Morley-Ellenbrook Line

Noranda Station Transport Impact Assessment

MEL-MLCX-MO-RPT-00009

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Table of Contents

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:
    - 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.

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)

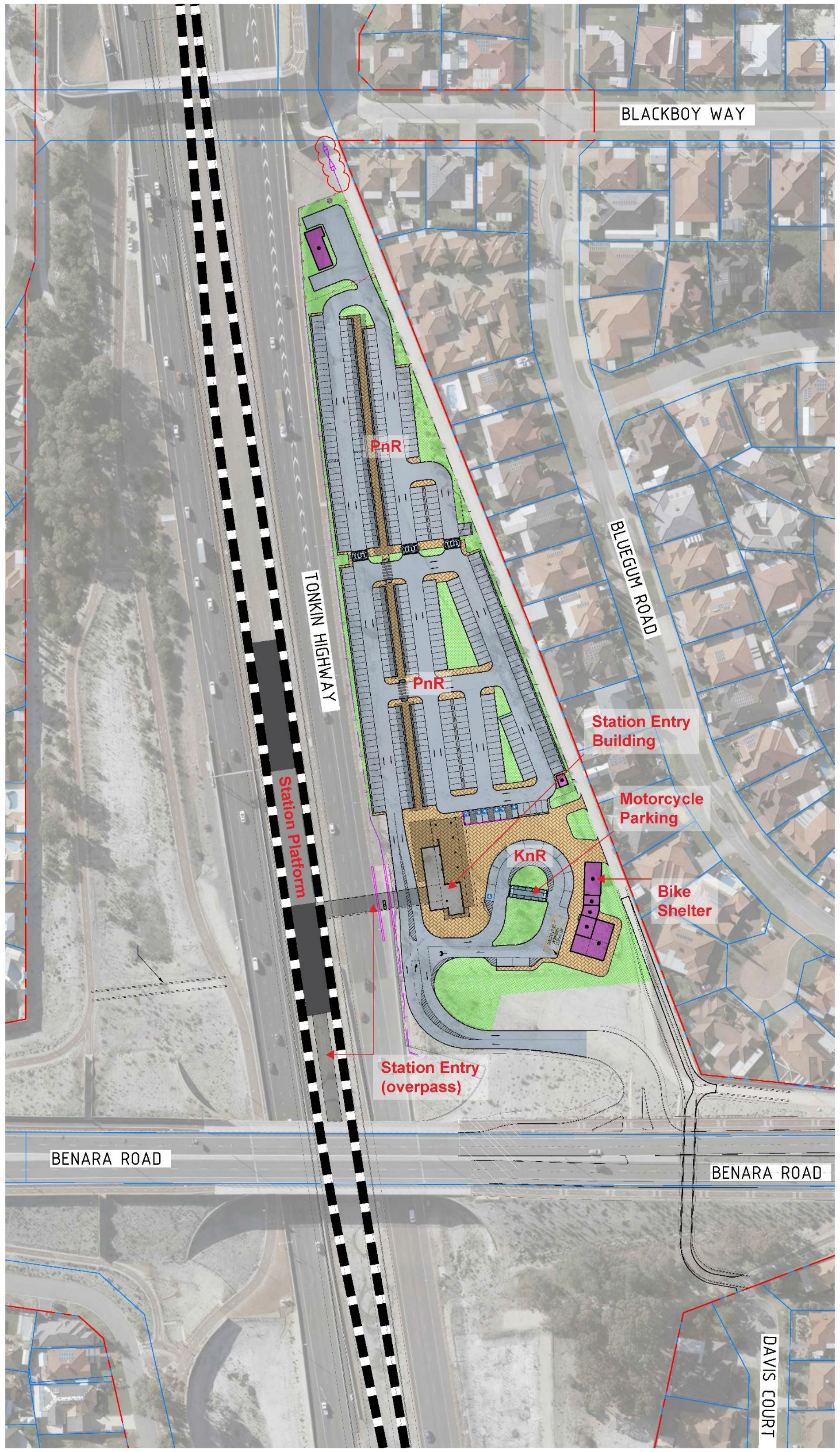


Figure 6: Noranda Station overall location plan

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.

