Morley-Ellenbrook Line

Morley Station Transport Impact Assessment

MEL-MLCX-MO-RPT-00010

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Glossary

Phrase	Meaning	Notes
ACROD	*Australian Council for Rehabilitation of Disabled*	*ACROD bays are specifically designated bays for those with disabilities who qualify for the ACROD parking program*
DA	*Development Application*	*The required statutory application for individual developments on a parcel of land that go beyond the remit of a simple building application to the local government*
DOS	*Degree of saturation*	*A percentage measure of demand/capacity for an intersection, approach or lane*
DOT	*Department of Transport*	*The WA state government department responsible for implementing transport policies*
DPLH	*Department of Planning, Lands and Heritage*	*The WA state government department responsible for land-use planning*
KnR	*Kiss and Ride*	*Pick-up/drop-off facility for the train station*
LOS	*Level of service*	*A categorisation of the delay vehicles experience at a particular intersection, approach or lane*
MEL	*Morley-Ellenbrook Line*	*The proposed train line connecting from Bayswater to Ellenbrook as a spur line from the existing Midland line*
MRWA	*Main Roads Western Australia*	*Authority responsible for implementing Western Australia's policies on road access and main roads*
PCU	*Passenger Car Unit*	*A unit to measure the equivalent number of passenger cars represented by vehicles larger than a passenger car*
PDO	*Property Damage Only*	*A crash that causes damage only to property (built form or vehicles for example), with no harm caused to people*
PDP	*Project Definition Phase*	*The concept design phase of the Morley Ellenbrook Line*
PnR	*Park and Ride*	*All-day parking facility for the train station*
PUDO	*Pick-up/drop-off*	*Pick-up/drop-off parking bays typically have a maximum 5 minute parking time*
PSP	*Principal Shared Path*	*A wide (>3 metre) shared path, usually with lighting and priority or signalised crossings at road crossings*
PTA	*Public Transport Authority*	*Authority responsible for public transport in Western Australia.*
SCATS	*Sydney Coordinated Adaptive Traffic System*	*The control system used for all traffic lights within Western Australia*
STEM	*Strategic Transport Evaluation Model*	*The Department of Transport's multi-modal strategic transport model, used to forecast and assess transport demands in the Perth Metropolitan area*
SWTC	*Scope of Works and Technical Criteria*	*The documentation outlining the scope and criteria for the design and construction of the MEL project*
TIA	*Transport/Traffic Impact Assessment*	*An assessment report of the impact that a development or subdivision has on the surrounding transport network*
WAPC	*Western Australian Planning Commission*	*The section of the DPLH responsible for assessing statutory planning applications such as Development Applications*

Summary

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

Morley Station has been identified by METRONET and key stakeholders as a significant transit hub in connecting the Morley area by mass transit to the Perth CBD and other major centres in the Perth Metropolitan area. The station provides a significant point of transport access for local residents and the Morley Strategic Metropolitan Activity Centre which are currently under-served by mass rapid transit. The provision of this station provides a high-speed alternative transit mode for Morley, which is currently highly reliant on road-based transport. The provision of high-capacity rapid transit for the area is crucial in the context of growth projections outlined in *Perth & Peel@3.5Million Central Sub-regional Planning Framework*, which estimates a population of 100,000 for the City of Bayswater Local Government Area in 2050. Morley Station will anchor a planned medium-high density urban village adjacent to the Station and provide regional accessibility to the Morley Activity Centre.

In accordance with the *WAPC Transport Impact Assessment Guidelines*, this report provides an overview of the Transport Impact for the proposed Morley 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 is therefore classified as 'high impact' under the guidelines, necessitating a Transport Impact Assessment.

At opening day (proposed by year 2026). Morley Station is proposed to consist of:

- One island platform (accessed above grade from station entry buildings on Broun Avenue Bridge (north) and Bus Interchange Bridge (south))
- A 12 stand bus interchange comprised of:
  - 10 standard bus bays
  - 2 articulated bus bays
  - Plus 6 layover bays (4 standard and 2 articulated)
- A 395 bay Multi-Storey Car Park (MSCP) facility comprising:
  - 356 standard all-day bays
  - 2 EV charging bays
  - 7 ACROD bays
  - 21 short term bays
  - 1 accessible pick-up/ drop-off bay (PUDO)
  - 1 taxi bay
  - 4 staff parking bays
  - 1 tenant parking bay
  - 2 service bays/ loading bay
  - 10 covered motorcycle bays
- A 5 bay kiss 'n' ride (KnR) facility is located directly north of the MSCP and co-located with station access and vertical transport elements.
- Secure bicycle storage shelter for 72 bicycles
- U-rail bicycle stands within proximity of the 'patio' welcome area (adjacent to the MSCP) and within the bus interchange within proximity of the station entry building.

Additional transport upgrades include:

- Modification of the Doyle Street / Broun Avenue intersection to a signalised intersection to accommodate Bus Interchange access.
- Modification of the Embleton Avenue / Broun Avenue intersection.
- Construction / connection of the PSP on the eastern side of Tonkin Highway and new connections to existing shared paths
- New shared paths on both sides of the Broun Avenue bridge.

Morley Station is located within the Tonkin Highway median and features an elevated concourse on the south of the proposed Broun Avenue Bus Interchange Bridge that provides access to the at-grade platform via stairs and a lift (with provision for a future lift). It also includes a secondary access point to the north of Broun Avenue that also provides access to the at-grade platform via stairs and a lift.

A multi-level carpark is located to the west of Tonkin Highway and south of Broun Avenue. Access from the carpark to the station is provided via an elevated walkway from the upper level of the car park to the Broun Avenue Bus Interchange.

The Morley Station site is primarily contained within a MRS Primary Regional Road Reserve (Tonkin Highway and Broun Avenue). The adjacent area exhibits a mixture of land uses including Local Public Open Space, Medium Density Residential, Light Industry and General Industry. The *Morley Station Precinct Concept Master Plan* proposes long term urban change for the industrial and residential zoned areas within 500m of the Station, transitioning to higher-density residential and commercial development. Morley Station is located a short distance from Bayswater Waves, Wotton Reserve, Hampton Senior High School, and a Local Centre around the Walter Rd / Beechboro Rd N intersection.

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	233 (55%)	0	119 (28%)	119 (28%)	352	119
PM peak hour	0	174 (41%)	93 (22%)	93 (22%)	93	267

Table S2: PnR and KnR traffic distribution

	Distribution of Inbound traffic		Distribution of Outbound traffic	
Associated STEM year	**From North**	**From South**	**To the North**	**To the South**
2026 - 2031	43%	57%	71%	29%
2031 onwards	43%	57%	57%	43%

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 the LinSig modelling software. This includes an assessment of the Broun Avenue/ Embleton Avenue and Broun Avenue/ Doyle Street/ Bus Interchange intersections.

Based on the completed traffic analysis, the road network surrounding the Morley Station precinct will operate within the required MRWA performance requirements up to and including 10-years post opening of the station.

The Broun Avenue/ Embleton Avenue intersection is forecast to perform with an intersection LOS E and a DOS of 93.1% and 89.4% during the AM and PM peak periods respectively.

The Broun Avenue/ Doyle Street/ Bus Interchange intersection reports an intersection LOS D and LOSE E during the AM and PM peak periods respectively with a DOS below 100% DOS during both peak periods.

General traffic access into Morley Station through the Embleton Avenue/ Wotton Street intersection is forecast to operate with good performance 10-years post opening of the station with an overall intersection LOS C or better and a DOS below 60% during both peak periods.

These results suggest that general traffic and public transport access into Morley Station via the surrounding road network is expected cope with the additional station generated traffic and operate with within the MRWA performance requirements.

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 Morley 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

Morley Station has been identified by METRONET and key stakeholders as a significant transit hub connecting the Morley-Bayswater area by mass transit to Bayswater Station, and onward 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 and industrial development.

Morley Station is proposed to be located within the Tonkin Highway median and the Broun Avenue bridge. The concourse level of the station building will be above the island platform with above grade access to car parking on the western side of Tonkin Highway and active transport links on both sides of Tonkin Highway. The Morley-Ellenbrook rail line travels approximately north–south within the Tonkin Highway median.

At opening day (proposed by year 2024). Morley Station is proposed to consist of:

- One island platform (accessed above grade from station entry buildings on Broun Avenue Bridge (north) and Bus Interchange Bridge (south))
- A 12 stand bus interchange comprised of:
  - 10 standard bus bays
  - 2 articulated bus bays
  - Plus 6 layover bays (4 standard and 2 articulated)
- A 395 bay Multi-Storey Car Park (MSCP) facility comprising:
  - 356 standard all-day bays
  - 2 EV charging bays
  - 7 ACROD bays
  - 21 short term bays
  - 1 accessible pick-up/ drop-off bay (PUDO)
  - 1 taxi bay
  - 4 staff parking bays
  - 1 tenant parking bay
  - 2 service bays/ loading bay
  - 10 covered motorcycle bays
- A 5 bay kiss 'n' ride (KnR) facility is located directly north of the MSCP and co-located with station access and vertical transport elements.
- Secure bicycle storage shelter for 72 bicycles
- U-rail bicycle stands within proximity of the 'patio' welcome area (adjacent to the MSCP) and within the bus interchange within proximity of the station entry building.

Figure 6 shows the proposed general layout of Morley Station.

1.4 Key issues

The existing site is surrounded by low-density residential and light industrial development with poor regional active and public transport links. A number of bus routes operate within the station catchment, with 15 – 60 minute headways. Morley Bus Station is located centrally within the Morley Activity Centre - approximately 2.8km to the west of the site by road (5 minutes travel time by car and 9 minutes by bus). The nearest train station is Bayswater Station – approximately 2.9km to the south by road (5 minutes travel time by car or 26 minutes by bus). The introduction of a transit node connecting the surrounding residential and employment catchment to high capacity public transport creates a critical need for transport infrastructure upgrades in the station surrounds. In order to facilitate safe and efficient access to support the station, construction of active transport infrastructure and alteration of feeder bus services is required. Some of these upgrades are being delivered as part of Tonkin Gap works.

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:

- 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)
- Perth & Peel @ 3.5 million – Central Sub-Regional Planning Framework (2018)
- Morley Station Precinct Concept Masterplan (2021)
- City of Bayswater Local Housing Strategy (2012)

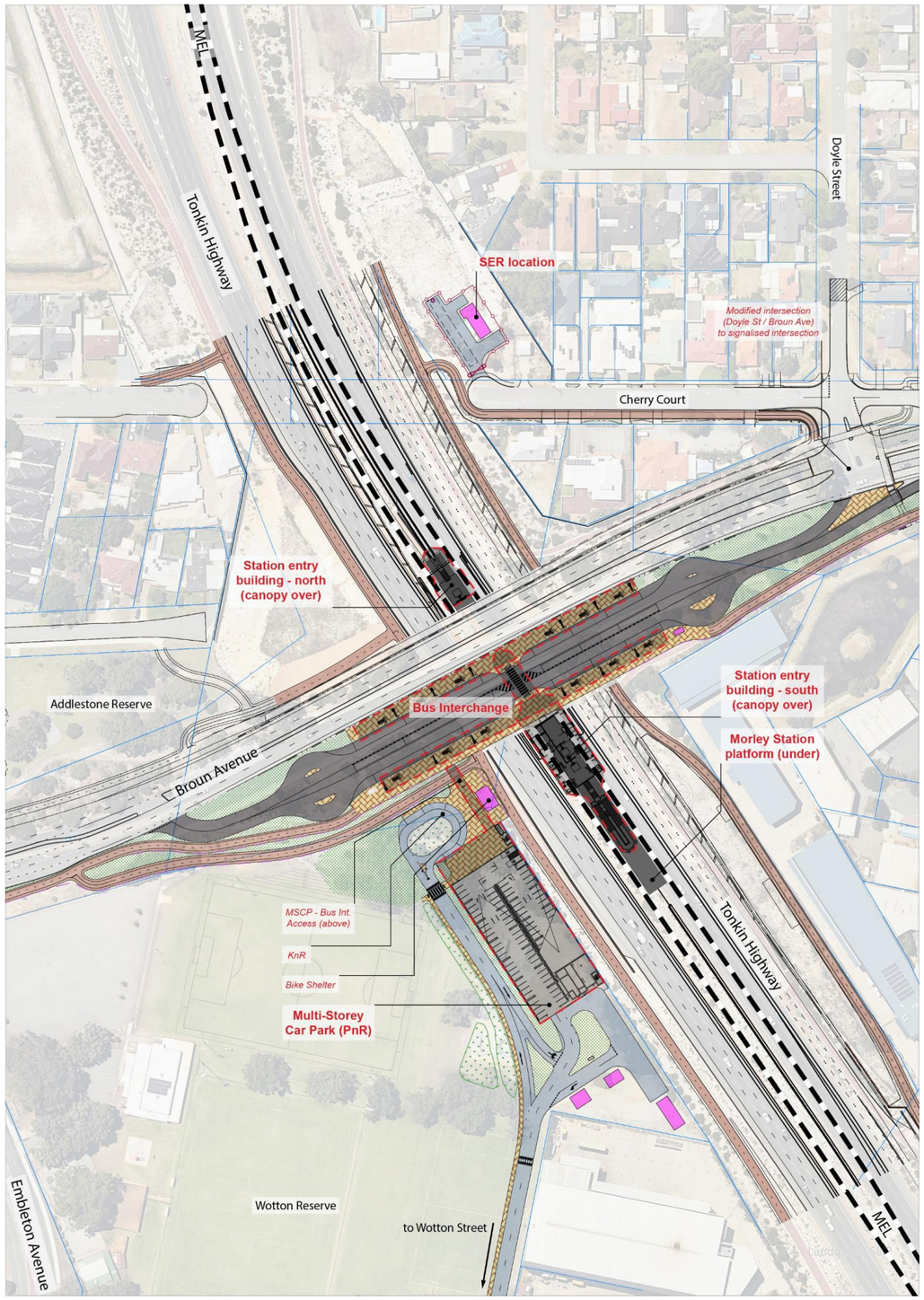


Figure 6: Morley Station location plan and general arrangement

2 Existing context

To understand the transport impact of the proposed Morley 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 contain a mixture of uses primarily made up of low-density single residential development and light / general industrial development in addition to relatively low intensity neighbourhood services including schools, public open space, and a number of small local centres. The existing road network represents a logical functional hierarchy adapted to accommodate the Tonkin Highway intervention, which dominates the area. Existing active transport network connections within the catchment are fair, however Broun Avenue and Tonkin Highway currently represent significant barriers to movement, with few safe / priority crossing opportunities. A number of bus routes currently operate within the catchment, however these largely serve the residential areas to the north of Broun Avenue with significant gaps to the south.

This section of the report examines the existing surrounding land uses, active transport, public transport, road network, and crash history context.

2.1 Site uses

The Morley Station site is contained within MRS Primary Regional Road Reserves (Tonkin Highway and Broun Avenue). Broun Avenue does not provide access to Tonkin Highway and therefore the existing land use does not generate vehicle trips. The Multi-Storey Car Park (MSCP) is partially located within Wotton Reserve within MRS Industrial zoned land and replaces an existing skate park. Vehicle access to the skate park is via the at-grade car park on the corner of Broun Avenue and Embleton Avenue, and will be removed, with new dedicated vehicle access to the MSCP to be constructed and accessed from Wotton Road (see section 3). The existing parking associated with Wotton Reserve serving the playing fields will be retained in its present location.

2.2 Surrounding land uses

As seen in Figure 7, the subject site is located within the City of Bayswater (CoB), in the suburbs of Morley and Embleton. The surrounding area includes a mixture of land uses 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 residential zoned land immediately surrounding the site is zoned between R25 – R40 and is a mix of single residential and grouped dwellings. Access to residential lots is primarily from local access roads, however some have direct frontage to Beechboro Road North.

