligations to impacted stakeholders and demonstrating genuine sensitivity.	Compliance with all environmental conditions and minimise adverse environmental impact.

Figure 3: Key Project Objectives, Critical Success Factors and Key Compliance Objectives

2.3 Alliance vision and delivery approach

The MEL Project will be delivered under an alliance contract to support the management of project and stakeholder interfaces and to mitigate project risks. A collaborative alliance approach will see the Works carried out in a cooperative, coordinated and efficient manner in compliance with the Alliance Principles.

MELconnx understands that the successful delivery of the Project is critically linked to meeting the PTA's Key Project Objectives. These objectives have shaped our vision for the Project that is around delivering a high-quality product and creating exceptional value-for-money. We are committed to a no-blame culture and to the prompt and mutual resolution of any issues that may arise.

During the AD Stage, representatives from both the PTA and MELconnx participated in an interactive workshop to begin the process of developing a suitable Alliance Vision for the Project (refer Figure 4 below for workshop outcomes).

Figure 4: AD Stage Alliance Vision Development Outcomes (developed with the PTA)

The Alliance Foundation workshop was held on 11/11/2020 and the results of this workshop generated the basis for the Vision, Purpose, Values and Behaviours Commitment Statements represented here.

Figure 5: MELconnx Alliance Vision, Purpose and Values

2.4 Purpose of the Report

The Design Report identifies any interdependencies between each Design Package and how those dependencies have been accommodated within the document. The Design Report describes the relationship between each of the Package(s) engineering lifecycle and the assurance gates throughout the Project.

2.5 Changes Since Previous Design Submission

2.5.1 Alliance Development Stage to Reference Design Stage

The following design changes have occurred during the Reference Design development:

- Revised station precinct layout in response to:
  - Revised landscape architecture masterplan.
  - Revised location of Pick-up and Drop-off bays and access arrangements.
- Revised location of ancillary buildings and access arrangement.
- Further development of FSLs with the view of reducing the volume of imported fill.
- Further development of Stormwater Drainage strategy in light of TGA IFC report and design documentation.
- Development of precinct primary services (utilities) routes.
- Incorporation of Landscape Architecture masterplan requirements.

2.5.2 Reference Design to Interim Detailed Design

The following design changes have occurred during the Interim Detailed Design development.

Not applicable at Reference Design Stage.

2.5.3 Interim Detailed Design to Final Detailed Design

The following design changes have occurred during the Final Detailed Design development.

Not applicable at Reference Design Stage.

2.5.4 IFC Design Finalisation

The following design changes have occurred during the IFC Design finalisation.

Not applicable at Reference Design Stage.

3. Design Description

3.1 Scope of this Design Package

In accordance with the SWTC, *Book 3: Part A – Scope of Works, Section 3.3 Noranda Station Surrounds*, the scope of this Design Package is outlined as follows.

3.1.1 General

The scope requirements within the Noranda Station Precinct encompass the confirmation and detail design of the civil engineering elements as follows.

- Precinct layout and geometry.
- Stormwater drainage.
- Bulk earthworks
- Pavement design.
- Precinct services.

The above have been undertaken for the following:

- Car Parking areas and associated access roads.
- Station forecourt and public realm areas.
- SER compound.
- Ancillary buildings and associated access and egress.

3.1.2 Civil Engineering Scope of Works

The civil engineering scope of works include the following:

- An at grade PTA Station car park to the east of the Station and north of Benara Road with Kiss and Ride areas and access for carpark patrons to the station from the carpark to and Station Entry building. The pick-up and drop-off bays must be located adjacent to main station entrance facility. The capacity of bays as described in the Schedule of Accommodation (Book 3 - Part A, Station, Station Surrounds and Station Precinct Design).
- Vehicle access road from Benara Road to the Noranda Station precinct carpark with a priority-controlled intersection and turning pockets as required by traffic studies. Minimum requirements must include a left in, left out and right in.
- Shared path connection to proposed underpass to Benara Road.
- Modification to existing shared path and provision of priority crossing on the north side of Benara Road where the new vehicle station car park access road severs the existing shared path to maintain shared path continuity.
- Access road and associate civil works including secure fencing and gates as required for a Western Power Point of Connection, fire tank, pump room and booster, Signalling and Communications Equipment Room (SER) and Radio Mast located within the station precinct.
- MRWA access and gate to be provided via Acacia Court.
- A dedicated point of access for MRWA is to be provided to Tonkin Highway median via station precinct for MRWA to maintain lighting and communication assets.
- The pad level of the Western Power point of connection at Noranda Station must be 300mm above the 1% AEP storm event flood level.
- Provision of stormwater drainage system for station precinct to incorporate infiltration basins or underground stormwater storage system structures where open basins cannot be accommodated.
    - To accommodate the car parking runoff and existing MRWA open drainage basin (Basin 2) storage using StormTrap units or similar approved stormwater storage infrastructure. Stormwater drainage strategy is subject to approval by PTA and MRWA, and endorsement by METRONET and DWER.
- Separation between LGA, MRWA and PTA drainage to be achieved.
- Provide new utility connections and supplies to the new Noranda Station including sewer and water.

3.2 Design Description

The basis of the design and the specific design methodology adopted is described below.

3.2.1 General

This section outlines the design considerations associated with the Reference design phase of the Noranda Station including carpark, bus interchange and associated precinct.

The design is documented on the following: Drawings:

- 25-A-286-CI0001 Cover Sheet and Drawing Index
- 25-A-286-CI0002 Bulk Earthworks - Plan
- 25-A-286-CI0011 Drainage and Finished Surface - Plan
- 25-A-286-CI0012 Drainage and Finished Surface - Plan - Sheet 1

- 25-A-286-CI0013 Drainage and Finished Surface - Plan - Sheet 2
- 25-A-286-CI0039 General Arrangement - Plan
- 25-A-286-CI0046 Combined Proposed Utilities - Plan
- 25-A-286-CI0073 Pavement and Kerbing - Plan
- 25-A-286-CI0078 Pavement and Kerbing - Detail - Sheet 1
- 25-A-286-CI0086 Minor Structures - Plan
- 25-A-286-CI0093 Vehicle Tracking Plan

Models:

- 25-B-286-CI0001 (Earthworks)
- 25-B-286-CI0002 (Drainage)
- 25-B-287-CI5004 (Car Parking)
- 25-B-286-CI5005 (Utilities)

3.2.2 Precinct Layout

The precinct design has been progressed based on AD Phase Noranda Precinct Design 1, and further precinct amendments agreed during Reference Design development..

In summary the revised layout has been developed to a higher level of detail and includes:

- Revised carpark located east of the station and Tonkin Highway and north of the Kiss and Ride.
- Revised pick-up and drop-off south of the car park.
- Precinct access road from Benara Road.

Refer to the table below for a summary of proposed parking facilities. A total of 400 car parking bays are achieved for the station precinct.

Table 1: Noranda Station Total Car Parking Numbers

Location	Description	No.	Notes
Car Park	Standard All Day Car Parking Bays	357	
	Tenant All Day Parking Bays	0	
	Electric All Day Car Bays	2	
	Short Term Bays	21	Within main car park
	Short Term Bay	1	Accessible
	Accessible Car Bays	7	
	Taxi Bays	1	
	Service Bays (co located loading bay)	2	
	Staff Parking Bays	4	
Pick-Up & Drop-Off	-	5	Short Term Bays (within Pick-Up &Drop-Off)
	Sub-total	**400**	

Bicycle storage facilities have been proposed adjacent to the west of the station building.

3.2.2.1 Car Park

The carpark has been designed to maximise the number of car parking bays whilst allowing for all vehicle movements and providing safe pedestrian access to Noranda Station.

The carpark layout has been designed to be compliant with Australian Standards 2890.1 Off-street Car Parking and 2890.6 Off-street parking for people with disabilities, and include:

- Parking Bay Dimensions: 2.4m x 5.4m (assuming no overhang)
- ACROD bay dimensions: 2.4m x 5.4m perpendicular bays (one shared access bay for every two ACROD bays)
- Aisle width: 6.2m (bays at 90 degrees)

3.2.2.2 Pick-up and Drop-off

The pick-up and drop-off layout has been designed to be compliant with Australian Standards 2890.1 Off-street Car Parking and 2890.6 Off-street parking for people with disabilities, and include:

- Parking Bay Dimensions: 3.0m x 8.0m parallel parking
- Circulation access road width: 3.5m (one-way)
- Turning facilities

3.2.2.3 Precinct Access Roads

The carpark access road has been designed to interface with the proposed Benara Road intersection design (refer to JAJV Highways drawings).

3.2.2.4 Vehicle Tracking

Vehicle tracking movements have been assessed for the following Austroads 2013 design vehicles:

- 5.2m passenger vehicle (for internal carpark movements)
- 9.9m service vehicle (bin store related internal carpark movements)
    - Includes swept path movement requirements for a refuse vehicle
- 12.2m pumper fire truck (emergency vehicle access to the station concourse area and fire pumps and tanks compound)

3.2.3 Earthworks

The design surface has been modelled using 12D software design package, with the resulting bulk earthworks cut/fill volumes shown on drawings 25-A-286-CI0002.

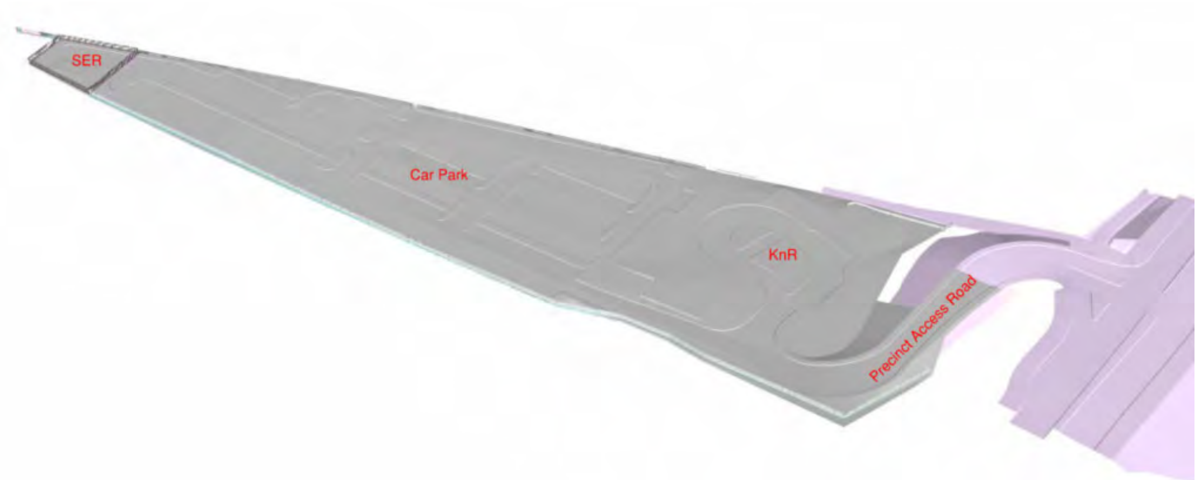


Figure 6: Perspective view indicating proposed Noranda Station Precinct design

The site has been modelled to minimise cut and fill volumes, using the level of the top of Main Roads WA basin as the design level for the station car park.

Two retaining walls are required as part of the design:

- A 110m long wall with a max retained height of 2.0m between the Benara Bridge wing wall and the station entry building.
- A 200m long wall with a max retained height of 1.3m along the western edge of the car park.

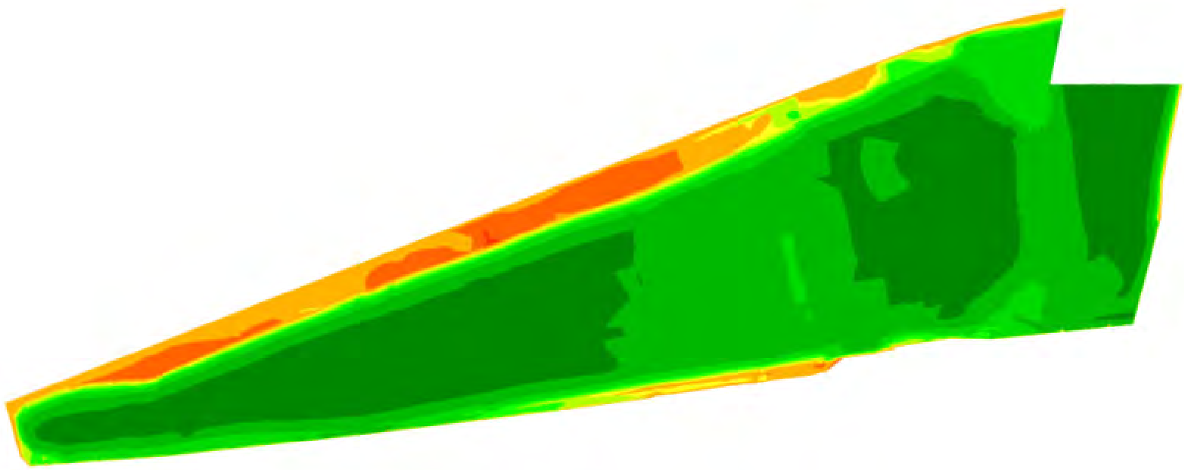


Figure 7: Noranda station precinct earthworks depth range (cut/fill requirements)

Bulk earthworks volumes have been calculated based on the bulk earthworks design surface (design surface minus 300mm depth to allow for pavement build-up and landscaping) and the existing surface model (minus 100mm for topsoil stripping).

Bulk Earthworks volumes are as below:

- Cut: 570 m^3
- Fill: 35,720 m^3

The existing surface model is based on model no. MEL-MLCX-SV-MDL-00001.

3.2.3.1 Car Park

Carpark design levels grade in a south-north direction for major flood routing, nevertheless contained within the car parking area due to the level difference with the surrounding areas. Interface with proposed levels at the precinct access road and Benara Road and Tonkin Highway have been taken into consideration. Falls are introduced to the carpark surface between rows of car bays and towards road gullies.

Carpark, pick-up and drop-off facilities, are designed to be at grade facilities.

3.2.3.2 Station Forecourt

The station forecourt and public open space east of the proposed station entry building are proposed to tie-in with the station forecourt. Levels range from +29.85m AHD to +29.25m AHD to support the step in the entry building. The design surface grades towards the pick-up and drop-off for stormwater drainage purposes.

3.2.3.3 SER Compound

The SER compound drainage has been designed with a one way fall from east to west.

3.2.3.4 Pick-up and Drop-Off

The road design surface falls towards the internal kerb line for stormwater drainage collection purposes with a typical crossfall of 2%. Allowance for footpath and landscaping works have been included. A central soft landscaped area segregates traffic flows in opposite directions.

3.2.4 Pavements

In coordination with landscape architecture, eight (8no.) pavement types have been specified for the station, as follows:

- Pavement Type 1: Asphalt Pavement (Light-Duty)
- Pavement Type 2: Asphalt Pavement (Heavy Duty)
- Pavement Type 3A: Block Paving, not subject to vehicular loading
- Pavement Type 7: Concrete Pavement (motorcycle parking shelter)
- Pavement Type 8A: Pedestrian areas (concrete), not subject to vehicular loading

Pavements subject to vehicular traffic have been designed to MRWA Engineering Road Note 9. Pavement design thicknesses have been rationalised based on a 40-year design life and following design traffic assumptions:

- Carpark and circulation areas: 4 million ESA
- Pedestrian areas subject to occasional vehicular loading: 3 million ESA

The pavement extents and details and are documented on drawings 25-A-287-CI0088, 25-A-287-CI0089 and 25-A-287-CI0097 respectively.

In line with Advisian geotechnical investigation interpretive report, document number MEL-ADV-GE-RPT-0010 dated 15/12/2020, a design CBR value of 12% has been assumed – given the sand geology of the site.

3.2.5 Drainage

3.2.5.1 Existing Drainage

The Noranda Precinct development impacts existing Main Roads stormwater drainage infrastructure (Basin 2). The site accommodates a 1% AEP stormwater drainage basin serving a total catchment of approximately 6.64 hectares (Source: AD Stage Design Report MELconnx 2020).

3.2.5.2 General design strategy

An increase in the impermeability through precinct areas carparks and station buildings will increase the stormwater runoff. The general design strategies for the precinct are as follows:

- Capture and treat the 1EY 1hour runoff.
- Minor Storm: 10% AEP. The drainage system shall be capable of carrying and controlling flow from the minor storm event. The flood level to be kept below the pavement level.
- Major Storm: 1% AEP. Safe, well-defined overland flow paths will be incorporated in the surface design. Above ground storage will be kept away from critical infrastructure (i.e., buildings, major roads) with a minimum of 300mm freeboard. All drainage infrastructure will be approved by the relevant local council. A maximum flood depth of 200mm to be maintained.
- Major Storm: 1% AEP. Station building and platform runoff to be captured and dissipated on site.

Furthermore, where management of superficial groundwater is required as part of the project work, groundwater to be managed consistent with the DWER's publication "Water resource considerations when controlling groundwater levels in urban development, DoW, April 2013", and the requirements specified in the SWTC Book 3: Part A: Scope of Works.

3.2.5.3 General design input

The key drainage design inputs for the station precincts are noted as:

- Design Intensity-Frequency-Duration (IFD) Rainfall – BOM 2016 IFD (climate change factor is applied)
- 2% AEP Ground Water Levels
- Geotechnical investigation and report
- Climate change factor applied to the IFD
- An Infiltration rate for the site has been adopted as 10 m/day for the minor and major analysis (as per MELconnx Geotechnical Interpretive Report MEL-MLCX-GE-RPT-00010)
- Infiltration rate for the design of soakwells has been reduced to 3 m/day to account for the clogging factor.

3.2.5.4 Drainage Design

The stormwater strategy for the site is documented on drawings 25-B-286-CI0012 and 25-B-286-CI0013 and is separated into five components as follows:

- SER
- Pick up and drop off
- Car Park
- Access Road
- Station Building and Eastern Overpass

The station platform is discussed further in the hydraulics section.

The design was completed using 12D. The pipe network was modelled in 12D and pipe sizes were checked using ILSAX method. The underground storages and soakwells were modelled using PCSump V6.1.

Figure 6 below shows the design contours and proposed stormwater drainage networks which indicate the proposed stormwater drainage management strategy.

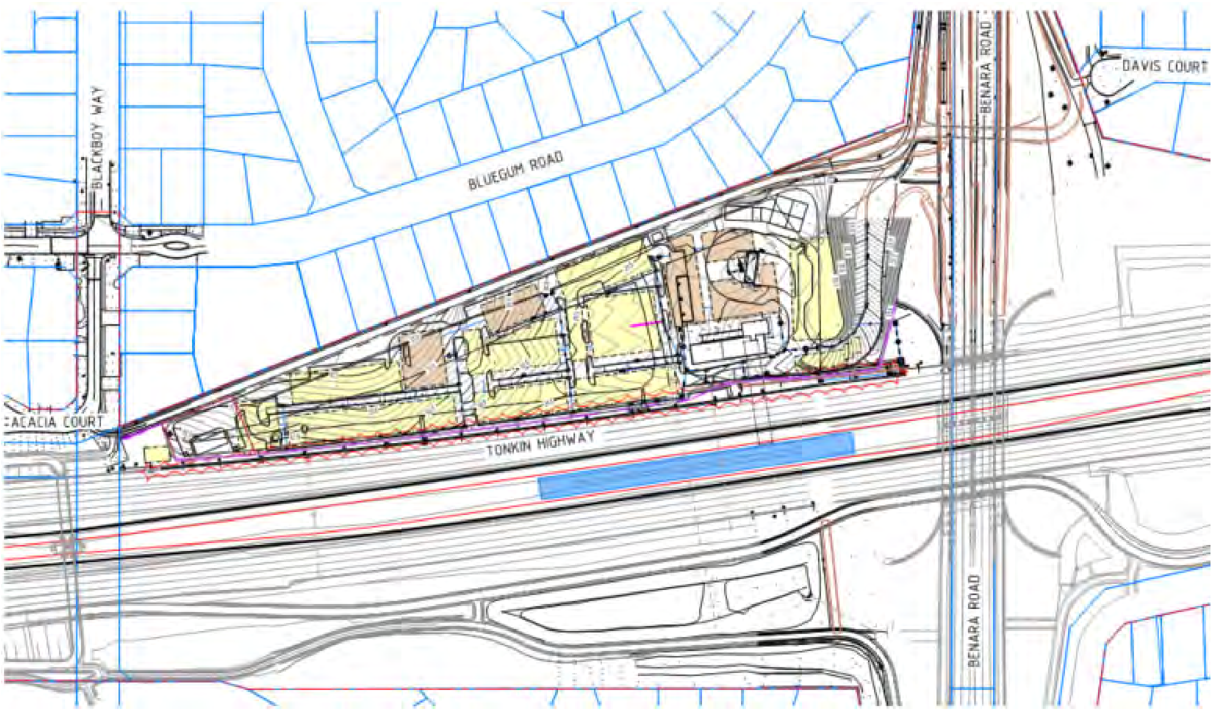


Figure 6 Noranda Station main precinct stormwater drainage and proposed contour

3.2.5.5 SER

The SER is located at the northern end of the car park, with the compound graded to the west. Kerbing along the perimeter of the trafficable compound area will convey 10% AEP runoff to soakwells. Runoff from the 1% AEP flood event will be conveyed within a swale to the northern end of the site to a depression. The flood depth within the SER compound does not exceed the maximum allowance of 200 mm.

3.2.5.6 Pick-up and Drop-off

The pick-up/drop off loop is located to the east of the station access building at the southern end of the car park. The loop is graded towards the central island to be collected and conveyed by a pit and pipe network into underground storage. Major rainfall events will overtop and pond within the central island, with ponding depth over the pavement not exceeding the maximum allowance of 200 mm.

GPT prior to the underground storage inlet will provide treatment for the 1EY 1 hour event.

3.2.5.7 Carpark

The car park is generally crowned in the centre of each vehicular aisle to direct runoff towards the parking bay medians. A pit and pipe network collects and conveys runoff into underground storage beneath the car park and pedestrian thoroughfares. Major rainfall events will pond over the pavement not exceeding the maximum allowance of 200 mm. Events greater than the 1% AEP will exit the site onto the Tonkin Highway.

The current car park layout does not provide suitable area for bioretention areas to treat runoff. In-line proprietary SQIDs are proposed prior to underground infiltration storages to treat car park runoff.

3.2.5.8 Access Road

The precinct access road has a one-way crossfall towards the outbound lane. A pit and pipe system on the low side will collect and convey runoff to the underground storage located to the east of the station access building.

In the 1% AEP flood event ponding over the pavement will not exceed the maximum allowance of 200 mm.

3.2.5.9 Station building and Entry Building

The train station and platform drainage are discussed further in the hydraulics section. The existing MRWA pipes under the Tonkin Highway will be retained to convey flows from the track and platform areas.

The Station building and eastern overpass drainage systems will be conveyed into the car park drainage system. There will be three points of discharge/ connection.

Roof drainage is directed to the ground level via downpipes, connecting to the access road and car park pit and pipe networks along the northern and western facades of the building. The downpipe discharge locations are highlighted in the Hydraulic design package.

3.2.5.10 Existing Geology

The existing geology is characterized by Bassendean Sands underlain by coffee rock for some portion of the area. The exact extent and nature of this coffee rock is unclear based on historical geotechnical investigation undertaken at the site. However, based on the available investigation previously completed by Advisian (2020) (MELADV-GE-RPT-00002 rev 0), Coffee rock (or Ferricrete) was encountered in some of the investigation points, which is summarized as follows:

- 6 Hand augers (HA) tests were completed at Basin 2 and surrounding area; NOR-HA01, NOR-HA04, NOR-HA05, NOR-HA06, NOR-HA07 (RSR) and NOR-HA08(K). Coffee rock was encountered in 5 of the 6 tests at a depth between 26.3m-26.5m AHD and 0.1-0.2m thick. Groundwater levels were generally encountered below the coffee rock at 25.8m AHD and 26.0m AHD.
- CPT tests: NOR-CPT01 and NOR-CPT02 terminated at 25.9m AHD and 26.3m AHD due to early refusal, potentially due to the presence of coffee rock. This is consistent with the depth of coffee rock present in the HA tests above.
  - Boreholes: NOR-BH05 and NOR-BH06. Coffee rock was encountered was encountered in both tests at a depth of 26m AHD and 26.5m AHD and 0.3m thick. Groundwater levels were generally encountered below the coffee rock at 25.7m AHD and 26.0m AHD.
  - One infiltration rate was undertaken at hand auger NOR HA08(K) at 2.0 m depth, which is within the
- Bassendean Sand but did not include Coffee rock. Advisian Interpretive Report, 2020 (MEL-ADV-GERPT-
- 00007 rev 0) noted NOR-HA08 (k) coefficient K20 = 4.5m/day.

Based on the assessment above it is likely that Noranda Station Precinct (existing MRWA 'Basin 2') is underlain by Coffee Rock at a depth 26.3m AHD to 26.5m AHD and between 0.1-0.3m thick.

Where coffee rock is encountered within the precinct, options for penetration through the rock or removal are recommended to be developed to improve infiltration and take full advantage of the underlaying aquifer.

In light of the above, a Technical Memo note (doc. Ref MEL-MLCX-CI-NTE-81003 was developed describing the investigations into the presence of coffee rock at the Noranda Station Precinct, in that it impacts on the sizing of detention storage replacing the current MRWA infiltration basin draining Tonkin Highway and other parts of the surrounding suburbs.

In summary, three options can be considered to remove the impact of the presence of the Coffee Rock Layer:

- Option 1: Excavate Coffee Rock layer and replace with granular imported fill.

- Option 2: Excavate and reuse the Coffee Rock layer as granular fill
- Option 3: Puncturing the Coffee Rock layer

Furthermore, as part of the assessment of eliminating the effects of coffee rock on infiltration, a review of available information has been undertaken, together with limited modelling, to determine a suitable regime of penetrations through the coffee rock to enable full engagement with the underlying aquifer.

This work was based on finite element modelling, to calculate the size and spacing of penetrations through the coffee rock that will allow full utilization of the aquifer that lies beneath. The results of the modelling are critically dependent on the assessed permeability of the coffee rock. No testing of this has been done, so a site-wide investigation is required to confirm design assumptions made in the modelling.

Sensitivity testing of the coffee rock permeability has been made though, which can be seen to have a significant effect on the time taken for the storage to empty. In making recommendation of the size and spacing of penetrations through the coffee rock, a value of 0.001 m/day has been adopted, but this needs to be confirmed by further testing.

In summary, the assessment work suggests that 450 mm dia holes at a 5 m spacing through the coffee rock will lead to a satisfactory emptying time for the StormTrap units. An investigation program is required to confirm the design assumptions relating to permeability of the coffee rock. If a permeability greater than 0.001 m/day is shown to be applicable, then the spacing of 450 mm dia holes could be increased. Conversely, a lower value would reduce the spacing.

3.2.5.11 Underground Storage

The existing site accommodates a MRWA 1% AEP drainage basin (Basin 2) for the Tonkin Highway and various adjoining main roads. In developing this site, storage of on-site (Precinct) and off-site (Roads) runoff is to be accommodated separately within the Noranda Precinct and car park. The full development of the site for the proposed Noranda Precinct and car park results in limited area to accommodate separate surface storages for the MRWA (off-site) and Precinct (on-site) 1% AEP flows.

Reporting by TGA suggested the required storage volume to contain and infiltration the 1%AEP event from the Tonkin Highway catchment is approximately 7,360 m^3. This volume is accommodated across 10 underground storage chambers within the precinct car park. Refer to drawing 25-B-286-CI0011.

Pre-treatment via a GPT has not been provided upstream of the MRWA underground storages due to limited space available for the placement and provision of safe access for maintenance. The proposal to provide a TL5 barrier along the edge of the Tonkin Highway and a retaining wall on the western side of the car park and access road limits placement of devices within the road corridor.

As the site is proposed to be filled up to 2.5 m above the existing surface level it was deemed practical in the AD phase to provide underground storage within the site. As there is a large volume of flow from an external catchment contributing to the precinct catchment it is proposed to separate the Station Precinct and off-site MRWA runoff flows into a series of underground storages to be managed and maintained by PTA and MRWA. The proposed drainage units have been located to account for the precinct buildings, amenities, facilities, site and utility services. Due to its efficient storage capacity and suitability for use in spatially constrained sites, the proposed solution is StormTrap system.

The units are sized for 1% AEP with infiltration through the base based on an infiltration rate of 10 m/day as per MELconnx Geotechnical Interpretive Report (MEL-MLCX-GE-RPT-00010).

3.2.5.12 PTA Noranda Precinct

Five underground storages (of varying size) are provided to retain and infiltrate the 1% AEP event flow from the proposed PTA infrastructure (precinct and car park). For the PTA drainage storage, the base is kept at 200mm above the 2% groundwater level. The storage volume that can be achieved within the site is approximately 1,560 m^3.

Each inlet into the StormTrap chambers will include a treatment device to provide treatment for the 1EY 1 hour event. Due to area constraints within the site, utilisation of bioretention areas within the carpark and drop off / pick-up area is not feasible.

3.2.6 Utilities

3.2.6.1 Existing Utility Impacts

Existing services within the vicinity of the Noranda Station and associated precinct are documented on drawing 25-A-286-CI0046.

Several services are likely to be impacted by the proposed works. These include:

- Existing Main Roads WA Tonkin Highway lighting infrastructure. The Noranda Precinct access road has been designed in close proximity to the existing concrete barrier on Tonkin Highway. An existing Main Roads lighting pole and lighting pit are located immediately east of the existing barrier. It is envisaged that the existing lighting pit may need to be relocated. Furthermore, the location of lighting pole will need to be surveyed to assess the impact of the access road. The impact to the lighting infrastructure in the vicinity of the proposed access road will need to be coordinated with MRWA during detailed design stage.
- Existing City of Bayswater lighting on Benara Road due to the required reconfiguration of the existing island to facilitate the turning pockets for access and egress to the proposed station precinct.
- Not in use 600mm Water Corporation Water Main. The proposed station platform and precinct car park have been designed over a mapped existing 600mm Water Corporation Water Main which has been confirmed by the Water Corporation as not being in use. It is envisioned that this main may no longer be required and may not require any protection measures, however, this will need to be confirmed with Water Corporation at detailed design phase.

Temporary utility supplies, utility protection measures considering construction activities and utility relocations and modifications are not included as part of this scope of works.

3.2.6.2 Proposed Utilities

3.2.6.3 Overall Strategy

The general strategy for the Noranda Precinct is to provide dedicated services corridors with connections to:

- Existing Western Power services in Acacia Court.
- There is no existing water corporation water or sewer network at the boundary of Noranda station. existing water corporation networks to be extended to this point to facilitate proposed connections. Water pipe outside lot boundary will be owned by water corporation. refer to water corporation network extension drawing MEL-MLCX-UT-SKT-81020.

The width of the services corridors has been kept as narrow as possible to minimise impact on the adjacent landscaping and proposed underground stormwater storage units.

Consideration has been given to the future precinct lighting and CCTV provision in the positioning of primary chambers.

3.2.6.4 HV Electricity

The HV power connection to the station will be taken from the Western Power 22kV distribution line within Acacia Court.

Two Western Power Assets are proposed. A Western Power Ring Main Unit (RMU) is proposed to be just north of the SER compound, and a Western Power substation proposed east of the Station forecourt area.

- 6no. 100mm Ø ducts are proposed between the assets stated above.

3.2.6.5 LV Electricity

A precinct wide primary network has been developed from the main site switchboard located adjacent to the Western Power Substation to the south facade of the station entry building.

Typical connectivity has been provided as follows:

- 6no. 100mm Ø LV ducts between Station Isolation Transformer and the station intake point located along the southern façade of the entry building
- 2 x 2no 100mm Ø LV ducts running along the Pick-Up and Drop-off eastern edge and along the western precinct boundary on a north south direction serving the parking area.
    - 1no.100mm Ø LV ducts will feed the car park in an east west direction

3.2.6.6 Precinct Telecommunications

The telecommunications connection will be taken from the existing Telstra cable within the Benara Road (Note: This existing Telstra cable will be modified as part of the Benara Road realignment).

3.2.6.7 Potable Water

There is no existing water corporation water network at the boundary of Noranda station. existing water corporation networks to be extended to this point to facilitate proposed connections.

Water Corporation has confirmed that a 50mm connection to the existing 100mm RC water main located on the south side of Acacia Court is acceptable.