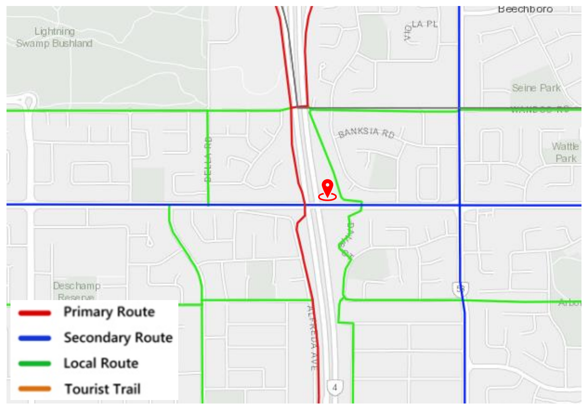


Figure 8: DoT Long Term Cycle Network Plan

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***

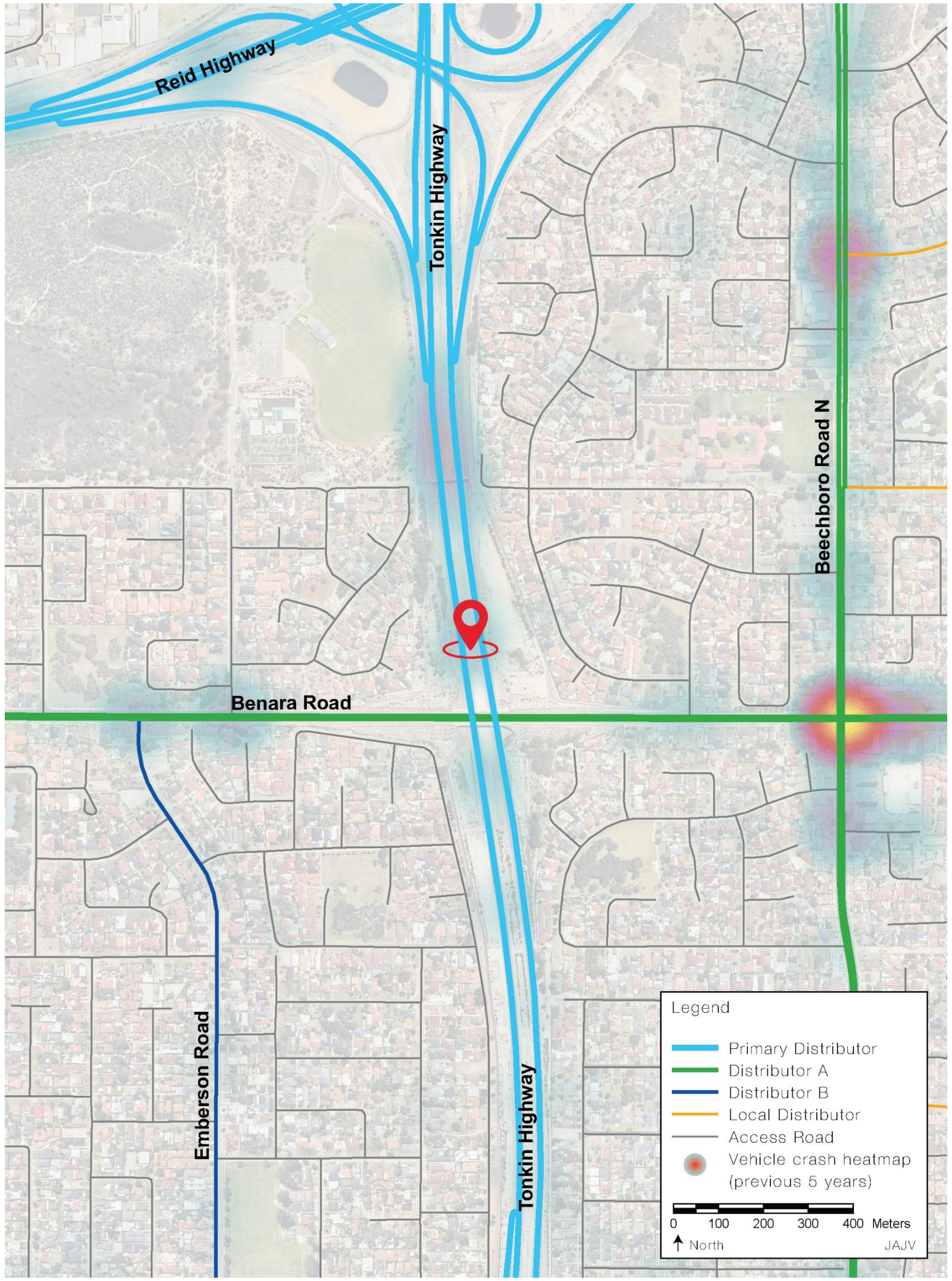


Figure 10: Functional existing road hierarchy and crash data

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.