To the east of the site is Light Industry zoned land under TPS24 and a drainage sump within Local Public Open Space zoned land, and Medium and High Density Residential zoned land east of Beechboro Road North. The Light Industry zone includes automotive repairs, club premises, health studios, industrial hire services, a service station, showrooms/warehouses, storage yards and trade display premises. Vehicle access to these land uses is primarily from Beechboro Road North and local access roads.

To the west of the site is Local Public Open Space zoned land under TPS24 - Wotton Reserve, which includes playing fields, a soccer club, skate park and a drainage sump, and General Industry zoned land south and east of Wotton Reserve. Vehicle access to Wotton Reserve is primarily from Embleton Avenue to a large at-grade car park. A smaller car park and on-street parking is accessed from Wotton Street.

The wider station catchment includes 4 government schools on Public Purpose zoned land under TPS24: Hampton Senior High School, Weld Square Primary School, Embleton Primary School, and Hampton Park Primary School.

A Neighbourhood Centre is situated at the corner of Broun Avenue and Beechboro Road North, approximately 400m east of the proposed Morley 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 uses, localities and catchments

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.

The existing pedestrian and cycling environment surrounding the site is fair, however a number of significant gaps and barriers exist. There is an existing Principal Shared Path (PSP) running north-south on the western side of Tonkin Highway which provides continuous access between the Reid Highway PSP to the north and the Midland Railway PSP to the south. There is a high quality shared path running north-south along portions of the eastern side of Tonkin Highway. The surrounding pedestrian and cycle infrastructure is disconnected and requires on-road travel. 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 (Figure 8) has designated future cycling routes planned within the study area. This identifies Broun Avenue, Walter Road W, Beechboro Road N, Grey Street and Collier Road as Secondary Routes, along with Local Routes proposed to provide east-west and north-south connections in the immediate vicinity of the proposed site.

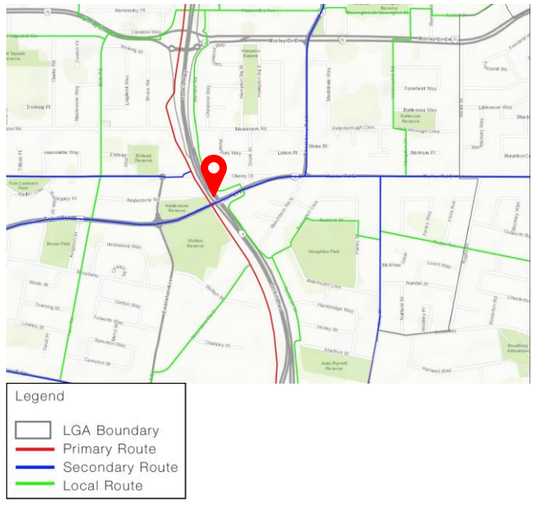


Figure 8: DoT Long Term Cycle Network Plan

2.4 Public transport provisions

A high-level summary of the existing public transport provisions surrounding the future station is shown in Figure 9.

The Morley Station site is currently served by three PTA bus routes, with an additional three routes serving the wider catchment owing to the sites proximity to Morley Bus Station approximately 2.8km to the west.

- Route 341 – Morley Bus Station to Beechboro (via Broun Ave bridge), typically with 20-30 minute peak period headways.
- Route 342 – Morley Bus Station to Beechboro (via Broun Ave bridge), typically with 25-30 minute peak period headways.
- Route 345 – Morley Bus Station to Bennett Springs (via Broun Ave bridge), typically with 10-20 minute peak period headways.
- Route 48 – Perth to Morley Bus Station, typically with 20 minute peak period headways.
- Route 343 – Morley Bus Station to Beechboro, typically with 10-55 minute peak period headways.
- Route 955 – Ellenbrook north to Morley Bus Station, typically with 8-20 minute peak period headways.

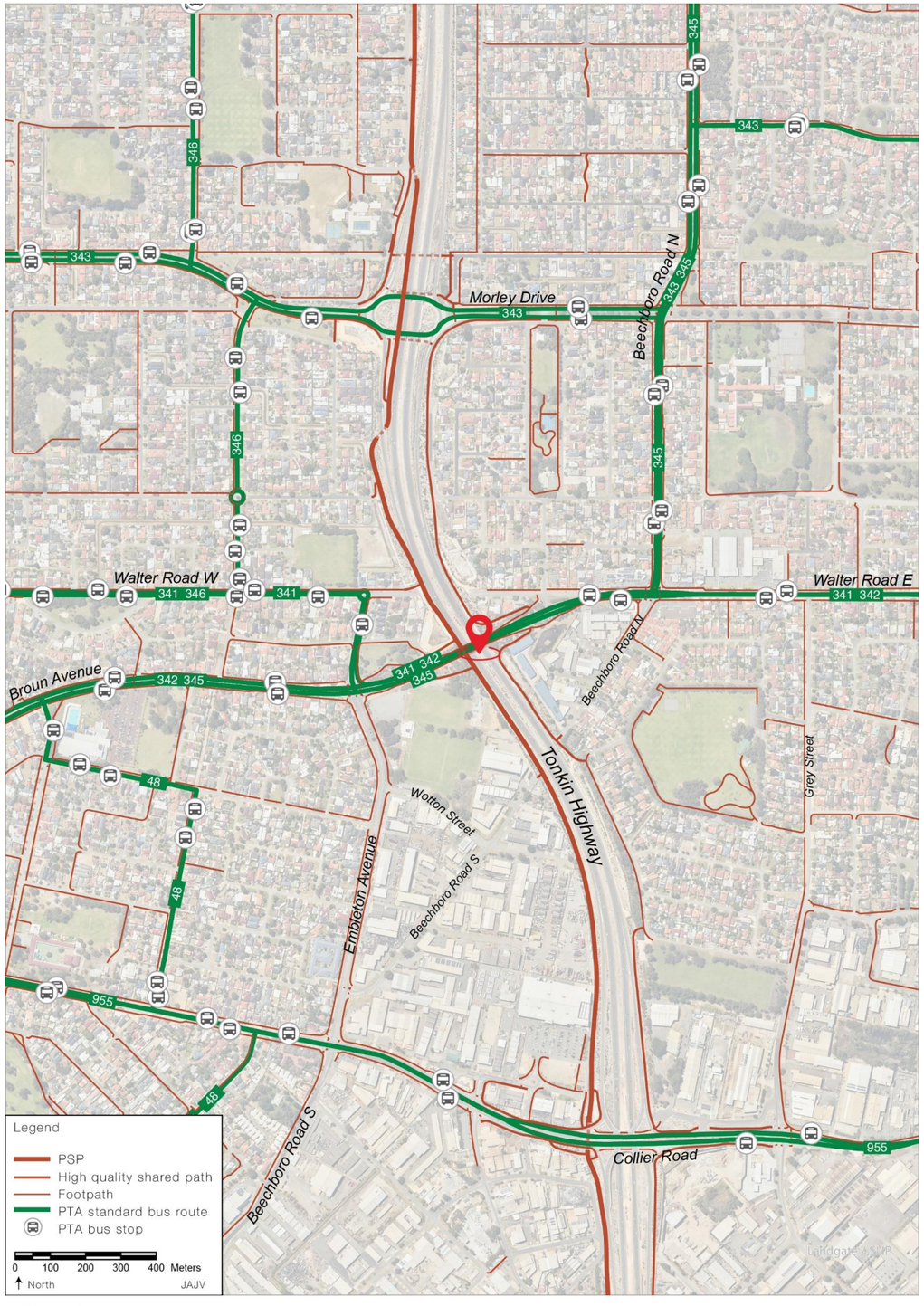


Figure 9: Existing active and public transport provisions

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.

Broun Avenue

Is a four-lane Distributor A road running north-east – south-west, bisecting the site. It traverses Tonkin Highway above grade and travels from south of Coode Street to the south-west, where it continues as Beaufort Street, to Beechboro Road North in the north-east, where it continues as Walter Road East. Broun Avenue services the suburbs of Morley, Embleton and Bedford and provides wider access to Perth CBD via Beaufort Street and Bassendean via Walter Road East. It currently carries approximately 24,000 vehicles per day (Main Roads WA Traffic Map, 2018/19[1]) with a posted speed limit of 60kph.

Embleton Avenue

Is a four-lane Distributor A road running north-south directly west of the site. It travels from Walter Road West in the north to Beechboro Road South in the south, where it continues as Beechboro Road South. It serves the suburbs of Embleton and Morley and provides wider access to Bayswater via Beechboro Road South. It currently carries approximately 12,000 vehicles per day (Main Roads WA Traffic Map, 2016/17[1]) with a posted speed limit of 60kph.

Beechboro Road North

Beechboro Road is a four-lane Distributor A road north of Walter Road East, and a two-lane Local Access Road south of Walter Road East, 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. It carries approximately 20,000 vehicles per day (Main Roads WA Traffic Map, 2016/17[1]) with a posted speed limit of 60kph.

2.6 Existing intersections surrounding the site

The following existing intersections surrounding the site have been identified as potentially impacted by development traffic.

1 **Broun Avenue-Walter Road East / Beechboro Road North** is a four-way at-grade signalised intersection directly east of the site. The intersection currently has through lanes and turning pockets on the east and west approaches, with filter lanes provided on the north and south approaches.

2 **Broun Avenue / Embleton Avenue** is a four-way at-grade signalised intersection directly west of the site. The intersection currently has two through lanes and right turning pockets on the east, west and north approaches and one through lane and two right-turn lanes on the southern approach.

3 **Broun Avenue / Doyle Street** is a priority controlled (give-way) T-junction directly east of the proposed site. The existing intersection currently has two through lanes along Broun Avenue travelling east and west, with a right turn pocket to access Doyle Street for westbound traffic.

4 **Embleton Avenue/ Wotton Street** is a priority controlled (give-way) T-junction south-west of the proposed site. The existing intersection currently has two through lanes along Embleton Avenue travelling north and west, with a right turn pocket to access Wotton Street for northbound traffic and a U-turn pocket for southbound traffic.

5 **Beechboro Road South/ Wotton Street** is a four-way priority controlled intersection south of the proposed site. The intersection currently has single through along Beechboro Road South travelling approximately north - south. Movements from Wotton Street are controlled by stop sign and are single lane travelling approximately east – west.

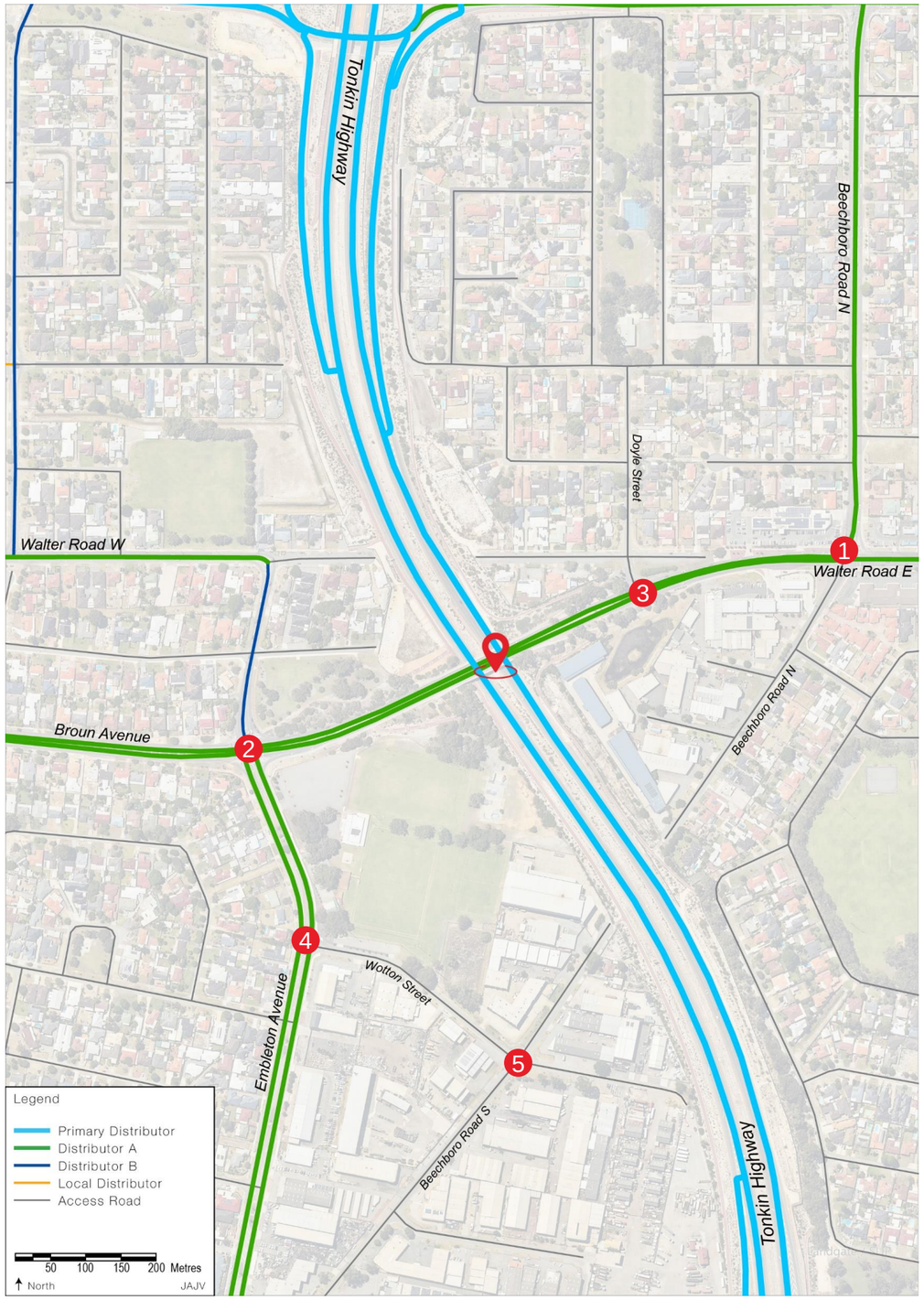


Figure 10: Functional existing road hierarchy and crash data

[1] These mid block counts are the most recent available two-way counts available from Traffic Map at the time of development of this report.

2.7 Crash data

Historical crash data (last five years, 2016-2020) has been presented in Figure 11, in the form of a heatmap, and tabulated in Table 1 and Table 2.

The data highlights that most crashes have occurred at the intersections surrounding the site, principally Broun Avenue-Walter Road East / Beechboro Road North and Broun Avenue / Embleton Avenue. Midblock crashes on Broun Avenue, west of Beechboro Road North are also notable.

The majority (74%) of the crashes over both major intersections were from rear ends or right angle collisions. A significant number of sideswipe collisions (32%) make up the total collisions at the Broun Avenue-Walter Road East / Beechboro Road North intersection. This is likely due to the left traffic lane acting as a left-only lane for eastbound traffic on Broun Avenue in this location and the relatively late lane-change movement this generates for through traffic. This, combined with car park access to the business land use on the north-west corner of the intersection, likely contributes to the relatively high number of midblock collisions directly to the west of the intersection.

The crash severity in the study area was typically low, with 0 fatalities, 2 hospitalisations and 14 medical crashes across the five years. The vast majority (86%) of crashes were Property Damage Only (PDO).