A water meter is proposed to be located at the entrance to the station precinct boundary.

3.2.6.8 Fire Water

Water Corporation has confirmed that a 50mm connection to the existing 100mm RC water main located on the south side of Acacia Court is acceptable.

Similarly, to potable water a meter will be required at the entrance to the station precinct.

3.2.6.9 Sewer

Water Corporation has confirmed that a 150mm connection to the existing sewer MH: T7500, IL26.79 extension of 150 PVC-U at 1:200, IL at property connection = 27.39, is acceptable.

In light of the existing sewer connection, a private pump station is proposed to be located to the north of the proposed station building to enable discharge from the precinct area to the future Water Corporation 150mm diameter pipe.

3.3 Relationship with other Design Packages

The relationship and/or reliance of this design package on other MEL design packages is outlined in the Design Interface Matrix included in Appendix X of this report.

3.4 External Interfaces

The relationship and/or reliance of this design package on external interfaces and details of integration strategies are outlined in the Table below.

Item	External Party	Interface Elements	Integration Strategy
1	Main Roads WA	Storm Water Drainage	LOR to facilitate liaison with MRWA
2	Main Roads WA	Extent and design of TL5 Barriers along Tonkin Highway	LOR to facilitate liaison with MRWA
3	Water Corporation	Water Supply	LOR to facilitate liaison with Water Corporation.
4	Water Corporation	Sewer Connection	LOR to facilitate liaison with Water Corporation.
5	Water Corporation	Interface with existing 900mm diam. Gravity sewer	LOR to facilitate liaison with Water Corporation.
6	Western Power	Power Supply	LOR to facilitate liaison with Western Power.

7	Western Power	Interface with existing 22kV distribution cables	LOR to facilitate liaison with Western Power.
8	Western Power	Proposed Western Power RMU	LOR to facilitate liaison with Western Power.
9	NBN/ Telstra	Fibre connection	LOR to facilitate liaison with Telstra/ NBN.
10	DFES	Access and Egress	Ensure that access and egress for fire and emergency vehicles in agreed.

4. Design Inputs

4.1 Project Design Requirements

The following design inputs have been used in preparation of this report.

4.1.1 SWTC Requirements

The following sections of the SWTC are applicable to the Permanent Way Design and have been considered:

- MEL-PTAWA-PM-RPT-00001.0.IFU_Ver1 - Book 1: Part A - General Scope of the Alliance Works.
- MEL-PTAWA-PM-RPT-00002.0.IFU_Ver1 - Book 1: Part B - Limit of Works.
- MEL-PTAWA-PM-RPT-00004.0.IFU_Ver1 - Book 3: Part A - Scope of Works.
- MEL-PTAWA-PM-RPT-00006_Ver2 - Book 4: Technical Criteria.
- MEL-PTAWA-PM-RPT-00007_Ver1 - Book 5: Appendices to the SWTC.

4.2 Design software used for this package

The following design software has been used in preparation of the design.

- AutoCAD
- 12D
- DRAINS

4.3 Applicable Codes and Standards

The applicable standards, codes and guidelines are in accordance with SWTC Appendix 3. Standards and codes listed in the Table below are those in addition or amended revisions applied to the design.

Reference	Description/Title	Compliance (Specific Provisions, Criteria and Classifications)
Australian and Other Standards and Guidelines		
-	Main Roads WA Supplements to Austroads Guide to Road Design	
AS3798 -2007	Guidelines on earthworks for commercial and residential developments	

AS2890.1	Part 1: Off-Street car parking	
AS2890.6	Part 6: Off-street parking for people with disabilities	
-	Utility Providers Code of Practice for Western Australia	
-	Water Corporation Design Standard No. DS 50 Wastewater Gravity Sewers	
-	Water Corporation Design Standard No. DS 51 Wastewater Pump Stations and Pressure Mains	
-	Water Corporation Design Standard No. DS 60 Distribution pipelines other than reticulation	
-	Water Corporation Design Standard No. DS 63 Water reticulation pipelines	
-	Western Power Underground Cable Installation Manual and other design guidelines	
-	ATCO Gas Additional Information for Working around Gas Infrastructure	
-	APA Group Information for Planners and Developers	
-	Department of Lands – Land Use Guidelines, Dampier to Bunbury Natural Gas Pipeline Corridor.	
-	DWER's guidelines 'Decision Process for Stormwater Management in WA November 2017' & 'Stormwater Management Manual for WA"	
-	Local council engineering standards for drainage (City of Swan, City of Bayswater) – including: • City of Swan Handbook of Storm Water Drainage Design. • City of Swan Development Design Specification – Storm Water Drainage Design.	
-	MRWA Supplement to Austroads Guide to Road Design Part 5, Part 5A and Part 5B	
-	Water Corporation Design Standard No. DS66 Urban Main Drainage Standard	

-	Department of Water and Environmental Regulation - Stormwater Management Manual for Western Australia	
-	Department of Water and Environmental Regulation – Decision Process for Stormwater Management	
-	Australian Rainfall and Runoff: A Guide to Flood Estimation. Commonwealth of Australia (2016)	
-	Australian runoff quality - a guide to water sensitive urban design (2006)' published by Engineers Australia	

4.4 Reference Information

The project specific reference information and reports that have been used as inputs into the development of the detailed design are included in the table below.

Document Reference	Description/Title
25-B-00-CI001	Rail Model
25-B-286-LA0001	Landscape Masterplan
25-B-286-AR0001	Architectural Model
MEL-ADV-GE-RPT-00008 & MEL-MLCX-GE-RPT-00010	Geo reports
TIN_Grndwater_Full_Align_AEP002	Groundwater Models
MEL-MLCX-SV-MDL-00001	Topographical Survey
MEL-MLCX-CI-RPT-00001	Flooding Modelling Report
TGA-02-GE-0250-MEM-0001	TGA Infiltration Basin Parameters for PCSump (V6.1) – Associated Works - 100% Stage Geotechnical Design Report
TGA-02-CI-0180-REP-0001	TGA IFC Design Report

4.5 Design Criteria

The design criteria utilised in the development of this design package are outlined below.

4.5.1 Earthworks

Earthworks modelling was undertaken to provide cut and fill volumes for all design surfaces, including:

- Station forecourts
- Station carparks
- Station Pick-up Drop-off areas
- Precinct minor roads

The following key criteria shown in Table 7 and PTA Standard Drawing 00-C-04-0085 Cut and Fill Surface Railway, behave been used when developing batter slopes for the earthworks model for these various aspects of the design listed above.

	Precincts	Minor Roads
Max batter slope - cut	1:4	1:3
Max batter slope - fill	1:4	1:4

All imported material and excavated material for re-use will need to comply with Main Roads WA Specification 302 – Earthworks, and PTA Specification 8880-450-067 - Specification: Roads, Busways and Paths.

4.5.2 Utilities

All works associated with the MEL project will aim to avoid impacting existing utilities where possible and reasonable.

Where impacts to existing utilities are unavoidable, these will be identified. Diversions/realignments will be developed by MELConnx in accordance with the above standards in conjunction with the associated authorities, PTA and METRONET.

Clearances to existing utilities will be maintained (as applicable) as summarised below.

	Precincts / Road Reserves (Code of Practice)	Rail Reserve (not under tracks) AS4799	Rail Reserve (under tracks) (PTA: 8110-400-030)
Power	750mm	600mm	2500mm
Telecommunications	450mm/ 600mm	600mm/ 900mm	2500mm
MCR (Power)	1000mm	1000mm	2500mm
MCR (Telecomms)	1000mm	1000mm	2500mm
Water	600mm	600mm	2500mm
Sewer	600mm	600mm	2500mm
Trunk Services/ Major Pipelines	750mm	1200mm	2500mm

Cover to proposed services crossing the transit corridor will be assessed and discussed in detail with PTA on a case-by-case basis. Any non-conformances will be discussed and agreed with PTA, prior to progressing to Detailed Design.

4.5.3 Drainage Design Criteria

The drainage philosophy for the Noranda Precinct can be summarised as follows:

- Capture all runoff from the site for water quality treatment.
- Discharge runoff at a rate equivalent to the existing condition to ensure no increased flood risk to the downstream environment.
- Protect the environment and infrastructure.

Specific criteria and requirements are in the SWTC. Some criteria from ADA are highlighted below:

- Treatment of 1EY 1 hour runoff within bioretention areas in the carpark.

- 10% AEP flood level to be kept below the pavement level.
- Depth of the 1% AEP flood on the pavement does not exceed 200mm on the pavement surface.

As a minimum, the design for the station precinct has considered the following:

- An assessment of surface water hydrology and groundwater hydrology.
- Modifications to existing LGA drainage systems has been undertaken to the design standard for the relevant authority.
- Drainage must be designed and constructed in accordance with the PTA relevant specifications, and project specific requirements.
- The invert level for swales and basins must be minimum of 300mm above the maximum groundwater (1%, 2%% AEP) level (MGL). MGL to be determined by groundwater monitoring and historical data
- Limited use of pit and pipe drainage solutions may be used in locations where there is insufficient room for swale drains
- Drainage features wherever possible will be integrated into the built form and proposed landscaping design
- Maintenance vehicular access to basins to be incorporated into overall design
- WSUD principles will be incorporated into the storm water strategy
- LGA Water Management requirements will be included in Design requirements.

4.6 Design Life

The design life requirements related to this design package are outlined in the Table below.

Item	Asset Element of the Works	Design Life (Years)
1	All civil and structural elements of tunnels, underground stations, dive structures and other associated underground structures, inclusive of other load bearing elements, internal support structures, foundations, retaining structures, track slab structures, transition slab structures, drainage structures and waterproofing elements.	120
2	All civil and structural elements of on or above-ground structures and buildings, inclusive of any other load bearing elements, internal support structures, steel trusses, purlins and associated roof structural elements, foundations, retaining structures, drainage structures and waterproofing elements.	120
3	All civil and structural elements of rail bridges or bridge overpasses, including pedestrian bridges associated with the stations or spanning the railway inclusive any other load bearing elements, foundations, retaining structures, transition slab structures, drainage structures and waterproofing elements.	120
4	Storm water surface drainage structures, tanks and inaccessible pipe systems including all pits	50
5	Water treatment systems excluding structural elements.	7
6	Noise barriers, noise attenuation devices and acoustic panels and support systems excluding structural elements.	30
7	Artwork, signage and way finding excluding foundations and supporting structures.	20
8	External pedestrian paving (including substrate and paving finish).	25

9	External furniture and fittings, fences and security/fire gates or doors excluding structural elements.	20
10	Internal non-structural elements - fit out, fixtures and finishes	20
11	Protective galvanised coatings to steelwork (excluding structural elements)	25
12	Associated support, gantries and other equipment associated with ticketing systems not otherwise supplied by PTA	30
13	Road sign support structures and other roadside furniture	25
14	Flexible (asphalt) road pavements, car park surfaces, external paving, footpaths, shared paths and hard landscaping features	25
15	External pedestrian paving (including substrate and paving finish)	25
16	Existing drainage structures underneath new pavement	50 years residual
17	Street lighting and light fittings excluding structural elements	20
18	Road surfacing of dense graded asphalt	25
19	Road surfacing of open graded asphalt	20
20	Road and pedestrian bridges (including foundations) and all road drainage structures	120
21	All other Assets not described above must be agreed with the PTA's Representative to meet with Design Life in the above category	

4.7 Durability Requirements

Details of durability issues and risks, and measure to comply with the durability requirements are outlined in Appendix U of this report.

4.8 Specialist Technical Inputs

The following specialist technical design documents have provided inputs to this design package:

- Geotechnical Interpretive Reports
- Groundwater Models
- Flooding Models.
- Topographical Survey

4.9 Constructability Requirements

Details of constructability issues and measures, including traffic management during construction of the Works and the Temporary Works, where this influences design.

- Works will be carried out in the vicinity of live services.
- Dewatering activities are likely to be required considering the high ground water table.
- Sewer and water main extensions from the junction of Beechboro Road North and Marshall Road.

4.10 Environmental & Sustainability Design Criteria

The following key environmental and sustainability initiatives have been developed as part of this design package.

- Optimisation of earthworks requirements minimising the requirement for imported fill.
- Utilisation of Crushed Recycled Concrete (CRC) subbase in accordance with MRWA Specification Series 500, Clause 501.92
- Integration of Water Sensitive Urban Design (WSUD) initiatives in close collaboration with Landscape Architecture to form the basis of the proposed Stormwater Strategy for the Station precinct. WSUD initiatives have been considered and implemented in the design. The main storm-water discharge principles rely on infiltration which will reduce the peak discharge to the main storm-water line (as applicable). Furthermore, planted swales have been incorporated which will aid the removal of first flush pollutants. During IDDR JAJV will work closely with the Landscape Architect for the choice of the planted species to best suit the WSUD strategy.

For further details refer to Sustainability Management Plan (MELAD-MLCX-EN-PLN-00002).

4.10.1 Risk and Opportunities Assessment

In the development of the design the following opportunities have been identified:

- Water Sensitive Urban Design (WSUD);
- Use of Crushed Recycled Concrete (CRC) for pavement sub-base material

4.11 Future Proofing

In the development of the design the climate change factor of RCP 4.5 has been considered. This has been adopted as a reasonable allowance based on the process that was outlined by PTA. The proposed factor will be revised after the risk analysis for the entire project is complete. A Project wide climate Change Risk Assessment workshop will be undertaken in June 2021 and any high risks identified will be mitigated through design, wherever possible.

Future proofed for the future overall wider precinct masterplan by aligning the proposed Pick-up and Drop off and associated roundabout with the proposed masterplan roundabout location. Furthermore, the proposed car park aisle positions have taken into consideration the proposed future lot boundaries.

4.12 Value Engineering

A Value Engineering Optimisation workshop has been completed. The outcomes of this workshop are summarised as follows:

- Significant reduction of earthworks fill requirements.
- Reduction in the requirements for precinct retaining structures.

4.13 Third Party Operational Stakeholders

The following key Third Party Operational Stakeholders requirements have been developed as part of this design package.

Not applicable to this design package.

For further information on third party requirements, refer to the RATM extract for this design package contained in Appendix O.

4.14 Design Input from Stakeholders and Community Involvement Process

The design inputs from Stakeholders and local Community are detailed in the following sub-sections:

4.14.1 Stakeholder Requirements Register

To be confirmed at the next Design state.

4.14.2 Community Involvement Process Input

4.15 Design Assumptions, Dependencies, and Constraints (ADC's)

Details of design assumptions, dependencies, and constraints are outlined in the following sub-section.

4.15.1 Design Assumptions

Design assumptions related to this design package are detailed in the Table below.

ID	Description	Status	Evidence of Validation
	No design assumptions have been made at this stage of design.		

4.15.2 Design Dependencies

Design dependencies related to this design package are detailed in the Table below.

ID	Description	Status	Evidence of Validation
1	Station Architecture Model	Closed	Precinct design has considered proposed architectural model. Model Ref. 25-B-286-LA0001
2	Landscape Architecture Masterplan	Closed	Precinct design has responded to the landscape masterplan. Drawing Ref. 25-B-286-AR0001
3	Benara Road Highways Model	Closed	Precinct design has considered proposed Benara Road highways model. Model Re.25-B-00-CI2006
4	Rail Transit Corridor Model	Closed	Precinct design has considered proposed transit corridor model. Model Ref. 25-B-00-CI002

4.15.3 Design Constraints

Design constraints related to this design package are detailed in the Table below.

ID	Description	Status	Evidence of Validation
1	High ground water table	Closed	Drainage design has considered revised ground water model. Model Ref. TIN_Grndwater_Full_Align_AEP002

2	Existing Main Roads WA Tonkin Highway lighting infrastructure. The Noranda Precinct access road has been designed in close proximity to the existing concrete barrier on Tonkin Highway. An existing Main Roads lighting pole and lighting pit are located immediately east of the existing barrier. It is envisaged that the existing lighting pit may need to be relocated. Furthermore, the location of lighting pole will need to be surveyed to assess the impact of the access road. The impact to the lighting infrastructure in the vicinity of the proposed access road will need to be coordinated with MRWA during detailed design stage.	Open	Further liaison with MRWA required during Detailed Design phase.
3	Not in use 600mm Water Corporation Water Main. The proposed station platform and precinct car park have been designed over a mapped existing 600mm Water Corporation Water Main which has been confirmed by the Water Corporation as not being in use. It is envisioned that this main may no longer be required and may not require any protection measures, however this will need to be confirmed with Water Corporation at detailed design phase.	Open	Further liaison with Water Corporation required during Detailed Design phase.

4.16 Requests for Information (RFI)

Requests for information submitted in relation to this design package are outlined in the Table below. Copies of the RFIs are provided in Appendix W of this report.

RFI REFERENCE	Description/Title	Status
MELD-MLCX-RFI-00239	RFI - Noranda Station Precinct Infiltration Rate (JAJV RFI-00181/RFIC128)	Closed
MELD-MLCX-RFI-00187	RFI - Northern dive, Southern dive and Gnangara Tunnel Change in SWTC (RFIC086)	Closed
MELD-MLCX-RFI-00168	RFI - Amended Scope for Independent Verification	Closed
MELD-MLCX-RFI-00154	RFI - Noranda On-Tracking Tonkin Highway (JAJV RFI-00150/RFIC048)	Closed
MELD-MLCX-RFI-00137	RFI - Settlement Requirements for Shallow Foundations	Closed
MELD-MLCX-RFI-00127	RFI - Blast Loading Tech Memo	Closed
MELD-MLCX-RFI-00125	RFI - Retaining Walls Specification PTA drawing (RFIC026)	Closed
MELD-MLCX-RFI-00113	RFI - Noise Walls Vertical Supports (RFIC014)	Change to SWTC Agreed with PTA

MELD-MLCX-RFI-00076	RFI - Confirmation of Parking Requirements – Station Precincts (Civil/BCA)	Closed
MELD-MLCX-RFI-00025	RFI - Aerial Imagery Updates	Closed
MELD-MLCX-RFI-00024	RFI - PTA RFI - Xref naming exemption from PTA Standard 8110-300-001	Closed
MELD-MLCX-RFI-00019	RFI - Review Requirements - Amended Scope for Independent Verification	Change to SWTC Agreed with PTA

5. Design Outputs

5.1 Deliverables List

A matrix of all document/ deliverable types required at each design stage associated with this design package are provided in the Table below.

Deliverable	Reference Design	Interim Detailed Design	Final Detailed Design	IFC
Design Report	X	X	X	X
Drawings	X	X	X	X
Specifications		X	X	X
Specialist Reports		X	X	X
Construction Methodologies		X	X	X
Third party approvals			X	X

5.2 Drawings and Models

The drawing and model list for this design package is provided in the TIDP in Appendix A of this report.

5.3 Specifications

The specification list for this design package is provided in the TIDP in Appendix A of this report.

5.4 Standard Reference Drawings

The standard drawings which form part of this design package have been summarised in the Table below.

Not applicable to this design stage.

Drawing Number	Description/Title	Revision
n/a		

5.5 System Coordination Drawings and Models

The system coordination drawings and models which form part of this design package have been summarised in the Table below (General arrangements and typical cross-sections).

Drawing Number	Description/Title
E007	Architecture drawings
E008	Landscape Architecture drawings
E018	Line Wide Track drawings
E020	MCR drawings
E025	Civil - Flooding & Hydrology Model
E026	Track, Earthworks, Drainage, Civils drawings
E089	Structures - Foundations, Platform, Concourse & Roofs and Canopies & Pedestrian Bridges and Walkways
E090	Electrical - Lighting & LV & Communications & Security
E092	Hydraulics and Wet Fire

5.6 Type Approvals

Not Applicable.

5.7 Calculations

Calculations are provided in Appendix E of this report.

Calculations are not required as part of this design stage.

5.8 Schedules

Schedules for this design package are provided in Appendix F of this report.

Schedules are not required as part of this design stage.

6. Competence for Design

The competence assessments for relevant design personnel have been undertaken and is evidenced in the PTA SRE Appointment form contained in Appendix J of this report.

7. Design Reviews and Certification

7.1 Interdisciplinary Design Coordination (IDC) Review

An Interdisciplinary Design Coordination (IDC) review has been carried out as outlined in the Table below

Reference	Design Stage	Description/Scope	Evidence
IDC-001	**Reference Design**	Noranda IDC	Refer to Appendix H & I
IDC-002	**Interim Detailed Design**	N/A	N/A
IDC-003	**Final Detailed Design**	N/A	N/A

7.2 IDC Certificate

Design checking has been carried out. An IDC Certificate is provided in Appendix I of this report.

7.3 Design Checking and Verification

Design verification has been carried out. Evidence of design checking and verification is provided in Appendix J of this report.

7.4 Independent Verification

Independent Verification has been carried out. Evidence of independent verification is provided in Appendix K of this report.

7.5 BCA

Not applicable to this design package.

7.6 DDA

Not applicable to this design package.

7.7 PTA Design Submission Reviews.

Review comments raised in the previous design stage have been responded to and closed out. The comments register is attached in Appendix N of this report.

8. Design Compliance

The demonstration of compliance with the requirements of the Project Definition Documents, including any non-conformances of concessions is summarised on the following sections.

8.1 Standards & Guidelines

The standards and guidelines relevant to this design package are outlined in Section 4.3. The design has been carried out, checked and verified by competent personnel as outlined in Section 6.

8.2 SWTC

Refer to the RATM extract in Appendix O of this report.

8.3 Planning & Environmental Approvals

Refer to the RATM extract in Appendix O of this report.

8.4 Third Party Requirements

Refer to the RATM extract in Appendix O of this report.

8.5 Engineering Change

The following categories of Engineering Change that have been considered for the design development are as follows:

- Engineering Change – A novel design solution that is subject to review and approval from PTA through Management of Engineering Process, refer to PTA Procedure 8110-100-014
- Design Departures – A design non-compliance to relevant codes and standards. Will be subject to review and approval from PTA through Management of Engineering Process, refer to PTA Procedure 8110-100-014.
- SWTC Departures – To be discussed and agreed with PTA in the first instance, technical justification required for departure and confirmation of impacts/benefits to the overall Project. Departure to be formalised through the RFI process once agreed in principle.

Engineering changes are summarised in the table below

ID	Category	Description	Status
NA	NA	No design departures are anticipated at this stage of design	

9. External Interface Work Packages

A copy of the Project Interface Management Plan will be provided at the next Design stage.

9.1 Project Interface Control Plan

A copy of the Project Interface Control Plan has been provided in Appendix X.

10. Effects of the Works

The predicted effects of the Works (EOW) in relation to this design package are outlined in the Table below.

ID	Description	Status
1	Interface with existing services that may require diversion or protection.	Open

11. Safety in Design

11.1 Overview

Safety in Design is a standard process defined as the integration of hazard identification and risk assessment methods early in the design process to eliminate or minimise the risks of injury throughout the life of the product being designed. It encompasses all design including facilities, hardware, systems, equipment, products, tooling, materials, energy controls, layout and configuration.

By this definition, the designer takes a leading role in the integration of concepts of safety into the design of a product. In brief, this is achieved through progressive development of the Project Hazard Log (PHL). The PHL included in Appendix Y has been filtered to communicate package relevant hazards and controls. Key Safety in Design considerations include the following (listed in order of precedence):

- Eliminating hazards at the source.
- If hazards cannot be eliminated, then a control will be established to reduce the level of risk associated with the hazard in order of a hierarchy of possibilities and controls:
- Substitution of a less hazardous alternative.
- Engineering controls.
- Administrative controls.
- Other control mechanisms.
- Communicate known controlled and residual risks to affected parties.

11.2 Safety in Design relevant to this Package

11.2.1 Hazard Log

A Master Hazard Log has been maintained for the project which covers the full scope of the project. The baseline set of hazards has been developed which is reflective of the current PTA suite of technical standards, as extracted from the SWTC. A PHA exercise has been conducted to build this baseline set of hazards which has included review of the PTA PHA and Tender Design SiD findings.

The hazard log will be progressively updated to incorporate outcomes from hazard analysis workshops, including those detailed in Section 11.2.2 below. An extract of the hazard log identifying hazards relevant to this design package is included in Appendix Y.

The hazard log will be progressively updated to capture and derive additional safety requirements that will be incorporated into the MELconnx requirements management system (DOORS).

Safety requirements which have been addressed by this design have been reported in the RATM (see Appendix O).

11.2.2 Safety in Design Activities and Reference Design

Safety in Design has been addressed through the engagement of appropriate SREs in a workshop discussion to examine and discuss the design details with a view to determining the safety risk and appropriate treatments in the minimisation of any identified safety risks. The SiD activity builds on the work conducted to manage the hazard log which forms and input to the SiD workshop.

At this issue of the design report a SiD workshop was conducted (MELconnx - Reference Design Safety-in-Design Workshop No. 1) on the 25th of February 2021 which covered hazard identification for:

- Package 1 – Linewide Rail Systems
- Package 2 – Gnangara / Lord Intersection
- Package 3 – Northern Dive to Whiteman Park - Linewide Civils, Roads and Structures
- Package 4 – Whiteman Park to Ellenbrook – Linewide Civils, Roads and Structures
- Package 9 – Malaga Station & Precinct
- Package 11 – Ellenbrook Station & Precinct

A record of which was captured in MEL - Safety in Design Workshop No.1 Report (MEL-MLCX-RS-MOM-70001) and the actions close-out has been captured as part of the SiD process. Any impacts on the hazard log have been managed by raising a hazard transfer form and specific hazards have been added to the hazard log.

A subsequent SiD workshop was conducted (MELconnx - IDDR Safety-in-Design Workshop No. 8 on the 1st September 2021 which covered Operating & Support Hazard Analysis (OSHA), Construction Hazard Assessment Implications Review (CHAIR) and a Sub-System Hazard Analysis (SSHA) for:

- Package 9 – Malaga Station & Precinct

A record of which was captured in MEL - Safety in Design Workshop No.8 Report (MEL-MLCX-RS-RPT-00018) and the actions close-out has been captured as part of the SiD process. Outputs including derivation of safety requirements and updates of the RATM are still under development in accordance with the requirements of the SSAMP and shall be included in subsequent design submissions.

A record of the SiD Workshop Reports detailed above have been included in Appendix Z.

11.3 Systems Safety Assurance Plan.

The Project Systems Safety Assurance Plan has been developed and will be updated during the various stages of design development. The SSAP includes Goal Structuring Notation (GSN) informing the safety arguments. The purpose of the SSAP is to define methods, activities, management of activities and deliverables required for the Alliance scope of the MEL Project (including design, construction, testing, commissioning, and handover). The intent is to demonstrate that the systems have been designed and constructed with safety hazards mitigated, meeting relevant safety standards and the completed Project can be operated and maintained with an acceptable level of safety by the Rail Operator.

The SSAP describes how the Alliance proposed to produce a design that is safe to construct, operate, maintain and decommission. It identifies:

- Those responsible for safety assurance;
- The process of capturing safety assurance arguments;
- The engineering safety and safety assurance principles to be followed;
- How the principals will be applied during the life cycle of the system;
- How a systematic approach to risk management will be adopted;
- How relevant knowledge will be imparted to designers; and
- How information about hazards and risk control measures are communicated to those who will work with the finished assets.

The scope of the SSAP includes safety assurance associated with the interfaces with the Tonkin Gap and Bayswater Station Projects design but excludes identification of safety assurance processes and deliverables associated with those two Projects.

11.4 Compliance with Safety Assurance Plan

The safety objectives of the overall project are to ensure that the design complies with statutory and design requirements, such as relevant standards and codes, and that all safety requirements are incorporated into the design, reducing the risk to "So Far As Is Reasonably Practicable (SFAIRP)".

Safety hazards are being identified and will be managed in accordance with the Alliance Systems Safety Assurance Plan.

11.5 Safety Analysis

The SSAP outlines the Hazard Analysis to be conducted during the detailed design stages MEL Project to identify hazards related to interfaces, hazards specific to each sub-system, potential operation and support issues with the proposed designs and any construction specific risks.

A number of hazard analysis workshops will be progressively conducted during the design stages broken down into relevant disciplines and analysis types (combined SHA/IHA, OSHA, Construction) to ensure hazards are effectively identified at the relevant stages as the design progresses.

11.6 Safety Argument

The Safety Argument is based on the GSN for the Project as shown in the MELconnx Systems Safety Assurance Plan and is as summarised in

11.7 Section 11.9 Hazard Analysis

Risk has been assessed against hazards in accordance with the Risk Matrix and Tolerability Criteria in the MEL System Safety Assurance Plan as outlined in the Project Hazard Log (PHL) in Appendix Y of this report.

11.8 Satisfaction of Safety Integrity Level Targets

Not applicable to this design package.

11.9 Satisfaction of GSN Requirements

The assurance activities required to fulfil all the relevant GSN to support the safety argument for elements of the following goals, sub-goals and solutions appropriate to this design package are described in the Table below.

Ref	Goal	Evidence
G2.1	Design management processes incorporating safety are defined and implemented	Safety Assurance Statement (MEL-MLCX-RS-RPT-00038)
G2.2	Appropriate technical standards have been specified	
G2.3	Hazards have been identified and risks assessed	
G2.4	Detailed Design has been developed by competent personnel applying robust design management processes	
G2.5	Risks are identified, assessed, rated and eliminated or treated to SFAIRP principles	
G2.6	Sub-Contractor Assurances are managed	

G2.7	Design confirmed as meeting system requirements and technical standards	

11.10 Management of Safety Requirements

Controls identified in the workshops are raw controls that are transferred to relevant design package owners. During hazard identification workshops controls are identified as either to Implement or to Consider. Controls identified as implement are embodied in the design at the current design stage whereas controls to consider may be implemented into the design at some point in the future pending further consideration.

After the workshops, as part of the design process, hazard controls have been assessed as either Open, Implemented or Rejected:

- **Open** signifies that implementation is not yet confirmed.
- **Rejected** signifies that the control is not implemented. reasons for rejection recorded at Safety Control Verification Reference column in the PHL.
- **Implemented** signifies that implementation in the current stage design has been confirmed with evidence recorded at Safety Control Verification Reference column in the RATM.

Controls which are Implemented shall be further developed into Derived Safety Requirements which are traced in the RATM in DOORS. These safety requirements shall follow the wording convention of other requirements in the RATM and in addition shall be specific, measurable, relevant and realistic

11.11 Safety Assurance Statement

A Safety Assurance Statement No. 07 (MEL-MLCX-RS-RPT-00027) has been produced for this design and is submitted as part of the parent package for this design.

11.12 Transfer of Residual Risks and Safety Related Operational Conditions

All hazards which do not have a hazard status of “Hazard Eliminated” refer to residual risk to be transferred either to construction or operation.

Refer to Section 15 for operational phase requirements required to maintain the design integrity of the infrastructure referred to in this Design Package.

In addition, the following Safety Related Operational Conditions identified in the PHL must be met to maintain the design safety integrity of the infrastructure referred to in this Design Package:

12. Systems Engineering

12.1 Sub-system Allocation

The sub-system (s) related to this design package are:

SBS ID	Title	Related to Package	Level	Design Packages	E075, JAJV - Noranda Precinct - Civil - Earthworks	E076, JAJV - Noranda Precinct - Civil - Drainage & Highways Roads	E077, JAJV - Noranda Precinct - Civil - Car Parking, Fencing and ...tes, Retaining
2	Track & Structures	Yes	0		x	x	x
2.1	Structures	Yes	1			x	x
2.2	Track	Yes	1		x	x	x
2.2.1	Access Roads	Yes	2		x		x
2.2.2	Buffer Stop	Yes	2		x		
2.2.3	Railway Crossings	Yes	2			x	x
2.2.3.1	Level Crossing Control Box	Yes	3			x	x
2.2.3.2	Level Crossing	Yes	3			x	x
2.2.3.3	Pedestrian Crossing	Yes	3			x	x
2.2.3.4	Vehicle Access Apron	Yes	3			x	x
2.2.3.5	Vehicle Access Gate	Yes	3			x	x
2.2.4	Insulated Joint	Yes	2			x	x
2.2.5	Location Case	Yes	2			x	x
2.2.6	Lubricator	Yes	2			x	x
2.2.7	Hardstand	Yes	2			x	x
2.2.8	Slab track	Yes	2			x	x
2.2.9	Sleepers / bearers	Yes	2			x	x

12.2 Requirements Management

Requirements management occurs throughout the life cycle of the project and is described in the Systems Requirements Management Plan (RMP). The Requirements Allocation and Traceability Matrix (RATM) has been established and is used to track the requirements from the identification and allocation stages through to verification for contract requirements and derived requirements, such as safety and Human Factors requirements from hazard analysis.