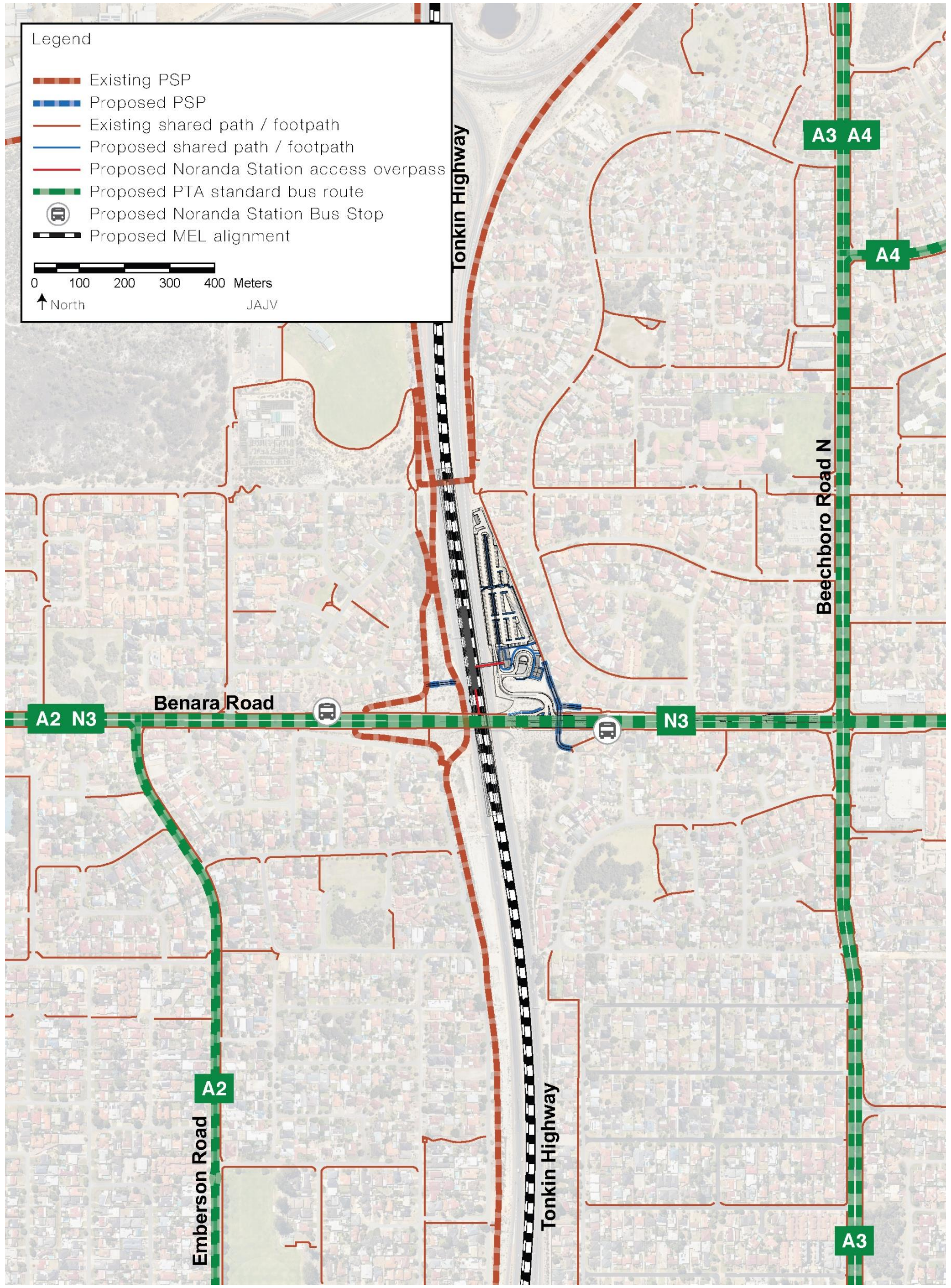


Figure 11: Proposed development and transport infrastructure upgrades

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.