Table 1: Crash types at surrounding intersections and midblock locations

Crash type	Broun Avenue-Walter Road East/ Beechboro Road North	Broun Avenue (midblock)	Broun Avenue/ Doyle Street	Broun Avenue/ Embleton Avenue	Embleton Avenue/ Wotton Street
Rear end	24	11	0	15	0
Head on	0	0	0	0	0
Sideswipe	18	2	0	2	0
Right angle/ right turn thru	10	4	1	18	3
Non-collision/ other	1	0	0	0	0
Hit object	3	1	0	0	0
Total	***56***	***18***	***1***	***35***	***3***

Table 2: Crash severity at surrounding intersections and midblock locations

Crash type	Broun Avenue-Walter Road East/ Beechboro Road North	Broun Avenue (midblock)	Broun Avenue/ Doyle Street	Broun Avenue/ Embleton Avenue	Embleton Avenue/ Wotton Street
Fatal	0	0	0	0	0
Hospitalisation	1	0	0	1	0
Medical	5	2	0	7	0
PDO Major	36	13	1	18	3
PDO Minor	14	3	0	9	0
Total	***56***	***18***	***1***	***35***	***3***

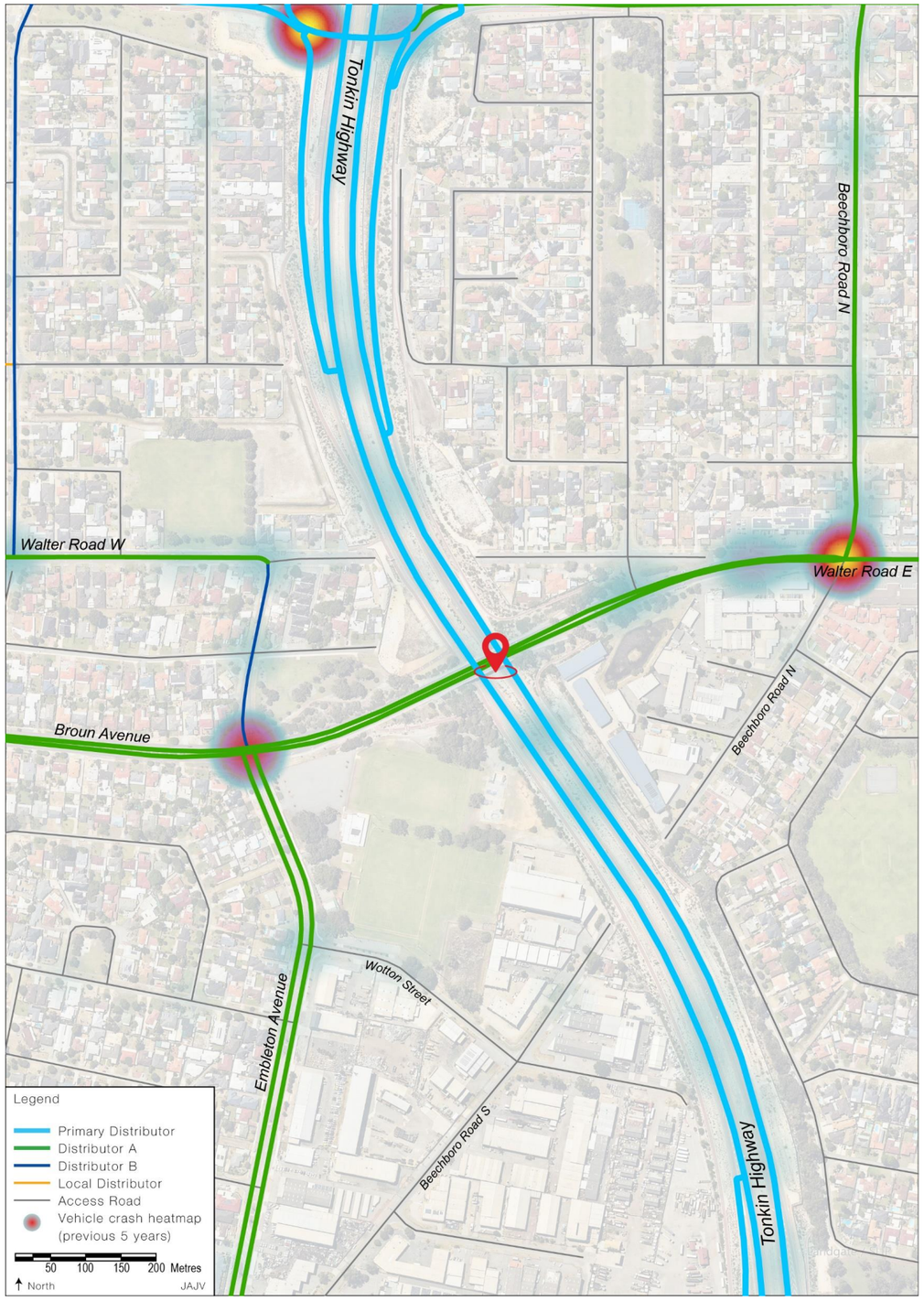


Figure 11: Functional existing road hierarchy and crash data

3 Proposal

The Morley Station platform is proposed to be located at grade within the Tonkin Highway median. The station precinct is proposed to be located above grade on the Broun Avenue bridge, within the Primary Regional Road Reserve. Station Buildings are located on both the northern and southern sides of Broun Avenue with stairs and elevators providing access to the station platform. Station Buildings include ticketing areas, a kiosk, staff facilities and public bathrooms. A five-storey multi-storey car park is located within Wotton Reserve, immediately to the west of Tonkin Highway, and provides access to the station welcome area and bus interchange via an above grade walkway from the rooftop level of the MSCP. A shared path tying in to the Tonkin Highway PSP and Wotton Reserve shared path provides pedestrian and cycle access to the MSCP at it's northern end, adjacent to the KnR, Bike Store and elevator core. Stairs and elevators provide access between MSCP levels.

The station precinct will comprise the following features:

- One island platform (accessed above grade from station entry buildings on Broun Avenue Bridge (north) and Bus Interchange Bridge (south))
- A 12 stand bus interchange comprised of:
  - 10 standard bus bays
  - 2 articulated bus bays
  - Plus 6 layover bays (4 standard and 2 articulated)
- A 395 bay Multi-Storey Car Park (MSCP) facility comprising:
  - 356 standard all-day bays
  - 2 EV charging bays
  - 7 ACROD bays
  - 21 short term bays
  - 1 accessible pick-up/ drop-off bay (PUDO)
  - 1 taxi bay
  - 4 staff parking bays
  - 1 tenant parking bay
  - 2 service bays/ loading bay
  - 10 covered motorcycle bays
- A 5 bay kiss 'n' ride (KnR) facility is located directly north of the MSCP and co-located with station access and vertical transport elements.
- Secure bicycle storage shelter for 72 bicycles
- U-rail bicycle stands within proximity of the 'patio' welcome area (adjacent to the MSCP) and within the bus interchange within proximity of the station entry building.

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 1100, 1800 and 2500 patrons for the year 2026, 2031 and 2041 respectively.

Figure 12 shows a summary of active and public transport infrastructure upgrades to be delivered as part of the Morley 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 Morley, Embleton and Bayswater immediately surrounding the proposed Morley Station is a mix of residential – ranging from low (R20) to medium density (R40) – and industrial.

The Morley Station Precinct Concept Masterplan (CMP) "provides for a neighbourhood scale urban village next to Morley Station, with new medium and higher density housing (i.e. townhouses and apartments), and smaller-scale commercial, retail, and food and beverage opportunities for the community" (Morley Station Precinct Concept Masterplan, METRONET, 2021). The CMP is primarily concerned with the industrial zoned land to the east and south of the site, and includes residential and business zoned land to the east of Beechboro Road North, and land directly abutting Broun Avenue, Walter Road West and Embleton Avenue to the west of the site.

Morley 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, outlined in the CMP.

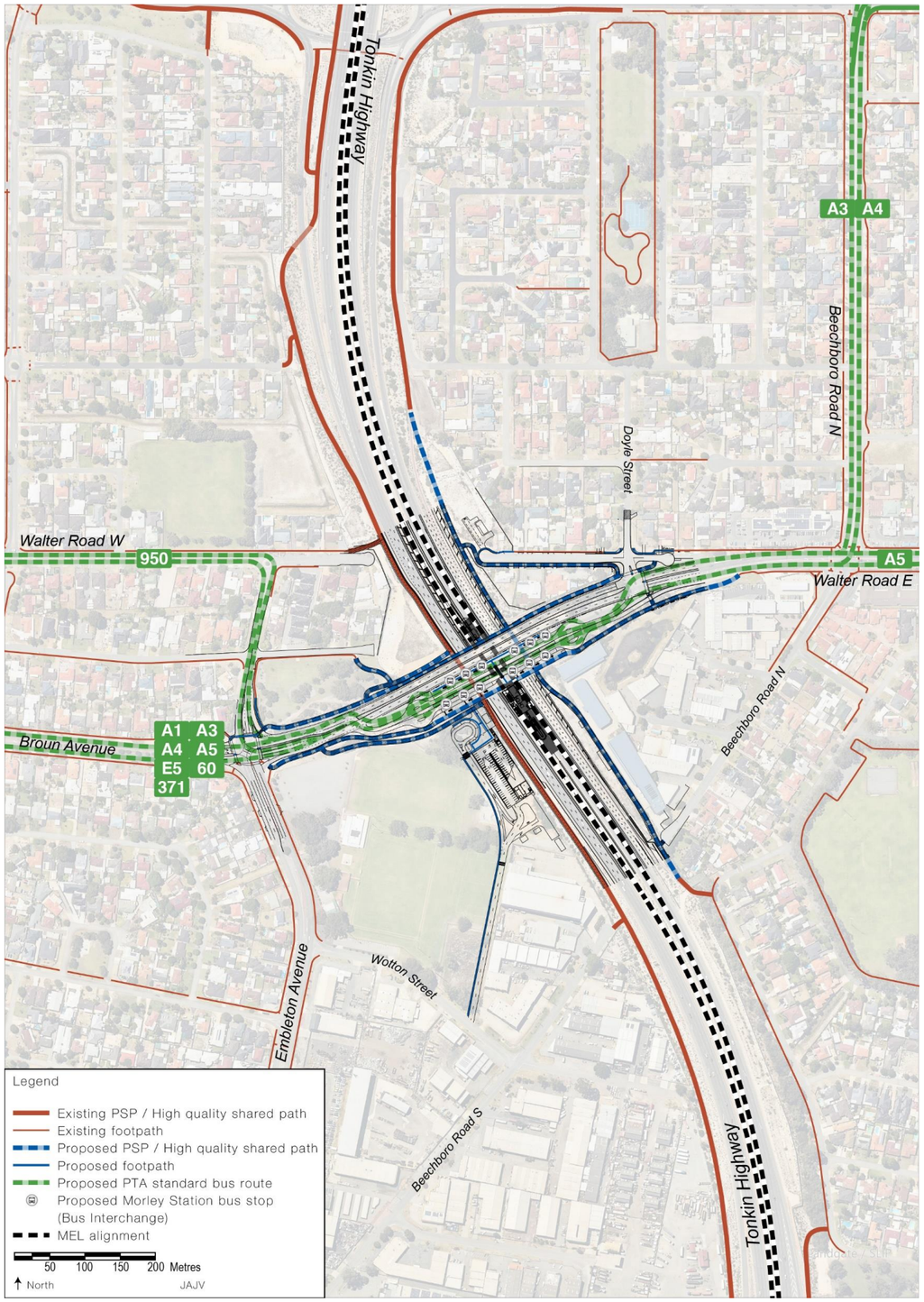


Figure 12: Proposed development and transport infrastructure upgrades

3.2 Proposed access arrangement

3.2.1 Proposed pedestrian and cycling infrastructure

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):

- An upgraded, wide (5m+) shared path on the southern side of Broun Avenue between Embleton Avenue and east of Doyle Street. This connects existing footpaths and the Tonkin Highway PSP and shared path with the station concourse level, southern Station Entry Building and Bus Interchange.
- An upgraded shared path on the northern side of Broun Avenue between Embleton Avenue and Doyle Street, providing access to the northern Station Entry Building.
- New shared path connections to the Tonkin Highway PSP through Wotton Reserve and Addlestone Reserve. New shared path connection to the realigned Tonkin Highway shared path to Cherry Court.
- Provisions for up to 72 bicycle parking bays. These will utilise Transperth's existing secure cycle storage system, requiring registration and use of a SmartRider card for access. Bike storage facility is located on the ground floor of the MSCP, with convenient access to the Tonkin Highway PSP.
- Bicycle 'u' rails within proximity of station accesses within MSCP and the bus interchange.

3.2.2 Proposed public transport provisions

The introduction of Morley 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.

Given the anticipated demand for rail service in the surrounding suburbs, a bus interchange is proposed to improve local connectivity and access to the station, with additional feeder bus services. Morley Station service routes, as advised by the PTA are shown in Figure 12 on the previous page. Buses will access the interchange from Broun Avenue from either the west of Tonkin Highway via a right-turn pocket, or from the east via the new signalised intersection with Doyle Street.

The Bus Interchange includes 12 active stands (10 standard and 2 articulated) and 6 layover bays (4 standard and 2 articulated).

The bus routes proposed to service the future Morley Station Bus Interchange will supersede existing routes (341, 342, 345) and extend others to access Morley Station (60, 371, 950). Anticipated frequencies are provided in Table 5 in Section 5.2.2.

3.2.3 Proposed vehicle access and parking

The station design has been undertaken to allow for station access for commuter and service vehicles, and for buses travelling to and from the bus interchange.

PnR and KnR are located within the MSCP via a new access road within Wotton Reserve, accessed from Wotton Street. Wotton Street is accessed from Embleton Avenue to the west and Beechboro Road South to the east. Primary vehicle access to Wotton Street is from a right-turn pocket on Embleton Avenue for northbound traffic or an uncontrolled left-turn for southbound traffic.

The incorporation of the proposed bus interchange access points on Broun Avenue to and from Morley Station will result in changes to the layout of the Broun Avenue road corridor. This includes the addition of a new signalised intersection at Broun Avenue / Doyle Street providing bus access for westbound-in and eastbound-out bus routes. Westbound-out / eastbound-in bus routes access the bus interchange via a new priority controlled (give-way) intersection to the west of the interchange, accessed via a new right-turn pocket on Broun Avenue.

Realignment of Broun Avenue to accommodate widening / reconstruction of the Broun Avenue bridge will tie into existing intersections with Embleton Avenue and Beechboro Road North.