In Reference Design phase, these requirements were allocated to package(s) for demonstrating compliance at agreed points in the project lifecycle. For the Interim and Final Detailed Design phases, the progressive compliance of requirements allocated to this package is shown at Appendix O.

Further details of requirements management activities can be found in Engineering Assurance Summary (MEL-MLCX-EA-RPT-00008).

12.3 Engineering Assurance Summary

Prior to formal submission of the RD and FDDR for each design package, and to support PMF3 and PMF4 gate approvals, Melconnx shall provide an Engineering Assurance Summary for PTA's review. This is provided to evidence an integrated design approach has been adopted and all Engineering Assurance activities have been completed to the extent required for the specific design stage.

Engineering Assurance documentation is supported by the Safety Assurance Statement detailed in Section 11.11. The table below provides a breakdown of where each of the assurance artefacts is contained.

Item	Description	Reference	Documented in SAS (Y/N)	Documented in EAS (Y/N)	Evidence/ Traceability in SAS
1	Scope of Work summary	EAS & SAS	Y	Y	Section 2.6 & Section 4
2	Environmental Planning Approval	EAS	N	Y	N/A
3	Whole of Life Sustainability Outcomes	EAS Design Report, Appendix V	N	Y	N/A

4	SWTC & SRS Compliance	EAS & SAS	Partial	Y	Section 7.4
5	Stakeholder Consultations	EAS Design Report, Appendix N	N	Y	N/A
6	Safety Assurance Activities	SAS	Y	N	Section 6
7	Engineering Change Approvals	EAS & SAS	Partial	Y	Section 5.1.4
8	RAM Considerations	EAS & SAS	Partial	Y	Section 7.5
9	ADC	EAS & SAS	Partial	Y	Section 2.10
10	Operation and Maintenance Strategy	EAS	N	Y	N/A
11	Design Review	EAS Design Report, Appendix H and I	N	Y	N/A
12	Program / Schedule	EAS	N	Y	N/A
13	Human Factors Analysis	SAS	Y	N	Section 7.6

13. Sustainability in Design

Development and documentation of sustainability initiatives have been determined for this design package and are included in detailed in Section 4.10.

14. Testing & Commissioning Requirements

Inspection and Test Plans (ITP) summarise the requirements of the Specifications and Design Drawings by detailing the criteria for workmanship, verification activities including Witness and Hold Points, and related authorities/responsibilities for each stage of the construction/installation process.

Refer to summary below for specific ITP requirements including Hold Points and Witness Points which will be required to be undertaken as part of the construction phase support activities.

14.1 ITP's

ITP's relevant to this Design Package will be included at detail design.

14.2 Hold Points

To be provided when specifications are provided in future design stages.

14.3 Witness Points

Witness points relevant to this Design Package will be included at detail design.

15. Human Factors

As outlined in the Human Factors Integration Plan (HFIP) the Design Report will detail the strategies and initiatives to identify, manage and integrate Human Factors (HF) risks and requirements through all phases of the Project.

The purpose of applying the HF process is to ensure human interactions with the system and system elements are well designed through the application of established HF principles and knowledge so that the delivered operational system benefits the end users by:

- Minimising errors
- Improving effectiveness
- Improving user comfort
- Increasing system acceptance.

A review of HF activities and the implantation of HF controls was reviewed during Safety-in-Design Workshop No. 01 (MEL-MLCX-RS-MOM-70001) & 08 (MEL-MLCX-RS-RPT-00018).

Further details of human factors activities can be found in Design Safety Assurance Report (MEL-MLCX-RS-RPT-00038) that will be submitted at FDDR.

16. Reliability, Availability and Maintainability (RAM)

Details of Reliability, Availability and Maintainability activities undertaken for this design package are contained within Engineering Assurance Summary (MEL-MLCX-RS-RPT-00038).

17. Construction Methodology

The following construction methodology and staging has been assumed in the development of this design package.

17.1 Construction Methods

The following construction methodology and staging has been assumed in the development of this design package.

17.2 Operational Staging

The works associated with this design package will be delivered in one Operational Stage as it is a brownfield site with limited interfaces with the operational network along Benara Road.

17.3 Works in Track Occupancies

To be confirmed at the next Design stage.

18. Asset Maintenance Strategy

The following asset management strategy is required for this design package:

18.1 RTO Assets

To be confirmed at the next Design stage.

18.2 Other Assets

To be confirmed at the next Design stage.

19. Asset Operations Strategy

The following operational strategy has been assumed in this design package:

19.1 Normal Modes of Operations

To be confirmed at the next Design stage.

19.2 Degraded Modes of Operations

To be confirmed at the next Design stage.

20. Decommissioning Strategy

A decommissioning review, including a decommissioning methodology and staging review has been undertaken to identify any restrictions on the assets capability to be modified, and or decommissioned on final completion of the Works (following transfer to the final asset owner).

20.1 Capability to Modify

To be confirmed at the next Design stage.

20.2 Decommissioning Strategy

To be confirmed at the next Design stage.

21. Project Actions

A list of outstanding issues and assumptions that may affect the design are outlined in the Table below.

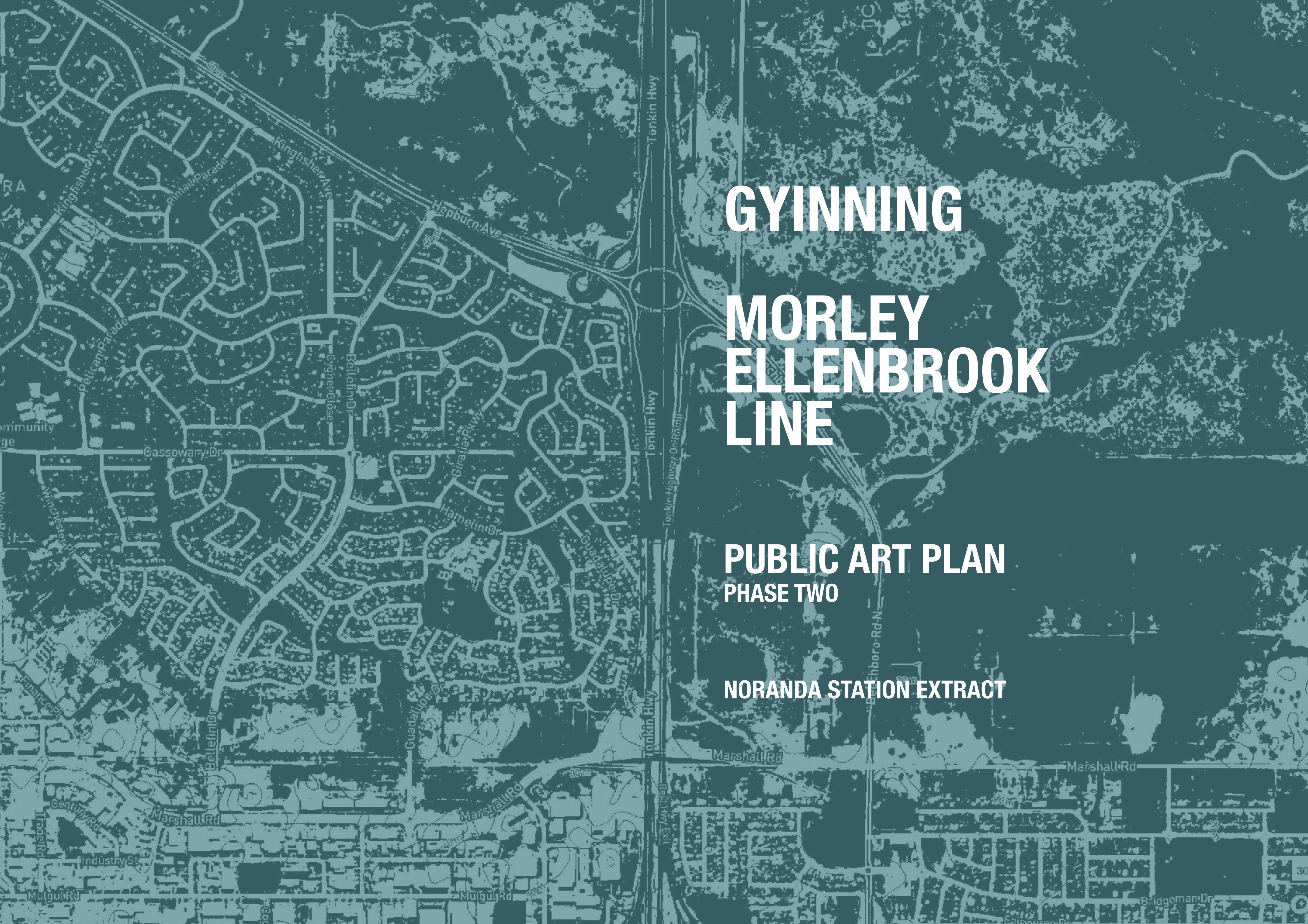
ID	Outstanding Issues	Potential Effect	Status
1	**Addition to VT on northern side of the station**	Revised precinct layout to the north side of the station. Additional precinct fill material and associated civil infrastructure items (pavements etc)	Open
2	**Final sizing and location of station roof drainage storage tanks**	An indicative size has been added to the Civil precinct drawings for costing purposes.	Open
3	**Fencing/ Risk assessment of swales**	Increase fencing type 2 length requirements and/ or additional soft landscaping.	Open
4	**Review of pedestrian desired lines with PTA**	Precinct layout amendments.	Open

Appendix A: Drawing and Model List

Appendix B: Specifications

Doc No.	Doc Title	Discipline	Revision	Revision Date
Example: MEL-MLCX-CI-SPC-00302	Example: MEL - MLCX - Specification 302 - Earthworks	Example: Civil	Example: A	Example: 01/10/2021

Appendix G – Public Art Plan



GYINNING

MORLEY ELLENBROOK LINE

PUBLIC ART PLAN

PHASE TWO

NORANDA STATION EXTRACT

Public Art Consultant
Malcolm McGregor

TITLE	AUTHOR	REVISION	DATE
PUBLIC ART PLAN	M MCGREGOR	A	1 JUN 21
	M MCGREGOR	B	14 JUL 21

CONTENTS

Acknowledgement of Country

We acknowledge the People of the Noongar Nation as the Traditional Custodians of the land and waters on which the MELconnx program of projects is located.

We pay our respect to their Elders, both past, present and emerging and thank them for their continuing connection to country, culture and community.

We acknowledge that Noongar languages are oral in nature and this can result in the same word being spelt in multiple ways.

Boorloo, Charmaine Cole

01

INTRODUCTION

1.1 PURPOSE

PUBLIC ART PLAN

The Public Art Plan (the Plan) will guide the planning and delivery of public artworks undertaken as part of the Morley-Ellenbrook Line project.

The Public Art Plan: Phase One addresses the three northern stations at Ellenbrook, Whiteman Park and Malaga, that are currently more advanced in their design.

The Public Art Plan: Phase Two will address the remaining southern stations at Noranda and Morley.

It is envisioned that the Plan will be used by artists, architects, landscape architects, project managers, contractors, LGA's and community groups, as part of the Morley-Ellenbrook Line's program of works.

The Plan acknowledges existing local, state government and private sector plans and policies. It will acts as a guide for organisations such as the City of Bayswater, City of Swan, Development WA and private developers involved in public art commissioning within the greater station precincts. It will:

- Outline METRONET's expectations for integration of public artworks into the planning and delivery of the Morley Ellenbrook Line.
- Provide a curatorial framework to assist in the preparation of artist briefs and to ensure consistency across the METRONET public art program.
- Develop the Sense of Place Statements, with input from the broader project team, for inclusion in the Final Place Plans and to guide the artwork briefs.
- Identify a variety of art types for each station and common elements across stations that can be developed as a coherent suite of artworks along the line.
- Identify the forms, locations and budget allocations for public art across the project;
- Outline the artwork procurement process through to delivery, including commissioning, contracts, management and review.
- Identify strategies for incorporating artworks from emerging artists, or other creatives unfamiliar with public art commissioning processes; and
- Identify stakeholder engagement associated with the METRONET public art process, including, but not limited to, Noongar Reference Group, METRONET Office, LGAs, community and other stakeholders.

1.2 BACKGROUND

METRONET

METRONET is the State Government's vision to integrate transport and land use planning and provide a framework to support sustainable growth in Perth over the next 50 to 100 years.

More than just a rail infrastructure program of works, METRONET planning goes beyond the station forecourts to shape and support development of communities within the surrounding walkable catchments.

Stage One of METRONET is proposed to deliver approximately 72km of new passenger rail and up to 18 new stations which represents the single largest investment in public transport in Perth's history.

METRONET will create the opportunity to transform Perth through an expanded rail network that will see urban intensification in more than 5,000 hectares of land within walking distance of the stations, supporting delivery of the State's metropolitan growth strategy for Perth and Peel.

Existing Transperth Train Network and Proposed Stage 1 Metronet Initiatives

MORLEY-ELLENBROOK LINE

The Morley-Ellenbrook Line will give people living and working in Perth’s north-eastern suburbs more transport choice and will be a catalyst for future urban growth.

The project will provide 21km of new track spurring from the existing Midland Line east of Bayswater Station and includes five new integrated station precincts.

The new rail line extends from the existing Bayswater Station, enters the median of Tonkin Highway where it heads north to include new stations at Morley and Noranda. The line then dives under Tonkin Highway north of Marshall Road and runs east to Malaga Station, before turning north along Drumpellier Drive to Whiteman Park Station.

The line ends at the new station within the town centre of Ellenbrook. Future-proofing also includes provision for an additional station at Bennett Springs. In addition to the station and station precincts, the project incorporates site wide civil and rail works within the rail corridor and Tonkin Highway median.

Major new structural elements include grade separated structures such as ramps, viaducts, dives, tunnels and bridges extending over and under the new rail

The MELconnx Consortium has been awarded the contract to build the Morley Ellenbrook Line. Laing O'Rourke Australia Construction is leading the consortium.

02

CONTEXT

2.1 GUIDING DOCUMENTS

OVERVIEW

The early planning stage has involved DevelopmentWA and PTA, led by METRONET and the Department of Local Government Sports & Cultural Industries (DLGSC).

Complementary documents have been developed to guide ongoing planning and delivery of key elements of the METRONET program, including.

- METRONET Public Art Strategy;
- METRONET Public Art Guide;
- METRONET Gnarla Biddi Aboriginal Engagement Strategy;
- METRONET Noongar Cultural Context Document; and
- METRONET Station Precinct Design Guide.

The documents support a holistic and integrated design approach, with each discipline contributing to the overarching project vision.

METRONET
Public Art Strategy

The METRONET Public Art Strategy guides decision making and selection of public art across the METRONET program for both transport infrastructure and station precincts.

The strategy provides a thematic guide and identifies program level art opportunities that will be refined and developed for each project in the Public Art Plan. The strategy aims to:

- Delivery of a diverse program of high-quality public art;
- Support the legibility of public spaces connected to stations and other transport infrastructure;
- Animate public spaces, showcase local cultures and build place identity;
- Promote Aboriginal connection to place, culture and community;
- Encourage creativity and innovation;
- Support employment opportunities for professional and emerging artists; and
- Leave a positive and enduring legacy.

METRONET
Public Art Guide

The Public Art Guide provides details for how the METRONET Lead Agency will meet the requirements outlined in the Public Art Strategy by:

- Inspiring the project's overall design and delivery to ensure the infrastructure connects with place and community;
- Creating a Sense of Place Statement, that recognises the histories, stories, beliefs and value of Noongar and non-Noongar people;
- Identifying public art themes and approaches;
- Describing public art types and allocations;
- Providing line-wide and station priorities;
- Identifying stakeholders and engagement processes;
- Describing the expected management, procurement and review processes; and
- Completing the Public Art Plan to guide the forms, locations and budget allocation for public artworks.

GNARLA BIDDI
Aboriginal Engagement Strategy

The METRONET Aboriginal Engagement Strategy outlines the WA State Government commitment to embed genuine engagement with the Aboriginal community across the METRONET program.

It recognises that appropriate and authentic Aboriginal engagement can contribute to the delivery of enhanced place and project delivery outcomes, whilst also achieving significant community, social and economic benefits through cultural contribution and participation.

The strategy supports outcomes that align with the METRONET vision, purpose and objectives by ensuring:

- Noongar culture is reflected in the infrastructure designed and built as part of the METRONET program;
- Education for those involved in the METRONET program on the significance of Noongar culture;
- Ongoing Noongar input into project planning and delivery processes; and
- Workforce and industry participation for Noongar and other Aboriginal people.

METRONET
Noongar Cultural Context

The Noongar Cultural Context document has been developed in close consultation with the METRONET Noongar Reference Group (MNRG).

The group provided input and comment on the document to convey a Noongar 'sense of place' for the Gyinning / Morley-Ellenbrook Line by sharing stories and cultural themes behind each place and its people.

The document summarises both publicly available content and stories for the project area and seeks to:

- Facilitate early and ongoing engagement between METRONET, the Public Transport Authority and the Noongar Reference Group;
- Describe the 'sense of place' by mapping the storylines that have created the place or other relevant cultural themes;
- Inspire project designers, architects and artists to develop themes and concepts during the design process; and
- Promote artwork opportunities for Noongar artists.

METRONET
Station Precinct Design Guide

The METRONET Station Precinct Design Guide (Station Precinct Guide) outlines key objectives and specific design advice to be considered in the design and planning of station precincts across the Perth metropolitan rail network as part of the METRONET program.

The intent is to provide guidance for decision making, planning and design of newly developing and redeveloping station precincts.

It aims to embed best practice sustainable place-making principles into the design, development and ongoing function of station precincts.

The Station Precinct Guide introduces design objectives that are fundamental to supporting the delivery of all METRONET station precinct and provides long-term expectations for station precincts based on a range of place types.

2.2 PUBLIC ART POLICIES

WA STATE GOVERNMENT

Percent for Art Scheme

The State Government's Percent for Art Scheme encourages art in the built environment by using a percentage of a development's overall budget to commission art on new public buildings such as schools, police stations and hospitals.

The scheme is managed by the Department of Finance in partnership with the Department of Local Government, Sport and Cultural Industries, which is responsible for arts policy in the State.

The scheme requires up to one percent of the construction budget for new works over $2 million, to be spent on public artwork.

It has established industry standards for public art, including procurement models and 'fit for purpose' artist contacts that have been adopted by other State Government agencies such as Main Roads WA, PTA, DevelopmentWA and LandCorp.

CITY OF BAYSWATER

Percent for Public Art (2017)

The City of Bayswater's 'Percent for Public Art' policy relates to the provision of public art for development proposals and provides guidance on how and where the City of Bayswater will apply the policy to enhance and promote the public realm and streetscape to:

- Facilitate public art that contributes towards creating a strong sense of place, which promotes the expression of local identity and responds to the culture and character of the community.
- Facilitate public art that positively contributes to its streetscape.
- Improve legibility by introducing public art which assists in making streets and buildings more identifiable.

The policy applies where a development proposal on private land has a construction cost of $1 million or greater and is a commercial, non-residential or mixed use development.

The cost of any public art provided under this policy is to be no less than 1% of the construction value of the eligible development proposal.

CITY OF SWAN

Public Art Policies

The City of Swan's policy supports public art by:

- Developing and locating public artworks in areas of significance and meaning to the community;
- Ensuring public artworks are sensitive to their local environment and communities of interest;
- Installing public artworks on sites selected specifically for their suitability with regard to the conception, development and installation of a work of art;
- Where possible, supporting and promoting high calibre local artists;
- Building strong partnerships with the Federal Government, State Government, other Local Governments, and the City's Art sector to ensure that the opportunities for quality public art are maximised;
- Funding public artwork through the City's capital works program and operational budget processes; and
- Utilising private developer cash-in-lieu contributions as per policy POL-LP-1.10 Provision of Public Art.

03

APPROACH

3.1 GUIDING PRINCIPLES

CONNECTIONS AND PATHWAYS

Transport infrastructure projects can be complex, with delivery occurring over an extended timeframe. The five stations and associated civil infrastructure provide numerous public art opportunities.

The success of these projects will be largely dependent on an art procurement model that is equitable and responsive to evolving project needs. Along with other objectives, the public art program aims to:

- Deliver a diverse program of high-quality public art;
- Encourage creativity and innovation;
- Support opportunities for professional and emerging artists;
- Promote Noongar cultural input into place making; and
- Ensure commissioning, mentoring and training opportunities for Noongar and Aboriginal artists.

Meeting these goals requires an art procurement approach that is equally creative, flexible and innovative. It enlists a number of strategies to enable the participation of a wide range of artist and creatives over the duration of the project.

OPEN AND EQUITABLE

The Expression of Interest will be widely promoted to Western Australian artists and creatives. The aim is to establish a creative pool that can be drawn upon as art projects are developed.

The pool will include highly experienced and emerging artists, as well as other creatives that may contribute to the art program.

PARTNERSHIPS

The art program will foster connections between artist, creatives design professionals, suppliers and fabricators. One of the biggest challenges for emerging artists is access to the skills, specialist expertise and resources needed to undertake a public art project.

The procurement process will explore ways of up skilling artists through strategic partnerships. The Alliance team can assist by providing information on designers, materials, suppliers, fabricators and installers.

MENTORING

The art program will include mentorship opportunities designed to provide career pathways that build new skills and employment opportunities for Aboriginal artists, with a focus on Noongar artists.

Collaborative design workshops will allow Aboriginal artists to develop their skills though a structured and supported process. More detail is provided in the following sections.

OPEN COMPETITION

Open competition is fair and equitable in that it allows all artists and creatives to be considered for station projects. The Expression of Interest can be widely promoted to Western Australian artists and creatives, with submission requirements tailored to achieve the best outcome for the project.

The open competition process can establish a creative pool of suitably qualified artists and creatives that can be drawn upon as art projects are developed.

The pool will include highly experienced and emerging artists, as well as other creative that may contribute to the program. Artists can submit Expressions of Interest as individuals or as part of a creative team that includes the requisite skills and capabilities.

NOONGAR PROJECTS

The procurement model seeks to minimise potential barriers to participation by new and emerging Noongar artists, in line with other State Government initiatives.

The public art program will explore multiple pathways for Noongar artists to contribute to the project. This may include open competition, limited invitation, direct engagement or a structured workshop process.

The Expression of Interest for Noongar artists will allow for a targeted response to project requirements and support a collaborative approach to Noongar place making. Selected artists may participate through the following pathways:

- Shortlisted artists invited to prepare a Design Concept, or
- Selected artists invited to participate in design workshops for ‘design only’ elements, or
- Selected artists invited to participate in mentoring opportunities.

ABORIGINAL ENGAGEMENT FRAMEWORK

The METRONET Aboriginal Engagement Framework sets targets for engagement with Noongar and other Aboriginal stakeholders during planning and delivery. The Plan establishes actions to address the relevant engagement streams.

STREAM ONE
Noongar Cultural Recognition

- Ensure 'Welcome to Country' occurs at all appropriate art events in accordance with advice provided by the METRONET Noongar Reference Group;
- Include Acknowledgement of Country in the design of built form and/or landscape for all five stations

STREAM TWO
Noongar Cultural Input into Place Making

- Initiate a collaborative design process that allows the local community to be involved in identifying appropriate themes;
- Enable Noongar artists to contribute to the architectural and landscape design of stations;
- Embed themes and stories contained within the Noongar Cultural Context Document within the architectural and landscape design,
- Liaise with the METRONET Noongar Reference Group, though the development of designs and approval.

STREAM THREE
Aboriginal Procurement

- Encourage Noongar artists and creatives to register as Aboriginal Businesses with the Aboriginal Business Directory WA (ABDWA) and Supply Nation;
- Explore opportunities for Noongar suppliers and fabricators in delivering the public art program;

STREAM FOUR
Aboriginal Employment

- Facilitate career development opportunities for Noongar artists and creatives;
- Engage Noongar cultural advisors to contribute to the inter-disciplinary design approach
- Enable skills development and capacity building for Noongar artists through structured mentoring opportunities.

PUBLIC ART PRINCIPLES

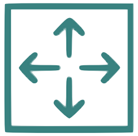
The METRONET Public Art Strategy identifies six public art principles that will guide decision making through the planning and delivery of the Public Art Program.

Place Making

Public art contributes to place making and interpretation of place. It can aid the understanding of the area's history or cultural heritage, assist how people currently understand or use a space, or provide new interpretations and meanings.

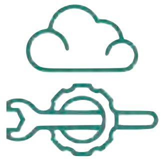
Site Specific

Artworks are to be designed specifically for the site and are to be responsive to the site context - its surrounds, its use and users, and reflecting the relevant precinct art themes.



Scale and Fit

The scale of artwork needs to be consistent with the artwork brief and intent. Artwork scale also needs to be responsive to the site context - such as the surrounding landscape and buildings and pedestrian circulation.



Well Considered & Managed

Artworks must be designed and constructed with best practice risk and asset management, being mindful of public safety, straightforward and low-cost maintenance, resistance to vandalism, and constructed with robustness appropriate for the lifespan of the artwork.

Attractor

Public art can be used as an attractor for visitors and tourists – particularly places with landmark artworks or seasonal art programs.

Sustainable

Public art is designed to consider key environmental, social and economic opportunities for both procurement/delivery and ongoing function and use.

3.2 CURATORIAL FRAMEWORK

The curatorial framework identifies themes and narratives to encourage a cohesive approach to public art across the five stations.

The framework responds to planning, place-making and station design principles established across the Morley-Ellenbrook Line. It acknowledges METRONET's attitudes towards site context, urban character, landscape values and the station's architectural typology.

The curatorial framework acknowledges the values and future aspirations of all stakeholders, local community members and transport users. It includes a vision for public art, describing what it aspires to achieve within the project.

CURATORIAL VISION

The curatorial vision is a resource for artists in developing site-specific responses to culture, landscape and place. It provides contextual inspiration and a starting point for artistic exploration.

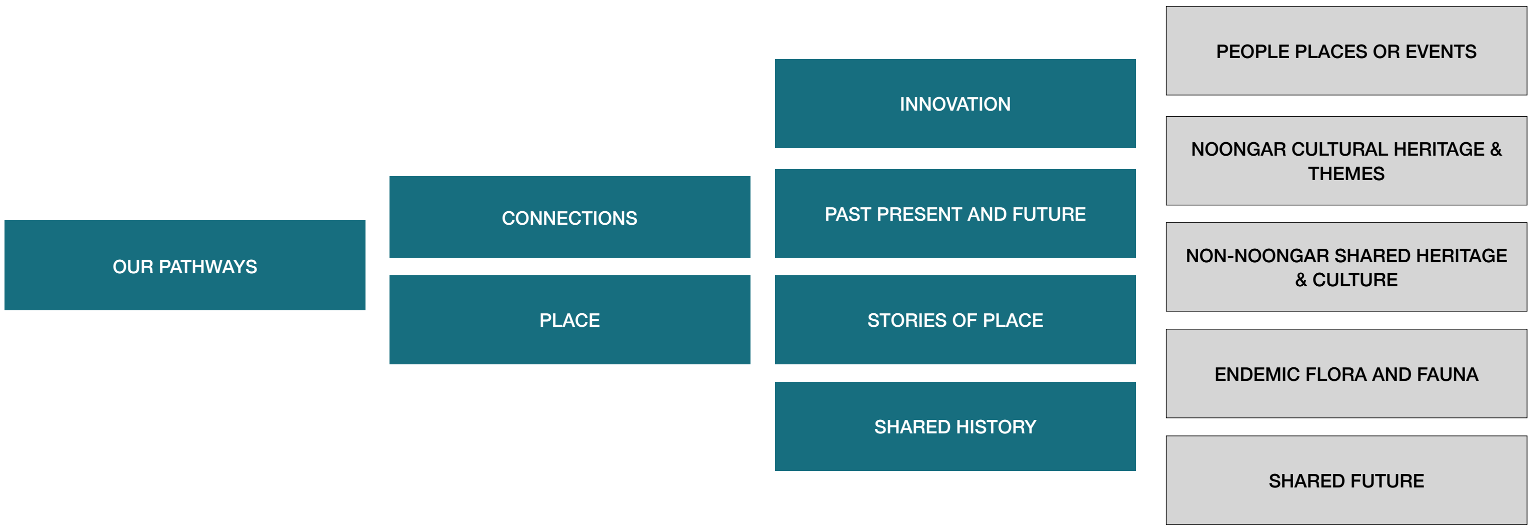
Every station has unique physical and functional characteristics that will affect its potential to develop as a liveable, vibrant urban centre. Public art will build on broader initiatives within the project to:

- Embody notions of identity and place, benefit local communities and leave a positive legacy for future generations;
- Foster connections between people and places, revealing embedding stories, ideas and authentic experiences within the stations and surrounding public space;.
- Celebrate the cultural diversity of communities and people;
- Draw on community values to provide active public spaces that can be enjoyed day and night;
- Contribute to the activation of new town centres, neighbourhood centres and transit node precincts;
- Create new gateway and arrival experiences for public transport users and the broader community; and
- Enrich daily life and support community gathering in a vibrant and safe environment.

3.3 CURATORIAL THEMES

The Curatorial Themes provide a high-level thematic guides which encapsulate various qualities of the diverse topographies, station types and communities along the Morley-Ellenbrook Line.

Evoking elements of the local history, landscape and people, they can act as an initial source of inspiration for artists, ensuring that artworks forge meaningful connections to the locality and community.



The three broad themes below encompass both universal experiences and evoke stories and narratives specific to people and places along the new rail line.

GATHER
Social Encounters

Stations and their surrounding precincts are places of arrival and departure. They are meeting and gathering points that are an expression of local identity and the communities that they service.

Local life can be described by the social encounters in a vibrant town centre. Whether spontaneous or planned, social experiences add to the richness of daily life. Within the station they can us make us feel comfortable and safe.

Before their was a city, Noongar people gathered on the Swan Coastal Plain to hunt, fish and celebrate culture. New stations, town centres and public spaces will become the places where people meet, rest and play.

DWELL
Being of a Place

The landscapes and places along the line have changed significantly over time. From the wetlands and banksia woodland that was once there, the land has been shaped and altered.

The new line will accelerate that rate of change, creating new places and making the familiar less so. Though much of the original vegetation is gone, the line continues to reveal its topography and offer spectacular vistas to places beyond.

The pattern of land subdivisions, laid across the landscape largely remain today. Their boundaries shape the networks of roads that connect the suburbs and people.

Communities continue to evolve as farmlands give way to suburbs and commercial areas. As the city moves outward, people seek new ways of connecting to places and making it their home.

STREAM
Passing Through

The streams and wetlands are ancient. They have sustained life in the area for millennia. From deep beneath the surface, the water rises and flows towards the river.

The stream exists within the landscape and as a metaphor for the confluence of pathways, routes and cultures. It is a place where people camped, gathered food. It sustains farmlands and is an attractor for recreation .

The stream can be the experience of travel and transition across the landscape. It embodies the experience of movement and change that defines the rail journey. It is the life force that connects places.

Beneath the station the stream is still there, hidden.

3.4 ARTWORK TYPES

The METRONET Public Art Strategy uses the DLGSC Public Art Commissioning Guidelines to define main categories of public art, recognising that boundaries between art types overlap.


Barry McGuire


Madeleine Brown


Jill Anholt Studio

Hannah Quinlivan

STAND ALONE

Stand-alone artworks are arguably, the best known and recognised form of public art. They include sculptural works at a variety of scales, from landmark artworks that are major attractors and destinations through to small-scale elements interwoven within the landscape design.

They can be singular works sited at locations with high visual impact or be a series of small scale elements disbursed throughout a public space.

Stand-alone artworks are usually acquired through a standard artist commissioning process, with the artist responsible for design, fabrication and installation.

On more complex construction projects, artworks are sometimes delivered to site, with installation by the construction contractor or their subcontractors.


Stuart Green


Rod Garlett


Kylie Graham


Phil Gamblen

INTEGRATED

Integrated artworks is a broad category that includes art concepts and design elements integrated into the fabric of built form and urban environments. Often developed through a collaborative design process, the artist is best engaged during the early design stage.

Art concepts can be incorporated into the overall design as 'value added' elements, allowing artist to response to the scale of the buildings and landscaped environments. This could include treatments to walls, ceilings, glazing, screens and floors, landscape elements and paving.

Integrated artworks can be developed as 'design only' or through a standard commissioning process. There can be a combination of approaches with the artists sometimes responsible for documenting, fabricating and installing the artwork elements.