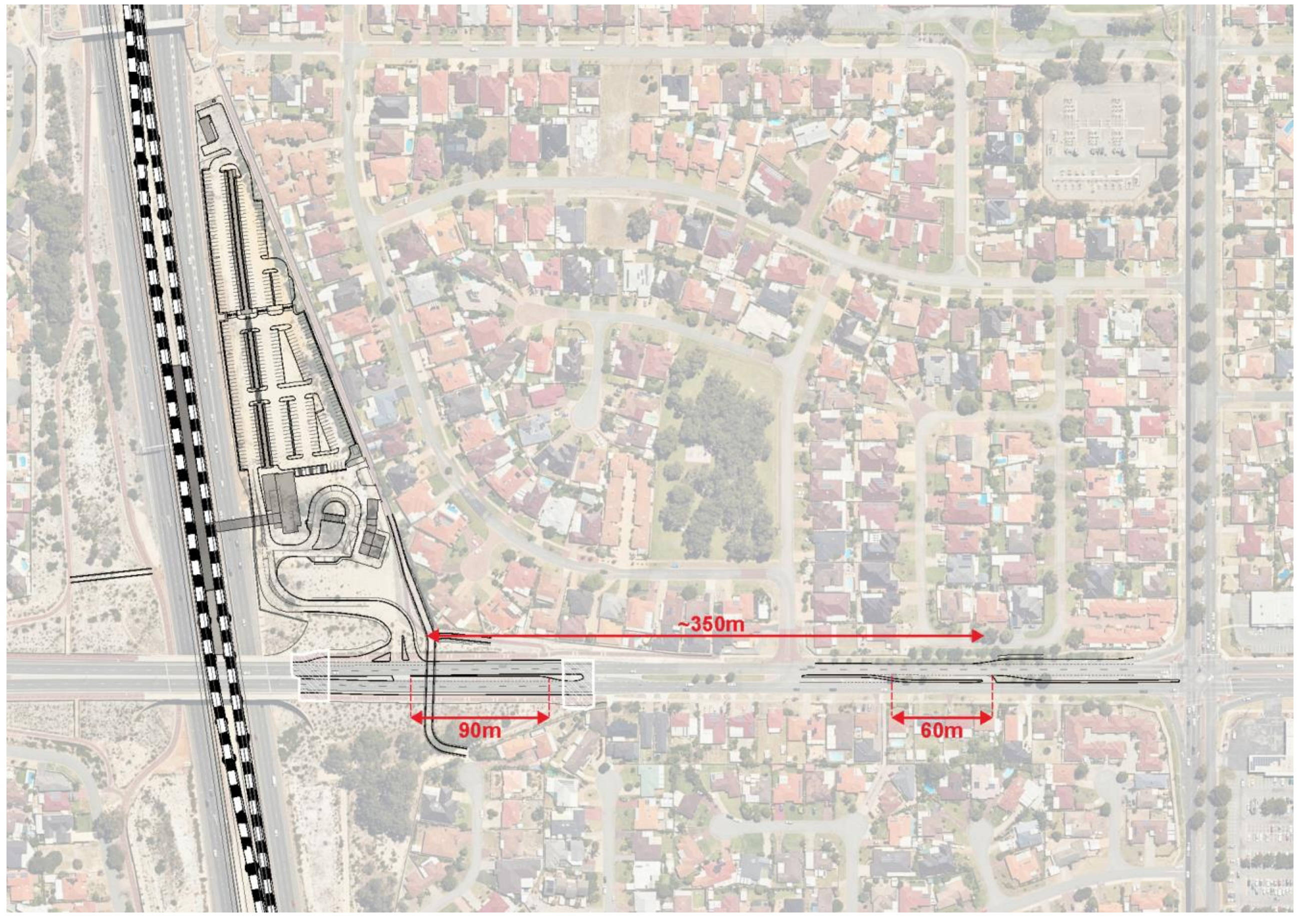


Figure 12: Proposed road network upgrades

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.