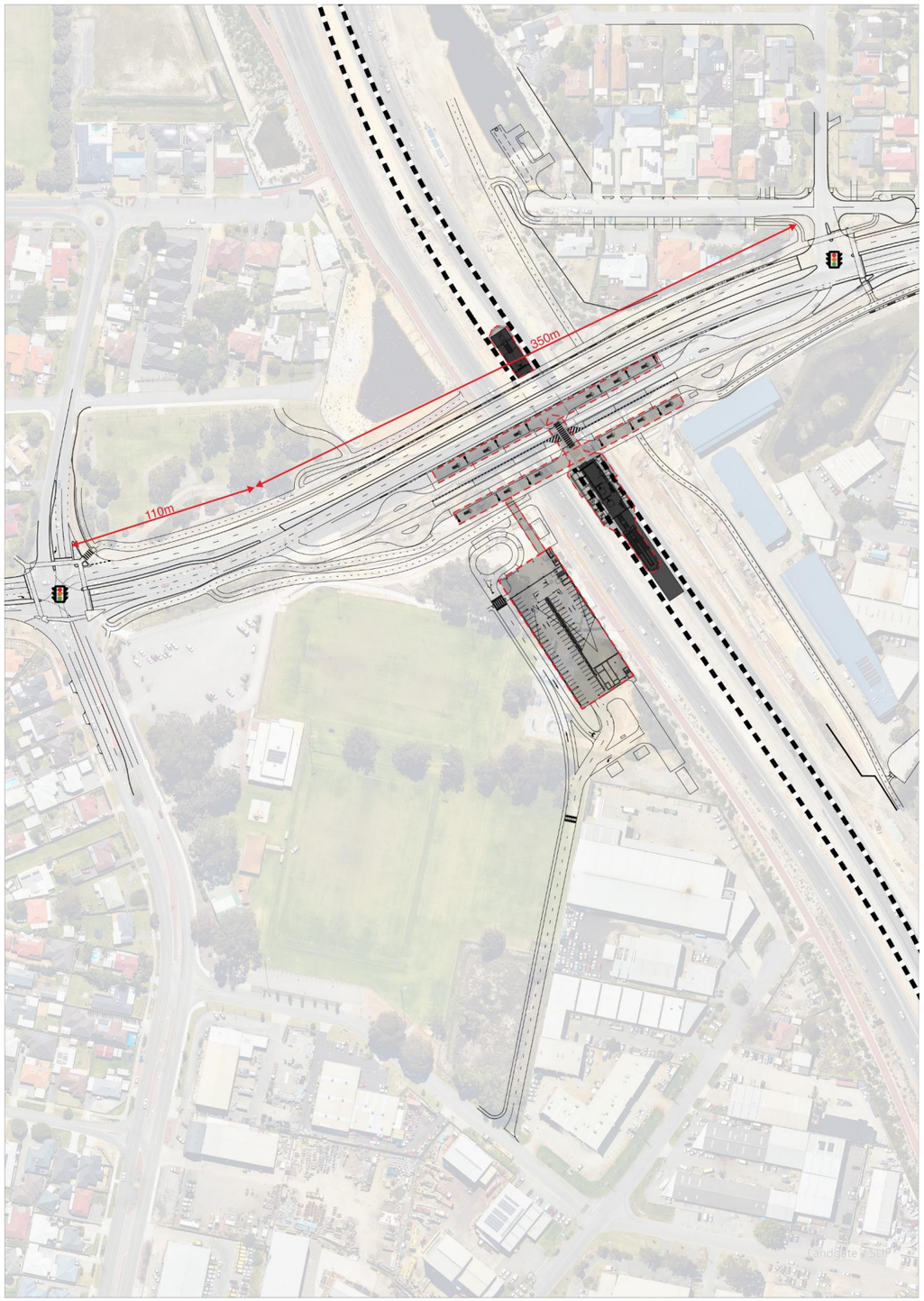


Figure 13: Proposed road network upgrades

4 Access strategy

4.1 Pedestrian and cyclist access

The pedestrian and cyclist catchment surrounding the Morley Station development is expected to be well serviced by connections both internal to the station precinct and the wider network. Active transport to the station will be enhanced by improved connections to the existing PSP on the western side of Tonkin Highway, and upgrades and realignment of the existing shared path on the eastern side of Tonkin Highway. New shared path access to the station is proposed on both sides of Broun Avenue, tieing in to the Tonkin highway PSP and shared path, and the surrounding footpath network.

Pedestrian access to the northern Station Entry Building (1) is via a high-quality shared path on the northern side of Broun Avenue, between the existing footpaths on Embleton Avenue and Doyle Street. Access to the Station platform is via stairs or an elevator. Pedestrian access to the southern Station Entry Building (2) is via a new, wide (5m+) high quality shared path on the southern side of Broun Avenue which connects the Welcome Area with existing footpaths on Embleton Avenue and Beechboro Road North. The eastern Tonkin Highway shared path also provides direct access to this pathway. Access to the Station platform is via stairs or an elevator. Access within the bus interchange is via a zebra crossing to access bus stands from the southern Welcome Area.

Existing signalised crossing facilities exist at the Broun Avenue / Embleton Avenue and Broun Avenue-Walter Road East / Beechboro Road North intersections, however priority controlled crossings between these two intersections do not currently exist. The Broun Avenue / Doyle Street intersection is proposed to be upgraded to a signalised intersection to facilitate bus access to / from the bus interchange. Pedestrian crossing facilities are proposed to enable east-west movement on the northern side of Broun Avenue, and the perpendicular movement across Broun Avenue on the eastern pedestrian approach to the intersection.

Cyclist access to Morley Station from the western side of Tonkin Highway is provided via a new shared path within Wotton reserve, between the existing PSP on the western side of Tonkin Highway and new shared path on the southern side of Broun Avenue, connecting with Embleton Avenue to the west and the Station Welcome Area. The Bike Store is located on the ground floor of the MSCP, adjacent to the elevator / stair access structure, and directly adjacent to the PSP. Access from the Bike Store to the southern Station Entry Building is via elevator or stairs to the MSCP above-grade walkway to the bus interchange. Cyclist access from the eastern side of Tonkin Highway is via a new shared path connection between the upgraded and realigned high-quality shared path on the eastern side of Tonkin Highway and the new shared path on the southern side of Broun Avenue, connecting with Beechboro Road North to the east and the Station Welcome Area. Bicycle U-rails are provided on concourse level, and access to the Bike Store is provided by the aforementioned Wotton Reserve shared path.

Figure 14 shows the key connections surrounding the site.

4.2 Public transport access

In order to provide high quality feeder bus services to and from Morley Station, several new or modified bus services are proposed as part of the MEL project. These feeder services provide direct public transport connection to the station for the surrounding suburbs of Morley, Embleton, Bedford, Bayswater, Dianella and Bassendean.

Frequent bus services between Morley Station and Morley Bus Station are also to be provided, enabling greater access to the Morley Activity Centre.

Bus access has been prioritised in the station precinct design, with the bus interchange located directly adjacent to the southern Station Entry Building. Eastbound-in routes access the western interchange access from a right-turn pocket on Broun Avenue. Westbound-out routes exit the interchange on to Broun Avenue via a priority controlled (give-way) western interchange access. Westbound-in and eastbound-out routes access the interchange from a new four-way signalised intersection with the eastern interchange access-Doyle Street / Broun Avenue. The shared path deviates into the station precinct at this location so there is no conflict with pedestrians or cyclists.

Bus stands are sheltered and the Station Entry Building roof canopy extends over the zebra crossing providing sheltered access for patrons switching modes at Morley Station.

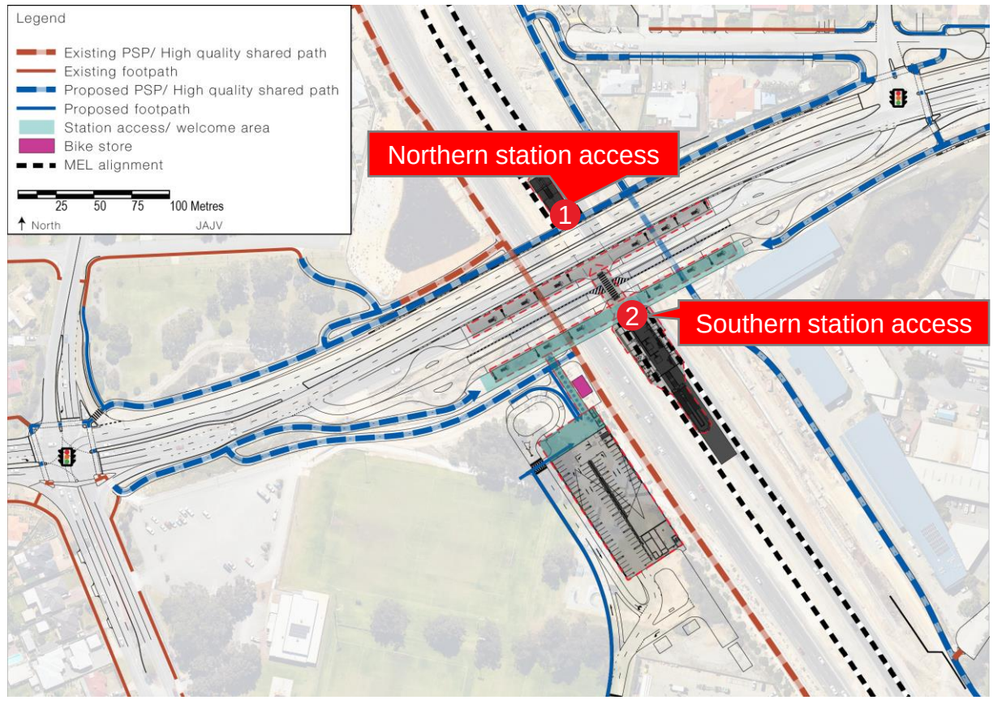


Figure 14: Pedestrian and cycling connections surrounding the development

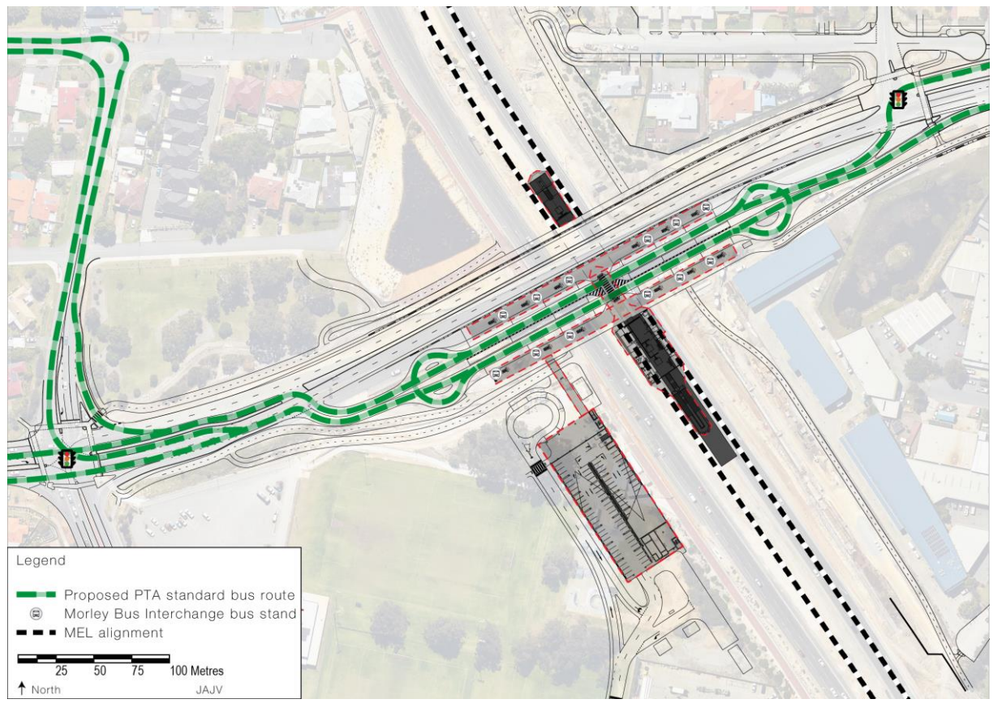


Figure 15: Proposed public transport provisions surrounding the development

4.3 Vehicular access

Based on the proposed access arrangement and modification of existing roads as described in Section 3.2, Figure 16 illustrates the proposed inbound and outbound routes from various origin and destination points surrounding the station precinct. As shown, access and egress to the MSCP PnR and KnR facilities will be facilitated by the proposed priority controlled access road from Wotton Street.

During the AM peak period, inbound vehicles will access the station via this proposed access located south-west of the site. This access offers connectivity from both the northbound and southbound directions along Embleton Avenue through a left in and right in access point.

Similarly in the PM peak, all vehicles egress the MSCP PnR and KnR facilities at the Embleton Avenue/ Wotton Street intersection to head in either the northbound and southbound directions.

4.3.1 Parking and parking management

As outlined in Section 3, a 395 bay MSCP facility is proposed at Morley Station to support patronage to the MEL passenger rail service. 356 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, 26 short-term bays, including 5 KnR bays have been provisioned for Morley 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.

There is an abundance of unrestricted on-street parking in the vicinity of the station precinct – this has a high potential to become a parking management issue for the City of Bayswater once the station opens as this presents an attractive and free alternative to using station parking. It is recommended that the City of Bayswater develop a parking management plan for the area, which will need to more broadly consider the parking needs and outcomes for adjacent land uses.

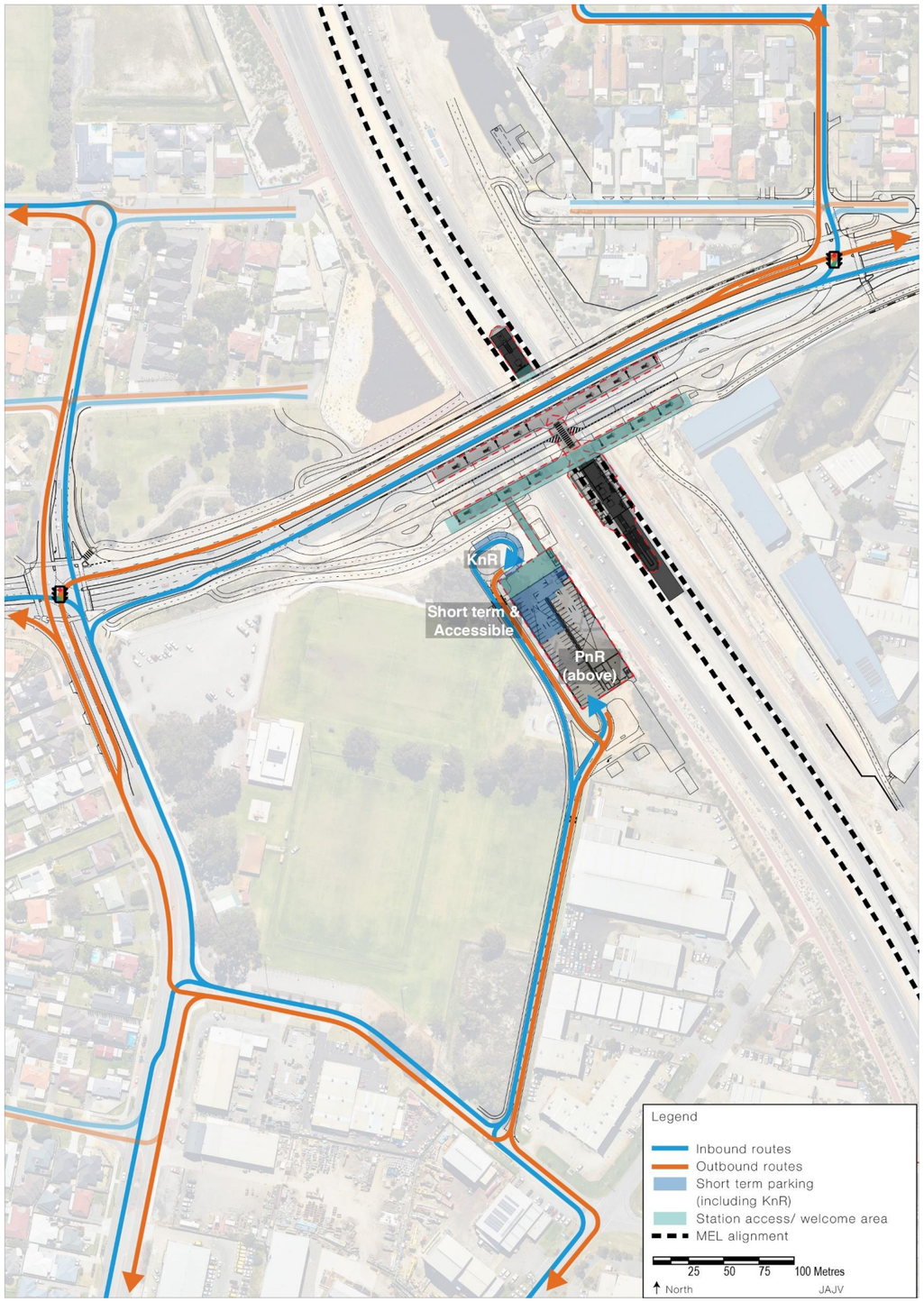


Figure 16: Primary Inbound and outbound routes for the PnR and KnR facilities

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.

Note that this analysis is subject to Main Roads WA Stage 2 Traffic Signals Approvals Process (TSAP).

5.1 Assumptions and parameters

5.1.1 Proposed site plan

Traffic modelling for Morley has been undertaken based on the proposed station configuration, as described in previous sections and shown in Figure 17 on the following page, and the likely impacts station generated traffic will have on the surrounding road network.

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 Morley Station
- 2031 AM/ PM peaks – Opening of Morley Station +5 years
- 2036 AM/ PM peaks – Opening of Morley 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.

Following consultation with the METRONET team, the traffic forecasts for the Morley Station precinct were endorsed on the 1st October 2020. These final demand forecasts have been provided within **Appendix B.**

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 Morley 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 Morley 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.