Jon Tarry


Judy Watson


Nancy Blum


Unknown

APPLIED

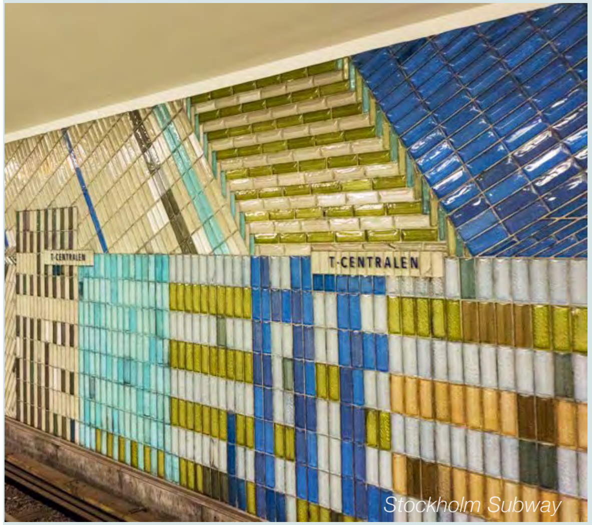
Applied public art is defined as elements applied to existing surfaces and structures. It may include, but not limited to, painted finishes, tiling, metal or other elements fixed to existing walls, floors or ceilings. They can be permanent or semi-permanent in nature.

Applied artworks are often designed and fabricated by the artist with installation towards the end of construction or after project completion.

To some extent, the artist is able to develop and fabricate artworks independently of the built form, meaning that they can be introduced later in the design process.

Applied artworks are usually acquired through a standard artist commissioning process, with the artist responsible for design, fabrication and installation.

On more complex construction projects, artworks are sometimes delivered to site, with installation by the construction contractor or their subcontractors.



Stockholm Subway


David Franklin


Superflex


Paul Deej

TEMPORARY

Temporary or programmed artworks include non-permanent artworks or events which activate a specified space or location for a pre-determined amount of time.

Temporary artworks add a vital layer of life and energy to public spaces, providing new experiences that build a sense of place over time, engage the community and encourage repeat visitation.

Temporary or programmed works can be curated as part of festivals or events and include a wide variety of art forms including hoardings, art installations, light festivals, musical and theatrical performances.

Art events can play a crucial role in place activation over time. During the station construction phase they can be a vehicle for positive community engagement. Post construction, they can be instrumental in the activation of new spaces and building a sense of community ownership.

Mel McVee

Bewley Shaylor

Guido Van Helten

Gare du Nord, Paris

LIGHT

Light can be a crucial component of any artwork types. At its most simple level, it may involve the illumination of artworks to enhance their night-time presence. At its best, it becomes an integral component of the artwork concept.

Light may be integrated into the fabric of the built form and urban environments as art concepts. They can become part of the overall design, allowing artist to response to the scale of the buildings and landscaped environments.

Sculptural works may incorporate light at a variety of scales, from landmark artworks that are major attractors and destinations through to small-scale elements interwoven within the landscape design.

Light can be an integral component of temporary or programmed works, curated as part of festivals or events. it can play a crucial role in place activation and safety.

Jim Sanborn

Chris Nixon and Tom Lucey

Midland Railway Square

Dan Templeman

3.5 PROCUREMENT MODELS

ART COMMISSIONS

The majority of public artworks are procured through a standard commission process. The artist is usually responsible for the full scope of work, including design, documentation, fabrication and installation of the artwork.

The method is most relevant for stand-alone and applied artworks, which constitute the majority of public art projects.

The art commission model can also be appropriate for some integrated artworks, depending on the nature of the integration. The standard two stage process for artist selection involves:

- Shortlisted artists from the Expression of Interest are invited to prepare a detailed Design Concept;
- Shortlisted artists present their Design Concepts to the selection panel who select one artist or artist team;
- Alternatively, the selection panel may interview shortlisted artists and invite one artist to prepare design options before completing the Design Concept.

DESIGN COLLABORATIONS

Sometimes referred to as 'Design Only', artworks are developed through a collaborative design process.

Design elements are incorporated into the overall design as 'value added' elements, allowing artist to respond to the scale of the buildings and landscaped environments.

The artist is responsible for the Design Concept and Design Development only. The documentation, fabrication and installation is delivered as part of the larger project. Artist selection involves the following:

- Shortlisted artists from the Expression of Interest are interviewed by the selection panel. Alternately, artists may be shortlisted from a limited invitation.
- One artist or artist team is selected and engaged to prepare design options through a collaborative design process.
- The preferred options are developed into the Design Concept for approval before proceeding to Design Development.

A variation of this model can be applied to artworks developed through design workshops.

DESIGN WORKSHOPS

The Gnarla Biddi Art and Placemaking Workshops are a vehicle for ensuring that Noongar culture is reflected in the infrastructure designed and built as part of the MEL program of works.

The workshops are a direct response to requirements of the Gnarla Biddi Engagement Strategy and Gyinning/ Morley- Ellenbrook Noongar Cultural Context Document, which promote Aboriginal connection to place, culture and community.

The model aims to reduce barriers for participation by Noongar artists. The workshops will identify public art opportunities for both experienced and emerging Noongar artists.

Artists will develop concepts that can be incorporated into the overall design as 'value added' elements, with artists only be responsible for the Design Concept and Design Development. The documentation, fabrication and installation is delivered as part of the larger project.

Workshop participants will also gain insight into the documentation process. Their involvement may extend into the implementation phase through visits to fabricators and station sites.

3.6 PROCUREMENT PHASES

ARTIST SELECTION

EXPRESSION OF INTEREST

- Nomination of art procurement model and process
- Prepare Expressions of Interest and Artist Brief documents
- Advertise and invite artists to respond to the Expressions of Interest
- Manage the artist shortlisting process, including identifying and liaising with the selection panel.

DESIGN CONCEPT

- Prepare RFP documents, including the Stage 2 Artist Brief
- Compile drawings and models for issue for issue to shortlisted artists
- The selection panel Invite shortlisted artists to prepare Design Concepts
- Arrange artist briefings and site visits
- Manage stakeholder engagement as part of the artist selection process.
- The selection panel conduct interviews and select artists
- Assist with the preparation of artist contractual documents

DESIGN

DESIGN DEVELOPMENT

- Manage the interface between the artist and Alliance team
- Support the artist in negotiating the complexity of the project and assist with reporting to the Alliance team
- Provide a program and update, as required
- Preliminary engineering advice and liaison with design consultants and construction team
- Artists and/or Alliance team provide final models and computer generated visualisations, where required.
- Arrange artist payments
- Manage review and approval of Design Development Report

DESIGN DOCUMENTATION

- Manage liaison with design consultants and construction team
- Full construction documentation and engineering certification including samples and prototypes, where required
- Final construction budget review with Alliance team
- The art consultant manages the review and approval of the Design Documentation Report

CONSTRUCTION

FABRICATION

- Alliance approvals for material samples and prototypes
- Quality control of materials and fabrication process
- Monitor fabrication and arrange periodic inspections
- Project management and budget control of artwork fabrication
- Ensure artists meet Alliance program requirements
- Coordinate transport and on-site storage, where required

INSTALLATION

- Ensure necessary insurances and permits for artists to work on site, where required.
- Contract administration to final completion.
- Arrange Project Handover documentation and Maintenance Manual.
- Arrange attribution plaques
- Project close out

3.7 ARTIST CONTRACTS

Artist agreements will set out the obligations and conditions of all parties involved in the public art program.

MELconnx has been nominated as the commissioning body for public artworks delivered through the art program. 'Fit for purpose' contracts will need to be developed that address the various ways that artists may be engaged.

The DLGSC Commissioning Guidelines (2019) provides a best practice model for engagement of artists. The BMW Artwork Commission Agreement is used for artist commissioned through the State Government Percent for Art Scheme and is based on the Arts Law standard agreement.

Other State Government departments and agencies such as PTA, LandCorp, DevelopmentWA and Main Roads WA have also adopted the agreement.

Design Concepts

Shortlisted artists are invited to prepare a Design Concept in response to a Stage 2 Artwork Brief, which sets out the conditions and submission requirements. Artists are paid a fee which is based on the value of the commission and the complexity of submission requirements. Conditions can be usually be addressed though a Letter of Agreement and reference to the Stage 2 Artwork Brief.

Design Agreement

A design agreement can be used when the artist is engaged for the Design Concept and Design Development stage only. In some instances, the agreement may also specify limited involvement in the implementation phases.

Documentation, fabrication and installation is delivered as part of the larger project and is not the artists' responsibility. The agreement provides details of the artist's moral and intellectual property rights in the design.

Commission Agreement

Artists commissioned through the State Government Percent for Art Scheme are engaged through a standard artist commission agreement. This form of contract is widely used when the artist is responsible for the full scope of work, including design, documentation, fabrication and installation of the artwork.

3.8 PRELIMINARY BUDGET

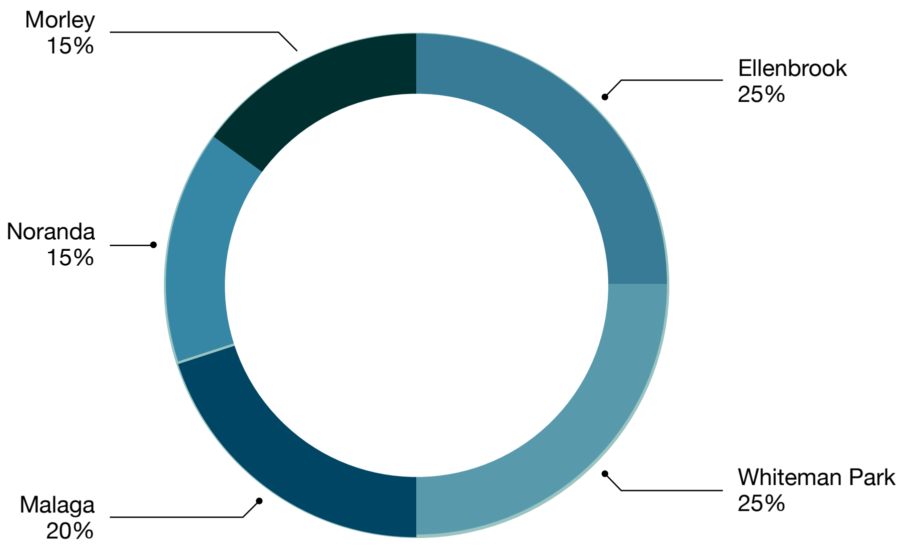
The preliminary budgets provides high level allocations for public artworks. Percentages have been assigned to zones within the station precincts rather than to individual art projects. Budgets for individual project will be determined as the opportunities become more defined. The amounts are currently inclusive of:

- Design Concept fees
- Commission budgets
- Design Workshop costs. (Artist fees associated with Noongar input into placemaking will be covered by a separate budget allocated to implementation of the Gnarla Biddi Strategy)
- ‘Value added” costs. This is the additional cost for artwork treatment of an exisiting element above the estimated base cost
- Contingencies and disbursements
- Contractors’ margin for management of the public art process

The high level allocations are based on the ability to maximise the visual impact of public art by ‘value adding’ to existing architectural and landscape elements, where appropriate.

This will be particularly crucial when considering potential input into urban design solutions for civil infrastructure that are currently not included in the scope of works.

An updated schedule for all five stations will be included in the Phase 2 Plan.



STATION BUDGET

Noranda	Linewide	10%
	Welcome Place	10%
	Station Building	50%
	Noise Walls & Underpass	25%
	Fees & Contingencies	5%

04

LINE WIDE

4.1 CONTEXT

The Morley-Ellenbrook Line is a connector for the central and northern suburbs of Perth. It creates an expanded web of connected places in distinctive landscapes and settings on the Swan Coastal Plain.

The new rail line echoes the path of the Swan River, which provides landscape markers as it meanders northwards into the Avon Valley. The line will become an equally distinctive marker and corridor in the urban landscape.

The rail line, like the river, links various points along the way. The idea of connection along the trail translates into a more integrated family of station buildings and precincts: a line and an extension to the greater transport network.

Initially tracking north through established suburbs and road infrastructure, it cuts east below Whiteman Park and across Bennett Creek.

As it swings north towards Ellenbrook, and up the eastern flank of Whiteman Park, it shadows the upper reaches of the Swan River to the east, forming a man-made reflector of light along the length of the line.

Each station is conceived as an important civic place – distinctive, contextually appropriate and a safe and inviting setting for the gathering and movement of people on and off the train line.

STATIONS

Stations and their immediate surrounds are convergence points and places of transition between transport modes and the surrounding environment. Public art can contribute to the legibility of these functional spaces by responding to the way people use them.

WELCOME PLACE

The Welcome Place is the heart of the station. It is the place where people arrive in the town or suburb and can be an expression of the community's identity and sense of place.

The Welcome Place is a meeting place where people congregate or wait before proceeding on their journeys. It is also the place where people need to make decisions when making transfers. It is also a primary focus for public artworks, including:

- Large-scale destination artworks intended to be an iconic attractor that is easily identifiable and highly memorable;
- Medium-scale markers that define nodes. focal points and decision points;
- Small-to-medium scale artworks and integrated elements that introduce elements of surprise, pause and intrigue.

KISS AND RIDE

The Kiss and Ride is a focal point within the car park. It is a transitional zone where the user's priority is accessing vehicles, drop-offs and passenger pick-up.

Public artworks may assist with guiding people towards the station building. They may take the form of elements integrated into canopies, arbours or pavement treatments.

BUS INTERCHANGE

Located at bus stands, along pathways and routes, artworks can be a variety of forms, primarily integrated into the fabric of transport infrastructure.

They can tell stories, explore themes or assist in orientation while guiding users towards the station building.

ENTRIES

Entry points need to provide clear connections and pathways to the Welcome Place, Station and Bus Interchange. Public art in these locations needs to be appreciated at a vehicular, cyclist and pedestrian scale and may:

- Reinforce major gateways or arrival points; and
- Strengthening wayfinding along key pedestrian corridors.

CIVIL INFRASTRUCTURE

Civil infrastructure along the 21km route includes roads, tunnels, underpasses, viaducts, retaining walls and noise walls. Most of this infrastructure is currently not included in the scope of the public art program, which focuses on station buildings and immediate surrounds.

In some instances, the impact of civil infrastructure can be significant. Public art can respond to the scale of the infrastructure by contributing to urban design solutions that provide gateway experiences or mitigate visual impact.

STATION BUILDINGS

As people arrive at the train station the experience must be quick and easy. The space needs to be organised around smooth flows and intuitive wayfinding, that provides all the clues before relying on signage.

Artworks may be experienced progressively as station users move along pathways and through zones. They may frame and direct attention towards spaces beyond.

Artworks may be incorporated into the fabric of the building to provide a more diffused or immersive experience. They can be integrated into surface treatments, such as walls, metal screens, soffit treatments or glazing.

4.2 SENSE OF PLACE

The Sense of Place Statements are intended to ensure that design decisions for public artworks in station buildings and their immediate surrounds align with community values and expectations.

The Public Art Plan includes Sense of Place Statements for each station on the Gyinning/Morley-Ellenbrook Line. They draw sources, including on the METRONET Noongar Cultural Context Document, Preliminary Place Plans and relevant Local Area Plans.

The Sense of Place Statements have also benefited from the input of community reference groups established for each project areas along the line, with the City of Bayswater and City of Swan playing key roles in representing community interests.

The statements establish common themes, narratives and stories for the whole line, as well as distinct local stories specific to certain localities.

They are not intended to be an extensive history for each station area. However, they will be available as a resource when developing the curatorial framework and themes included in artwork briefs.

MEL CONNX

Mussel Pool, Whiteman Park

THEMES AND STORIES

Sense of Place

The Morley-Ellenbrook Line encapsulates a variety urban and natural experiences as it travels through diverse landscapes along its 21km journey.

The rail line, like the Swan River, links various points along the way. The idea of connecting stories and themes along the line translates into a more integrated family of stations: a line and an extension to the greater transport network.

Line wide and location-specific stories and themes are addressed in detail under the relevant station heading.

Gnarla Biddi

" Since the Koondarm our ancestral pathways have guided us through Noongar Boodjar from significant place to significant place from one water body to another.

Now we work together to strengthen Gnarla Biddi, the way that people travel and connect to places, still linked to our shared history and culture."

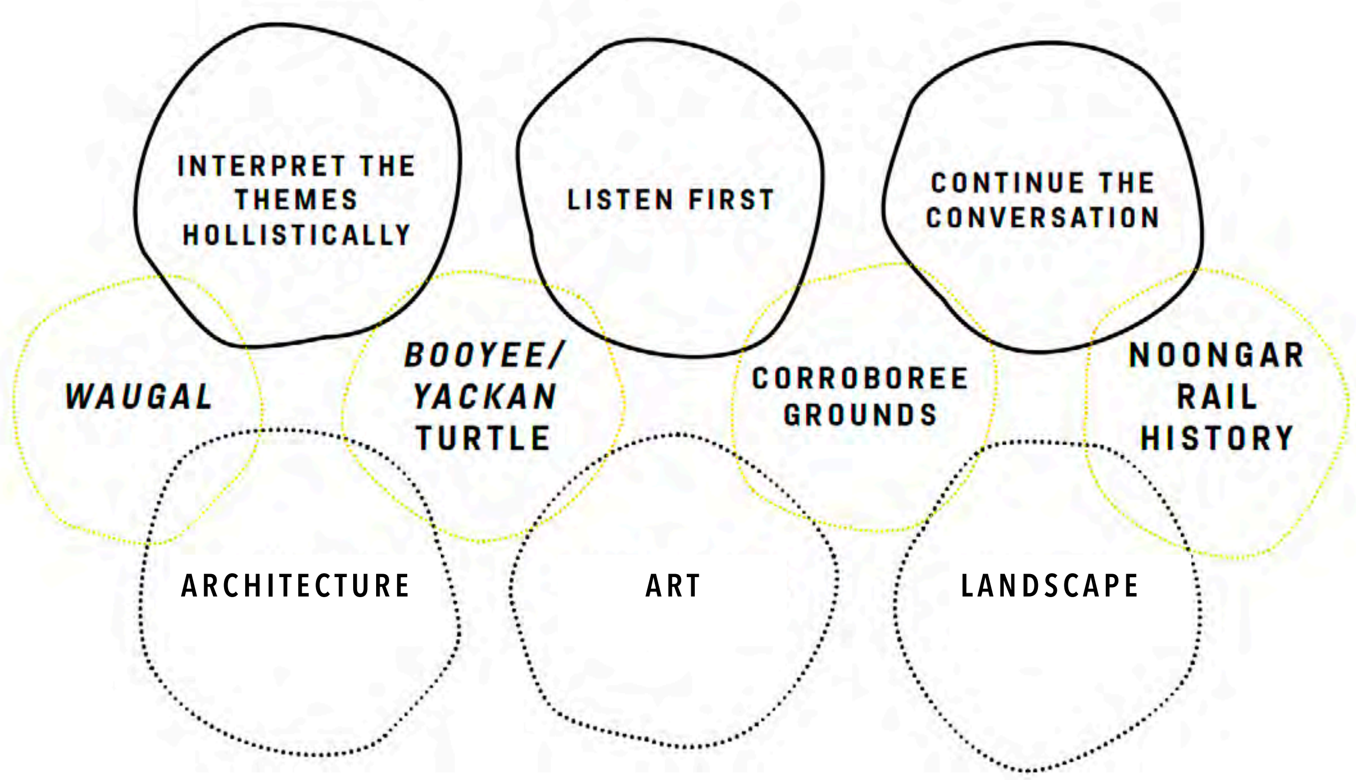
The Gnarla Biddi statement, contained in the METRONET Aboriginal Engagement Strategy, provides a unifying and all encompassing theme that is relevant to all artists, whether Noongar or non-Noongar.

Noongar Cultural Context

Significant local Noongar themes include, but are not limited to:

- Waugul - the creation story of the spirit/rainbow serpent; a place of water with many wetland and river features;
- Turtle (Boyee or Yackan) - Illustrating belief in the shared spiritual essence of all living things
- Corroboree Grounds - Important meeting and ceremony places within the biddi network;
- Noongar Rail History - Language maintenance, cultural renewal and resistance, travelling, residence and return to country through the railways.

NOONGAR THEMES



The Noongar Cultural Context Document identifies line-wide themes that will be further developed through a collaborative design approach led by Noongar cultural advisors and artists.

The approach is intended to ensure that Noongar culture and placemaking is embedded in the design of stations and their immediate surrounds. Artwork concepts will initially be developed to reinforce and complement elements of the landscape design, including planting, furniture, paving and signage.

Artwork concepts and design elements may also be incorporated as 'Design Only' elements in station buildings.

Design workshops will facilitate input into the design of stations and their surrounds. They will involve input from both experienced Noongar artists and emerging Noongar artists.

Design fees directly associated with Noongar input into placemaking will be covered by a budget allocated to support the implementation of the Gnarla Biddi Engagement Strategy.

The Noongar Design Workshops will play an important role in Noongar story telling and interpretation of cultural material.

DESIGN WORKSHOPS

The workshop process will allow sufficient time for artists to have meaningful engagement with the Noongar Reference Group, cultural advisors and the Alliance team.

It will also allow time for artists to become familiar with the complexities of the rail project and to develop concepts through a structured and supported process.

The thematic approach will be informed by the overarching Gnarla Biddi theme of ‘Our Pathways” while also addressing the following sub-themes:

- Acknowledgement of Country
- Shared Stories and Knowledge
- Cultural Mapping
- Noongar Language
- Dual Naming
- Meeting Place
- Culturally Significant Plants
- Bush Foods & Medicine
- Seasonal Flowers & Fruits
- Totemic Species






The initial focus will be on concepts that can be incorporated into landscape elements in stations at Ellenbrook, Whiteman Park and Malaga. Potential design elements may include:

- Garden beds
- Furniture and paving
- Wayfinding signage
- Interpretation

Architectural elements may include, but is not limited to:

- Facade treatments
- Metal screens
- Glass balustrades

4.3 OPPORTUNITIES

Stations are convergence points and places of transition between transport modes and the surrounding environment. They need to be organised around smooth flows and intuitive wayfinding.

Artworks may be experienced progressively, as station users move along pathways and through zones. They may frame and direct attention towards spaces beyond.

Artworks can emphasise arrival or meeting points,. They can also be part of the fabric of the station building and surrounding landscaped spaces, as more diffused or immersive experiences.

Stand-alone artworks may include sculptural works at a variety of scales. They can be singular works sited at locations with high visual impact or a series of small scale elements disbursed throughout landscaped spaces.

Art concepts may also be incorporated into the overall design as 'value added' elements, allowing artist to response to the scale of the buildings and landscaped environments. This could include treatments to walls, soffits, glazing, screens and floors, landscape elements and paving.

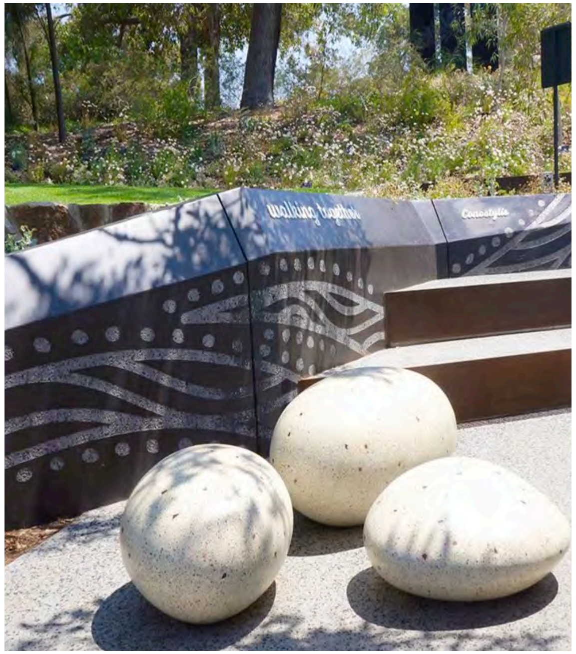
Some artwork opportunities have already been identified within the station designs. They will be refined and added to as station designs progress. They may include, but are not limited to the following examples;

Stuart Green

MARKERS

Stand-alone artworks provide markers and episodes along a journey and can operate at different scales:

- Landmark artworks can emphasise arrival or gateways points where their scale and visibility make them identifiable and memorable
- Medium scale artworks may consist of a single focal element or multiple elements extending along pathways or routes.



LANDSCAPE

Small-to-medium in scale, fine grained artworks can be incorporated into the landscape design as integrated or stand-alone elements.

They may be integrated into functional elements, such as retaining walls, screens, informal seating, paving and interpretive signage.

SCREENS

Station buildings include extensive areas of permeable metal panels. The artwork may 'value add' to these existing elements as:

- Screen walls on vertical circulation buildings
- Weather screening on platforms
- Perimeter fencing
- Balustrading on elevated concourses and walkways

CANOPIES

Stations and bus interchanges are connected by a series of canopies and arbours. The canopies guide transport users towards the station while also offering weather protection. The artwork may take the form of treatments to:

- Fabrics on green and/or unplanted arbours
- Soffits in linking canopies

GLAZING

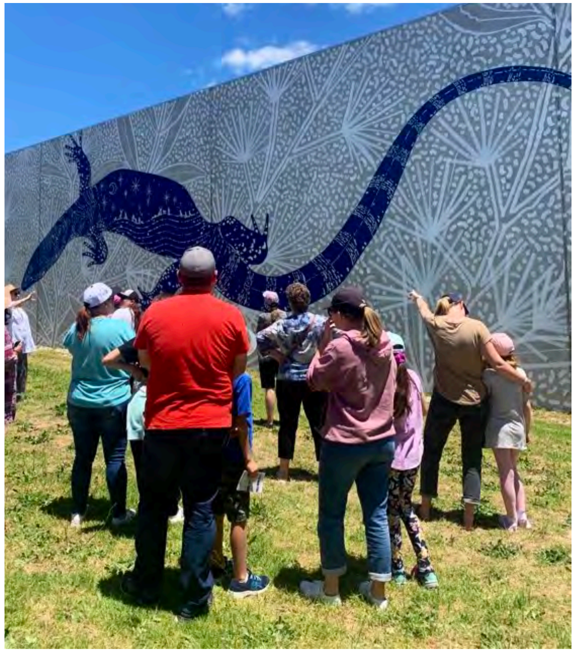
Station buildings and bus interchanges include glass panels as weather, privacy and security protection. Artworks may be incorporated as fitted designs to:

- Skylights located centrally along the length of the station and platform canopies
- Internal waiting areas in station buildings
- Bus stands

PLAY

Forecourt areas connect stations to the bus interchanges, car park and surrounding precinct. These 'Welcome Places' are the social 'heart' of the station and important places of social gathering and interaction.

Informal playscapes can offer a wide range of open-ended play options that allow people to be creative and use their imagination. They can have multi-generational appeal to children, families, and people of all ages.



MURALS

Along its length the rail line rises and dives as it travels though different environments. Artworks may include:

- Constuction hoardings
- Painted mural treatments to noise walls
- Applied or cast panel treatments to noise walls
- Integrated lighting to noise walls
- Painted ancillary buildings, such as bike storage.
- Service buildings on platforms and surround areas

CIVIL INFRASTRUCTURE

Grade separated structures such as ramps, viaducts, dives, tunnels and bridges extending over and under the new rail. Artwork opportunities include;

- Vertical surfaces of viaducts
- Painted or applied soffit treatments
- Painted or applied columns
- Retaining walls and bridge embankments
- Integrated lighting solutions

05

STATIONS

5.4 NORANDA STATION

Art Opportunities

Themes

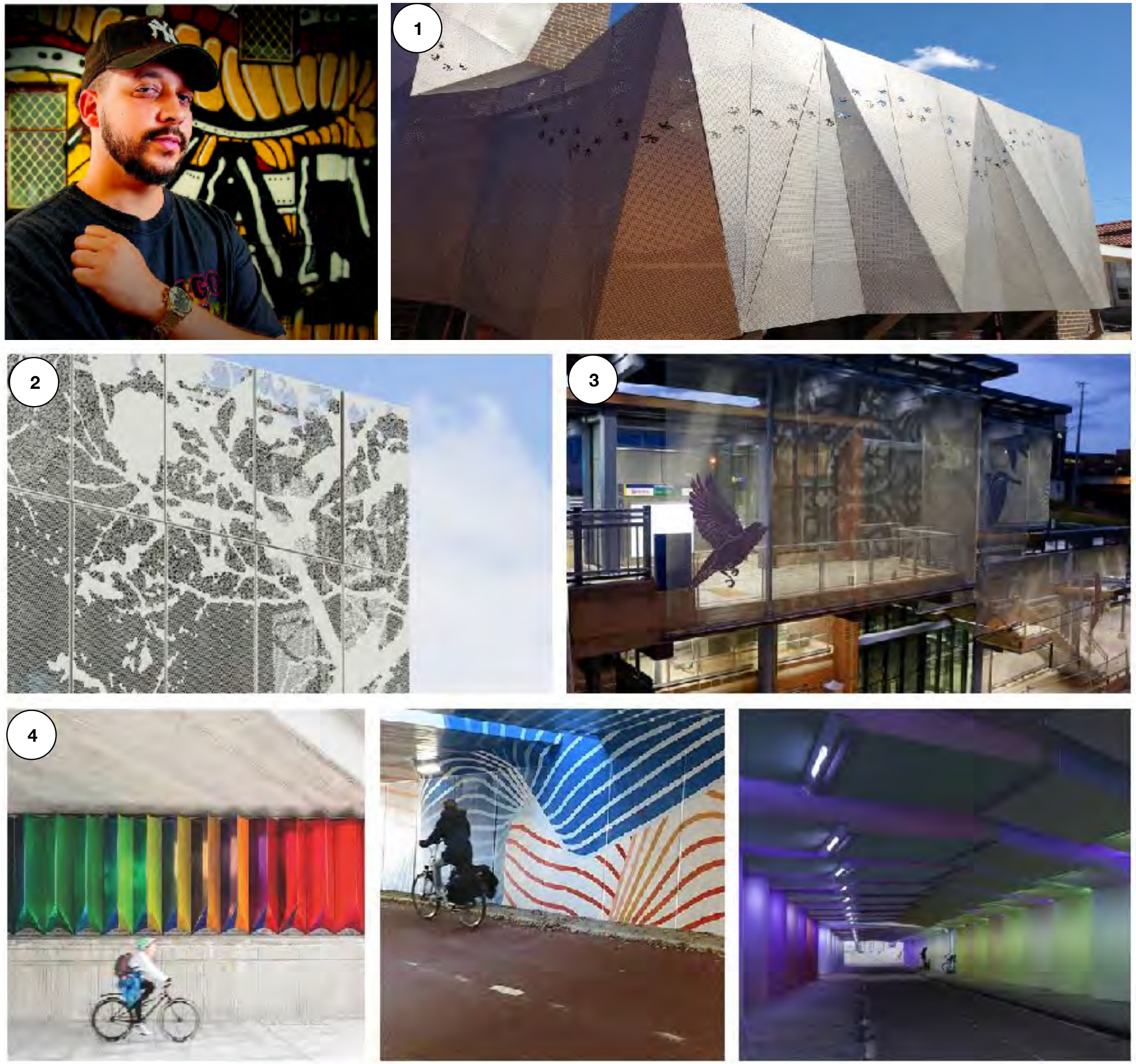
Artwork themes will address the qualities that make Noranda Station distinct from other stations on the line. These may include:

- Passage, Transition and Movement
- Cultural Diversity and Migration
- Youth Culture
- Urban Bushland
- Exotic Plants Species

Noongar input into placemaking will be structured around the network-wide 'Our Pathways' theme described in the Gnarla Biddi Engagement Strategy and the four main themes contained in the Noongar Cultural Context document. Additional input may include, but is not limited to:

- Acknowledgement of Country
- Noongar Language
- Shared Knowledge and Stories
- Night Sky
- Culturally Significant Plants and Animals

1. Concourse - Folded Screens
2. Pedestrian Bridge
3. VT Building
4. Noise Walls and Underpass



Art Opportunities

Noranda Station is the place where the urban meets the bush. The artwork approach aims to express the fusion of contrasting but connected landscapes that are experienced along the rail corridor and throughout the greater transport network.

To the north west, Lightning Swamp Bushland is the City of Bayswater's largest bush reserve. To the east the suburb of Noranda pays homage to its 1970s origins.