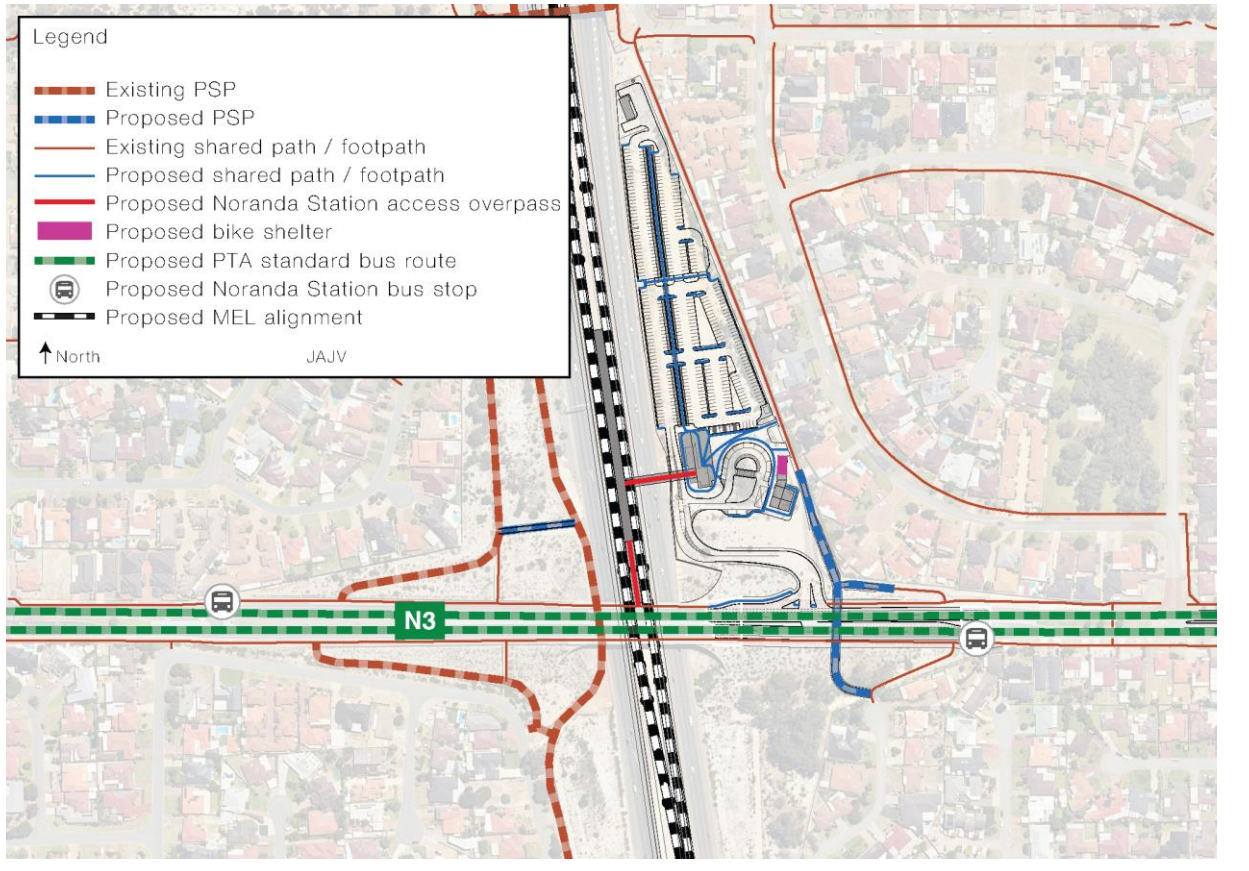


Figure 13: Pedestrian and cycling connections surrounding the development

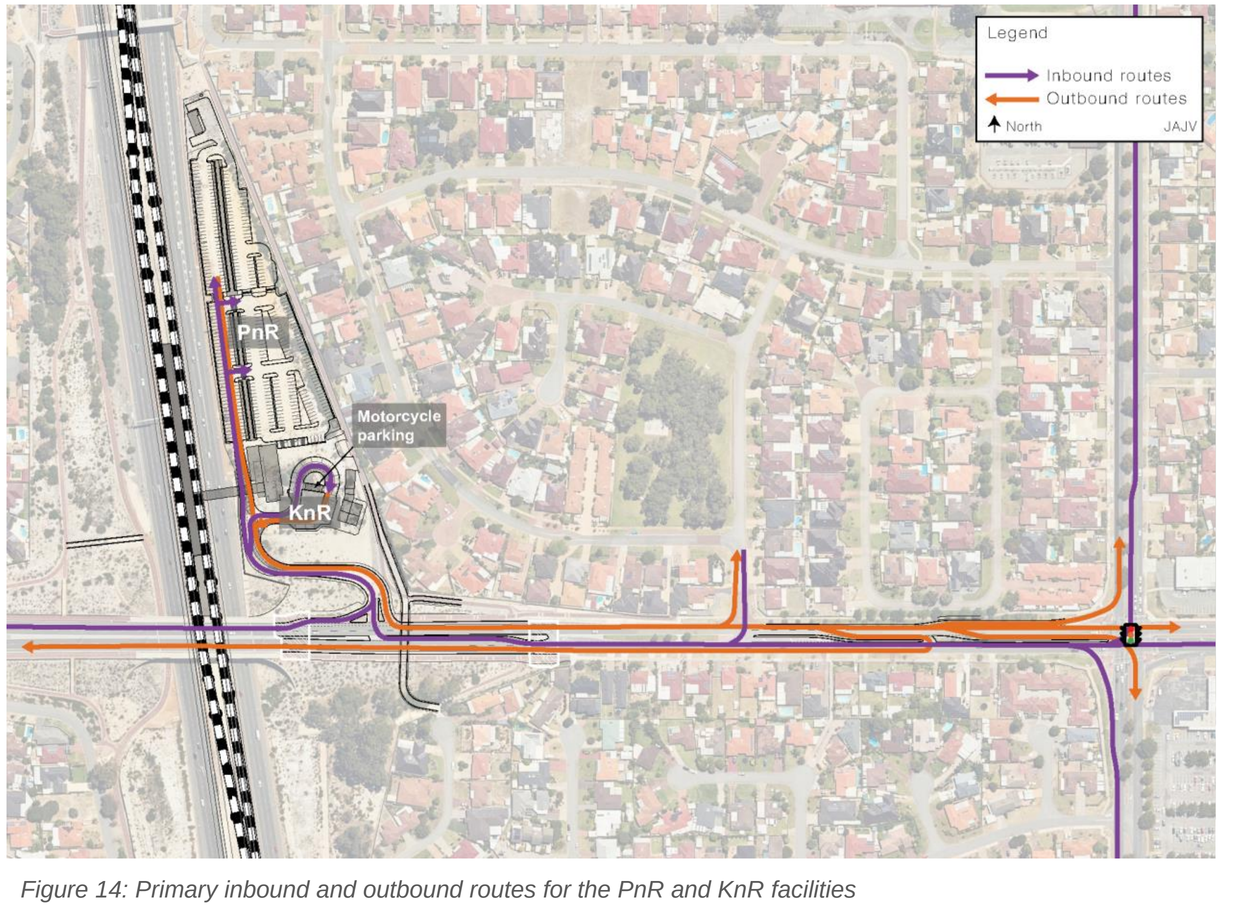


Figure 14: Primary inbound and outbound routes for the PnR and KnR facilities

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%

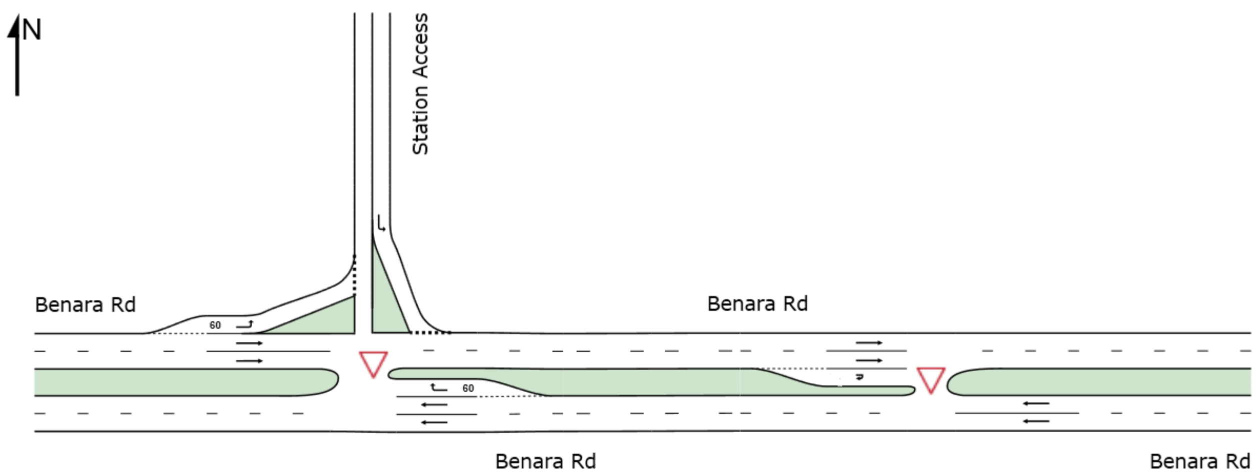


Figure 15: Project case modelled layout – Noranda Station

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:

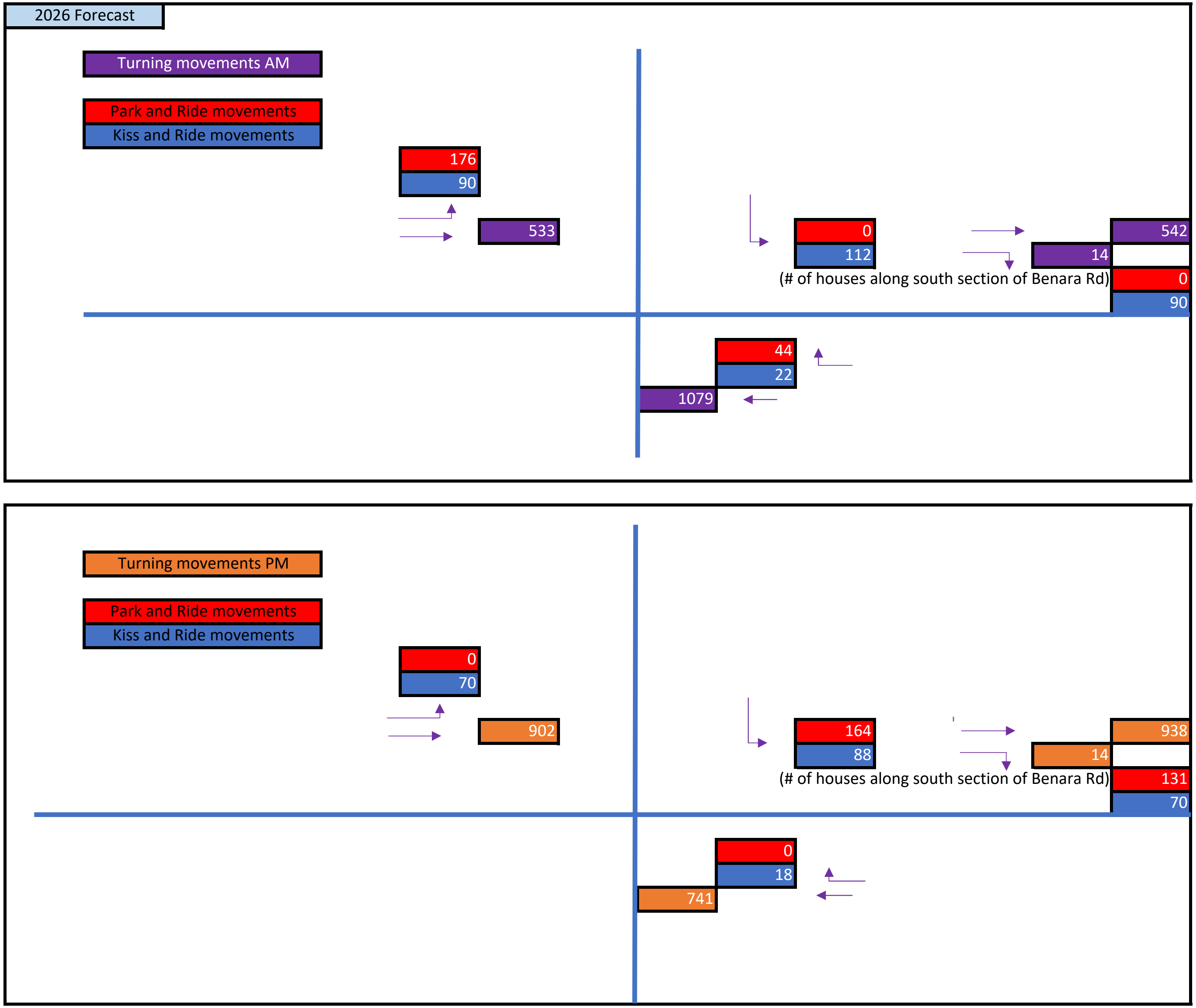
- It is recommended that further investigation of extending the pocket length of the U-Turn facility east of the proposed site is conducted. This could be facilitated by decreasing the length of the right turn pocket lane into Mahogany Road which could allow for an extension of the U-Turn lane.
- Main 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