Refer to Appendix B for a full breakdown of the station traffic distribution at each intersection of the road network surrounding the Morley Station precinct.

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	233 (55%)	0	119 (28%)	119 (28%)	352	119
PM peak hour	0	174 (41%)	93 (22%)	93 (22%)	93	267

Table 4: PnR and KnR traffic distribution

	Distribution of Inbound traffic		Distribution of Outbound traffic	
Associated STEM year	**From North**	**From South**	**To the North**	**To the South**
2026 - 2031	43%	57%	71%	29%
2031 onwards	43%	57%	57%	43%

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 Morley Station road network as used in this analysis have been shown previously in Figure 12 on Page 11. The accompanying headways for the services illustrated within Figure 12 have been summarised in Table 5.

5.2.3 Traffic flows

The distribution of vehicle classifications travelling along Broun Avenue during both the AM and PM peak periods are shown within Table 6 and Table 7 respectively.

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 LinSig modelling for each peak period scenarios.

Peak period turning movement volumes within the road network for all future modelled scenarios have been summarised within **Appendix B** with a copy of the traffic forecast endorsement provided by David Van Den Dries supplied within **Appendix C.**

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
60	*Elizabeth Quay Bus Station to Morley East Station via William Street and Broun Avenue*	*15*	*5*	*5*	*15*
371	*Warwick Station to Morley East Station via Morley Bus Station and Broun Avenue*	*15*	*15*	*15*	*10*
950	*QEII Medical Centre to Morley East Station via Perth, Morley Bus Station and Walter Road West*	*5*	*7*	*10*	*5*
A1	*Morley Central Station to Malaga Station via Crimea Street*	*10*	*10*	*10*	*10*
A3	*Morley Central Station to Malaga Station via Beechboro Road*	*10*	*10*	*10*	*10*
A4	*Morley Central Station to Malaga Station via Bottlebrush Drive and Danube Avenue*	*20*	*20*	*20*	*20*
A5	*Morley Central Station to Malaga Station via Walter Road and Bassendean Station*	*10*	*10*	*10*	*10*
E4	*Morley Central Station to Whiteman Park Station via Bassendean Station and Altone Road*	*10*	*10*	*10*	*10*
E5	*Morley Central Station to Mirrabooka Bus Station*	*20*	*20*	*20*	*20*

Table 6: Vehicle classification proportions – AM Peak

	Vehicle classification (%) w/o buses											
Class	1	2	3	4	5	6	7	8	9	10	11	12
Class %	97.0%	0.6%	2.0%	0.1%	0.1%	0.1%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%
Group %	97.0%	2.8%				0.2%				0%	0%	0%

Table 7: Vehicle classification proportions – PM Peak

	Vehicle classification (%) w/o buses											
Class	1	2	3	4	5	6	7	8	9	10	11	12
Class %	98.5%	0.3%	1.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Group %	98.5%	1.5%				0.0%				0%	0%	0%

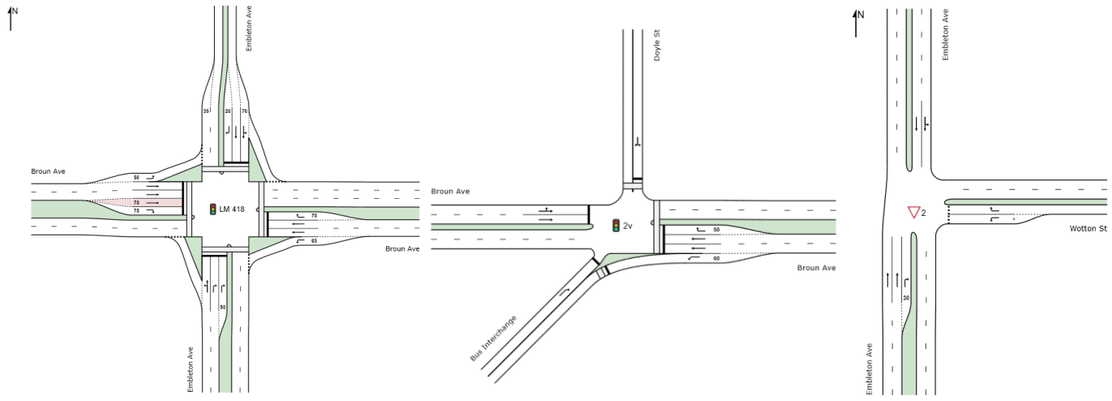


Figure 17: Project case modelled layout – Broun Ave/ Embleton Ave (Left), Broun Ave/ Doylle St/ Bus Interchange (Middle) and Embleton Ave/ Wotton St (Right)

Note. The intersection of Embleton Avenue/ Wotton St has been modelled with a left turn flare lane with a length that can adequately store one vehicle.

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 LinSig has been used to analyse the operational performance at both the Broun Avenue/ Embleton Avenue and Broun Avenue/ Doyle Street/ Bus Interchange intersections.

SIDRA Intersections has been utilised to analysis the Embleton Avenue/ Wotton Street due to the priority controlled nature of this intersection.

As directed by the Public Transport Authority and in keeping with the Traffic Signals Approvals Policy directorate, no future modelling has been completed at Beechboro Road/ Broun Avenue-Walter Road intersection as part of this assessment due to the absence of any proposed traffic signal modifications.

This assessment evaluates the operational performance of each intersection in isolation for the purposes of Main Roads TSAP. The following section provides commentary on some queueing constraints which are noted to potentially impact adjacent intersections. It is noted that the queueing may begin to pose constraints post opening of Morley Station. However, the operational performances of each individual intersection modelled in isolation meets all MRWA operational performance requirements up to and including 10-years post opening of the MEL.

A detailed summary of the project case scenario results has been provided within **Appendix A**.

5.3.1 Base year modelling (2019)

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 Morley Station precinct comprises of the Broun Avenue/ Embleton Avenue and Embleton Avenue/ Wotton Street intersections. The existing Broun Avenue/ Doyle Street intersection is currently priority controlled and did not require any base modelling to be undertaken.

The project-case model is anticipated to expand this network with the inclusion of the proposed Broun Avenue/ Doyle Street/ Bus Interchange signalised intersection east of the station access.

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.

The results of the base modelling of Broun Avenue/ Embleton Avenue and Embleton Avenue/ Wotton Street is shown within Table 8 below.

The Broun Avenue/ Embleton Avenue intersection is operating within capacity during both assessed peak periods with an overall intersection LOS C.

Table 8: Base year traffic performance – Broun Avenue/ Embleton Avenue and Embleton Avenue/ Wotton Street

	Intersection	Broun Avenue/ Embleton Avenue		Embleton Avenue/ Wotton Street	
	Peak	**AM**	**PM**	**AM**	**PM**
	Worst approach (DoS)	East	West	North	North
Criteria	*Overall Intersection LOS*	**LOS C**	**LOS C**	**NA**	**NA**
	Worst approach LOS	**LOS D**	**LOS E**	**LOS B**	**LOS A**
	Overall average delay (s/pcu)	25.0	26.6	0.9	1.7
	Worst approach delay (s/pcu)	36.2	42.4	12.3	6.1
	Worst DoS (%)	74.7	63.1	20.5%	7.4%
	Worst queue results (pcus)	9.9	6.9	0.1	0.1

The results demonstrate that the east approach of the intersection to be most critical in terms of DOS and MMQ during the AM peak (74.7% and 9.9 PCUs). This differs during the PM peak in which the west approach of the intersection was most critical, demonstrating a DOS of 63.1% and 6.9 PCUs respectively.

5.3.2 Project Case - Opening year

During the opening year of Morley Station, the Broun Avenue/ Embleton Avenue intersection operates with an intersection LOS D and a DOS below 80% during both peak periods indicating adequate performance as shown in Table 9.

The worst performing approaches from a queue perspective were the east approach during the AM peak and the west approach during the PM peak. Both approaches reported LOS E with queues of 24.7 pcus and 12.3 pcus respectively. The queueing along the east approach extends beyond the bus interchange access.

The Embleton Avenue/ Wotton Street intersection is also operating within capacity with an overall intersection LOS B and LOS A during the AM and PM peak periods respectively. This indicates residual future capacity for the intersection which is proposed to serve as the main access entering and egressing the Park and Ride facilities for Morley Station.

The operation along this approach should be closely monitored to ensure that public transport access into the bus interchange is not blocked, with an opportunity to provide for a 'Keep Clear' signage.

Both the Broun Avenue/ Doyle Street/ Bus Interchange and Embleton Avenue/ Wotton Street intersections reported good operation with a LOS C or better during both peak periods. The intersection reported a DOS below 80% during both peak periods indicative of residual capacity for both general traffic and public transport access into Morley Station.

Table 9: Future modelling results – Opening Year

	Intersection	Broun Avenue/ Embleton Avenue		Broun Avenue/ Doyle Street/ Bus Interchange		Embleton Avenue/ Wotton Street	
	Peak	**AM**	**PM**	**AM**	**PM**	**AM**	**PM**
	Worst approach (DoS)	North	East	East	West	South	East
Criteria	*Overall Intersection LOS*	**LOS D**	**LOS D**	**LOS C**	**LOS C**	**NA**	**NA**
	Worst approach LOS	**LOS E**	**LOS E**	**LOS E**	**LOS F**	**LOS C**	**LOS A**
	Overall average delay (s/pcu)	44.0	42.9	14.9	16.2	4.4	3.9
	Worst approach delay (s/pcu)	73.0	59.2	76.5	88.6	17.2	6.9
	Worst DoS (%)	79.9	78.2	78.4	78.4	40.3	24.1
	Worst queue results (pcus)	24.7	12.3	22.0	25.4	0.8	0.5

5.3.3 Project Case - Opening +5 years

5-years post opening of Morley Station, the road network surrounding the station precinct is forecast to continue to operate with adequate performance.

The Broun Avenue/ Embleton Avenue intersection continues to report an intersection LOS D and a DOS at or below 85% during both peak periods.

The worst performing approaches from a queue perspective is reported to be the east approach during the AM peak and the west approach during the PM peak with a queue length of 22.6 pcus and 14.2 pcus respectively. The queueing along the east approach is still noted to extend beyond the bus interchange access 5-years post opening of the station.

Both the Broun Avenue/ Doyle Street/ Bus Interchange and Embleton Avenue/ Wotton Street intersections continues to report an intersection LOS D or better and a DOS below 85% during both peak periods.

Table 10: Future modelling results – Opening +5 Years

	Intersection	Broun Avenue/ Embleton Avenue		Broun Avenue/ Doyle Street/ Bus Interchange		Embleton Avenue/ Wotton Street	
	Peak	**AM**	**PM**	**AM**	**PM**	**AM**	**PM**
	Worst approach (DoS)	East	West	East	West	South	East
Criteria	*Overall Intersection LOS*	**LOS D**	**LOS D**	**LOS C**	**LOSD**	**NA**	**NA**
	Worst approach LOS	**LOS E**	**LOS E**	**LOS E**	**LOS F**	**LOS C**	**LOS A**
	Overall average delay (s/pcu)	44.6	45.0	15.7	17.2	4.4	3.7
	Worst approach delay (s/pcu)	75.9	62.7	76.5	88.6	18.8	7.1
	Worst DoS (%)	83.5	84.0	82.5	82.4	45.2	20.0
	Worst queue results (pcus)	22.6	14.2	24.5	28.0	1.0	0.4

5.3.4 Project Case – Opening +10 years

The performance of the Morley Station precinct road network degrades 10-years post opening of the station. However, the network continues to operate within the required performance requirements in terms of both DOS and LOS.

The Broun Avenue/ Embleton Avenue intersection reports an intersection LOS E and a DOS below 100% during both peak periods. This performance meets the required MRWA performance requirements for scenarios 10 years post opening of the station (Intersection LOS E or below and a DOS below 100%).

The worst performing approach from a queue perspective is reported to be the east approach during the AM peak and the west approach during the PM peak with a queue length of 40.8 pcus and 24.9 pcus respectively.

The Broun Avenue/ Doyle Street/ Bus Interchange intersection reports an intersection LOS D and a DOS at or below 100% DOS during both peak periods.

The results of the Embleton Avenue/ Wotton Street intersection continues to operate with good performance 10-years post opening of the station with an overall intersection LOS C or better and a DOS below 60% during both peak periods.

Table 11: Future modelling results – Opening +10 Years

	Intersection	Broun Avenue/ Embleton Avenue		Broun Avenue/ Doyle Street/ Bus Interchange		Embleton Avenue/ Wotton Street	
	Peak	**AM**	**PM**	**AM**	**PM**	**AM**	**PM**
	Worst approach (DoS)	East	East	East	West	South	East
Criteria	*Overall Intersection LOS*	**LOS E**	**LOS E**	**LOS D**	**LOS E**	**NA**	**NA**
	Worst approach LOS	**LOS F**	**LOS F**	**LOS F**	**LOS F**	**LOS C**	**LOS A**
	Overall average delay (s/pcu)	59.6	62.4	19.8	26.0	4.8	3.6
	Worst approach delay (s/pcu)	112.0	84.3	105.7	105.7	23.2	7.4
	Worst DoS (%)	93.1	89.4	95.5	93.1	53.3	21.0
	Worst queue results (pcus)	40.8	24.9	35.4	43.9	1.2	0.4

5.3.5 Summary of findings

Based on the completed traffic analysis, the road network surrounding the Morley Station precinct will operate within the required MRWA performance requirements up to and including 10-years post opening of the station.

The Broun Avenue/ Embleton Avenue intersection is forecast to perform with an intersection LOS E and a DOS of 93.1% and 89.4% during the AM and PM peak periods respectively.

The Broun Avenue/ Doyle Street/ Bus Interchange intersection reports an intersection LOS D and LOSE E during the AM and PM peak periods respectively with a DOS below 100% DOS during both peak periods.

General traffic access into Morley Station through the Embleton Avenue/ Wotton Street intersection is forecast to operate with good performance 10-years post opening of the station with an overall intersection LOS C or better and a DOS below 60% during both peak periods.

These results suggest that general traffic and public transport access into Morley Station via the surrounding road network is expected cope with the additional station generated traffic and operate with within the MRWA performance requirements.

6 Recommendations and summary

The Morley 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 site.

Morley Station is proposed to be located within the Tonkin Highway median and the Broun Avenue bridge. The concourse level of the station will be above the island platform with above grade access to car parking on the western side of Tonkin Highway and active transport links on both sides of Tonkin Highway and Broun Avenue.

The station will be accompanied by a 395 bay MSCP, a 5 bay KnR facility and a bicycle parking for both station and non-station users. Vehicular access to the station will be provided by a new access road within Wotton Reserve with crossover to Wotton Street. Primary access is expected from the Embleton Avenue/ Wotton Street intersection south-west of the proposed site. This will service both the PnR and KnR facilities.

Active transport to the station will be enhanced by improved connections to the existing PSP on the western side of Tonkin Highway, and upgrades and realignment of the existing shared path on the eastern side of Tonkin Highway. New shared path access to the station is proposed on both sides of Broun Avenue, tieing in to the Tonkin highway PSP and shared path, and the surrounding footpath network.

The Morley Station site is primarily contained within a MRS Primary Regional Road Reserve (Tonkin Highway and Broun Avenue). The adjacent area exhibits a mixture of land uses including Local Public Open Space, Medium Density Residential, Light Industry and General Industry. The *Morley Station Precinct Concept Master Plan* proposes long term urban change for the industrial and residential zoned areas within 500m of the Station, transitioning to higher-density residential and commercial development.

Vehicle 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 352 vehicle trips by the opening year of the station during the AM peak hour and 267 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 the LinSig modelling software. This includes an assessment of the Broun Avenue/ Embleton Avenue and Broun Avenue/ Doyle Street/ Bus Interchange intersections.

Based on the completed traffic analysis, the road network surrounding the Morley Station precinct will operate within the required MRWA performance requirements up to and including 10-years post opening of the station.