The artwork approach explores the station building as a sculptural form floating in the traffic stream - a still point with the ebb and flow of daily life. It also emphasises the experience of passage and movement, at a human scale, as pedestrians and cyclist pass through the station precinct. The art opportunities include:

1. The folded metal screens of the Concourse, experienced by passing vehicles and passengers arriving and departing the station.
2. Perforated mesh screens on the pedestrian bridge, seen from a distance when approaching from the north and by passenger moving through the station.
3. Vertical surfaces of the VT Building offering a first impression on arrival at the station or ascending the stairs.
4. Noise wall located at the intersection of pathways on the approach to the station from the underpass.
5. The pedestrian underpass linking areas to the south to the station and beyond

06

REFERENCES

The following documents and websites have been referenced in the preparation of the Plan:

- METRONET Public Art Strategy
- METRONET Morley-Ellenbrook Line Public Art Guide
- METRONET Aboriginal Engagement Strategy (Gnarla Biddi)
- METRONET Noongar Cultural Context - Gyinning/Morley-Ellenbrook Line
- METRONET Station Precinct Guide
- Ellenbrook Station - Preliminary Place Plan (Place Laboratory)
- City of Swan - Ellenbrook Local Area Plan
- City of Swan - Growth Corridor Local Area Plan
- Whiteman Park Station Station - Preliminary Place Plan (Place Laboratory)
- Whiteman Park Strategic Plan 2017-2021 (Department of Planning)
- https://www.whitemanpark.com.au/
- https://www.bushlandperth.org.au/treasures/whiteman-park/
- Malaga Station - Preliminary Place Plan (Place Laboratory)
- City of Swan - Malaga Local Area Plan
- City of Swan - Ballajura Local Area Plan
- Beeralain/Bayswater - Station Precinct Placemaking Plan (UDLA and Apparatus)
- https://www.noongarculture.org.au/

Appendix H – Bushfire Management Plan

Bushfire management plan/Statement addressing the Bushfire Protection Criteria coversheet

Site address: Metronet - Noranda Station - Lot 461 (DP P021673) Benara Road

Site visit: Yes ☑ No ☐

Date of site visit (if applicable): Day 22 Month September Year 2021

Report author or reviewer: Linden Wears

WA BPAD accreditation level (please circle):

Not accredited ☐ Level 1 BAL assessor ☐ Level 2 practitioner ☐ Level 3 practitioner ☑

If accredited please provide the following.

BPAD accreditation number: 19809 Accreditation expiry: Month June Year 2022

Bushfire management plan version number: Rev 0

Bushfire management plan date: Day 29 Month October Year 2021

Client/business name: Perth Transport Authority

	Yes	No
Has the BAL been calculated by a method other than method 1 as outlined in AS3959 (tick no if AS3959 method 1 has been used to calculate the BAL)?		✔
Have any of the bushfire protection criteria elements been addressed through the use of a performance principle (tick no if only acceptable solutions have been used to address all of the bushfire protection criteria elements)?		✔

Is the proposal any of the following (see SPP 3.7 for definitions)?	Yes	No
Unavoidable development (in BAL-40 or BAL-FZ)		✔
Strategic planning proposal (including rezoning applications)		✔
High risk land-use		✔
Vulnerable land-use	✔	

None of the above ☐

Note: Only if one (or more) of the above answers in the tables is yes should the decision maker (e.g. local government or the WAPC) refer the proposal to DFES for comment.

Why has it been given one of the above listed classifications (E.g. Considered vulnerable land-use as the development is for accommodation of the elderly, etc.)?

Vulnerable land use due to public transport use of the station

The information provided within this bushfire management plan to the best of my knowledge is true and correct:

Signature of report author or reviewer: [signature]

Date: 29 October 2021

Metronet – Noranda Station

Benara Road, Noranda

Bushfire Management Plan

Date: 29 October 2021

Prepared For: Public Transport Authority

Linfire Ref: 20210416136LOR-BMP-003_0

Linfire Consultancy

ABN: 577 930 47299

BPAD Bushfire Planning & Design Accredited Practitioner Level 3

Revision	Issue Date	Revision Description	Approved By
A	10 Oct 2021	Issued for Approval	Linden Wears (Level 3 BPAD 19809)
0	29 Oct 2021	Issued for Approval	Linden Wears (Level 3 BPAD 19809)

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To the maximum extent permitted by the law, Linfire Consultancy, its employees, officers, agents and the writer ("Linfire") excludes all liability whatsoever for:

1. claim, damage, loss or injury to any property and any person caused by fire or as a result of fire or indeed howsoever caused;
2. errors or omissions in this report except where grossly negligent; and the proponent expressly acknowledges that they have been made aware of this exclusion and that such exclusion of liability is reasonable in all the circumstances.

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Fire is an unpredictable force of nature. Changing climatic factors (whether predictable or otherwise) either before or at the time of a fire can also significantly affect the nature of a fire and in a bushfire prone area it is not possible to completely guard against bushfire. The mitigation strategies contained in this Bushfire Management Plan (BMP) are considered to be prudent minimum standards only, based on the standards prescribed by relevant authorities. It is expressly stated that Linfire do not guarantee that if such standards are complied with or if a property owner exercises prudence, that a building or property will not be damaged or that lives will not be lost in a bush fire.

Further, the achievement of the level of implementation of fire precautions will depend on the actions of the landowner or occupiers of the land, over which Linfire has no control. If the proponent becomes concerned about changing factors then either a review of the existing BMP, or a new BMP, should be requested. Linfire accepts no liability or responsibility whatsoever for or in respect of any use or reliance upon this report and its supporting material by any third party.

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1.0 Proposal details

1.1 Background

1.1.1 Proposed development

Melconnx, on behalf of Public Transport Authority (PTA; the Proponent) is lodging a Development Application (DA) in relation to proposed development of Noranda Train Station, on the Morley-Ellenbrook line, within a portion of Lot 461 (DP P021673) Benara Road (the project area), located in the City of Bayswater.

The Precinct Master Plan (see Figure 1) identifies that the proposed development will comprise the following elements:

- Station building with platform and concourse areas located within the Tonkin Highway reservation, between the northbound and southbound lanes
- Vertical Transport (VT) building
- Pedestrian bridge from the VT building to the station, over Tonkin Highway southbound lanes (eastern overpass)
- Pedestrian bridge from Benara Road to the station (southern overpass)
- Pedestrian underpass on Benara Road
- Signalling Equipment Compound (SER) building
- Bike store and services enclosure buildings (including Western Power transformer, generator, pumps and tanks)
- Fire booster connection and DFES hardstand
- Irrigation and isolator compounds
- Motorbike parking shelter
- Carparking bays
- Canopy shelter/covered walkway
- Kiss n Ride drop off area
- Welcome Place outdoor plaza
- Seating nook
- Perimeter fencing
- Onsite roads consisting of internal access and services roads
- Pedestrian shared path (PSP), including realignment of a portion of the existing PSP
- Onsite landscaping, drainage and revegetation
- Drainage and revegetation external to the station development site – to the west of Tonkin Highway and south of Benara Road.

Development of the train station will also involve construction of the Metronet railway track and associated batters within the Tonkin Highway road reservation. Construction of the rail alignment does not form part of this DA and it has been assumed that this will be completed prior to occupancy of the station and commencement of station operations. Revegetation along both sides of the Tonkin Highway road reservation is also proposed, as shown in Figure 1.

1.1.2 Project area

The project area extends around the portion of Lot 461 that lies to the north of Benara Road and east of Tonkin Highway which contains the majority of the train station precinct. The project area also includes the station building, platform and concourse within the Tonkin Highway road reservation as well and the two pedestrian overpasses (eastern and southern), as shown in Figure 2.

1.1.3 Train station operations

The station will be operated by PTA and will be manned at all times that it is open to the public.

1.1.4 Access

Vehicular access to the station for the public will be via Benara Road which lies to the south of the project area. An internal loop road exists in the south of the station precinct, providing access to the Kiss'n'Drop area and services enclosure (including bike shelter). The internal road also extends north to the carpark, which comprises a series of loop roads with no dead-ends. This road also provides access to the SER building at the northern tip of the project area.

Access to the SER building will be provided on the small service road from the carpark, which is access-controlled to prevent unauthorised access or use by the public.

Pedestrian access will be via an underpass on Benara Road which leads to the main site entrance. A pedestrian overpass will also be constructed from Benara Road to enable direct access to the station buildings and platform. A pedestrian overpass will be constructed from the VT building (within the project area) over the Tonkin Highway southbound lane, to enable access from the carpark to the station buildings and platform.

1.1.5 Emergency management

Given the nature of the facility, this station has its own onsite fire hydrant system which consists of dedicated fire water tanks, pump room and booster connection located in the services enclosure building. Emergency management provisions, including evacuation, are expected to be conducted in accordance with the PTA Emergency Management Manual (EMM). Linfire notes that while the PTA EMM details the response to a variety of onsite emergencies, including station fires, there isn't any specific information in the EMM relating to bushfire emergencies, which may require different responses and evacuation protocols to other emergencies. As outlined in Section 1.4, it is proposed that bushfire emergency management measures be incorporated into the PTA EMM to satisfy bushfire policy requirements.

1.2 Site description

The project area is located within a predominantly built-up residential area, with the nearest significant area of remnant vegetation being located within Lightning Swamp Bushland reserve, approximately 400 m to the northwest.

The project area consists of vacant land that has been subject to historical clearing and is now predominantly non-vegetated, aside from a planted screen along the eastern site boundary.

Land uses surrounding the project area include:

- Existing residential development on Bluegum Drive to the east.
- Benara Road and remnant wooded vegetation associated with the Tonkin Highway/Benara Road interchange to the south. Residential properties also exist to the south of Benara Road.
- Tonkin Highway to the west and a small area of remnant bushland within the Tonkin Highway road reservation. Residential properties exist to the west of the Tonkin Highway reserve.
- Tonkin Highway and residential properties located within the City of Swan to the north.

1.3 Habitable buildings and assets

Review of the proposed development has identified the following proposed habitable buildings and assets that Linfire considers requires protection from bushfire impact:

- Main station rooms and infrastructure (beneath the main station canopy) on both the platform and concourse levels including toilets, staff crib, kiosk, offices, cleaners room, electrical and communications rooms and other infrastructure. This also includes the Toilets/Tea Prep/Communications/Electrical/Mechanical building on the northern part of the platform, not located beneath the main canopy.
- Vertical Transport (VT) building
- Signalling Equipment Room (SER) building
- Services building, housing the bike store, and fire pumps, tank and booster.

Linfire note that the fire pumps, tank and booster are not considered habitable buildings, however given the importance of these assets and their location near proposed revegetation, it is considered appropriate that they are provided a level of protection from bushfire, especially given loss of this infrastructure would result in a lack onsite water supply.

1.4 Purpose

The project area contains proposed habitable development located within a designated bush fire prone area that is subject to a BAL rating above BAL-Low. On this basis, this Bushfire Management Plan (BMP) has been prepared to address requirements under Policy Measures 6.2 and 6.5 of *State Planning Policy 3.7 Planning in Bushfire-Prone Areas* (SPP 3.7; WAPC 2015) and *Guidelines for Planning in Bushfire-Prone Areas* (the Guidelines; WAPC 2017).

The proposed development is considered a vulnerable land use which triggers additional requirements under Policy Measure 6.6 of SPP 3.7. In accordance with Policy Measure 6.6.1 and Section 5.5 of the Guidelines, development applications for vulnerable land uses require a Bushfire Emergency Evacuation Plan (BEEP) detailing the emergency management provisions for the facility, accompanies the BMP.

For this project, it is proposed that a BEEP is not prepared at this time, but is included as a future implementation measure within this BMP and conditioned as part of the DA approval. Linfire consider the most appropriate approach is to have the proposed bushfire emergency management arrangements for this station incorporated into the existing PTA Emergency Management Manual (EMM) to standardise the procedures across the Metronet network. To achieve this, there is a significant liaison process required with PTA and given occupation of the station by vulnerable occupants (i.e. the public) isn't likely until 2024, there is considerable time to define these bushfire emergency management arrangements. This BMP will provide some guidance in relation the overall strategy in order to provide decision-makers with some information regarding the anticipated emergency management measures. Notwithstanding, a standalone BEEP for the station may still be an option if this is PTA's preference, however it should be aligned with and referenced in the EMM.

1.5 Other plans/reports

There are no known bushfire or environmental assessments or reports that have been prepared previously for the project area.

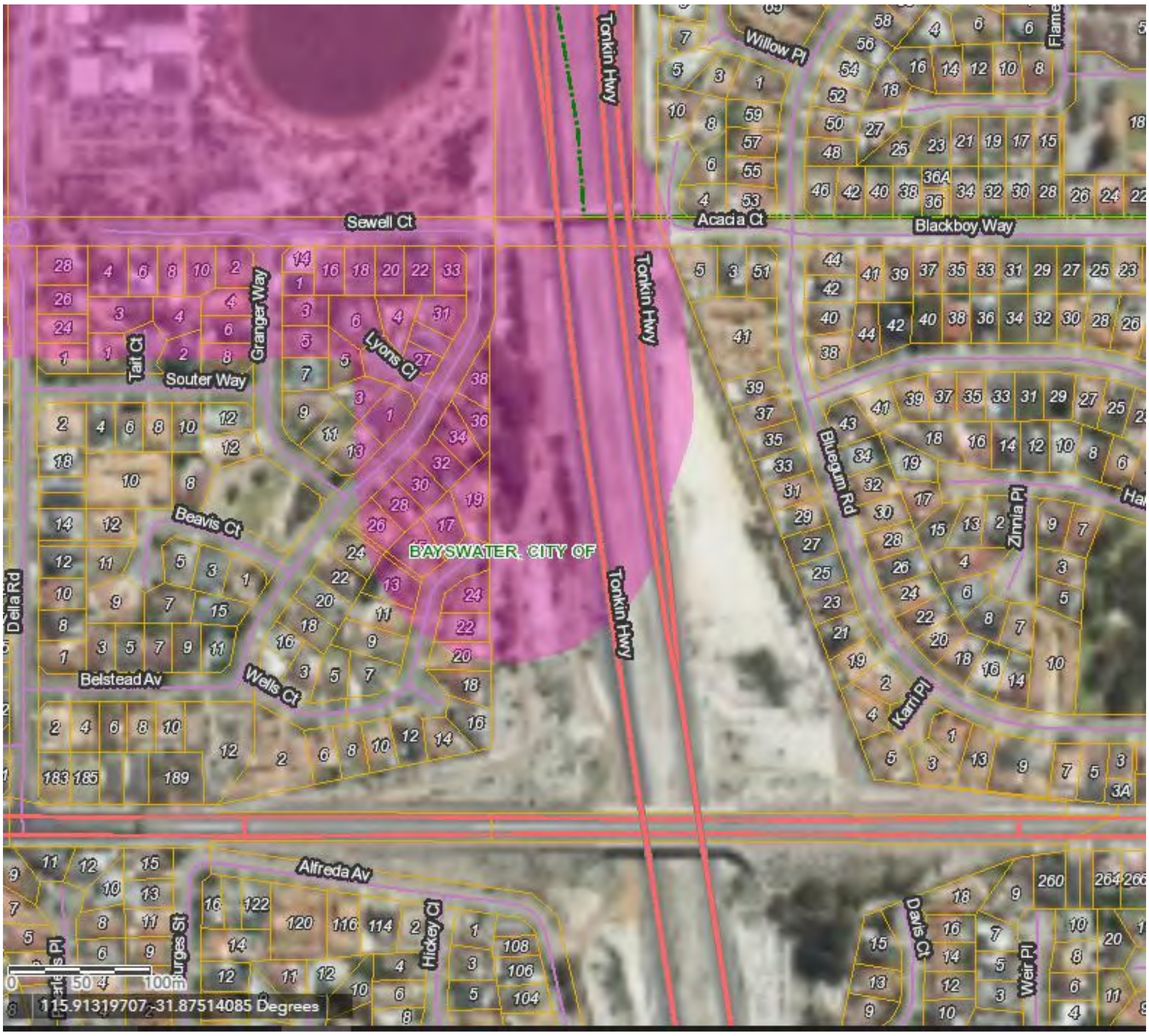
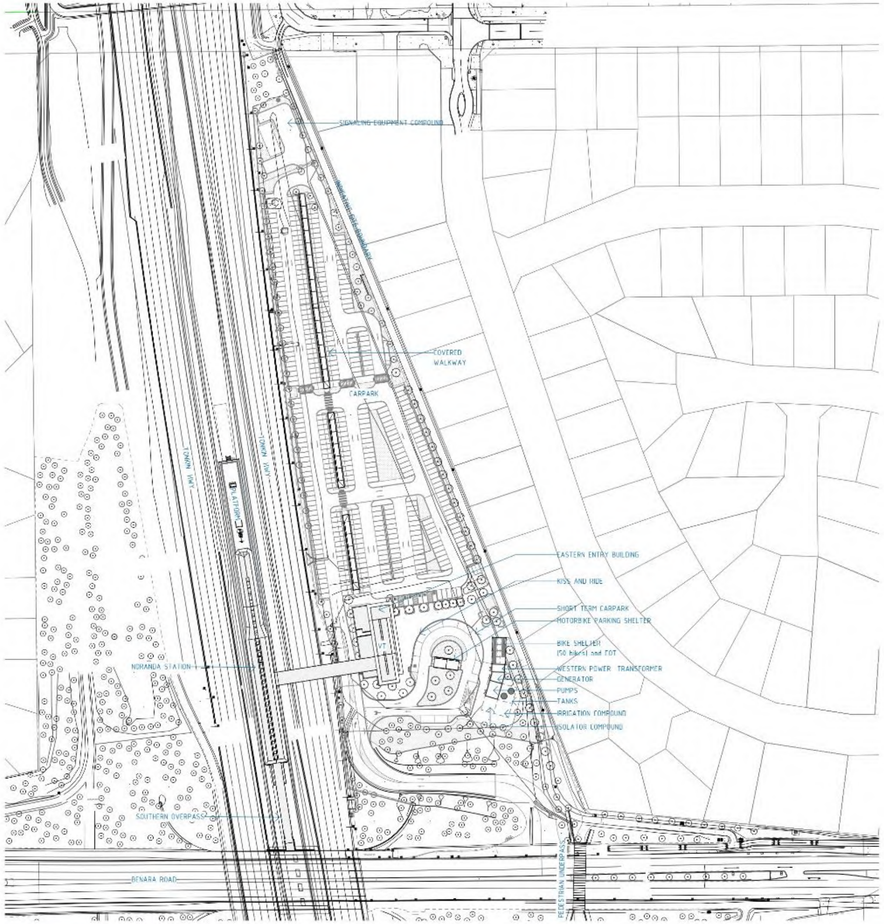


Plate 1: Map of Bush Fire Prone Areas (DFES 2019)



1 NORANDA STATION - LOCATION PLAN / SITE PLAN
SCALE 1 : 1000

PRELIMINARY ONLY
NOT FOR CONSTRUCTION

REV	DATE	AMENDMENT	DSN	DRN	CHK	APP
A02	23.09.21	ISSUED FOR RD-IDC	SK	NG	DO	
A01	06.08.21	ISSUED FOR INFORMATION	SK	NG	DO	

ORIG SIZE A1 — 0 10 20 30 40 50 100mm AT ORIGINAL PLOT SIZE

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CAD DRAWING PATHNAME BIM 360://160729_Metronet Morley Ellenbrook Line/25-B-286-AR0001.rvt

MEL CONNX

REFERENCES

SCALE 1 : 1000 (@ A1)

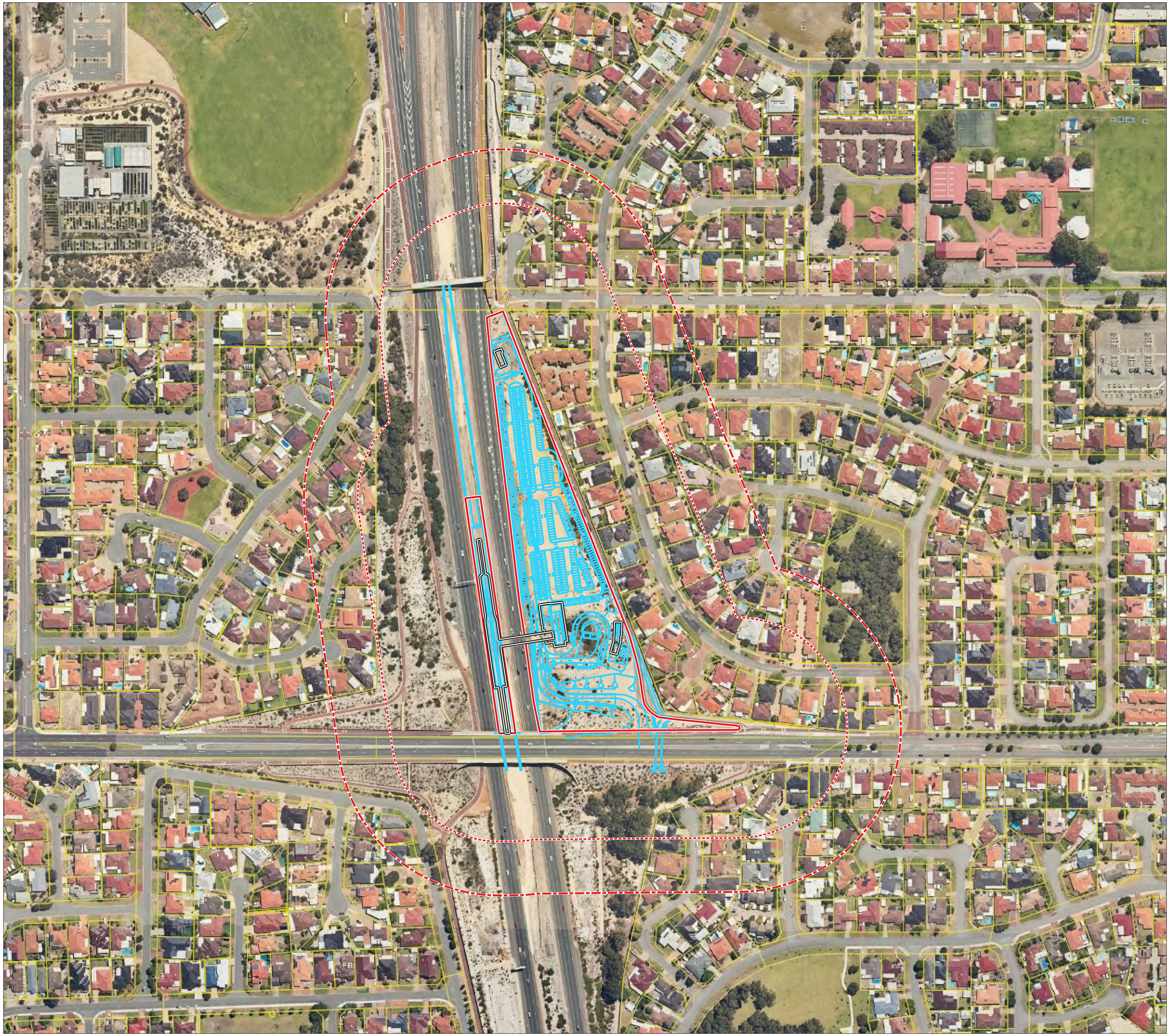
DATUM
HORIZONTAL: PCG2020
VERTICAL: AHD71

DESIGNED Designer
DRAWN Author
CHECKED Checker
APPROVED Approver
DATE 23.09.21

Government of Western Australia Public Transport Authority
MORLEY ELLENBROOK LINE
NORANDA STATION - ARCHITECTURE
OVERALL PLANS
LOCATION PLAN
PTA Drawing No: 25-A-286-AR0010 Rev: A02

Figure 1: Development Plan

LINFIRE



Legend

- Proposed Development
- Project Area
- 100m Assessment Area
- 150m Assessment Area
- Building Outline
- Cadastre

Scale 1: 4,000

0 50 100 150 Metres

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Metronet: Noranda Station

Figure 2: Site Overview

2.0 Environmental considerations

2.1 Native vegetation - modification and clearing

The project area was historically vegetated but was fully cleared and subjected to site earthworks in 2016. Following clearing, a vegetated screen was planted along the eastern site boundary (adjacent to the cycle path at the rear of the properties on Bluegum Road). The only clearing of on-site vegetation proposed is that of revegetating plant species within the previously cleared area. The screen is expected to be retained.

A desktop assessment of publicly available environmental information has been conducted in order to identify any environmentally significant values within the project area and immediate surrounds that may be impacted by the proposed development. As demonstrated in Table **1**, and by virtue of the site being fully cleared, there are no environmental values within or adjacent to the project area that are expected to be impacted by the development.

Linfire understands that any environmental impacts resulting from implementation of the proposal have been addressed at previous planning stages.

Table 1: Summary of environmental values

Environmental value	**Mapped as occurring within or adjacent to the project area**		**Description**
	Within	**Adjacent**	
Environmentally Sensitive Area		✓	The project area is not mapped as being within an Environmentally Sensitive Area (ESA). The nearest ESA is mapped as occurring approximately 400 m to the west of the project in associated with a Conservation Category Wetland (Lightning Swamp Bushland reserve) No Environmentally Sensitive Area have been identified within the project area but has been immediately to the north of Beechboro Rd North
Swan Bioplan Regionally Significant Natural Area			The project area is not located within a Swan Bioplan Regionally Significant Natural Area.
Ecological linkages	N/A	N/A	This layer not publicly available at the time of document preparation.
Wetlands	✓	✓	The southern portion of the project area is mapped as Resource Enhancement wetland. However, given the site has been cleared and subjected to earthworking, this wetland is no longer considered to be present within the project area. A Conservation Category as mapped as occurring within the Lightning Swamp Bushland reserve, approximately 400 m to the west of the project area.
Waterways			No waterways or lakes are present within or adjacent to the project area.
Threatened Ecological Communities listed	✓	✓	Threatened Ecological Communities are mapped as occurring within and adjacent to the project area. However, given the project area and immediate

Environmental value	Mapped as occurring within or adjacent to the project area		Description
	Within	Adjacent	
under the EPBC Act			surrounds are cleared, no TECs are considered to exist.
Threatened and priority flora	N/A	N/A	This layer was not publicly available at the time of document preparation.
Fauna habitat listed under the EPBC Act	✓	✓	The project area is mapped as containing confirmed roosting sites for the Endangered Carnaby's Black Cockatoo. However, given no remnant trees remain within the project area, this habitat is no longer considered to exist.
Threatened and priority fauna	N/A	N/A	This layer not available at the time of document preparation.
Bush Forever Site		✓	The project area is not identified as a Bush Forever site. The nearest Bush Forever site is located approximately 400 m to the west of the project area, within Lightning Swamp Bushland reserve (BF307).
DBCA managed lands and waters (includes legislated lands and waters and lands of interest)			There are no DBCA managed or legislated land and waters within or adjacent to the project area.
Conservation covenants			No information has been provided by the client regarding Conservation Covenants.
Aboriginal Heritage		✓	The project area does not contain any Aboriginal Heritage Places. A 'Registered Site' is located within Lightning Swamp Bushland reserve, approximately 400 m to the west of the project area.
Crown Reserves			No Crown Reserves were identified within or adjacent to the project area.

2.2 Revegetation and Landscaping

A landscaping strategy has been developed for the proposed development as shown on the landscaping plans in Appendix 1.

Revegetation is proposed to occur on the western side of Tonkin Highway, both north and south of Benara Road, and will be planted with a combination of trees with understorey non-irrigated tubestock. The structure of the mature vegetation is considered to be consistent with Class A Forest, due to canopy coverage exceeding 30% and understorey ground cover and shrub vegetation creating a tiered fuel profile. Revegetation to the east of Tonkin Highway but south of Benara Road will be subject to the same treatments and resultant classification as Class A Forest.

Landscaping within the station precinct itself will comprise a combination of managed landscaping and revegetation and is to achieve the following outcomes:

- proposed revegetation planting in the south of the station precinct, to the north of Benara

Road and south of the VT building and services compounds, is to achieve a Class B Woodland vegetation structure, being low understorey species <0.5 m high with trees between 10% - 30% canopy cover.

- proposed revegetation at the northern tip of the station precinct, to the north of the SER building, is to achieve a Class C Shrubland classification, being shrubs up to 2 m height scattered overhead trees maintaining no more than 10% canopy coverage at maturity.
- landscaping within the remainder of the station precinct, including the carparks and road verges is to be instated and managed as low threat vegetation which complies with provisions of *AS 3959-2018 Construction of buildings in bushfire prone areas* (AS 3959) Clause 2.2.3.2 (f).

Asset Protection Zones (APZs) are to be implemented around nominated buildings which are exposed to proposed onsite revegetation, to the dimensions detailed in this BMP, and in accordance with the APZ standards of the Guidelines (see Schedule 1 in Appendix 2). Outside the APZs, the managed landscaping around the station is to consist of either non-vegetated elements or low threat landscaping in accordance with AS 3959 Clauses 2.2.3.2 (e) and (f).

As the rail alignment lies central within the Tonkin Highway road reservation, there are minimal batters and no revegetation occurring within direct proximity of the rail tracks

3.0 Bushfire assessment results

3.1 Assessment inputs

3.1.1 Vegetation classification

Linfire assessed classified vegetation and exclusions within the project area and surrounding 150 m through on-ground verification on 22 September 2021 in accordance with AS 3959 and the *Visual Guide for Bushfire Risk Assessment in Western Australia* (DoP 2016). Georeferenced site photos and a description of the vegetation classifications and exclusions are contained in Appendix 3 and depicted in Figure 3 and Table 2.

The following vegetation classifications were identified during the site inspection within the project area and adjacent 150 m assessment area:

- Class C Shrubland
  - within the revegetation area to the north of the SER building, comprising low shrubs (0.5 m to 2 m) with tree canopy coverage less than 10% at maturity (Plot 1).
- Class D Scrub
  - Remnant scrub vegetation fringing Tonkin Highway west (northbound lanes) consisting of vegetation with a continuous vertical and horizontal fuel structure, 2-4 m high (Plots 2 and 3).
- Class B Woodland
  - Within the revegetation areas in the southern portion of the station precinct, comprising low shrub understorey and open canopy of trees (10-30%) (Plots 7,8).
- Class A Forest
  - within the revegetation areas to the west of Tonkin Highway and south of Benara road to the east of Tonkin Highway (Plots 4, 5, 6).

The project area and adjacent 150 m assessment area also contains land excluded from classification, including:

- vegetation that is more than 100 m from the proposed development area which is excluded under Clause 2.2.3.2 (a) (Plot 10).
- existing non-vegetated areas and low threat vegetation including residential lots, roads and managed verges, cultivated gardens and the future rail alignment, excluded under Clauses 2.2.3.2 (e) and (f) (Plot 11).
- areas of existing vegetation to be modified to non-vegetated areas and low threat vegetation as part of the proposed development in accordance with Clauses 2.2.3.2 (e) and (f) (Plot 12) include:
  - the APZs around the nominated buildings, which are to be managed in accordance with APZ standards of the Guidelines.
  - areas of the station precinct that are not proposed for revegetation which are to be managed as non-vegetated or low threat vegetation.

3.1.2 Effective slope

Linfire assessed effective slope under classified vegetation through on-ground verification on 22 September 2021 in accordance with AS 3959. Results were cross-referenced with Landgate 5m contour data and are depicted in Table 2 and Figure 3.

Site observations indicate that land within the project area and adjoining 150 m assessment area is predominantly flat/upslope or with a slight effective downslope of between 5-10º in relation to the project area. A steep but relatively short incline exists to the south of Benara Road and the Class A Forest vegetation has been mapped accordingly as having an effective downslope of >10-15º, with respect to onsite assets.

3.1.3 Summary of inputs

Table 2 illustrates the anticipated post-development vegetation classifications and exclusions following completion of development works, modification of applicable existing vegetation to a non-vegetated or low threat state and establishment of proposed revegetation treatments. The post-development vegetation classifications/exclusions and effective slope are summarised in Table 2.