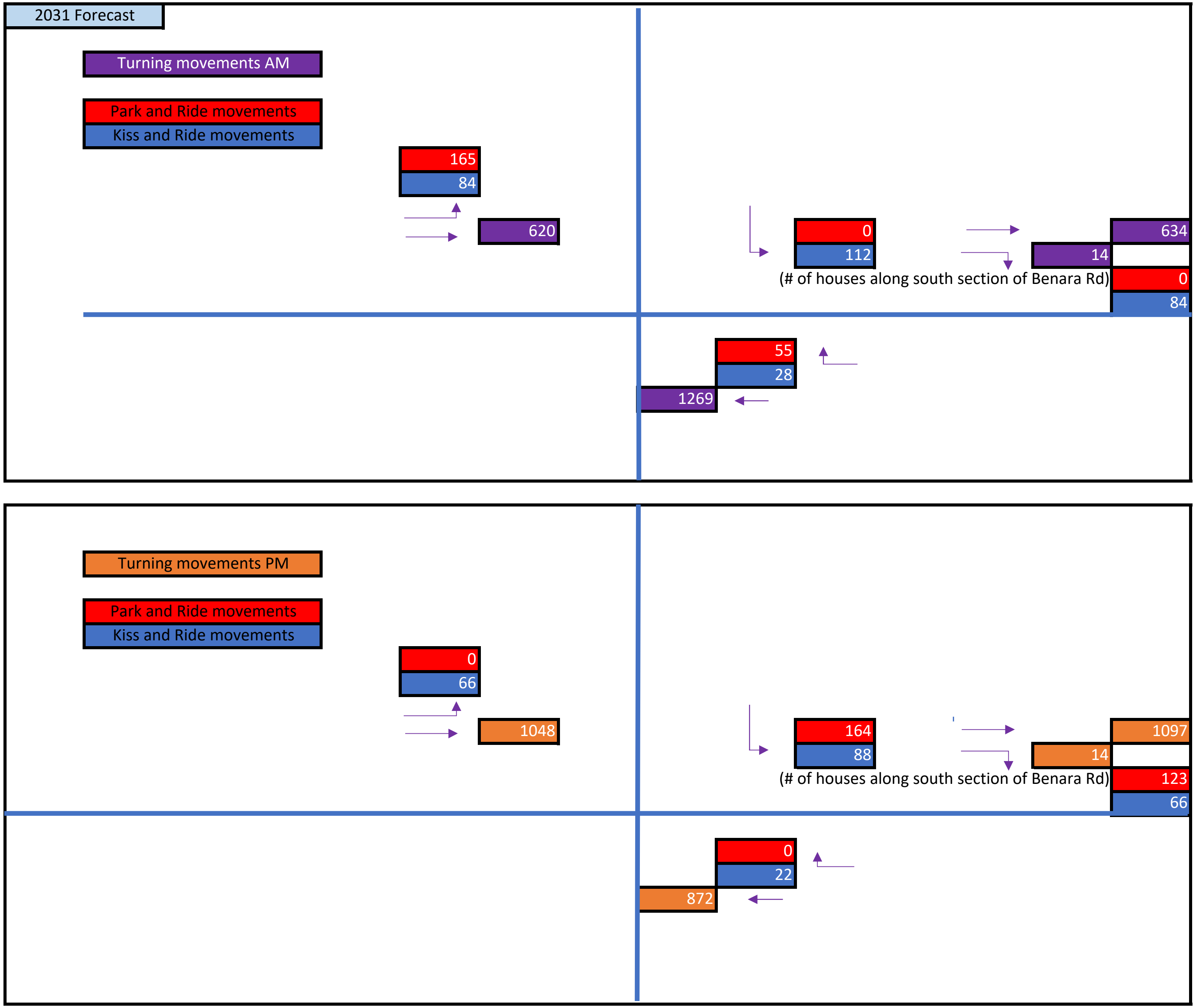
Based on these findings it is recommended that the site requirements and supporting infrastructure within the surrounding road network be implemented prior to opening of the station.