The Broun Avenue/ Embleton Avenue intersection is forecast to perform with an intersection LOS E and a DOS of 93.1% and 89.4% during the AM and PM peak periods respectively.

The Broun Avenue/ Doyle Street/ Bus Interchange intersection reports an intersection LOS D and LOSE E during the AM and PM peak periods respectively with a DOS below 100% DOS during both peak periods.

General traffic access into Morley Station through the Embleton Avenue/ Wotton Street intersection is forecast to operate with good performance 10-years post opening of the station with an overall intersection LOS C or better and a DOS below 60% during both peak periods.

These results suggest that general traffic and public transport access into Morley Station via the surrounding road network is expected cope with the additional station generated traffic and operate with within the MRWA performance requirements.

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.

Public transport access:

- The proposed routes outlined in this TIA are yet to be finalised, and are still being refined by the PTA. Although, it is not anticipated that the final frequencies of these bus routes will change significantly enough to affect the findings of the TIA, any amendments to the proposed public transport routes should be monitored.

Vehicle access and parking:

- Modifications to the road network including access points should be subject to a Road Safety Audit in accordance with the Main Roads/IPWEA guidelines

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 efficient access for pedestrians, cyclists and personal vehicles.

Appendix A – Traffic modelling results output

Base Year - AM Peak

MEL Traffic Modelling Linsig Output Template

Network Results

Item	Lane Description	Lane Type	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Level Of Service	Back of Uniform Q At End of Red(pcu)	Mean Max Queue (pcu)
Network: Morley Station	-	-	-	-	-	**74.7%**	**17.9**	-	**C**	-	-
Embleton Ave/ Broun Ave	-	-	-	-	-	**74.7%**	**17.9**	-	**C**	-	-
1/2+1/1	Broun Ave (West Approach) Ahead Left	U+O	139	1920:1906	513+36	25.3 : 25.3%	0.9	24.4	C	1.9	2.3
1/3+1/4	Broun Ave (West Approach) Right Ahead	U+O	186	2105:1849	553+70	29.8 : 29.8%	1.3	24.9	C	2.4	2.9
2/2+2/1	Embleton Ave (South Approach) Left Ahead	U+O	94	1985:1839	239+57	31.8 : 31.8%	0.9	33.2	C	1.3	1.7
2/3+2/4	Embleton Ave (South Approach) Right	U	146	1914:1875	252+247	29.4 : 29.2%	1.4	34.9	C	1.3	1.6
3/2+3/1	Broun Ave (East Approach) Ahead Left	U+O	808	1965:1722	562+606	69.2 : 69.2%	3.4	15.1	B	5.6	7.8
3/3+3/4	Broun Ave (East Approach) Ahead Right	U+O	717	2199:1843	644+316	74.7 : 74.7%	5.2	26.2	C	6.9	9.9
4/2+4/1	Embleton Ave (North Approach) Ahead Left	U	312	1985:1757	212+229	70.6 : 70.6%	3.1	36.2	D	3.0	5.0
4/3+4/4	Embleton Ave (North Approach) Right Ahead	U	177	2125:1796	363+71	40.8 : 40.8%	1.7	33.9	C	2.4	3.1
5/1	Broun Ave (West Exit)	U	413	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
5/2	Broun Ave (West Exit)	U	504	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
6/1	Embleton Ave (South Exit)	U	370	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
6/2	Embleton Ave (South Exit)	U	368	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
7/1	Broun Ave (East Exit)	U	285	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
7/2	Broun Ave (East Exit)	U	318	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
8/1	Embleton Ave (North Exit)	U	198	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
8/2	Embleton Ave (North Exit)	U	123	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
Ped Link: P1	North approach	-	40	-	0	Inf	Inf	Inf	-	-	Inf
Ped Link: P2	South approach	-	40	-	0	Inf	Inf	Inf	-	-	Inf
Ped Link: P3	East approach	-	20	-	0	Inf	Inf	Inf	-	-	Inf

MEL Traffic Modelling Linsig Output Template

Ped Link: P4	West approach	-	60	-	0	Inf	Inf	Inf	-	-	Inf
Ped Link: P5	North East approach	-	0	-	0	0.0%	Inf	Inf	-	-	Inf

C1 - Embleton Ave/ Broun Ave

PRC for Signalled Lanes (%): 20.4
PRC Over All Lanes (%): 20.4
Total Delay for Signalled Lanes (pcuHr): 17.92
Total Delay Over All Lanes(pcuHr): 17.92
Cycle Time (s): 76

Base Year - PM Peak

MEL Traffic Modelling Linsig Output Template

Network Results

Item	Lane Description	Lane Type	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Level Of Service	Back of Uniform Q At End of Red(pcu)	Mean Max Queue (pcu)
Network: Morley Station	-	-	-	-	-	**63.1%**	**16.9**	-	**C**	-	-
Embleton Ave/ Broun Ave	-	-	-	-	-	**63.1%**	**16.9**	-	**C**	-	-
1/2+1/1	Broun Ave (West Approach) Ahead Left	U+O	312	1920:1906	475+38	60.8 : 60.8%	2.7	31.6	C	4.3	6.2
1/3+1/4	Broun Ave (West Approach) Right Ahead	U+O	351	2105:1849	528+29	63.1 : 63.1%	3.2	32.4	C	4.8	6.9
2/2+2/1	Embleton Ave (South Approach) Left Ahead	U+O	173	1985:1839	411+69	36.0 : 36.0%	1.3	26.2	C	2.2	2.8
2/3+2/4	Embleton Ave (South Approach) Right	U	422	1914:1875	440+431	48.4 : 48.5%	3.4	28.7	C	3.2	4.3
3/2+3/1	Broun Ave (East Approach) Ahead Left	U+O	331	1965:1722	575+645	27.1 : 27.1%	0.9	10.0	B	2.3	2.4
3/3+3/4	Broun Ave (East Approach) Ahead Right	U+O	353	2199:1843	635+306	32.8 : 47.3%	1.9	19.2	B	3.0	3.4
4/2+4/1	Embleton Ave (North Approach) Ahead Left	U	298	1985:1757	67+431	59.8 : 59.8%	3.0	36.1	D	3.9	5.7
4/3+4/4	Embleton Ave (North Approach) Right Ahead	U	48	2125:1796	172+45	22.1 : 22.1%	0.6	42.4	D	0.7	0.9
5/1	Broun Ave (West Exit)	U	173	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
5/2	Broun Ave (West Exit)	U	226	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
6/1	Embleton Ave (South Exit)	U	136	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
6/2	Embleton Ave (South Exit)	U	135	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
7/1	Broun Ave (East Exit)	U	631	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
7/2	Broun Ave (East Exit)	U	671	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
8/1	Embleton Ave (North Exit)	U	232	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
8/2	Embleton Ave (North Exit)	U	84	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
Ped Link: P1	North approach	-	40	-	0	Inf	Inf	Inf	-	-	Inf
Ped Link: P2	South approach	-	40	-	0	Inf	Inf	Inf	-	-	Inf
Ped Link: P3	East approach	-	20	-	0	Inf	Inf	Inf	-	-	Inf

MEL Traffic Modelling Linsig Output Template

Ped Link: P4	West approach	-	60	-	0	Inf	Inf	Inf	-	-	Inf
Ped Link: P5	North East approach	-	0	-	0	0.0%	Inf	Inf	-	-	Inf

C1 - Embleton Ave/ Broun Ave	PRC for Signalled Lanes (%):	42.6	Total Delay for Signalled Lanes (pcuHr):	16.88	Cycle Time (s):	74
	PRC Over All Lanes (%):	42.6	Total Delay Over All Lanes(pcuHr):	16.88		

Opening Year - AM Peak

MEL Traffic Modelling Linsig Output Template

Network Results

Item	Lane Description	Lane Type	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Level Of Service	Back of Uniform Q At End of Red(pcu)	Mean Max Queue (pcu)
Network: Morley Station	-	-	-	-	-	**84.4%**	**43.7**	-	**D**	-	-
Embleton Ave/ Broun Ave	-	-	-	-	-	**84.4%**	**43.7**	-	**D**	-	-
1/2+1/1	Broun Ave (West Approach) Ahead Left	U+O	162	1920: Inf	294+19	51.6 : 51.6%	3.0	67.6	E	5.4	6.6
1/3	Broun Ave (West Approach) Ahead	U	171	2105	323	53.0%	3.3	70.3	E	5.9	7.1
1/4+1/5	Broun Ave (West Approach) Right Ahead	U	92	2105:1849	199+49	32.2 : 56.8%	1.8	71.4	E	2.2	2.6
2/2+2/1	Embleton Ave (South Approach) Left Ahead	U+O	183	1985:1839	248+59	59.7 : 59.7%	3.3	65.7	E	5.7	7.2
2/3+2/4	Embleton Ave (South Approach) Right	U	285	1914:1875	251+246	57.3 : 57.3%	5.3	67.5	E	5.0	6.2
3/2+3/1	Broun Ave (East Approach) Ahead Left	U+O	974	1965:1722	539+615	84.4 : 84.4%	6.6	24.4	C	10.0	24.0
3/3+3/4	Broun Ave (East Approach) Ahead Right	U	785	2199:1843	740+367	70.9 : 70.9%	8.3	38.0	D	11.9	20.9
4/2+4/1	Embleton Ave (North Approach) Ahead Left	U+O	353	1985:1757	179+242	83.9 : 83.9%	6.2	62.9	E	9.0	13.8
4/3+4/4	Embleton Ave (North Approach) Right Ahead	U	297	2125:1796	379+46	70.0 : 70.0%	5.8	69.8	E	9.4	12.3
5/1	Broun Ave (West Exit)	U	488	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
5/2	Broun Ave (West Exit)	U	559	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
6/1	Embleton Ave (South Exit)	U	464	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
6/2	Embleton Ave (South Exit)	U	498	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
7/1	Broun Ave (East Exit)	U	397	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
7/2	Broun Ave (East Exit)	U	414	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
7/3	Broun Ave (East Exit)	U	64	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
8/1	Embleton Ave (North Exit)	U	283	Inf	Inf	0.0%	0.0	0.0	-	-	0.0

MEL Traffic Modelling Linsig Output Template

8/2	Embleton Ave (North Exit)	U	135	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
Ped Link: P1	North approach	-	30	-	3360	1.2%	0.7	79.8	-	-	1.2
Ped Link: P2	South approach	-	50	-	3360	1.8%	0.8	56.4	-	-	2.0
Ped Link: P3	East approach	-	30	-	3360	0.6%	0.6	69.7	-	-	1.2
Ped Link: P4	West approach	-	50	-	3360	1.2%	0.9	66.6	-	-	2.0
Ped Link: P5	North East approach	-	0	-	2880	0.0%	0.0	0.0	-	-	0.0

C1 - Embleton Ave/ Broun Ave

PRC for Signalled Lanes (%): 6.7
PRC Over All Lanes (%): 6.7

Total Delay for Signalled Lanes (pcuHr): 43.70
Total Delay Over All Lanes(pcuHr): 43.70

Cycle Time (s): 150

Opening Year - PM Peak

MEL Traffic Modelling Linsig Output Template

Network Results

Item	Lane Description	Lane Type	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Level Of Service	Back of Uniform Q At End of Red(pcu)	Mean Max Queue (pcu)
Network: Morley Station	-	-	-	-	-	**73.8%**	**37.9**	-	**D**	-	-
Embleton Ave/ Broun Ave	-	-	-	-	-	**73.8%**	**37.9**	-	**D**	-	-
1/2+1/1	Broun Ave (West Approach) Ahead Left	U+O	342	1920: Inf	434+34	73.0 : 73.0%	6.3	66.1	E	10.6	14.3
1/3	Broun Ave (West Approach) Ahead	U	352	2105	477	73.8%	6.6	67.9	E	11.0	15.0
1/4+1/5	Broun Ave (West Approach) Right Ahead	U	102	2105:1849	409+62	19.5 : 35.7%	1.6	56.1	E	2.5	2.8
2/2+2/1	Embleton Ave (South Approach) Left Ahead	U+O	245	1985:1839	482+111	41.3 : 41.3%	2.9	42.0	D	6.4	7.9
2/3+2/4	Embleton Ave (South Approach) Right	U	571	1914:1875	392+385	73.6 : 73.6%	8.4	52.8	D	8.2	12.7
3/2+3/1	Broun Ave (East Approach) Ahead Left	U+O	445	1965:1722	448+466	48.7 : 48.7%	2.6	21.1	C	5.7	7.1
3/3+3/4	Broun Ave (East Approach) Ahead Right	U	449	2199:1843	361+260	72.2 : 72.2%	6.9	55.6	E	7.0	9.3
4/2+4/1	Embleton Ave (North Approach) Ahead Left	U+O	348	1985:1757	70+537	57.3 : 57.3%	1.4	14.4	B	1.4	3.0
4/3+4/4	Embleton Ave (North Approach) Right Ahead	U	70	2125:1796	301+56	19.6 : 19.6%	1.2	60.5	E	2.0	2.2
5/1	Broun Ave (West Exit)	U	247	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
5/2	Broun Ave (West Exit)	U	289	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
6/1	Embleton Ave (South Exit)	U	164	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
6/2	Embleton Ave (South Exit)	U	184	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
7/1	Broun Ave (East Exit)	U	759	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
7/2	Broun Ave (East Exit)	U	789	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
7/3	Broun Ave (East Exit)	U	80	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
8/1	Embleton Ave (North Exit)	U	305	Inf	Inf	0.0%	0.0	0.0	-	-	0.0

MEL Traffic Modelling Linsig Output Template

8/2	Embleton Ave (North Exit)	U	107	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
Ped Link: P1	North approach	-	30	-	3360	1.2%	0.6	76.1	-	-	1.2
Ped Link: P2	South approach	-	50	-	3360	1.8%	0.8	59.2	-	-	2.0
Ped Link: P3	East approach	-	30	-	3360	0.6%	0.6	69.7	-	-	1.2
Ped Link: P4	West approach	-	50	-	3360	1.2%	0.9	63.0	-	-	2.0
Ped Link: P5	North East approach	-	0	-	2880	0.0%	0.0	0.0	-	-	0.0

C1 - Embleton Ave/ Broun Ave

PRC for Signalled Lanes (%): 22.0
PRC Over All Lanes (%): 22.0

Total Delay for Signalled Lanes (pcuHr): 37.87
Total Delay Over All Lanes(pcuHr): 37.87

Cycle Time (s): 150

Opening +5 Years - AM Peak

MEL Traffic Modelling Linsig Output Template

Network Results

Item	Lane Description	Lane Type	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Level Of Service	Back of Uniform Q At End of Red(pcu)	Mean Max Queue (pcu)
Network: Morley Station	-	-	-	-	-	**85.1%**	**46.2**	-	**D**	-	-
Embleton Ave/ Broun Ave	-	-	-	-	-	**85.1%**	**46.2**	-	**D**	-	-
1/2+1/1	Broun Ave (West Approach) Ahead Left	U+O	183	1920: Inf	282+18	61.1 : 61.1%	3.7	72.9	E	6.2	7.7
1/3	Broun Ave (West Approach) Ahead	U	194	2105	309	62.8%	4.1	75.6	E	6.7	8.4
1/4+1/5	Broun Ave (West Approach) Right Ahead	U	95	2105:1849	161+49	39.7 : 62.9%	2.0	76.4	E	2.2	2.7
2/2+2/1	Embleton Ave (South Approach) Left Ahead	U+O	184	1985:1839	248+58	60.1 : 60.1%	3.4	65.9	E	5.8	7.2
2/3+2/4	Embleton Ave (South Approach) Right	U	286	1914:1875	251+248	57.3 : 57.3%	5.4	67.5	E	5.0	6.2
3/2+3/1	Broun Ave (East Approach) Ahead Left	U+O	1002	1965:1722	536+644	84.9 : 84.9%	6.7	23.9	C	9.8	24.2
3/3+3/4	Broun Ave (East Approach) Ahead Right	U	849	2199:1843	757+361	75.9 : 75.9%	9.3	39.4	D	13.2	24.4
4/2+4/1	Embleton Ave (North Approach) Ahead Left	U+O	346	1985:1757	176+230	85.1 : 85.1%	6.4	66.3	E	8.9	13.9
4/3+4/4	Embleton Ave (North Approach) Right Ahead	U	279	2125:1796	365+46	67.9 : 67.9%	5.4	69.7	E	8.9	11.5
5/1	Broun Ave (West Exit)	U	488	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
5/2	Broun Ave (West Exit)	U	608	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
6/1	Embleton Ave (South Exit)	U	439	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
6/2	Embleton Ave (South Exit)	U	537	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
7/1	Broun Ave (East Exit)	U	414	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
7/2	Broun Ave (East Exit)	U	434	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
7/3	Broun Ave (East Exit)	U	64	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
8/1	Embleton Ave (North Exit)	U	291	Inf	Inf	0.0%	0.0	0.0	-	-	0.0