Table 2: Post-development vegetation classifications/exclusions and effective slope

Vegetation plot	Vegetation classification	Effective slope	Comments
1	Class C Shrubland	Downslope >0–5°	Revegetation area to the north of the SER building.
2	Class D Scrub	Flat/upslope (0°)	Remnant scrub to the west of Tonkin Highway, <6 m height.
3	Class D Scrub	Downslope >0–5°	Remnant scrub to the west of Tonkin Highway, <6 m height.
4	Class A Forest	Flat/upslope (0°)	Revegetation areas consisting of canopy trees and understorey planting with an effective flat/upslope in relation to the project area.
5	Class A Forest	Downslope >0–5°	Revegetation areas consisting of canopy trees and understorey planting with an effective >0-5º downslope in relation to the project area.
6	Class A Forest	Downslope >10–15°	Revegetation area to the south of Benara Road with a steep downslope.
7	Class B Woodland	Flat/upslope (0°)	On-site revegetation in the south of the station precinct which will comprise shrubland understorey and overstorey trees with canopy coverage >30%.
8	Class B Woodland	Downslope >0–5°	On-site revegetation in the southeast of the station precinct with an effective downslope which will comprise shrubland understorey and overstorey trees with canopy coverage >30%.
10	Excluded – Clause 2.2.3.2 [a]	N/A	Remnant scrub vegetation located more than 100 m to the northwest of the project area.
11	Excluded – Non-vegetated and Low threat (Clause 2.2.3.2 [e] and [f])	N/A	Existing non-vegetated elements (buildings, roads etc) and low threat vegetation (managed verges, cultivated residential lots), adjacent to the project area.
12	Excluded – Non-vegetated and Low	N/A	Vegetation within the project area that will be modified to and maintained in a non-

Vegetation plot	Vegetation classification	Effective slope	Comments
	threat (Clause 2.2.3.2 [e] and [f])		vegetated/low threat state as part of the development.

Legend

- Site Photo
- Proposed Development
- Project Area
- 100m Assessment Area
- 150m Assessment Area
- Building Outline

Asset Protection Zone

- 10m
- 14m
- Vegetation Plot
- Cadastre

Classified Vegetation

- A.F orest
- B.W oodland
- C.S hrubland
- D.S crub
- Excluded Clause 2.2.3.2(a)
- Excluded Clause 2.2.3.2(e&f)
- Modified to non vegetated or low threat vegetation

Scale 1: 3,000

0 40 80 120 Metres

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Figure 3: Post-development vegetation classification and effective slope

3.2 Assessment outputs

3.2.1 Bushfire Attack Level (BAL) contour assessment

Linfire has undertaken a BAL contour assessment in accordance with Method 1 of AS 3959 for the project area (see Figure 4). The Method 1 procedure incorporates the following factors:

- state-adopted FDI 80 rating
- vegetation classification
- effective slope
- distance maintained between proposed development areas and the classified vegetation.

The BAL rating gives an indication of the level of bushfire attack (i.e. the radiant heat flux) that may be received by proposed future development and subsequently informs the standard of building construction and/or setbacks required for proposed habitable development to potentially withstand such impacts.

The BAL contours are based on:

- the vegetation classifications and effective slope observed at the time of inspection
- consideration of the post-development conditions resulting from on-site clearing and landscaping and resultant exclusions and separation distances achieved in line with the Development Plan and Sections 2.2 and 3.1.1.
- proposed revegetation within and external to the station precinct.
- ongoing management of on-site low-threat landscaping to enable exclusion as non-vegetated and low threat vegetation under Clauses 2.2.3.2 (e) and (f).

Should there be any changes in development design or classified vegetation extent that results in a modified BAL outcome, then the BAL contours will need to be reassessed.

The results of the BAL contour assessment are detailed in Table 3 and illustrated in Figure 4. Following implementation of low-threat/non-vegetated landscaping and Asset Protection Zones, the highest BAL applicable to the proposed habitable buildings and elements is BAL-29.

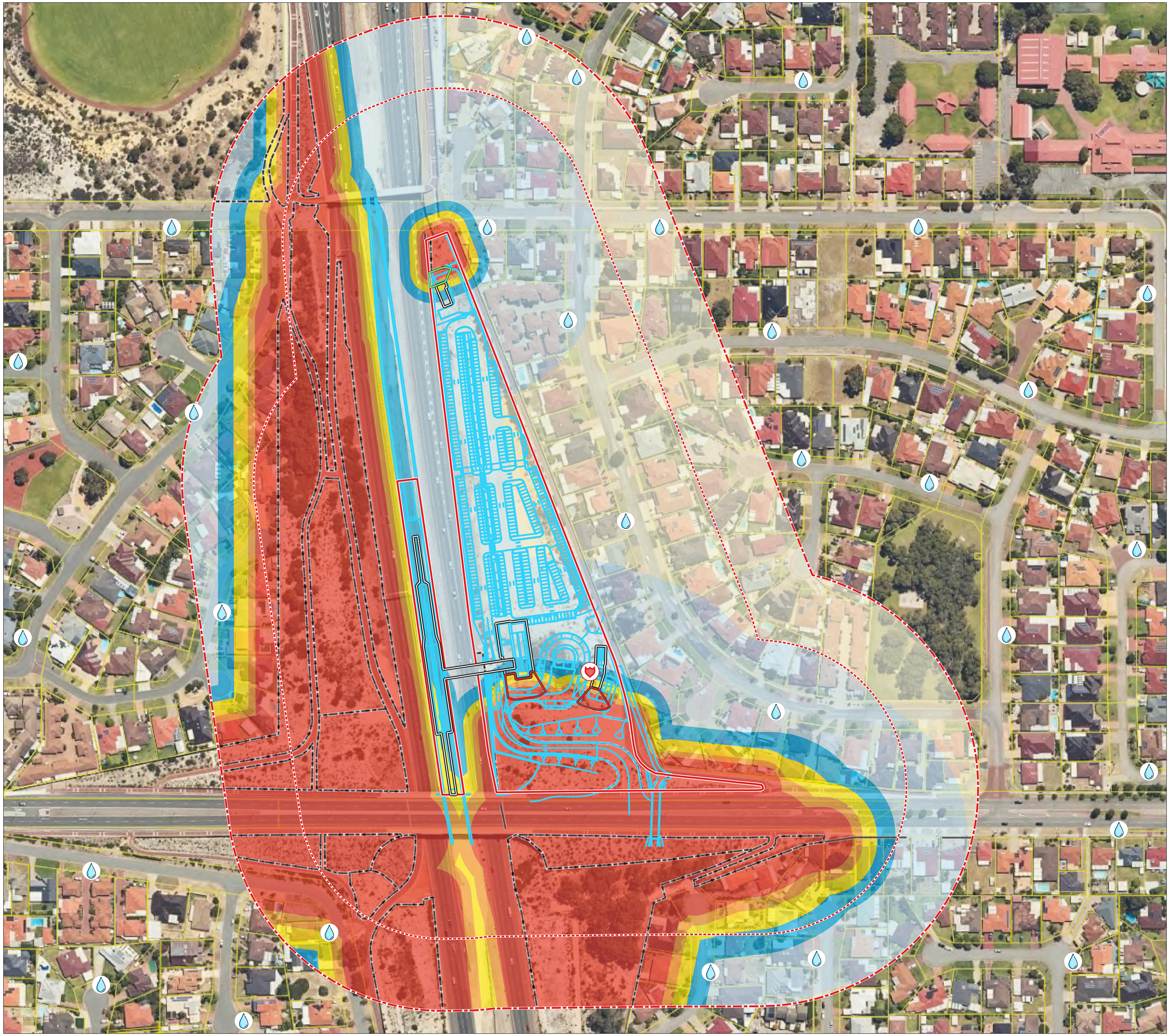
Table 3: BAL contour assessment results to proposed buildings and assets

Method 1 BAL determination				
Plot	**Vegetation classification**	**Effective slope**	**Separation distance**	**Highest BAL**
1	Class C Shrubland	Downslope >0–5°	10 m	BAL–29
2	Class D Scrub	Flat/upslope (0°)	21 m	BAL–19
3	Class D Scrub	Downslope >0–5°	>100 m	BAL–Low
4	Class A Forest	Flat/upslope (0°)	26 m	BAL–29
5	Class A Forest	Downslope >0–5°	32 m	BAL–29
6	Class A Forest	Downslope >10–15°	44 m	BAL–29
7	Class B Woodland	Flat/upslope (0°)	14 m	BAL–29
8	Class B Woodland	Downslope >0–5°	79 m	BAL–19
10	Excluded – Clause 2.2.3.2 [a]	N/A	N/A	BAL–Low

Table 4 lists the BAL applicable to each individual building or element within the proposed development.

Table 4: BAL applicable to each building/element

Building / element	Initial BAL (no management)	Proposed vegetation management	Revised BAL
Station building including lift lobby building (south of the main station canopy)	BAL–29	Permanent separation afforded by Tonkin Highway road reservation and dual use path	BAL–29
Signalling Equipment Room (SER) building	BAL–FZ	10 m wide APZ to the north of the building (clipped to the project area), toward the Class C Shrubland revegetation area.	BAL–29
Vertical Transport (VT) Building	BAL–FZ	14 m wide APZ to the south of the building, toward the Class B Woodland revegetation area.	BAL–29
Services building (including Fire Pumps, Tanks, Booster)	BAL–FZ	14 m wide APZ to the south of the building, toward the Class B Woodland revegetation area.	BAL–29



Legend

Fire Pumps, Tank, Booster

Street Hydrant

Proposed Development

Project Area

100m Assessment Area

150m Assessment Area

Building Outline

Asset Protection Zone

10m

14m

Vegetation Plot

Cadastre

BAL Contours

BAL FZ

BAL 40

BAL 29

BAL 19

BAL 12.5

BAL Low

Scale 1: 3,000

0 40 80 120 Metres

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Figure 4: BAL Contour Map and Bushfire Management Measures

4.0 Identification of bushfire hazard issues

4.1 Bushfire context

The project area is located within a predominantly built-up area, being surrounded by residential properties, managed parklands and major vehicular transport routes, including Tonkin Highway and Benara Road.

The nearest potential bushfire hazard is Lightning Swamp Bushland reserve which is located approximately 400 m to the northwest of the station precinct, across Tonkin Highway. This area of banksia dominated woodland is approximately 71 ha and has potential fire runs of up to 1.5 km toward the project area. The reserve is relatively isolated from any other areas of remnant vegetation but does have potential continuity with a narrow corridor of bushland running east-west between Mirrabooka Avenue (in the west) and Malaga Drive (in the east). However, the risk of landscape scale bushfire within the local area is very low, considering the developed landscape and limited areas of largely fragmented vegetation. In the instance of a bushfire occurring within Lightning Swamp Bushland to the north-west of the station, bushfire impact on the project area (most likely to be limited to ember attack) would be highest during summer northerly winds, which are uncommon but generally stronger than the predominant easterly and southwesterly winds for the locality.

The revegetation proposed within the project area and verges of the Tonkin Highway/Benara Road interchange will increase the bushfire hazards in proximity to the station precinct, however, this vegetation is isolated in nature, with limited potential to reach a fully developed state. As such, any bushfire occurring within the revegetation areas is expected to be limited to localised low-scale bushfire behaviour which would be easily contained by attending firefighting crews. Landscaping and revegetation proposed as part of the development has been designed to ensure that all habitable development will be located within an area subject to BAL-29 or lower.

Based on the above, bushfire impact to the proposed development is expected to be limited to localised fire behaviour from the surrounding freeway revegetation areas that would be easily managed through a direct fire suppression response. Notwithstanding, the habitable elements of the station precinct will be further protected from potential bushfire impacts through the provision of APZs to achieve BAL-29 and separation afforded by the public road network and low threat/non-vegetated landscaping and will be voluntarily constructed to meet AS 3959 BAL-12.5, where practicable.

4.2 Bushfire hazard issues

Examination of the environmental considerations (Section 2.0) and the bushfire risk assessment (Section 3.0) has identified the following bushfire hazard issues:

1. On-site revegetation in proximity to the proposed VT building, services building, and SER building will result in these buildings being subject to potential impact from a fire occurring within the woodland and shrubland type vegetation. Separation between the buildings and adjacent vegetation is to required to be provided by APZs, low threat vegetation or permanent non-vegetated elements.
2. Sufficient vehicular access is required to the proposed development, to enable egress by onsite occupants and to facilitate access for the fire brigade and emergency services.
3. Access to a sufficient bushfire fighting water supply is required to limit travel times to water supplies for appliance refills.
4. The proposed development constitutes a vulnerable land use, due to the presence of the public who may not be familiar with the facility or what to do in a bushfire emergency, potential evacuation challenges associated with the station and platform design, need

for provision of alternative transportation for passengers, and potential for occupants to have mobility or cognitive impairments.

4.3 Bushfire safety strategy

The following bushfire safety strategy is proposed to demonstrate compliance with the Bushfire Protection Criteria of the Guidelines and address the bushfire hazards identified above:

1. Create sufficient separation from on-site classified vegetation, by ensuring appropriately sized APZs are implemented around proposed buildings and assets to achieve BAL-29 or lower and comply with the APZ standards of the Guidelines. Given the low level of bushfire risk to the proposed development, an APZ to achieve BAL-29 will be implemented, with the buildings being constructed voluntarily to BAL-12.5, in recognition of the likely low levels of radiant heat impact and ember attack
2. Provision of compliant vehicular access within, to and from the proposed development, consisting of public roads and private driveways, to enable occupant egress and facilitate firefighter access to the project area and in particular the firewater supply.
3. Provision of a secure bushfire fighting water supply through installation of the proposed on-site fire hydrant system to provide hydrant coverage to the station building. Static water tanks on the hydrant system will also enable refill of bushfire fighting appliances from the fire booster connection.
4. Ensure appropriate bushfire emergency management procedures are incorporated into the overarching PTA EMM, to enable onsite staff to appropriately manage a bushfire event impacting the proposed development including:
    a. Monitoring of forecast Fire Danger Rating during bushfire season, and Total Fire Ban Days, to anticipate bushfire risk for the next day and consider pre-emptive actions
    b. Maintaining situational awareness during day in bushfire season by monitoring emergency services information
    c. Emergency management procedures for bushfire events including ceasing train and bus services and evacuating the train station.

Based on the above, Linfire considers the bushfire hazards within and adjacent to project area and the associated bushfire risks are manageable through standard management responses outlined in the Guidelines. These responses will be factored into proposed development as early as possible at all stages of the planning process to ensure a suitable, compliant and effective bushfire management outcome is achieved for protection of future life, property and environmental assets.

5.0 Assessment against the bushfire protection criteria

5.1 Compliance table

An assessment against the bushfire protection criteria is provided in Table 5.

Table 5: Compliance with the bushfire protection criteria of the Guidelines

Bushfire protection criteria				Development response		
Element	**Intent**	**Performance Principle**	**Acceptable solutions**	**Method of compliance**	**Proposed bushfire management measures**	**Compliance Comment**
Element 1: Location	To ensure that strategic planning proposals, subdivision and development applications are located in areas with the least possible risk of bushfire to facilitate the protection of people, property and infrastructure.	Performance Principle P1 Development location The strategic planning proposal, subdivision and development application is located in an area where the bushfire hazard assessment is or will, on completion, be moderate or low, or a BAL-29 or below, and the risk can be managed. For unavoidable development in areas where BAL-40 or BAL-FZ applies, demonstrating that the risk can be managed to the satisfaction of the Department of Fire and Emergency Services and the decision-maker.	A1.1 Development location The strategic planning proposal, subdivision and development application is located in an area that is or will, on completion, be subject to either a moderate or low bushfire hazard level, or BAL–29 or below.	**Acceptable Solution**	The BAL contour map (see Figure 4) indicates that all proposed buildings and infrastructure can be sited in an area of BAL-29 or lower, upon completion of development and implementation of the proposed Asset Protection Zones (APZs) and other onsite landscaping. Although the main station building and VT building are located in BAL-29, the decision has been made to voluntarily construct these buildings to achieve BAL-12.5, where practical, in recognition of the minimal risk of steady state bushfire impacting the project area, with the main risk being ember attack. The Proponent will incorporate BAL-12.5 construction elements to the station and VT buildings, where practicable given the building design.	Compliance with the Performance Principle and Intent of Element 1 is achieved through compliance with Acceptable Solution A1.1
Element 2: Siting and design of developme nt	To ensure that the siting and design of development minimises the level of bushfire impact.	Performance Principle P2 The siting and design of the strategic planning proposal, subdivision or development application, including roads, paths and landscaping, is appropriate to the level of bushfire threat that applies to the site. That it incorporates a defendable space and significantly reduces the heat intensities at the building surface thereby minimising the bushfire risk to people, property and infrastructure, including compliance with AS 3959 if appropriate.	A2.1 Asset Protection Zone (APZ) Every habitable building is surrounded by, and every proposed lot can achieve, an APZ depicted on submitted plans, which meets the following requirements: **Width**: Measured from any external wall or supporting post or column of the proposed building, and of sufficient size to ensure the potential radiant heat impact of a bushfire does not exceed 29kW/m² (BAL–29) in all circumstances. **Location:** the APZ should be contained solely within the boundaries of the lot on which the building is situated, except in instances where the neighbouring lot or lots will be managed in a low-fuel state on an ongoing basis, in perpetuity (see explanatory notes) **Management:** the APZ is managed in accordance with the requirements of 'Standards for Asset Protection Zones' (see Guidelines Schedule 1).	**Acceptable Solution**	On completion of development, the following APZs are to be implemented as non-vegetated elements and/or maintained low threat vegetation: • SER building: 10 m APZ to the north (clipped to the project area boundary) • VT building: 14 m APZ to the south. • Services building (housing fire pumps tank and booster). The station building and platform are subject to BAL-29 impacts through the permanent separation already afforded by Tonkin Highway and do not require formal separate APZs. The APZs are to be implemented and maintained in accordance with Schedule 1 of the Guidelines (see Appendix 2). All proposed APZs are located within the station precinct bounds.	Compliance with the Performance Principle and Intent of Element 2 is achieved through compliance with Acceptable Solution A2.1
Element 3: Vehicular access	To ensure that the vehicular access serving a subdivision/develop ment is available and safe during a bushfire event.	Performance Principle P3 The internal layout, design and construction of public and private vehicular access and egress in the subdivision / development allow emergency and other vehicles to move through it safely and easily.	A3.1 Two access routes Two different vehicular access routes are provided, both of which connect to the public road network, provide safe access and egress to two different destinations and are available to all residents/the public at all times and under all weather conditions.	**Acceptable Solution**	The station precinct is directly accessed from Benara Road, which enables access to surrounding urban areas which are at low risk of bushfire impact. Benara Road provides direct access to destinations to the west and east and being a major arterial road, has multiple connections to the public road network to the north and south. In this regard, the proposed development is provided with multiple access routes to multiple destinations.	Compliance with the Performance Principle and Intent of Element 2 is achieved through compliance with Acceptable Solution A3.1, and A3.5.
			A3.2 Public road	**Not applicable**	No new public roads are proposed as part of the development. The	

Bushfire protection criteria				Development response		
Element	**Intent**	**Performance Principle**	**Acceptable solutions**	**Method of compliance**	**Proposed bushfire management measures**	**Compliance Comment**
			A public road is to meet the requirements in Table 2, Column 1.		existing public roads sighted around the project area appeared compliant with public road specifications of the Guidelines and are considered sufficient for emergency egress or firefighter access to the site.	
			A3.3 Cul-de-sac (including a dead-end-road) A cul-de-sac and/or a dead-end road should be avoided in bushfire prone areas. Where no alternative exists (i.e. the lot layout already exists and/or will need to be demonstrated by the proponent), detailed requirements will need to be achieved (refer to the Guidelines for detailed cul-de-sac requirements).	**Not applicable**	No cul-de-sacs are proposed as part of the development and the project area is not serviced by an existing cul-de-sac.	
			A3.4 Battle-axe Battle-axe access leg's should be avoided in bushfire prone areas. Where no alternative exists, (this will need to be demonstrated by the proponent) detailed requirements will need to be achieved (refer to the Guidelines for detailed battle-axe requirements).	**Not applicable**	No battle-axe legs are proposed as part of the development and the project area is not serviced by an existing battle-axe.	
			A3.5 Private driveway longer than 50 m A private driveway is to meet detailed requirements (refer to the Guidelines for detailed private driveway requirements).	**Acceptable Solution**	The proposed internal road network is depicted in Figure 2, and comprise: • entrance from Benara Road • loop road servicing services enclosure and kiss'n'ride drop off area • access roads to and around the carpark and to the SER building. The internal road network will be constructed in accordance with technical requirements of the Guidelines for private driveways (see Appendix 4). Most proposed roads will exceed 6 m in width, so passing bays are not considered to be required within the project area. Similarly compliant turning arrangements are provided and no dead-ends are proposed. Keys to any locked access gates (e.g. to the SER compound) are to be made available to onsite PTA staff and to local DFES brigades, to enable them to be unlocked in an emergency.	
			A3.6 Emergency access way An access way that does not provide through access to a public road is to be avoided in bushfire prone areas. Where no alternative exists (this will need to be demonstrated by the proponent), an emergency access way is to be provided as an alternative link to a public road during emergencies. An emergency access way is to meet detailed requirements (refer to the Guidelines for detailed EAW requirements).	**Not applicable**	Emergency access ways (EAWs) are not required to provide through access to a public road. The project area is serviced by compliant public road arrangements.	
			A3.7 Fire service access routes (perimeter roads) Fire service access routes are to be established to provide access within and around the edge of the subdivision and	**Not applicable**	The internal road network will provide perimeter access around the project area. In this regard, the proposed development does not require fire service access routes (FSARs).	

Bushfire protection criteria				Development response		
Element	**Intent**	**Performance Principle**	**Acceptable solutions**	**Method of compliance**	**Proposed bushfire management measures**	**Compliance Comment**
			related development to provide direct access to bushfire prone areas for fire fighters and link between public road networks for firefighting purposes. Fire service access routes are to meet detailed requirements (refer to the Guidelines for detailed fire service access route requirements).			
			A3.8 Firebreak width Lots greater than 0.5 hectares must have an internal perimeter firebreak of a minimum width of three metres or to the level as prescribed in the local firebreak notice issued by the local government.	**Not applicable**	On completion of development, the project area will be developed with non-vegetated surfaces, low-threat landscaping and will be provided with an access road in proximity to the external boundaries of the station precinct. In this regard, formal firebreaks are not considered to be required.	
Element 4: Water	To ensure that water is available to the subdivision, development or land use to enable people, property and infrastructure to be defended from busfire.	Performance Principle P4 The subdivision, development or land use is provided with a permanent and secure water supply that is sufficient for firefighting purposes.	A4.1 Reticulated areas The subdivision, development or land use is provided with a reticulated water supply in accordance with the specifications of the relevant water supply authority and Department of Fire and Emergency Services.	**Not applicable**	The proposed development is located within an existing reticulated area, with the nearest fire hydrant being located on Bluegum Drive, to the east, approximately 520 m driving distance from the station precinct. Whilst the project area is located near these street hydrants, the main bushfire fighting water supply is likely to be accessed from the dedicated onsite fire hydrant system detailed below in A4.2 below.	Compliance with the Performance Principle and Intent of Element 4 is achieved through compliance with Acceptable Solution A4.2
			A4.2 Non-reticulated areas Water tanks for firefighting purposes with a hydrant or standpipe are provided and meet detailed requirements (refer to the Guidelines for detailed requirements for non-reticulated areas).	**Acceptable Solution**	The proposed development is to have an on-site fire hydrant system, designed, installed and maintained in accordance with the National Construction Code and relevant Australian Standards. The fire hydrant system is expected to include dedicated firewater storage tanks and duty/standby and booster connection situated near the services enclosure in the east of the site and serviced by the internal loop road. Onsite fire hydrants will be sited throughout the development and will provide attending fire fighters with fire hydrant coverage of the railway station, including the platform and concourse levels. Given the onsite water storage (and infill) associated with the proposed wet fire systems, the addition of an extra 50 kL to the proposed storage capacity for bushfire fighting purposes is considered appropriate. This static water supply will be available for attending firefighters from the firewater storage tanks, via the booster connection. Appliance turnaround will be achieved using the loop road within the bus interchange. The firewater tank/s are to be installed, filled and maintained for the life of the project by the Proponent.	
			A4.3 Individual lots within non-reticulated areas (Only for use if creating 1 additional lot and cannot be applied cumulatively) Single lots above 500 m^2 need a dedicated static water supply on the lot that has the effective capacity of 10,000 L.	**Not applicable**	The proposed development is being addressed in accordance with A4.2	

5.2 Additional management strategies

Linfire makes the following specific/additional bushfire management recommendations to inform ongoing planning stages of the development and increase the level of bushfire risk mitigation across the site.

5.2.1 Onsite landscaping and revegetation

The BAL contour assessment is reliant on all landscaping and revegetation being implemented in accordance with the endorsed Landscape Plan and in accordance with provisions with this BMP.

Proposed revegetation to the north of the SER building is to be established as a shrubland vegetation structure and revegetation in the south of the project area is to be maintained as a woodland vegetation structure as per AS 3959.

Repsonsiblities for maintenance of landscaping are discussed in Table 6.

5.2.2 Road verge fuel management

Existing and proposed public road verges that have been excluded as low threat are to be managed to ensure the understorey and surface fuels remain in a low threat, minimal fuel condition in accordance with Clause 2.2.3.2 (f) of AS 3959. Ongoing management of proposed internal road verges is the responsibility of the Proponent, until handed over to the City, with management of any existing road verges to continue to be the responsibility of the City.

5.2.3 Building construction standards

The proposed development does not include any Class 1, 2, or 3 residential buildings and associated Class 10a structures, and as such, there is no statutory requirement for proposed buildings to meet the construction requirements of AS 3959.

However, in recognition for the potential bushfire risk to the project area, limited as it is, the Proponent has agreed to review the construction of the main station building and VT building, and where practical for buildings of this nature, voluntarily incorporate BAL-12.5 construction measures. where practical for buildings of this nature. Although these buildings are situated within a location of BAL-29, BAL-12.5 construction is considered appropriate given the risk to the buildings from bushfire attack is low and likely limited to low levels of radiant heat and ember attack.

5.2.4 Vulnerable land use and recommended development condition

The proposed development constitutes a vulnerable land use. On this basis, a Bushfire Emergency Evacuation Plan (BEEP) is required to address the requirements of Policy Measure 6.6.1 of SPP 3.7.

The preference is that the BEEP is not prepared at this time but is included as a future implementation measure within this BMP and conditioned as part of the DA approval. Instead of producing a standalone BEEP for the station, the ideal approach is to incorporate the proposed bushfire emergency management arrangements for this station into the existing PTA Emergency Management Manual (EMM) to standardise the procedures. To achieve this, there is a significant liaison process to be undertaken with PTA and given occupation of the station by vulnerable occupants (i.e the public) is to be in 2024, there is considerable time to define these arrangements.

Based on the above, the following is proposed:

- The preparation, endorsement, and implementation of the bushfire emergency management arrangements (preferably within the PTA EMM) is specifically nominated as a condition of development approval (see Section 5.2.4.1)

- The bushfire emergency management arrangements consider the proposed philosophies outlined in Section 5.2.4.2, which have been included to provide some guidance about the overall strategy.

5.2.4.1 Recommended development condition

The following condition is recommended for the development application approval (subject to WAPC wording):

Bushfire emergency management procedures, detailing the management of vulnerable occupants at the proposed station, is to be prepared, endorsed by WAPC and implemented prior to occupation by any vulnerable occupants (i.e. the public). The proposed emergency management procedures will preferably be incorporated into the overarching PTA Emergency Management Manual (EMM) as standardised procedures, however it may also be documented within a standalone BEEP for the station that is aligned with the EMM.

5.2.4.2 Indicative Bushfire Emergency Management Procedures

It is expected that the bushfire emergency management procedures or arrangements would consider the following, to be incorporated into the PTA EMM (or a standalone BEEP that aligns with the EMM):

- Monitor the forecast Fire Danger Rating (FDR) each day (at 4pm) to enable consideration of any pre-emptive actions including
  - Heighten alertness for staff and public, including warnings when FDR is Extreme or Catastrophic
  - Consider adding extra staff to manage a bushfire emergency
  - Buses on standby for evacuation
  - DFES liaison
- Consider similar pre-emptive actions to the above, when a Total Fire Ban is declared and ensure no hot works or no other activities that may start a fire are conducted.
- Monitor emergency services information during the day (especially during bushfire season or days with elevated FDR) and conduct regular visual assessments, to maintain situation awareness during these days.
- Consider triggers for:
  - Alerting DFES
  - Ceasing train and bus services to train stations
  - Evacuating train station
  - This above would likely be station specific triggers
- Consider using Transperth buses for offsite evacuation of occupants
- Otherwise utilising the existing relevant PTA emergency management procedures and infrastructure as much as possible from the EMM, to manage bushfire emergencies.
- Ensure sufficient training for staff and regular exercise drills are conducted

5.2.5 BAL compliance and/or BAL assessment report

A BAL compliance and/or BAL assessment report may be prepared at the discretion of the City following completion of construction works and prior to issue of certificate of occupancy to validate and confirm the accuracy of the BAL contour assessment.

5.2.6 Compliance with annual firebreak notice

The Proponent or landowner is to comply with the current City of Bayswater annual firebreak notice as amended (refer Appendix 5).

6.0 Responsibilities for implementation and management of the bushfire measures

Implementation of the BMP applies to the Proponent (landowner, facility manager) and the City to ensure bushfire management measures are adopted and implemented on an ongoing basis. A bushfire responsibilities table is provided in Table 6 to drive implementation of all bushfire management works associated with this BMP.

Table 6: Responsibilities for implementation and management of the bushfire measures

Implementation/management table	
Decision maker – prior to development approval	
No.	*Implementation action*
1	Condition the preparation of the Bushfire Emergency Management Procedures for the station prior to occupation as part of the development approval
Proponent – prior to development occupation	
No.	*Implementation action*
1	Establish the Asset Protection Zones (APZs) around nominated buildings and infrastructure assets to the dimensions and standards stated in the BMP and Appendix 2.
2	Establish low threat landscaping throughout the project area in accordance with provisions of this BMP and endorsed Landscaping Plan
3	Establish on-site revegetation to Class C Shrubland or Class B Woodland structure (at maturity) to the standards stated within this BMP.
4	Install the private internal road network to the relevant technical requirements under the Guidelines (refer to Appendix 4). Ensure keys for any access gate keys are made available to onsite PTA staff and local DFES brigades.
5	Construct proposed onsite fire hydrant system for the proposed development, including the additional 50 kL firewater capacity in the tanks for bushfire fighting purposes as stated in this BMP.
6	Implement AS 3959 BAL-12.5 construction measures for the main station building and VT buildings, where practical for buildings of this nature.
7	Develop the Bushfire Emergency Management Procedures for the station, ideally incorporated into the PTA EMM, as documented in this BMP
8	Comply with the City of Bayswater annual firebreak notice issued under s33 of the Bush Fires Act 1954.
9	If required by the City, individual BAL assessment prior to issuing of building permits.
Proponent – ongoing	
No.	*Implementation action*
1	Maintain the Asset Protection Zones (APZs) around the nominated buildings and assets to the dimensions and standards stated in the BMP and Appendix 2.
2	Maintain low threat landscaping throughout the project area in accordance with provisions of this BMP and endorsed Landscaping Plan
3	Maintain on-site revegetation to Class C Shrubland or Class B Woodland structure (at maturity) to the standards stated within this BMP.
4	Maintain the private internal road network to the relevant technical requirements under the Guidelines
5	Maintain the onsite fire hydrant system in accordance with relevant Australian Standards and the standard stated in the BMP.

Implementation/management table	
6	Conduct ongoing review of the Bushfire Emergency Management Procedures to ensure they remain appropriate to the facility
7	Comply with the City of Bayswater annual firebreak notice issued under s33 of the Bush Fires Act 1954.
Local government – ongoing management	
No.	*Implementation action*
1	Maintain road verges in a low threat minimal fuel condition as per Clause 2.2.3.2 (f) of AS 3959.

7.0 References

Department of Fire and Emergency Services (DFES) 2019, *Map of Bush Fire Prone Areas*, [Online], Government of Western Australia, available from: https://maps.slip.wa.gov.au/landgate/bushfireprone/,.

Department of Planning (DoP) 2016, *Visual guide for bushfire risk assessment in Western Australia*, Department of Planning, Perth.

Standards Australia (SA) 2018, Australian Standard *AS 3959–2018 Construction of Buildings in Bushfire-prone Areas*, Standards Australia, Sydney.

Western Australian Planning Commission (WAPC) 2015, *State Planning Policy 3.7 Planning in Bushfire Prone Areas*, Western Australian Planning Commission, Perth.