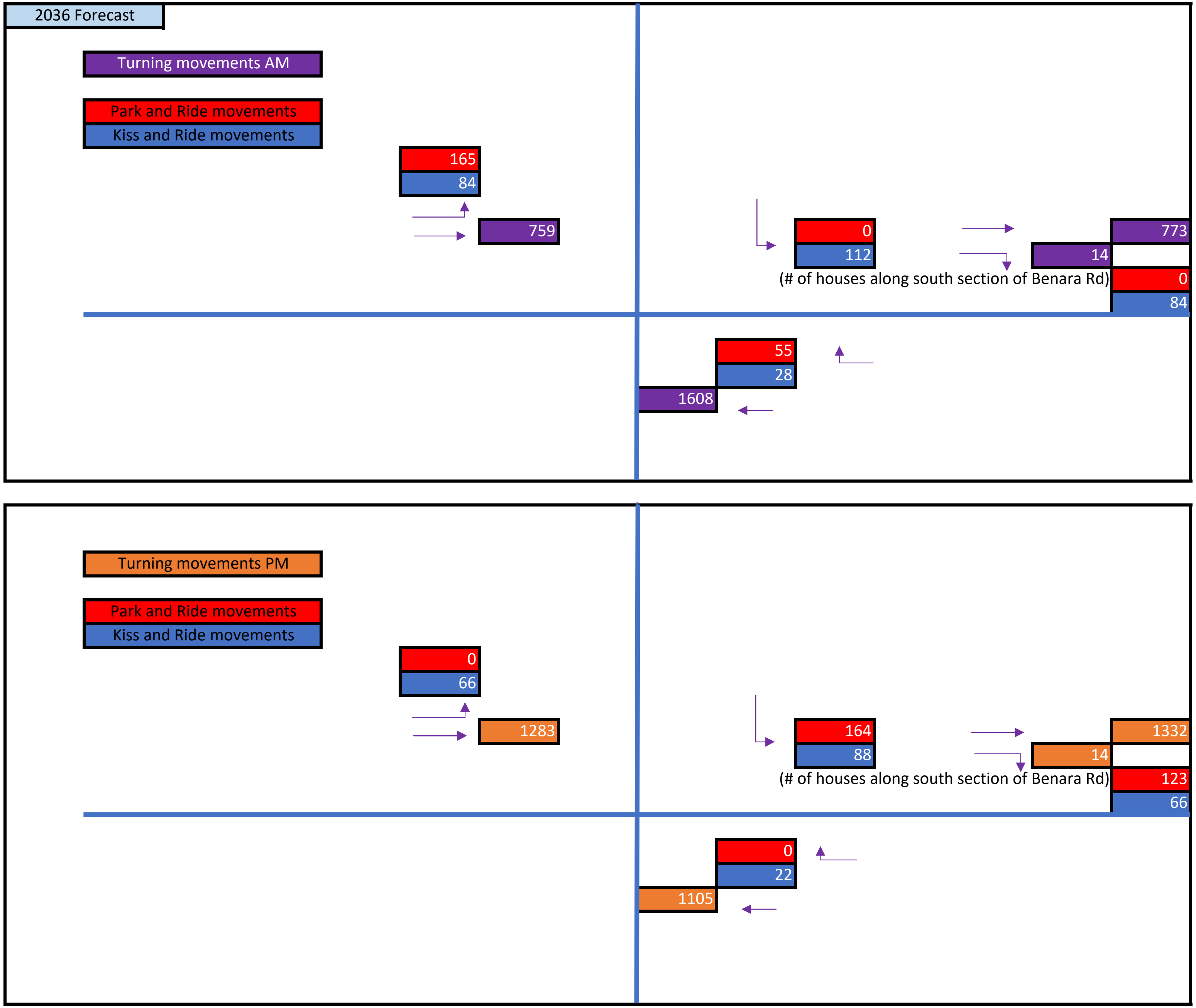
It is shown however, that the station is fit for purpose and well serviced by the proposed surrounding transport network, facilitating safe and adequate access for pedestrians, cyclists and general vehicles.

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
0
84
(# of houses along south section of Benara Rd)
55
28
1608
Turning movements PM
Park and Ride movements
Kiss and Ride movements
0
66
1283
164
88
1332
14
123
66
(# of houses along south section of Benara Rd)
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.

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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: [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	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	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.

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 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	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.

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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.

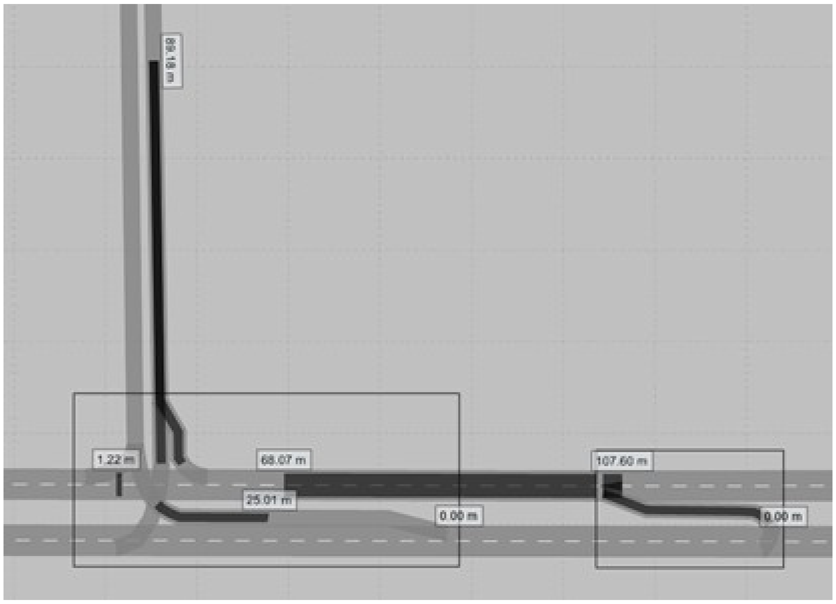
Based on the 2024 queueing results, no lengthening of the Benara Road eastbound turn pockets is necessary to accommodate opening year traffic.

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.

<u>Ellenbrook Station – LinSig and microsimulation modelling</u>
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
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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

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)