MEL Traffic Modelling Linsig Output Template

8/2	Embleton Ave (North Exit)	U	143	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
Ped Link: P1	North approach	-	30	-	3360	1.2%	0.7	80.1	-	-	1.2
Ped Link: P2	South approach	-	50	-	3360	1.8%	0.8	56.0	-	-	2.0
Ped Link: P3	East approach	-	30	-	3360	0.6%	0.6	69.7	-	-	1.2
Ped Link: P4	West approach	-	50	-	3360	1.2%	0.9	66.8	-	-	2.0
Ped Link: P5	North East approach	-	0	-	2880	0.0%	0.0	0.0	-	-	0.0

C1 - Embleton Ave/ Broun Ave	PRC for Signalled Lanes (%):	5.8	Total Delay for Signalled Lanes (pcuHr):	46.24	Cycle Time (s): 150
	PRC Over All Lanes (%):	5.8	Total Delay Over All Lanes(pcuHr):	46.24	

Opening +5 Years - PM Peak

MEL Traffic Modelling Linsig Output Template

Network Results

Item	Lane Description	Lane Type	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Level Of Service	Back of Uniform Q At End of Red(pcu)	Mean Max Queue (pcu)
Network: Morley Station	-	-	-	-	-	**76.7%**	**40.5**	-	**D**	-	-
Embleton Ave/ Broun Ave	-	-	-	-	-	**76.7%**	**40.5**	-	**D**	-	-
1/2+1/1	Broun Ave (West Approach) Ahead Left	U+O	390	1920: Inf	472+38	76.5 : 76.5%	7.1	65.7	E	11.8	16.5
1/3	Broun Ave (West Approach) Ahead	U	398	2105	519	76.7%	7.4	67.0	E	12.2	17.0
1/4+1/5	Broun Ave (West Approach) Right Ahead	U	105	2105:1849	386+86	20.7 : 29.0%	1.6	54.5	D	2.4	2.7
2/2+2/1	Embleton Ave (South Approach) Left Ahead	U+O	245	1985:1839	460+106	43.2 : 43.2%	3.0	43.9	D	6.6	8.0
2/3+2/4	Embleton Ave (South Approach) Right	U	569	1914:1875	379+372	75.8 : 75.8%	8.8	55.6	E	8.4	13.3
3/2+3/1	Broun Ave (East Approach) Ahead Left	U+O	452	1965:1722	444+477	49.1 : 49.1%	2.6	20.9	C	5.7	7.1
3/3+3/4	Broun Ave (East Approach) Ahead Right	U	467	2199:1843	361+254	75.9 : 75.9%	7.5	57.7	E	7.3	9.9
4/2+4/1	Embleton Ave (North Approach) Ahead Left	U+O	338	1985:1757	70+525	56.7 : 56.7%	1.4	14.8	B	1.4	3.2
4/3+4/4	Embleton Ave (North Approach) Right Ahead	U	66	2125:1796	298+60	18.5 : 18.5%	1.1	60.4	E	1.9	2.1
5/1	Broun Ave (West Exit)	U	247	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
5/2	Broun Ave (West Exit)	U	302	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
6/1	Embleton Ave (South Exit)	U	170	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
6/2	Embleton Ave (South Exit)	U	184	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
7/1	Broun Ave (East Exit)	U	797	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
7/2	Broun Ave (East Exit)	U	829	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
7/3	Broun Ave (East Exit)	U	80	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
8/1	Embleton Ave (North Exit)	U	310	Inf	Inf	0.0%	0.0	0.0	-	-	0.0

MEL Traffic Modelling Linsig Output Template

8/2	Embleton Ave (North Exit)	U	111	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
Ped Link: P1	North approach	-	40	-	3360	1.2%	0.8	73.8	-	-	1.6
Ped Link: P2	South approach	-	40	-	3360	1.2%	0.8	69.5	-	-	1.6
Ped Link: P3	East approach	-	20	-	3360	0.6%	0.4	69.7	-	-	0.8
Ped Link: P4	West approach	-	60	-	3360	1.8%	0.9	56.1	-	-	2.4
Ped Link: P5	North East approach	-	0	-	2880	0.0%	0.0	0.0	-	-	0.0

C1 - Embleton Ave/ Broun Ave

PRC for Signalled Lanes (%): 17.4
PRC Over All Lanes (%): 17.4

Total Delay for Signalled Lanes (pcuHr): 40.47
Total Delay Over All Lanes(pcuHr): 40.47

Cycle Time (s): 150

Opening +10 Years - AM Peak

MEL Traffic Modelling Linsig Output Template

Network Results

Item	Lane Description	Lane Type	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Level Of Service	Back of Uniform Q At End of Red(pcu)	Mean Max Queue (pcu)
Network: Morley Station	-	-	-	-	-	**96.2%**	**72.6**	-	**E**	-	-
Embleton Ave/ Broun Ave	-	-	-	-	-	**96.2%**	**72.6**	-	**E**	-	-
1/2+1/1	Broun Ave (West Approach) Ahead Left	U+O	229	1920: Inf	397+26	54.2 : 54.2%	3.9	60.6	E	7.2	8.9
1/3	Broun Ave (West Approach) Ahead	U	241	2105	435	55.4%	4.2	62.5	E	7.8	9.6
1/4+1/5	Broun Ave (West Approach) Right Ahead	U	102	2105:1849	83+49	77.1 : 77.1%	3.1	111.0	F	2.1	3.7
2/2+2/1	Embleton Ave (South Approach) Left Ahead	U+O	202	1985:1839	247+59	65.9 : 65.9%	3.9	69.2	E	6.4	8.3
2/3+2/4	Embleton Ave (South Approach) Right	U	314	1914:1875	252+245	63.2 : 63.2%	6.0	69.3	E	5.5	7.0
3/2+3/1	Broun Ave (East Approach) Ahead Left	U+O	1089	1965:1722	515+717	88.4 : 88.4%	7.7	25.4	C	9.4	27.0
3/3+3/4	Broun Ave (East Approach) Ahead Right	U	1081	2199:1843	788+336	96.2 : 96.2%	23.0	76.6	E	21.2	50.9
4/2+4/1	Embleton Ave (North Approach) Ahead Left	U+O	386	1985:1757	158+248	95.2 : 95.2%	10.3	96.2	F	9.8	18.8
4/3+4/4	Embleton Ave (North Approach) Right Ahead	U	364	2125:1796	355+41	91.8 : 91.8%	10.5	103.4	F	11.8	18.9
5/1	Broun Ave (West Exit)	U	493	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
5/2	Broun Ave (West Exit)	U	797	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
6/1	Embleton Ave (South Exit)	U	486	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
6/2	Embleton Ave (South Exit)	U	662	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
7/1	Broun Ave (East Exit)	U	492	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
7/2	Broun Ave (East Exit)	U	514	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
7/3	Broun Ave (East Exit)	U	64	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
8/1	Embleton Ave (North Exit)	U	332	Inf	Inf	0.0%	0.0	0.0	-	-	0.0

MEL Traffic Modelling Linsig Output Template

8/2	Embleton Ave (North Exit)	U	168	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
Ped Link: P1	North approach	-	30	-	3360	1.2%	0.6	77.1	-	-	1.2
Ped Link: P2	South approach	-	50	-	3360	1.8%	0.8	55.6	-	-	2.0
Ped Link: P3	East approach	-	30	-	3360	0.6%	0.6	69.7	-	-	1.2
Ped Link: P4	West approach	-	50	-	3360	1.2%	0.9	67.0	-	-	2.0
Ped Link: P5	North East approach	-	0	-	2880	0.0%	0.0	0.0	-	-	0.0

C1 - Embleton Ave/ Broun Ave

PRC for Signalled Lanes (%): -6.9
PRC Over All Lanes (%): -6.9

Total Delay for Signalled Lanes (pcuHr): 72.56
Total Delay Over All Lanes(pcuHr): 72.56

Cycle Time (s): 150

Opening +10 Years - PM Peak

MEL Traffic Modelling Linsig Output Template

Network Results

Item	Lane Description	Lane Type	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Level Of Service	Back of Uniform Q At End of Red(pcu)	Mean Max Queue (pcu)
Network: Morley Station	-	-	-	-	-	**90.1%**	**57.4**	-	**E**	-	-
Embleton Ave/ Broun Ave	-	-	-	-	-	**90.1%**	**57.4**	-	**E**	-	-
1/2+1/1	Broun Ave (West Approach) Ahead Left	U+O	485	1920: Inf	510+41	88.1 : 88.1%	10.3	76.5	E	14.3	22.5
1/3	Broun Ave (West Approach) Ahead	U	498	2105	561	88.7%	10.8	78.4	E	14.8	23.5
1/4+1/5	Broun Ave (West Approach) Right Ahead	U	111	2105:1849	254+99	31.4 : 31.4%	1.7	56.2	E	2.4	2.7
2/2+2/1	Embleton Ave (South Approach) Left Ahead	U+O	265	1985:1839	407+95	52.8 : 52.8%	3.7	50.5	D	7.5	9.4
2/3+2/4	Embleton Ave (South Approach) Right	U	616	1914:1875	347+340	89.6 : 89.6%	12.7	74.1	E	10.2	19.4
3/2+3/1	Broun Ave (East Approach) Ahead Left	U+O	506	1965:1722	441+582	49.5 : 49.5%	2.5	17.5	B	5.5	6.8
3/3+3/4	Broun Ave (East Approach) Ahead Right	U	621	2199:1843	426+263	90.1 : 90.1%	12.5	72.7	E	10.6	19.2
4/2+4/1	Embleton Ave (North Approach) Ahead Left	U+O	400	1985:1757	67+600	60.0 : 60.0%	1.7	15.2	B	1.4	5.1
4/3+4/4	Embleton Ave (North Approach) Right Ahead	U	87	2125:1796	303+53	24.4 : 24.4%	1.5	61.3	E	2.5	2.8
5/1	Broun Ave (West Exit)	U	250	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
5/2	Broun Ave (West Exit)	U	415	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
6/1	Embleton Ave (South Exit)	U	200	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
6/2	Embleton Ave (South Exit)	U	233	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
7/1	Broun Ave (East Exit)	U	940	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
7/2	Broun Ave (East Exit)	U	983	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
7/3	Broun Ave (East Exit)	U	80	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
8/1	Embleton Ave (North Exit)	U	352	Inf	Inf	0.0%	0.0	0.0	-	-	0.0

MEL Traffic Modelling Linsig Output Template

8/2	Embleton Ave (North Exit)	U	136	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
Ped Link: P1	North approach	-	30	-	3360	1.2%	0.6	74.1	-	-	1.2
Ped Link: P2	South approach	-	50	-	3360	1.8%	0.8	59.0	-	-	2.0
Ped Link: P3	East approach	-	30	-	3360	0.6%	0.6	69.7	-	-	1.2
Ped Link: P4	West approach	-	50	-	3360	1.2%	0.9	63.8	-	-	2.0
Ped Link: P5	North East approach	-	0	-	2880	0.0%	0.0	0.0	-	-	0.0

C1 - Embleton Ave/ Broun Ave

PRC for Signalled Lanes (%): -0.2
PRC Over All Lanes (%): -0.2

Total Delay for Signalled Lanes (pcuHr): 57.44
Total Delay Over All Lanes(pcuHr): 57.44

Cycle Time (s): 150

Opening Year - AM Peak

MEL Traffic Modelling Linsig Output Template

Network Results

Item	Lane Description	Lane Type	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Level Of Service	Back of Uniform Q At End of Red(pcu)	Mean Max Queue (pcu)
Network: Morley Station	**-**	**-**	**-**	**-**	**-**	**75.9%**	**17.6**	**-**	**C**	**-**	**-**
Beechboro Rd/ Doyle St/ Bus Interchange	**-**	**-**	**-**	**-**	**-**	**75.9%**	**17.6**	**-**	**C**	**-**	**-**
1/2+1/1	Broun Ave (West Approach) Ahead Left	U+O	378	1965:1786	936+58	38.0 : 38.0%	1.7	15.9	B	4.2	5.7
1/3	Broun Ave (West Approach) Ahead	U	394	2080	1040	37.9%	1.8	16.7	B	4.6	6.3
2/1	Bus Interchange (South Approach) Right	U	30	1871	125	24.1%	0.5	58.9	E	0.7	0.9
3/2+3/1	Broun Ave (East Approach) Ahead Left	U	749	1965:1786	952+40	75.6 : 75.6%	5.2	24.8	C	8.5	16.1
3/3+3/4	Broun Ave (East Approach) Ahead Right	U+O	793	2105:1871	1013+32	75.9 : 75.9%	5.6	25.3	C	9.1	17.3
4/1	Doyle St (North Approach) Right Left	U	227	1853	371	61.3%	2.9	45.2	D	4.4	6.0
5/1	Broun Ave (West Exit)	U	809	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
5/2	Broun Ave (West Exit)	U	859	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
6/1	Bus Interchange (South Exit)	U	30	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
7/1	Broun Ave (East Exit)	U	410	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
7/2	Broun Ave (East Exit)	U	417	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
8/1	Doyle St (North Exit)	U	46	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
Ped Link: P1	North Approach	-	0	-	4800	0.0%	0.0	0.0	-	-	0.0
Ped Link: P2	East Approach	-	0	-	4800	0.0%	0.0	0.0	-	-	0.0

C1 - Broun Ave/ Doyle St/ Bus Interchange

PRC for Signalled Lanes (%): 18.6 Total Delay for Signalled Lanes (pcuHr): 17.56 Cycle Time (s): 90

PRC Over All Lanes (%): 18.6 Total Delay Over All Lanes(pcuHr): 17.56

Network Results

Item	Lane Description	Lane Type	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Level Of Service	Back of Uniform Q At End of Red(pcu)	Mean Max Queue (pcu)
Network: Morley Station	**-**	**-**	**-**	**-**	**-**	**74.8%**	**16.6**	**-**	**C**	**-**	**-**
Beechboro Rd/ Doyle St/ Bus Interchange	**-**	**-**	**-**	**-**	**-**	**74.8%**	**16.6**	**-**	**C**	**-**	**-**
1/2+1/1	Broun Ave (West Approach) Ahead Left	U+O	746	1965:1786	917+80	74.8 : 74.8%	4.9	23.8	C	8.3	15.8
1/3	Broun Ave (West Approach) Ahead	U	776	2080	1040	74.6%	5.3	24.7	C	9.1	16.8
2/1	Bus Interchange (South Approach) Right	U	30	1871	125	24.1%	0.5	58.9	E	0.7	0.9
3/2+3/1	Broun Ave (East Approach) Ahead Left	U	335	1965:1786	909+89	33.5 : 33.5%	1.4	14.8	B	3.6	4.7
3/3+3/4	Broun Ave (East Approach) Ahead Right	U+O	354	2105:1871	991+40	33.8 : 47.5%	1.8	17.8	B	3.9	5.2
4/1	Doyle St (North Approach) Right Left	U	220	1846	369	59.6%	2.7	44.7	D	4.2	5.7
5/1	Broun Ave (West Exit)	U	383	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
5/2	Broun Ave (West Exit)	U	413	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
6/1	Bus Interchange (South Exit)	U	30	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
7/1	Broun Ave (East Exit)	U	748	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
7/2	Broun Ave (East Exit)	U	808	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
8/1	Doyle St (North Exit)	U	79	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
Ped Link: P1	North Approach	-	0	-	4800	0.0%	0.0	0.0	-	-	0.0
Ped Link: P2	East Approach	-	0	-	4800	0.0%	0.0	0.0	-	-	0.0