Western Australian Planning Commission (WAPC) 2017, *Guidelines for Planning in Bushfire Prone Areas*, Version 1.3 August 2017, Western Australian Planning Commission, Perth.

Appendix 1: Landscaping Plans

LEGEND

- P2-01A In-situ Coloured Concrete Pavement, Exposed-Aggregate
  Refer Engineer's Documentation and Material Schedule.
- P2-21B In-situ Standard Grey Concrete Pavement, Broom Finished
  Refer Engineer's Documentation and Material Schedule.
- P3-04A Stone Unit Pavement
  Refer Engineer's Documentation and Material Schedule.
- P6-01A Asphaly, Red
  Refer PTA Specification and Material Schedule.
- P6-01A Asphaly, Red
  Refer PTA Specification and Material Schedule.
- PV04A Tactile Concrete Unit Pavement - Dot
  Refer Detail and Material Schedule.
- PV04B Tactile Concrete Unit Pavement - T-Bar
  Refer Detail and Material Schedule.
- P7-01A Cement Stablised Granitic Gravel
  Refer Detail and Material Schedule.
- W2-00A Concrete Wall, 450mm Wide, Honed
  Refer Detail and Material Schedule.
- W4-00A Concrete Wall, 150mm Wide, Honed
  Refer Detail and Material Schedule.
- Landscape Works Boundary.
- Cadastral Boundary.
- Fenceline
  Refer Civil Engineers' Documentation.
- Overhead Architecture Canopy
  Refer Architecture Documentation.

- F1-01A Bike Hoop
  Refer Material Schedule
- F2-01A Dual Bin Enclosure
  Refer Material Schedule.
- F3-01A Drinking Fountain with 'Dog Watering Bowl'
  Refer Material Schedule.
- F4-01A Bench Seat
  Refer Material Schedule.
- F5-01A Maintenance Pillar - Dual Use Multiple GPO / Water Outlet
  Refer Material Schedule.
- F7-01A Core Drilled SS Bollard
  Refer Material Schedule.
- F7-01B Removable SS Bollard
  Refer Material Schedule.
- Existing Street Light Pole
- LU01 Light Unit 01 - Pole-top Light
  Refer Material Schedule and Public Realm Decorative Lighting Strategy.
- E4-01A 20-100mm Laterite Gravel Anti-Scour Edge
  Refer Material Schedule and Civil Engineer's Documentation
- E5-01A Standard Softscape Maintenance Edge (sub-surface, concealed. between pavement and softscape)
  Refer Material Schedule.
- RL 47000 Spot Height (mm)
  Refer Grading Plans.

- G1-00A High Quality Amenity Planting
  Refer Detail and Planting Schedule.
- G2-00A Standard Amenity Planting
  Refer Detail and Planting Schedule.
- G3-00A Basic Amenity Planting
  Refer Detail and Planting Schedule.
- G4-00A Basin
  Refer Detail and Planting Schedule.
- G7-00A Tubestock Revegetation
  Refer Detail and Planting Schedule.
- G8-00A Mulch Only
  Refer Detail and Planting Schedule.
- LAWN Irrigated Lawn
  Refer Detail and Material Schedule.

- T1-00A 1500L Tree
  Refer Detail and Planting Schedule.
- T2-00A 500L Tree
  Refer Detail and Planting Schedule.
- T3-00A 200L Tree
  Refer Detail and Planting Schedule.
- T4-00A 100L Tree
  Refer Detail and Planting Schedule.
- T5-00A 45L Tree
  Refer Detail and Planting Schedule.

NOTES:

1. DRAWINGS SHALL BE READ IN CONJUNCTION WITH ALL RELEVANT DOCUMENTATION (INCLUDING THAT OF DISCIPLINES INTERFACING WITH LANDSCAPE WORKS) PRIOR TO COMMENCEMENT OF WORKS. RELEVANT DOCUMENTATION SHALL INCLUDE BUT IS NOT LIMITED TO:
   - THE CONTRACT;
   - RELEVANT LEGISLATION, STANDARDS AND CODES OF PRACTICE;
   - LANDSCAPE AND IRRIGATION DRAWINGS, TECHNICAL SPECIFICATONS, SCHEDULES AND REPORTS;
   - ARCHITECTURAL DRAWINGS, TECHNICAL SPECIFICATONS, SCHEDULES AND REPORTS;
   - STRUCTURAL, CIVIL, SERVICES ENGINEERING DRAWINGS, TECHNICAL SPECIFICATONS, SCHEDULES AND REPORTS;
   - INSTRUCTIONS, CONSULTANT ADVICE NOTES AND ANY OTHER CONTRACTUAL NOTIFICATIONS FROM THE MANAGING CONTRACTOR;
   - REPORTS AND STUDIES, INCLUDING ENVIRONMENTAL, ARBORICULTURAL, GEOTECHNICAL, BUSHFIRE, HERITAGE, ETC;
   - BILLS OF QUANTITIES (WHERE PROVIDED);
   - ANY OTHER INFORMATION DEEMED PERTINENT BY THE MANAGING CONTRACTOR.
2. THESE DRAWINGS HAVE BEEN BASED ON A COMPILATION OF INFORMATION AND BASE DATA (INCLUDING DRAWINGS AND MODELS PROVIDED BY OTHER DISCIPLINES) AVAILABLE AT THE TIME OF PRODUCTION. THE LANDSCAPE DESIGN AND DOCUMENTATION IS RELIANT ON THE ACCURACY AND COMPLETENESS OF INFORMATION PROVIDED BY OTHERS. NO RESPONSIBILITY IS TAKEN FOR THE QUALITY OR COMPLETENESS OF INFORMATION FROM OTHERS ON WHICH THE LANDSCAPE DESIGN IS RELIANT.
3. ANOMALIES, OMISSIONS, ERRORS OR DISCREPENCIES IN THE PROJECT DOCUMENTATION ARE TO BE REFERRED TO THE MANAGING CONTRACTOR AND RELEVANT DISCIPLINE SRE'S IMMEDIATELY UPON DISCOVERY FOR DETERMINATION OF RESOLUTION AND SUBSEQUENT INSTRUCTION PRIOR TO CONTINUATION OF WORKS.
4. THE CONTRACTOR AND SUB-CONTRACTORS SHALL VERIFY ALL DIMENSIONS, SET-OUT, LEVELS, EXISTING AND PROPOSED INTERFACING WORKS (INCLUDING SERVICES AND SUB-SURFACE WORKS) PRIOR TO COMMENCEMENT ON SITE, PREPARATION OF DETAIL/SHOP DRAWINGS, AND FABRICATION OF CONSTRUCTION / BUILDING COMPONENTS
5. SET-OUT OF ALL WORKS SHALL BE UNDERTAKEN BY LICENSED SURVERYOR UTILISING 'ISSUE FOR CONSTRUCTION' DIGITAL FILES. LEVELS TO BE VERIFIED AGAINST THE 'ISSUE FOR CONSTRUCTION' DRAWINGS.
6. ALL DIMENSIONS ARE IN MM. DO NOT SCALE OFF DRAWINGS.
7. THE CONTRACTOR IS TO PROVIDE SHOP DRAWINGS (CAD DRAFTED TO SCALE WITH ADEQUATE NOTES AND DIMENSIONS FOR REVIEW AND FABRICATION) TO THE MANAGING CONTRACTOR FOR REVIEW PRIOR TO FABRICATION. FIXING AND FASTENING SELECTIONS ARE TO BE CONFIRMED VIA THE SHOP DRAWING PROCESS IN ACCORDANCE WITH THE AESTHETIC AND STRUCTURAL REQUIREMENTS OF THE DESIGN DOCUMENTATION.
8. WHERE STRUCTURAL FIXINGS AND CONNECTIONS AND / OR THEIR SET-OUT HAVE NOT BEEN NOMINATED IN THE DOCUMENTATION, THE CONTRACTOR IS TO VERIFY SUITABLE SELECTIONS AND SET-OUT WITH THE MANAGING CONTRACTOR PRIOR TO FABRICATION.
9. CONSTRUCTION WORKS SHALL ONLY BE UNDERTAKEN ON RECEIPT OF 'ISSUE FOR CONSTRUCTION' DOCUMENTATION.
10. TREES IDENTIFIED FOR RETENTION IN THE DOCUMENTS SHALL BE PROTECTED FOR THE DURATION OF CONSTRUCTION WORKS IN ACCORDANCE WITH TREE PROTECTION SPECIFICATIONS. *[NB. TREE SPECIFICATIONS ARE SUBJECT TO DEVELOPMENT AND CONFIRMATION IN THE NEXT DESIGN STAGE].*
11. ALL PAVED SURFACES ARE TO BE CONSTRUCTED IN COMPLIANCE WITH PROJECT 'DESIGN FOR DISABLED ACCESS' (DDA) REQUIREMENTS AND AS1428. DISCREPENCIES IN THE DOCUMENTATION PERTAINING TO PAVEMENT DESIGN AND DDA REQUIREMENTS ARE TO BE REFERRED TO THE MANAGING CONTRACTOR FOR RESOLUTION.
12. ALL SURFACES SHALL BE FREE-DRAINING. THE CONTRACTOR SHALL ENSURE SURFACES GRADES FALL AWAY FROM BUILDINGS, STRUCTURES, FURNITURE, KERB RAMPS AND PATHS OF TRAVEL.
13. SET-OUT AND SELECTION OF LIGHT FITTINGS ARE A WORK IN PROGRESS AND ARE NOT YET CAPTURED IN THE LANDSCAPE DOCUMENTATION FOR REFERENCE DESIGN. LIGHTING DETAILS WILL BE CONFIRMED IN THE NEXT PHASE OF DESIGN. IN THE INTERIM, PLEASE REFER TO PRELIMINARY LIGHTING STRATEGIES RD_LA_SK035 / RD_LA_SK038 FOR LIGHTING INTENT.
14. UNIT PAVING HEADER COURSES ARE NOT SHOWN DISTINCTLY ON FINISHES PLANS, REFER MATERIAL SCHEDULE FOR REQUIREMENTS.

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REV	DATE	AMENDMENT	DSN	DRN	CHK	APP
A04	04/11/21	Issue for RD	TCL	EL	SL	SL
A03	30/09/21	Issue for IDC	TCL	EL	SL	SL
A02	02/09/21	Issue for IDC	TCL	EL	SL	SL
A01	04/08/21	Issue for 50% RD	TCL	EL	SL	SL

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MEL CONNX

REFERENCES

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DATUM
HORIZONTAL: PCG2020
VERTICAL: AHD71

DESIGNED UDLA & TCL
DRAWN Enoch Liew
CHECKED Scott Lang
APPROVED Manoj Aravind
DATE 04/11/21

Government of Western Australia Public Transport Authority

MORLEY ELLENBROOK LINE

NORANDA STATION - LANDSCAPE ARCHITECTURE
LEGEND & NOTES

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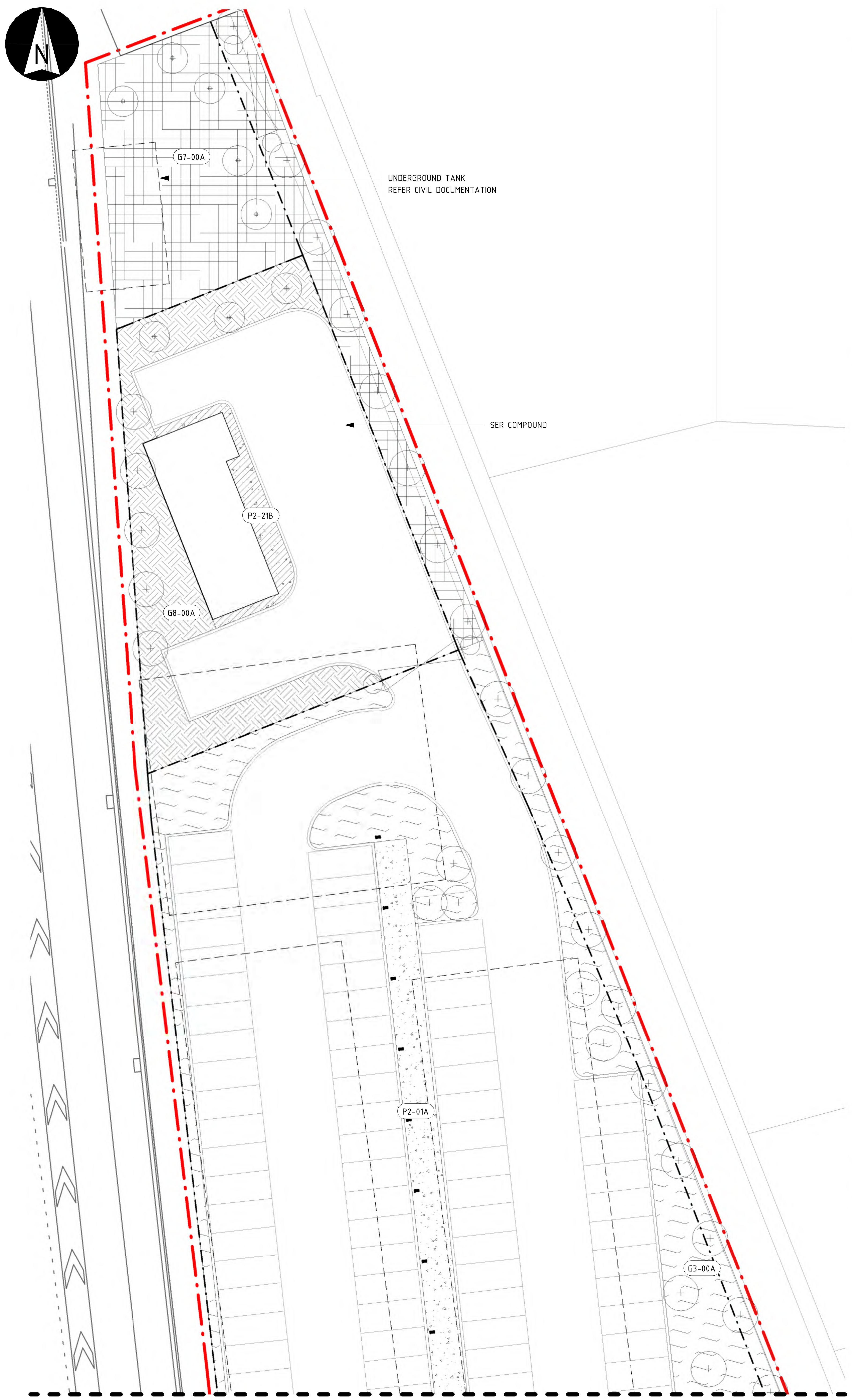

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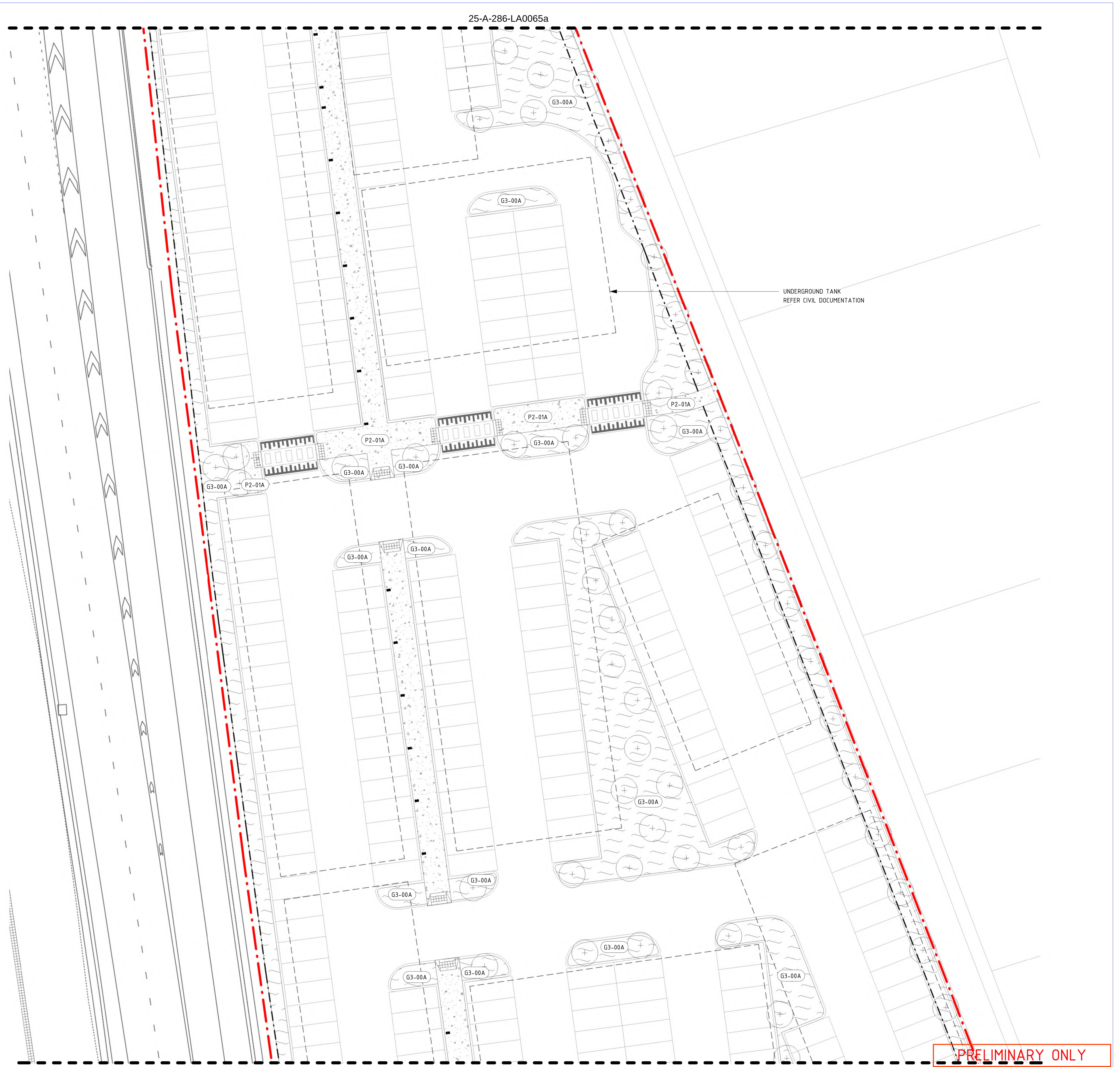

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VERTICAL: AHD71

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DRAWN Enoch Liew
CHECKED Scott Lang
APPROVED Manoj Aravind
DATE 04/11/21

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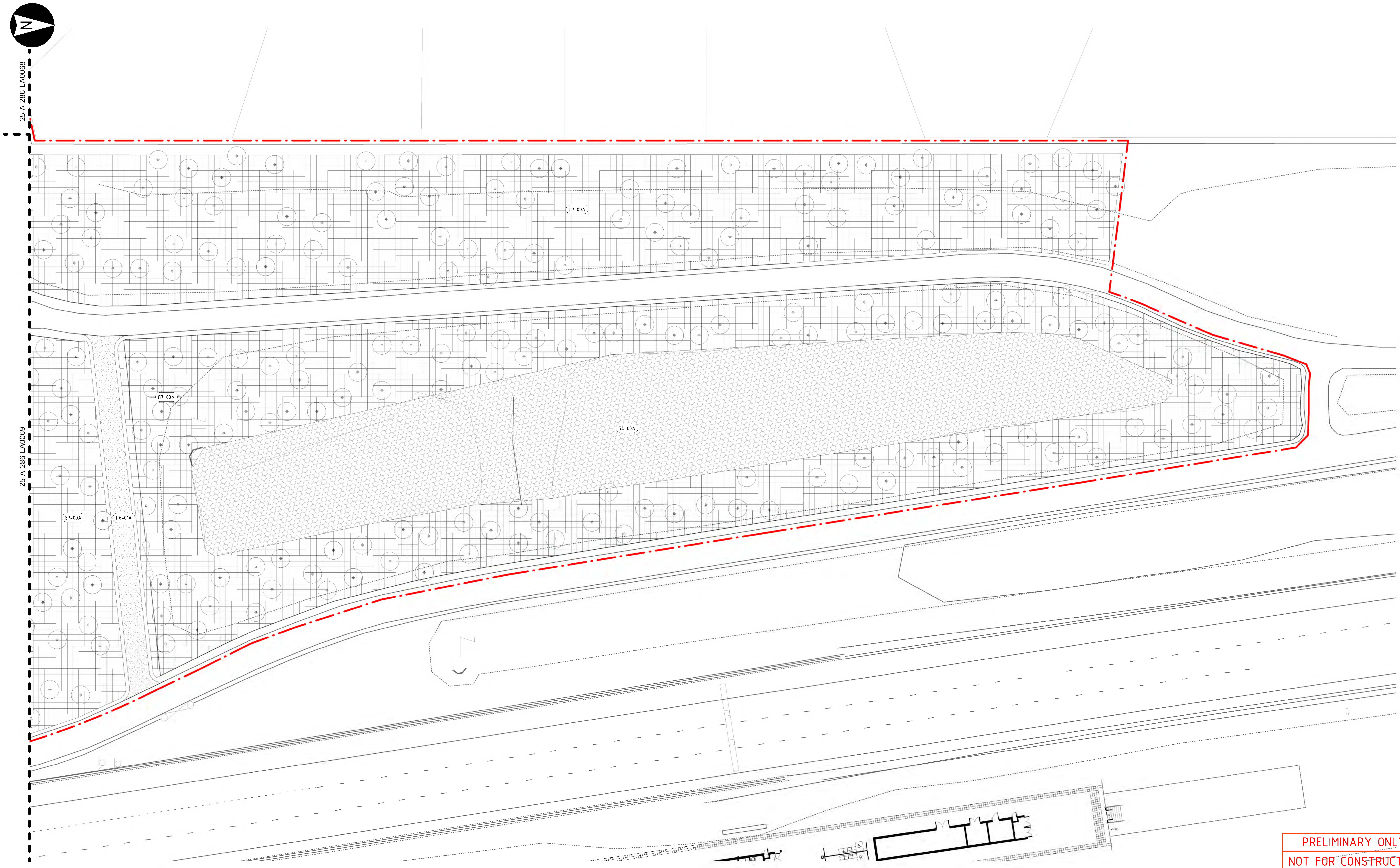

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NORANDA STATION - LANDSCAPE ARCHITECTURE
GENERAL ARRANGEMENT & FINISHES PLAN

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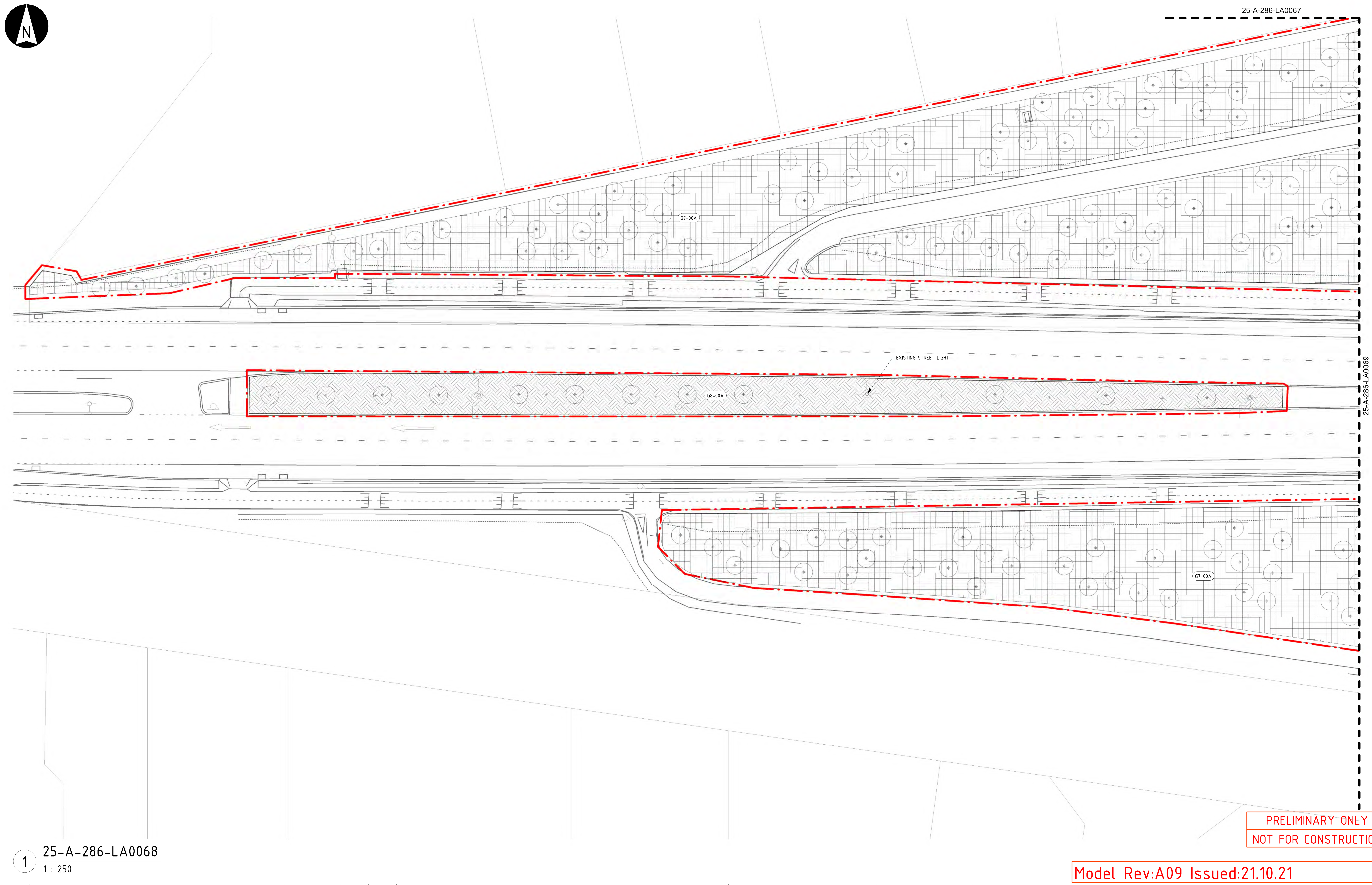

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CHECKED	Scott Lang
APPROVED	Manoj Aravind
DATE	04/11/21

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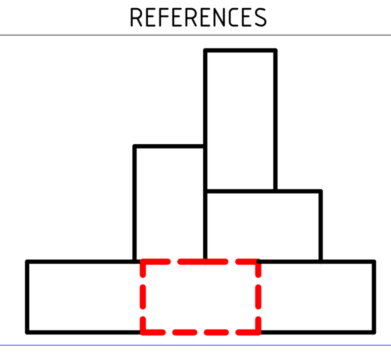

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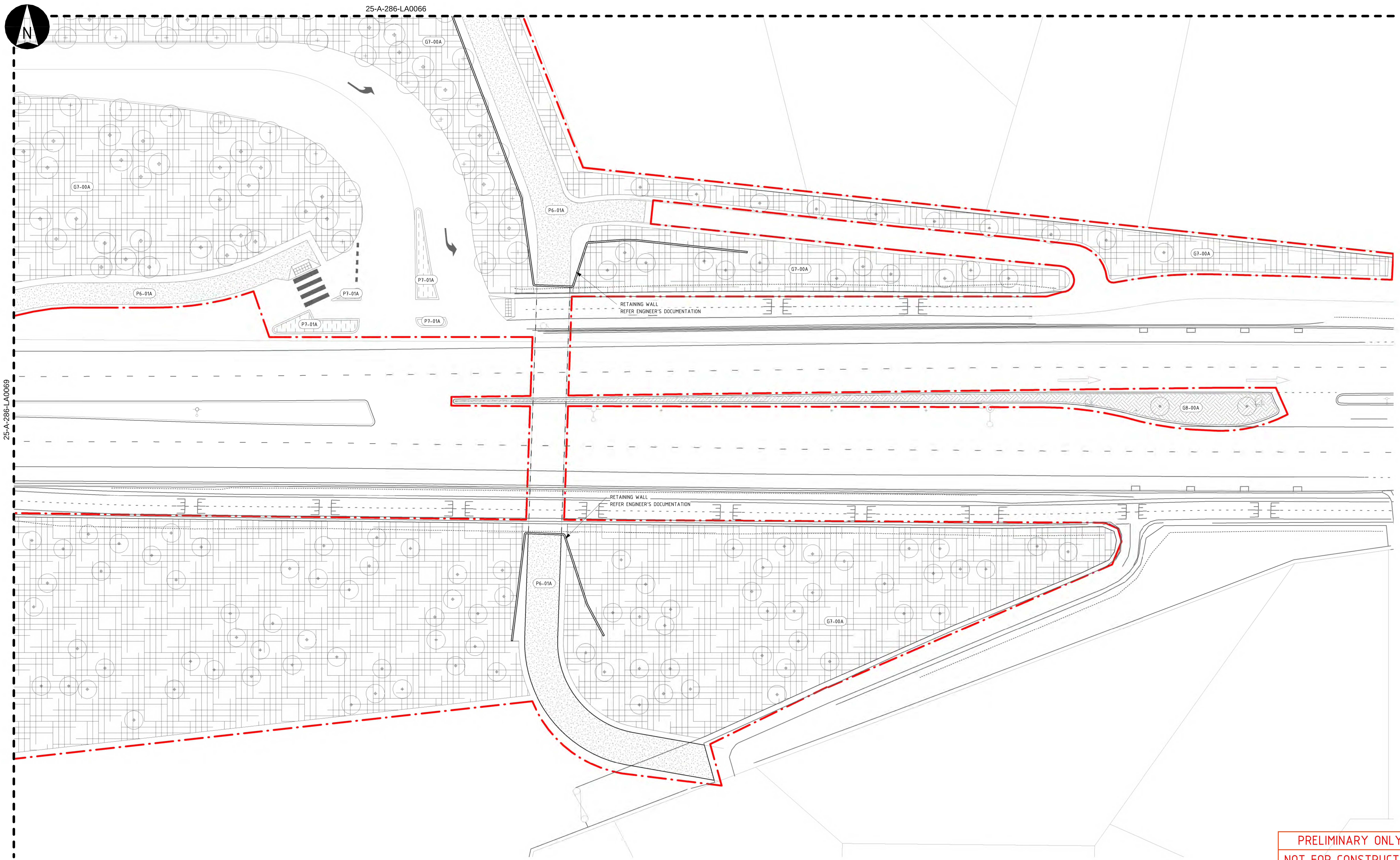
NORANDA STATION - LANDSCAPE ARCHITECTURE
GENERAL ARRANGEMENT & FINISHES PLAN

PTA Drawing No: 25-A-286-LA0069 Rev: A04



1 25-A-286-LA0070
1 : 250

PRELIMINARY ONLY
NOT FOR CONSTRUCTION

Model Rev:A09 Issued:21.10.21

REV	DATE	AMENDMENT	DSN	DRN	CHK	APP
A04	04/11/21	Issue for RD	TCL	EL	SL	SL
A03	30/09/21	Issue for IDC	TCL	EL	SL	SL
A02	02/09/21	Issue for IDC	TCL	EL	SL	SL
A01	04/08/21	Issue for 50% RD	TCL	EL	SL	SL

ORIG SIZE A1

0 10 20 30 40 50 100mm
AT ORIGINAL PLOT SIZE

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CAD DRAWING PATHNAME S:\JOB-LIVE\M2012\08 Doc\08-08 CAD\NORANDA\RVT\25-B-286-LA0001.rvt

MEL CONNX

REFERENCES

SCALE 1 : 250 (@ A1)

DATUM
HORIZONTAL: PCG2020
VERTICAL: AHD71

DESIGNED UDLA & TCL
DRAWN Enoch Liew
CHECKED Scott Lang
APPROVED Manoj Aravind
DATE 04/11/21

Government of Western Australia
Public Transport Authority

MORLEY ELLENBROOK LINE

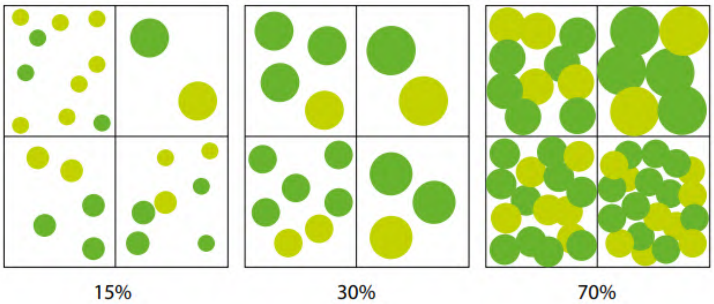
NORANDA STATION - LANDSCAPE ARCHITECTURE
GENERAL ARRANGEMENT & FINISHES PLAN

PTA Drawing No: 25-A-286-LA0070 Rev: A04

Appendix 2: APZ standards (Schedule 1 of the Guidelines)

Schedule 1: Standards for Asset Protection Zones

- **Fences:** within the APZ are constructed from non-combustible materials (e.g. iron, brick, limestone, metal post and wire). It is recommended that solid or slatted non-combustible perimeter fences are used.
- **Objects:** within 10 metres of a building, combustible objects must not be located close to the vulnerable parts of the building i.e. windows and doors.
- **Fine Fuel load:** combustible dead vegetation matter less than 6 millimetres in thickness reduced to and maintained at an average of two tonnes per hectare.
- **Trees (> 5 metres in height):** trunks at maturity should be a minimum distance of 6 metres from all elevations of the building, branches at maturity should not touch or overhang the building, lower branches should be removed to a height of 2 metres above the ground and or surface vegetation, canopy cover should be less than 15% with tree canopies at maturity well spread to at least 5 metres apart as to not form a continuous canopy.



- **Shrubs (0.5 metres to 5 metres in height):** should not be located under trees or within 3 metres of buildings, should not be planted in clumps greater than 5 m^2 in area, clumps of shrubs should be separated from each other and any exposed window or door by at least 10 metres. Shrubs greater than 5 metres in height are to be treated as trees.
- **Ground covers (<0.5 metres in height):** can be planted under trees but must be properly maintained to remove dead plant material and any parts within 2 metres of a structure, but 3 metres from windows or doors if greater than 100 millimetres in height. Ground covers greater than 0.5 metres in height are to be treated as shrubs.
- **Grass:** should be managed to maintain a height of 100 millimetres or less.

Appendix 3: Vegetation plot photos and description

Photo ID: 1a

Plot number		Plot 1
Vegetation classification	Pre-development	Class D Scrub
	Post-development	Class C Shrubland
Description / justification		Shrub vegetation less than 2 m high at maturity

Photo ID: 2a (note 1.2m fence for scale)

Photo ID: 2b (note 1.2m fence for scale)

Plot number		Plot 1
Vegetation classification	Pre-development	Class D Scrub
	Post-development	Class D Scrub
Description / justification		Vegetation with a continuous horizontal and vertical structure, greater than 2 m high at maturity

Photo ID: 2c (note 1.2m fence for scale)

Photo ID: 2d (note 1.2m fence for scale)

Plot number		Plot 2
Vegetation classification	Pre-development	Class D Scrub
	Post-development	Class D Scrub
Description / justification		Vegetation with a continuous horizontal and vertical structure, greater than 2 m high at maturity

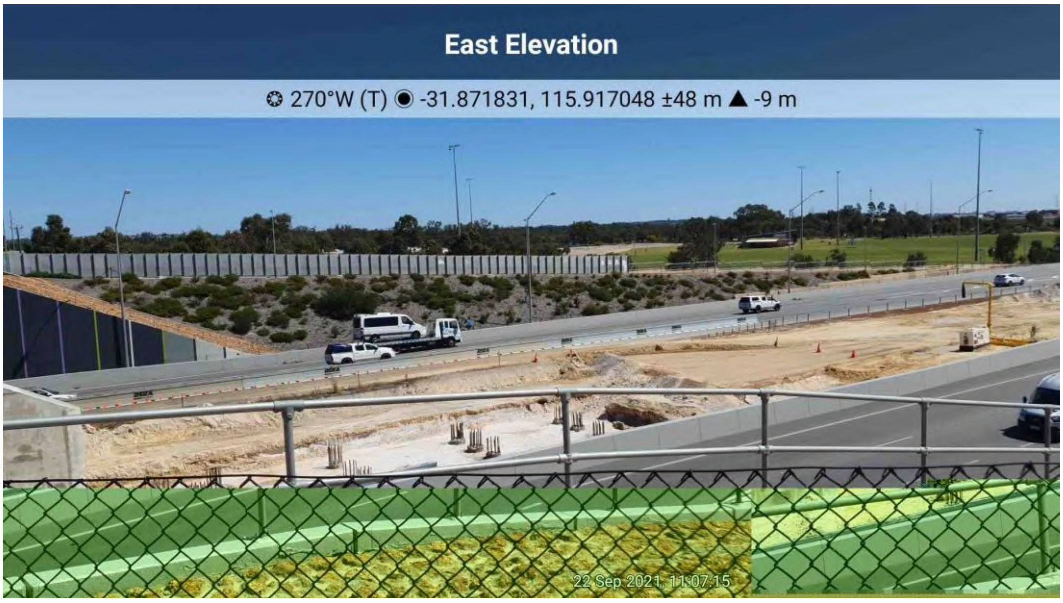


Photo ID: 3a

Plot number		Plot 3
Vegetation classification	Pre-development	Class D Scrub
	Post-development	Class D Scrub
Description / justification		Vegetation with a continuous horizontal and vertical structure, greater than 2 m high at maturity

Photo ID: 4a

Photo ID: 4b

Photo ID: 4c

Plot number		Plot 4
Vegetation classification	Pre-development	Class A Forest
	Post-development	Class A Forest
Description / justification		Trees 10-30 m high at maturity, dominated by Eucalypts, multi-tiered structure comprising tall canopy layer, shrubby middle layer and grass/herb/sedge understorey

Photo ID: 4d

Photo ID: 4e

Plot number		Plot 4
Vegetation classification	Pre-development	Class A Forest
	Post-development	Class A Forest
Description / justification		Trees 10-30 m high at maturity, dominated by Eucalypts, multi-tiered structure comprising tall canopy layer, shrubby middle layer and grass/herb/sedge understorey

Photo ID: 5a

Photo ID: 5b

Plot number		Plot 5
Vegetation classification	Pre-development	Class A Forest
	Post-development	Class A Forest
Description / justification		Trees 10-30 m high at maturity, dominated by Eucalypts, multi-tiered structure comprising tall canopy layer, shrubby middle layer and grass/herb/sedge understorey

Photo ID: 5c

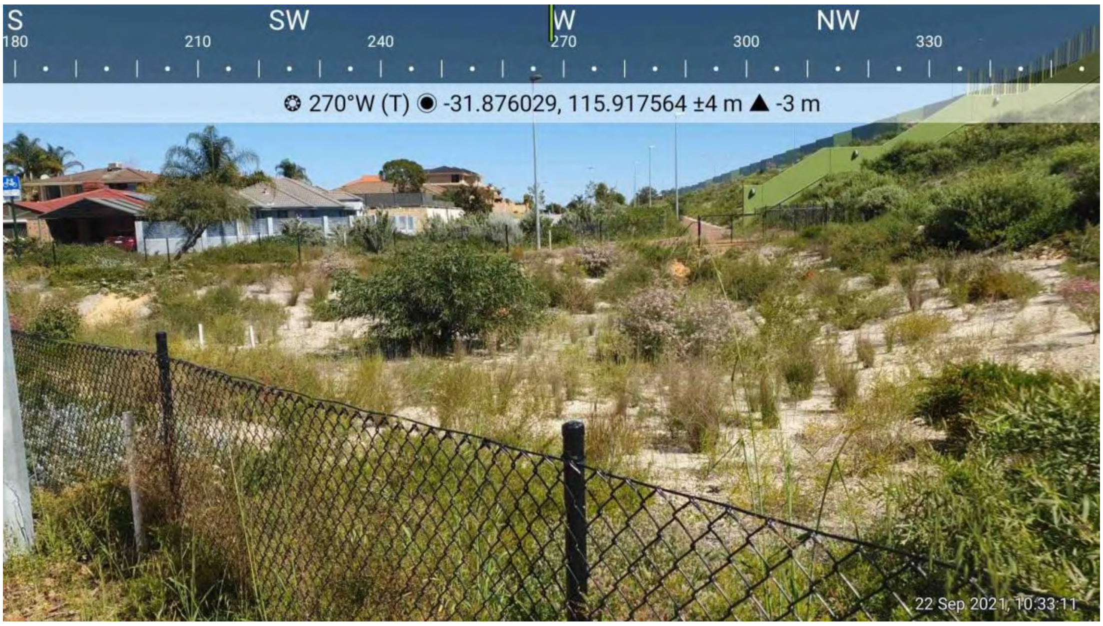


Photo ID: 5d

Plot number		Plot 5
Vegetation classification	Pre-development	Class A Forest
	Post-development	Class A Forest
Description / justification		Trees 10-30 m high at maturity, dominated by Eucalypts, multi-tiered structure comprising tall canopy layer, shrubby middle layer and grass/herb/sedge understorey

Photo ID: 5e

Photo ID: 5f

Plot number		Plot 5
Vegetation classification	Pre-development	Class A Forest
	Post-development	Class A Forest
Description / justification		Trees 10-30 m high at maturity, dominated by Eucalypts, multi-tiered structure comprising tall canopy layer, shrubby middle layer and grass/herb/sedge understorey

Photo ID: 5g

Plot number		Plot 5
Vegetation classification	Pre-development	Class A Forest
	Post-development	Class A Forest
Description / justification		Trees 10-30 m high at maturity, dominated by Eucalypts, multi-tiered structure comprising tall canopy layer, shrubby middle layer and grass/herb/sedge understorey

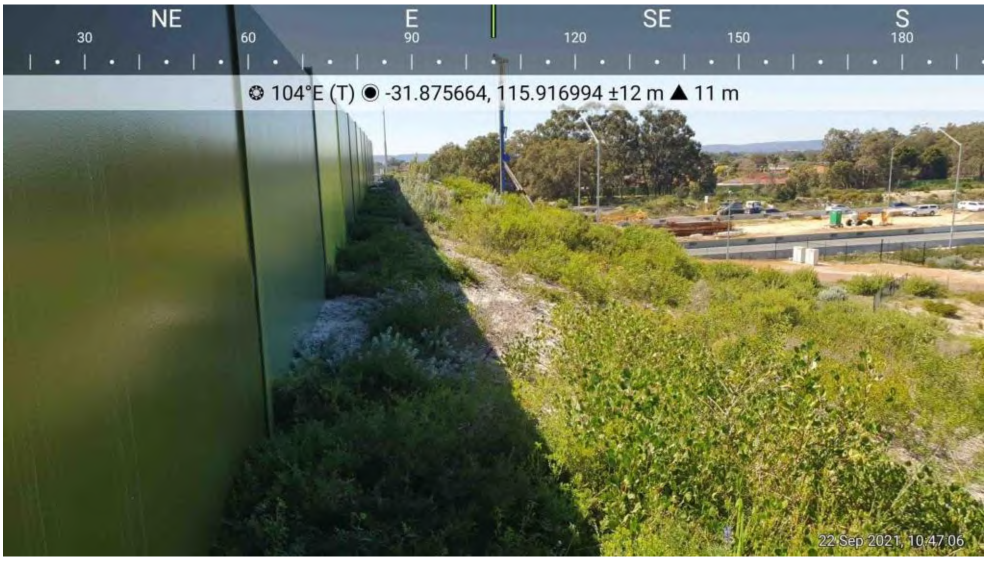


Photo ID: 6a

Plot number		Plot 6
Vegetation classification	Pre-development	Class C Shrubland
	Post-development	Class A Forest
Description / justification		Shrubland on embankment conservatively classified as forest

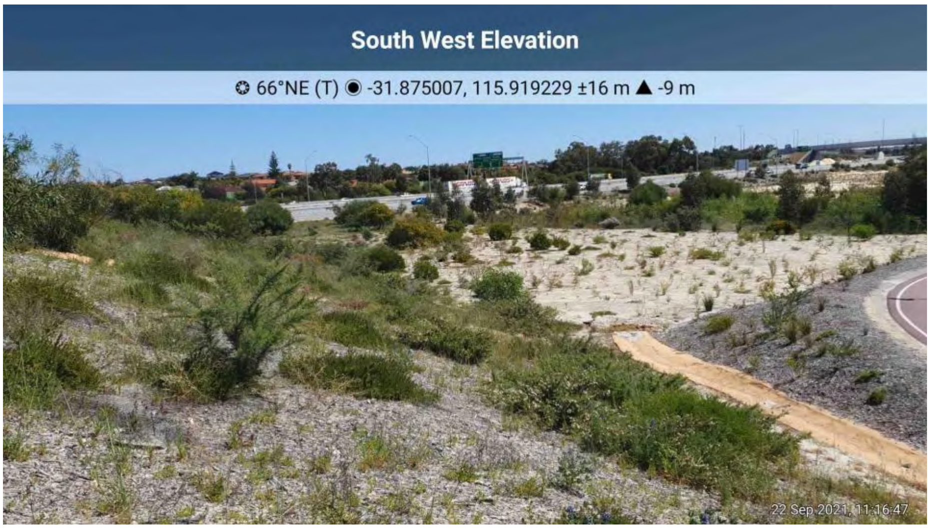


Photo ID: 7a

Plot number		Plot 7
Vegetation classification	Pre-development	Class C Shrubland
	Post-development	Class B Woodland
Description / justification		Revegetated with low understorey species (<0.5 m high) and trees that will be between 10% - 30% canopy cover

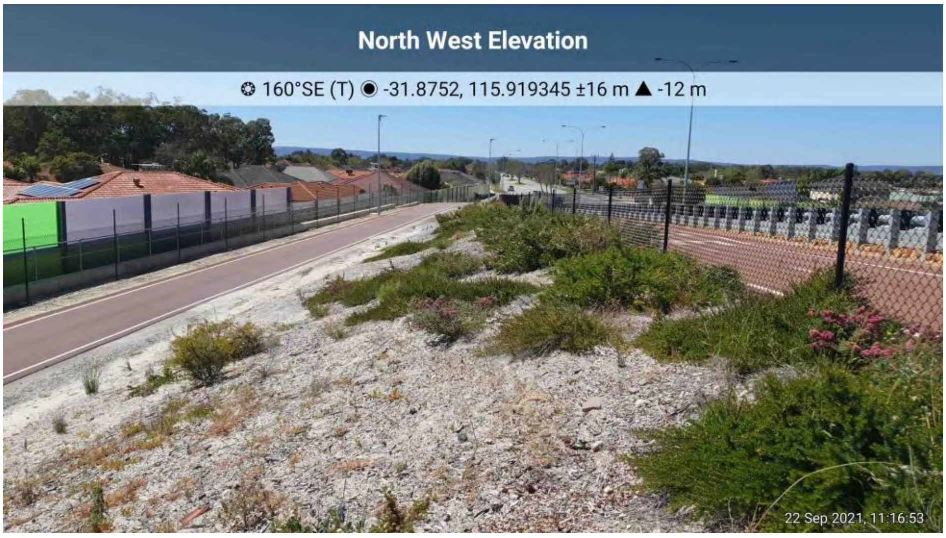


Photo ID: 8a

Plot number		Plot 8
Vegetation classification	Pre-development	Class C Shrubland
	Post-development	Class B Woodland
Description / justification		Revegetated with low understorey species (<0.5 m high) and trees that will be between 10% - 30% canopy cover

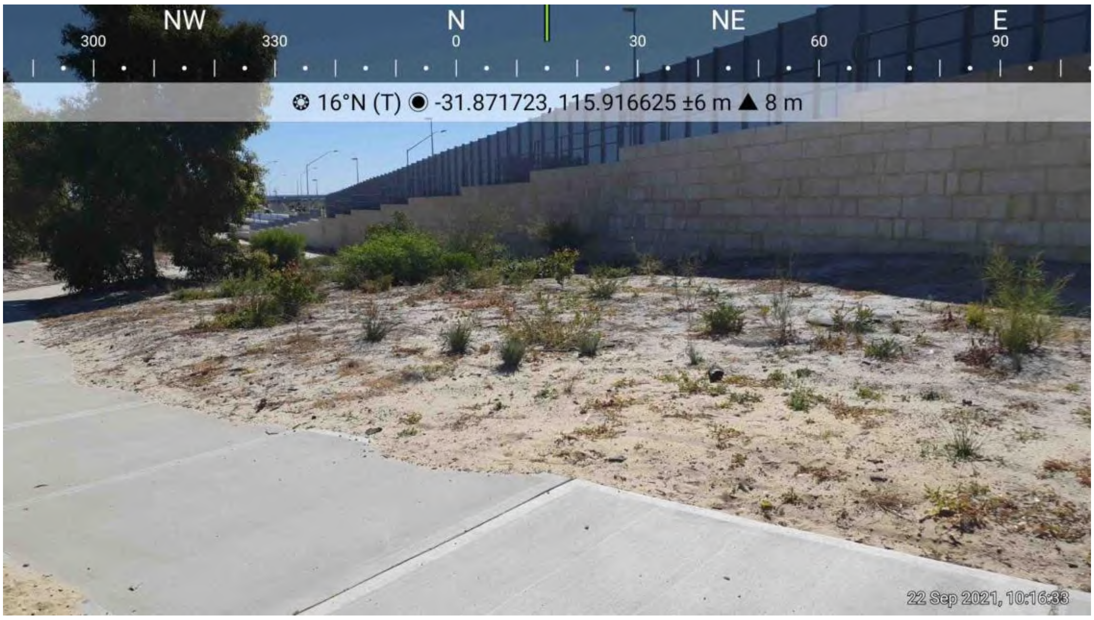


Photo ID: 10a

Photo ID: 10b

Plot number		Plot 10
Vegetation classification	Pre-development	Excluded – Clause 2.2.3.2 [a]
	Post-development	Excluded – Clause 2.2.3.2 [a]
Description / justification		Vegetation further than 100m from project area

Photo ID: 11a

Photo ID: 11b

Plot number		Plot 11
Vegetation classification	Pre-development	Excluded – Non-vegetated and Low threat (Clause 2.2.3.2 [e] and [f])
	Post-development	Excluded – Non-vegetated and Low threat (Clause 2.2.3.2 [e] and [f])
Description / justification		Low threat cultivated gardens and maintained lawns within surrounding properties and non-vegetated areas including roads, footpaths, driveways and building footprints

Photo ID: 11c

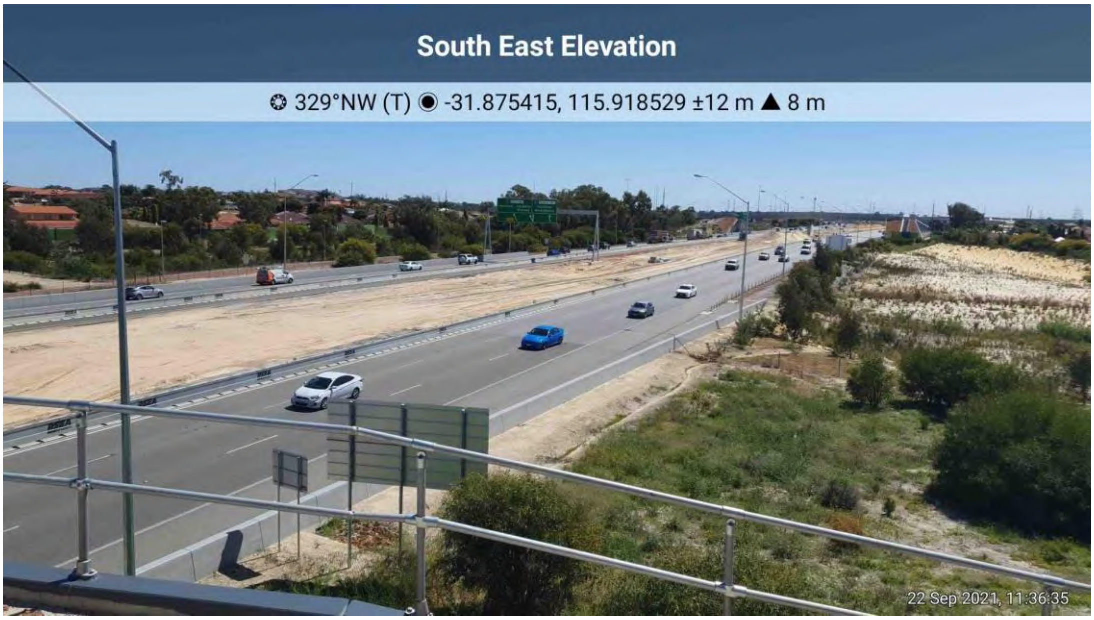


Photo ID: 11d

Plot number		Plot 11
Vegetation classification	Pre-development	Excluded – Non-vegetated and Low threat (Clause 2.2.3.2 [e] and [f])
	Post-development	Excluded – Non-vegetated and Low threat (Clause 2.2.3.2 [e] and [f])
Description / justification		Low threat cultivated gardens and maintained lawns within surrounding properties and non-vegetated areas including roads, footpaths, driveways and building footprints

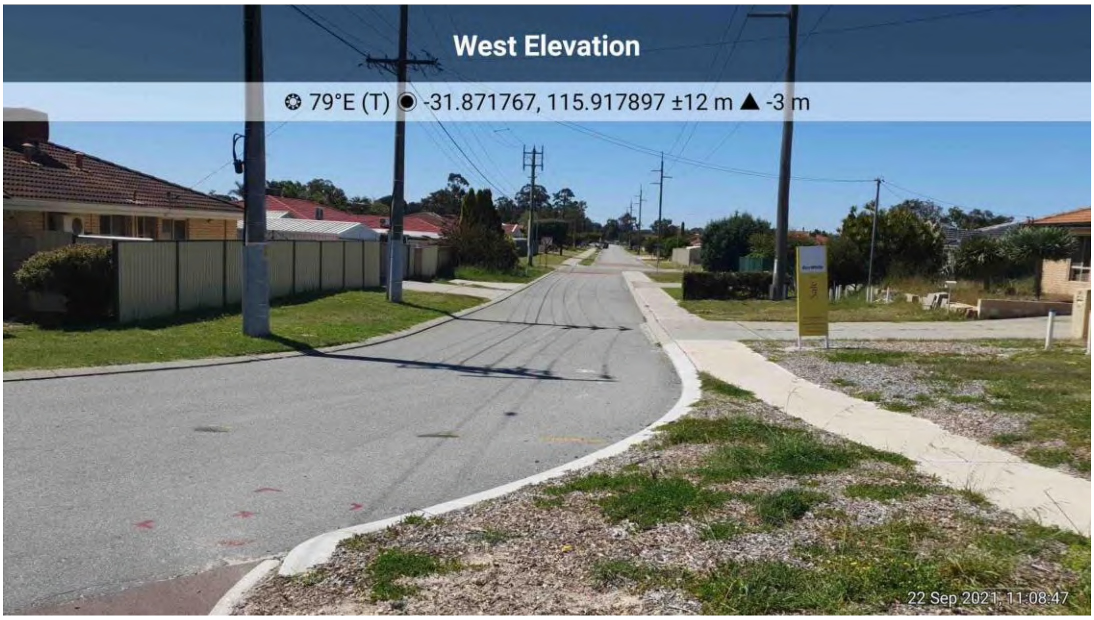


Photo ID: 11e

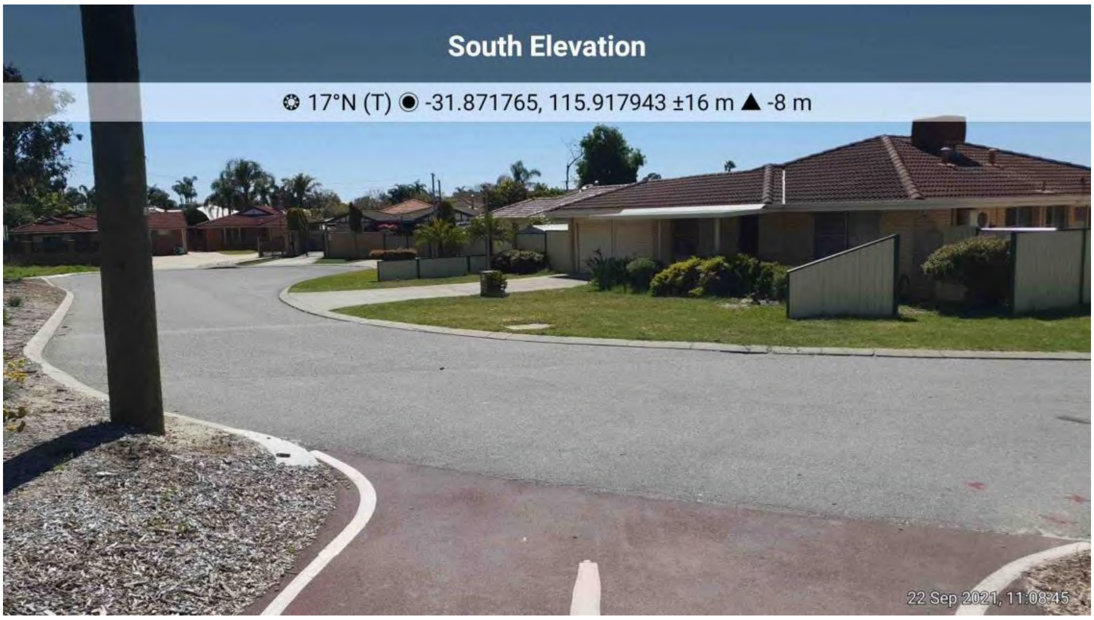


Photo ID: 11f

Plot number		Plot 11
Vegetation classification	Pre-development	Excluded – Non-vegetated and Low threat (Clause 2.2.3.2 [e] and [f])
	Post-development	Excluded – Non-vegetated and Low threat (Clause 2.2.3.2 [e] and [f])
Description / justification		Low threat cultivated gardens and maintained lawns within surrounding properties and non-vegetated areas including roads, footpaths, driveways and building footprints

Photo ID: 11g

Photo ID: 11h

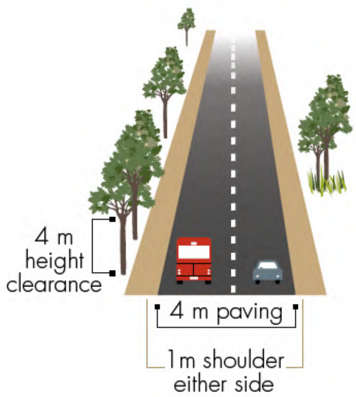
Plot number		Plot 11
Vegetation classification	Pre-development	Excluded – Non-vegetated and Low threat (Clause 2.2.3.2 [e] and [f])
	Post-development	Excluded – Non-vegetated and Low threat (Clause 2.2.3.2 [e] and [f])
Description / justification		Low threat cultivated gardens and maintained lawns within surrounding properties and non-vegetated areas including roads, footpaths, driveways and building footprints

Photo ID: 11i

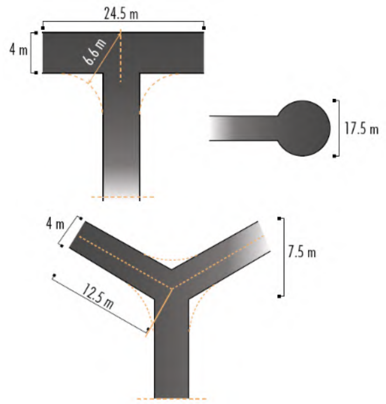
Photo ID: 11j

Plot number		Plot 11
Vegetation classification	Pre-development	Excluded – Non-vegetated and Low threat (Clause 2.2.3.2 [e] and [f])
	Post-development	Excluded – Non-vegetated and Low threat (Clause 2.2.3.2 [e] and [f])
Description / justification		Low threat cultivated gardens and maintained lawns within surrounding properties and non-vegetated areas including roads, footpaths, driveways and building footprints

Appendix 4: Vehicular access technical standards of the Guidelines

Public roads	
Acceptable solution A3.2	A public road is to meet the requirements in Table 1, Column 1.
Explanatory note E3.2	**Trafficable surface:** Widths quoted for access routes refer to the width of the trafficable surface. A six metre trafficable surface does not necessarily mean paving width. It could, for example, include four metre wide paving one metre wide constructed road shoulders. In special circumstances, where eight lots or less are being serviced, a public road with a minimum trafficable surface of four metres for a maximum distance of 90 metres may be provided subject to the approval of both the local government and Department of Fire and Emergency Services. **Public road design:** All roads should allow for two-way traffic to allow conventional two-wheel drive vehicles and fire appliances to travel safely on them. 

Private driveway longer than 50 metres	
Acceptable solution A3.5	A private driveway is to meet all of the following requirements: • **Requirements in Table 1, Column 3** • **Required where a house site is more than 50 metres from a public road** • **Passing bays:** every 200 metres with a minimum length of 20 metres and a minimum width of two metres (i.e. the combined width of the passing bay and constructed private driveway to be a minimum six metres) • **Turn-around areas:** designed to accommodate type 3.4 fire appliances and to enable them to turn around safely every 500 metres (i.e. kerb to kerb 17.5 metres) and within 50 metres of a house • **Any bridges or culverts:** are able to support a minimum weight capacity of 15 tonnes • **All-weather surface (i.e. compacted gravel, limestone or sealed).**
Explanatory note E3.5	For a driveway shorter than 50 metres, fire appliances typically operate from the street frontage however where the distance exceeds 50 metres, then fire appliances will need to gain access along the driveway in order to defend the property during a bushfire. Where house sites are more than 50 metres from a

Private driveway longer than 50 metres	
	public road, access to individual houses and turnaround areas should be available for both conventional two-wheel drive vehicles of residents and type 3.4 fire appliances. Turn-around areas should be located within 50 metres of a house. Passing bays should be available where driveways are longer than 200 metres and turn-around areas in driveways that are longer than 500 metres. Circular and loop driveway designs may also be considered. These criteria should be addressed through subdivision design. Passing bays should be provided at 200 metre intervals along private driveways to allow two-way traffic. The passing bays should be a minimum length of 20 metres, with the combined width of the passing bay and the access being a minimum of six metres. Turn-around areas should allow type 3.4 fire appliances to turn around safely (i.e. kerb to kerb 17.5 metres) and should be available at the house sites and at 500 metre intervals along the driveway. 

Technical requirement	**1**	**2**	**3**	**4**	**5**
	Public road	**Cul-de-sac**	**Private driveway longer than 50 m**	**Emergency access way**	**Fire service access routes**
Minimum trafficable surface (m)	6*	6	4	6*	6*
Horizontal distance (m)	6	6	6	6	6
Vertical clearance (m)	4.5	N/A	4.5	4.5	4.5
Maximum grade <50 m	1 in 10	1 in 10	1 in 10	1 in 10	1 in 10
Minimum weight capacity (t)	15	15	15	15	15
Maximum crossfall	1 in 33	1 in 33	1 in 33	1 in 33	1 in 33
Curves minimum inner radius	8.5	8.5	8.5	8.5	8.5

Technical requirement	1	2	3	4	5
	Public road	Cul-de-sac	Private driveway longer than 50 m	Emergency access way	Fire service access routes
* Refer to E3.2 Public roads: Trafficable surface					

Appendix 5: City of Bayswater Firebreak Notice

BUSH FIRES ACT 1954
SECTION 33
FIREBREAK NOTICE
City of Bayswater

Notice to all landowners and occupiers of land in the City of Bayswater.

All landowners and occupiers of land within the City of Bayswater are advised that, on or before the 1 November 2021 or within fourteen days of the date of becoming an owner or occupier up to and including 31 March 2022 must ensure compliance with the following firebreak conditions-

All land which is 2000 square metres or less in area-

Remove all inflammable matter from the whole of the land, except living trees and shrubs; plants under cultivation and lawn, by means of ploughing, cultivating or slashing to a height of no more than 50mm

All other land within the City of Bayswater;

i. Firebreaks of a minimum width and height of 3 metres are to be cleared immediately inside all external boundaries of the land;

ii. Firebreaks of a minimum width of 3 metres and height of 3 metres are to be cleared immediately surrounding all buildings situated on the land; and any place where inflammable liquids and gas products are kept.

If for any reason an owner and/or occupier consider it impractical to clear firebreaks or comply with other fire protection measures in accordance with this Notice, the owner and/or occupier may apply in writing to Council no later than 31 October 2021.

Where an owner and/or occupier of land fails or neglects to comply with any requirement of this Notice, Council may undertake the work and recover the costs and expenses from the owner and/or occupier pursuant to the Act, in addition to any penalty which might be imposed. A Penalty of not more than $5,000 applies.

Burning off within the City of Bayswater is prohibited. All clearing and disposal of waste should be carried out by methods other than burning.

Andrew Brien
Chief Executive Officer