C1 - Broun Ave/ Doyle St/ Bus Interchange
PRC for Signalled Lanes (%): 20.3
PRC Over All Lanes (%): 20.3
Total Delay for Signalled Lanes (pcuHr): 16.61
Total Delay Over All Lanes(pcuHr): 16.61
Cycle Time (s): 90

Opening +5 Years - AM Peak

MEL Traffic Modelling Linsig Output Template

Network Results

Item	Lane Description	Lane Type	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Level Of Service	Back of Uniform Q At End of Red(pcu)	Mean Max Queue (pcu)
Network: Morley Station	**-**	**-**	**-**	**-**	**-**	**79.9%**	**19.6**	**-**	**C**	**-**	**-**
Beechboro Rd/ Doyle St/ Bus Interchange	**-**	**-**	**-**	**-**	**-**	**79.9%**	**19.6**	**-**	**C**	**-**	**-**
1/2+1/1	Broun Ave (West Approach) Ahead Left	U+O	396	1965:1786	936+58	39.8 : 39.8%	1.8	16.1	B	4.4	6.1
1/3	Broun Ave (West Approach) Ahead	U	413	2080	1040	39.7%	1.9	16.9	B	4.8	6.8
2/1	Bus Interchange (South Approach) Right	U	30	1871	125	24.1%	0.5	58.9	E	0.7	0.9
3/2+3/1	Broun Ave (East Approach) Ahead Left	U	787	1965:1786	953+38	79.4 : 79.4%	5.8	26.7	C	9.2	18.0
3/3+3/4	Broun Ave (East Approach) Ahead Right	U+O	835	2105:1871	1014+31	79.9 : 79.9%	6.3	27.2	C	9.6	19.2
4/1	Doyle St (North Approach) Right Left	U	244	1853	371	65.8%	3.2	47.2	D	4.7	6.5
5/1	Broun Ave (West Exit)	U	854	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
5/2	Broun Ave (West Exit)	U	907	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
6/1	Bus Interchange (South Exit)	U	30	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
7/1	Broun Ave (East Exit)	U	428	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
7/2	Broun Ave (East Exit)	U	438	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
8/1	Doyle St (North Exit)	U	48	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
Ped Link: P1	North Approach	-	0	-	4800	0.0%	0.0	0.0	-	-	0.0
Ped Link: P2	East Approach	-	0	-	4800	0.0%	0.0	0.0	-	-	0.0

C1 - Broun Ave/ Doyle St/ Bus Interchange

PRC for Signalled Lanes (%): 12.6
PRC Over All Lanes (%): 12.6

Total Delay for Signalled Lanes (pcuHr): 19.56
Total Delay Over All Lanes(pcuHr): 19.56

Cycle Time (s): 90

Opening +5 Years - PM Peak

MEL Traffic Modelling Linsig Output Template

Network Results

Item	Lane Description	Lane Type	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Level Of Service	Back of Uniform Q At End of Red(pcu)	Mean Max Queue (pcu)
Network: Morley Station	**-**	**-**	**-**	**-**	**-**	**78.5%**	**18.3**	**-**	**C**	**-**	**-**
Beechboro Rd/ Doyle St/ Bus Interchange	**-**	**-**	**-**	**-**	**-**	**78.5%**	**18.3**	**-**	**C**	**-**	**-**
1/2+1/1	Broun Ave (West Approach) Ahead Left	U+O	783	1965:1786	917+80	78.5 : 78.5%	5.6	25.6	C	8.9	17.5
1/3	Broun Ave (West Approach) Ahead	U	816	2080	1040	78.5%	6.0	26.4	C	9.5	18.6
2/1	Bus Interchange (South Approach) Right	U	30	1871	125	24.1%	0.5	58.9	E	0.7	0.9
3/2+3/1	Broun Ave (East Approach) Ahead Left	U	342	1965:1786	911+88	34.3 : 34.3%	1.4	14.9	B	3.6	4.9
3/3+3/4	Broun Ave (East Approach) Ahead Right	U+O	361	2105:1871	992+40	34.5 : 47.5%	1.8	17.9	B	4.0	5.5
4/1	Doyle St (North Approach) Right Left	U	237	1846	369	64.2%	3.1	46.5	D	4.5	6.3
5/1	Broun Ave (West Exit)	U	396	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
5/2	Broun Ave (West Exit)	U	426	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
6/1	Bus Interchange (South Exit)	U	30	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
7/1	Broun Ave (East Exit)	U	785	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
7/2	Broun Ave (East Exit)	U	850	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
8/1	Doyle St (North Exit)	U	82	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
Ped Link: P1	North Approach	-	0	-	4800	0.0%	0.0	0.0	-	-	0.0
Ped Link: P2	East Approach	-	0	-	4800	0.0%	0.0	0.0	-	-	0.0

C1 - Broun Ave/ Doyle St/ Bus Interchange

PRC for Signalled Lanes (%): 14.6 Total Delay for Signalled Lanes (pcuHr): 18.31 Cycle Time (s): 90

PRC Over All Lanes (%): 14.6 Total Delay Over All Lanes(pcuHr): 18.31

Opening +10 Years - AM Peak

MEL Traffic Modelling Linsig Output Template

Network Results

Item	Lane Description	Lane Type	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Level Of Service	Back of Uniform Q At End of Red(pcu)	Mean Max Queue (pcu)
Network: Morley Station	**-**	**-**	**-**	**-**	**-**	**89.0%**	**33.0**	**-**	**D**	**-**	**-**
Beechboro Rd/ Doyle St/ Bus Interchange	**-**	**-**	**-**	**-**	**-**	**89.0%**	**33.0**	**-**	**D**	**-**	**-**
1/2+1/1	Broun Ave (West Approach) Ahead Left	U+O	472	1965:1786	951+58	46.8 : 46.8%	2.6	19.7	B	6.4	9.4
1/3	Broun Ave (West Approach) Ahead	U	491	2080	1059	46.4%	2.8	20.5	C	7.0	10.0
2/1	Bus Interchange (South Approach) Right	U	30	1871	102	29.4%	0.6	74.9	E	0.8	1.1
3/2+3/1	Broun Ave (East Approach) Ahead Left	U	882	1965:1786	972+34	87.7 : 87.7%	9.1	37.2	D	12.4	27.0
3/3+3/4	Broun Ave (East Approach) Ahead Right	U+O	938	2105:1871	1032+33	88.1 : 88.1%	9.8	37.6	D	13.1	28.6
4/1	Doyle St (North Approach) Right Left	U	405	1853	455	89.0%	8.1	71.7	E	9.0	15.5
5/1	Broun Ave (West Exit)	U	1012	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
5/2	Broun Ave (West Exit)	U	1070	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
6/1	Bus Interchange (South Exit)	U	30	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
7/1	Broun Ave (East Exit)	U	517	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
7/2	Broun Ave (East Exit)	U	533	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
8/1	Doyle St (North Exit)	U	56	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
Ped Link: P1	North Approach	-	0	-	3927	0.0%	0.0	0.0	-	-	0.0
Ped Link: P2	East Approach	-	0	-	3927	0.0%	0.0	0.0	-	-	0.0

C1 - Broun Ave/ Doyle St/ Bus Interchange

PRC for Signalled Lanes (%): 1.1
PRC Over All Lanes (%): 1.1

Total Delay for Signalled Lanes (pcuHr): 32.98
Total Delay Over All Lanes(pcuHr): 32.98

Cycle Time (s): 110

Opening +10 Years - PM Peak

MEL Traffic Modelling Linsig Output Template

Network Results

Item	Lane Description	Lane Type	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Capacity (pcu)	Deg Sat (%)	Total Delay (pcuHr)	Av. Delay Per PCU (s/pcu)	Level Of Service	Back of Uniform Q At End of Red(pcu)	Mean Max Queue (pcu)
Network: Morley Station	**-**	**-**	**-**	**-**	**-**	**90.1%**	**33.8**	**-**	**D**	**-**	**-**
Beechboro Rd/ Doyle St/ Bus Interchange	**-**	**-**	**-**	**-**	**-**	**90.1%**	**33.8**	**-**	**D**	**-**	**-**
1/2+1/1	Broun Ave (West Approach) Ahead Left	U+O	925	1965:1786	945+83	89.9 : 89.9%	10.0	38.8	D	12.5	28.9
1/3	Broun Ave (West Approach) Ahead	U	971	2080	1078	90.1%	10.7	39.6	D	13.5	30.9
2/1	Bus Interchange (South Approach) Right	U	30	1871	102	29.4%	0.6	74.9	E	0.8	1.1
3/2+3/1	Broun Ave (East Approach) Ahead Left	U	393	1965:1786	950+78	38.2 : 38.2%	1.9	17.4	B	5.1	7.1
3/3+3/4	Broun Ave (East Approach) Ahead Right	U+O	408	2105:1871	1027+33	37.6 : 67.2%	2.3	20.7	C	5.4	7.4
4/1	Doyle St (North Approach) Right Left	U	393	1846	436	90.1%	8.3	76.0	E	8.8	15.4
5/1	Broun Ave (West Exit)	U	502	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
5/2	Broun Ave (West Exit)	U	525	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
6/1	Bus Interchange (South Exit)	U	30	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
7/1	Broun Ave (East Exit)	U	938	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
7/2	Broun Ave (East Exit)	U	1028	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
8/1	Doyle St (North Exit)	U	97	Inf	Inf	0.0%	0.0	0.0	-	-	0.0
Ped Link: P1	North Approach	-	0	-	3927	0.0%	0.0	0.0	-	-	0.0
Ped Link: P2	East Approach	-	0	-	3927	0.0%	0.0	0.0	-	-	0.0

C1 - Broun Ave/ Doyle St/ Bus Interchange

PRC for Signalled Lanes (%): -0.1 Total Delay for Signalled Lanes (pcuHr): 33.81 Cycle Time (s): 110

PRC Over All Lanes (%): -0.1 Total Delay Over All Lanes(pcuHr): 33.81

Embleton Ave/ Wotton St Intersection - AM Peak

Staged Crossing at Two-Way Sign Control

Movement Performance - Vehicles														
Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Embleton Ave														
3	R2	227	0	227	0	0.403	11.1	LOS B	0.8	6.2	0.72	0.95	0.98	43.3
Approach		227	0	227	0	0.403	11.1	NA	0.8	6.2	0.72	0.95	0.98	43.3
East: Wotton St														
4	L2	28	3	28	3	0.021	6.3	LOS A	0	0.3	0.3	0.55	0.3	47.3
5	T1	89	3	89	3	0.275	17.2	LOS C	0.5	3.5	0.79	0.93	0.91	38.5
Approach		118	3	118	3	0.275	14.5	LOS B	0.5	3.5	0.67	0.84	0.76	40.5
North: Embleton Ave														
7	L2	212	10.9	212	10.9	0.247	5.7	LOS A	0	0	0	0.29	0	53.5
8	T1	694	2.2	694	2.2	0.247	0	LOS A	0	0	0	0.09	0	57.1
Approach		905	4.2	905	4.2	0.247	1.3	NA	0	0	0	0.14	0	55.4
All Vehicles		1251	3.3	1251	3.3	0.403	4.4	NA	0.8	6.2	0.19	0.35	0.25	49.9

Movement Performance - Vehicles														
Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Embleton Ave														
2	T1	374	3.8	374	3.8	0.099	0	LOS A	0	0	0	0	0	60
Approach		374	3.8	374	3.8	0.099	0	NA	0	0	0	0	0	60
East: Median Storage Area														
6	R2	92	25	92	25	0.069	2.6	LOS A	0.1	0.5	0.23	0.56	0.23	35.6
Approach		92	25	92	25	0.069	2.6	LOS A	0.1	0.5	0.23	0.56	0.23	35.6
All Vehicles		466	8	466	8	0.099	0.5	NA	0.1	0.5	0.04	0.11	0.04	56.2

Embleton Ave/ Wotton St Intersection PM Peak

Staged Crossing at Two-Way Sign Control

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Aver. Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Embleton Ave														
3	R2	60	0	60	0	0.055	4.6	LOS A	0.1	0.7	0.37	0.57	0.37	50.4
Approach		60	0	60	0	0.055	4.6	NA	0.1	0.7	0.37	0.57	0.37	50.4
East: Wotton St														
4	L2	64	0	64	0	0.041	5.7	LOS A	0.1	0.5	0.16	0.54	0.16	48
5	T1	201	4.3	201	4.3	0.241	6.9	LOS A	0.5	3.6	0.5	0.65	0.5	49.1
Approach		265	3.3	265	3.3	0.241	6.6	LOS A	0.5	3.6	0.41	0.63	0.41	48.8
North: Embleton Ave														
7	L2	80	8.6	80	8.6	0.085	5.7	LOS A	0	0	0	0.31	0	53.6
8	T1	235	0.9	235	0.9	0.085	0	LOS A	0	0	0	0.09	0	57
Approach		315	2.8	315	2.8	0.085	1.4	NA	0	0	0	0.15	0	55.3
All Vehicles		640	2.8	640	2.8	0.241	3.9	NA	0.5	3.6	0.21	0.39	0.21	51.5

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Aver. Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Embleton Ave														
2	T1	627	1.5	627	1.5	0.163	0	LOS A	0	0	0	0	0	60
Approach		627	1.5	627	1.5	0.163	0	NA	0	0	0	0	0	60
East: Median Storage Area														
6	R2	207	2.1	207	2.1	0.153	2.9	LOS A	0.1	1.1	0.31	0.64	0.31	42.4
Approach		207	2.1	207	2.1	0.153	2.9	LOS A	0.1	1.1	0.31	0.64	0.31	42.4
All Vehicles		835	1.6	835	1.6	0.163	0.7	NA	0.1	1.1	0.08	0.16	0.08	56.9

Embleton Ave/ Wotton St Intersection - AM Peak

Staged Crossing at Two-Way Sign Control

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Embleton Ave														
3	R2	228	0	228	0	0.452	12.9	LOS B	1	7	0.77	1	1.11	41.7
Approach		228	0	228	0	0.452	12.9	NA	1	7	0.77	1	1.11	41.7
East: Wotton St														
4	L2	43	3	43	3	0.033	6.4	LOS A	0.1	0.4	0.33	0.56	0.33	47.1
5	T1	72	3	72	3	0.251	18.8	LOS C	0.4	3	0.81	0.94	0.91	37.3
Approach		115	3	115	3	0.251	14.1	LOS B	0.4	3	0.63	0.8	0.69	40.6
North: Embleton Ave														
7	L2	217	10.9	217	10.9	0.269	5.7	LOS A	0	0	0	0.27	0	53.7
8	T1	772	2.2	772	2.2	0.269	0	LOS A	0	0	0	0.09	0	57.1
Approach		989	4.1	989	4.1	0.269	1.3	NA	0	0	0	0.13	0	55.6
All Vehicles		1332	3.3	1332	3.3	0.452	4.4	NA	1	7	0.19	0.34	0.25	49.8

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Embleton Ave														
2	T1	402	3.8	402	3.8	0.107	0	LOS A	0	0	0	0	0	60
Approach		402	3.8	402	3.8	0.107	0	NA	0	0	0	0	0	60
East: Median Storage Area														
6	R2	74	25	74	25	0.056	2.6	LOS A	0	0.4	0.23	0.56	0.23	35.6
Approach		74	25	74	25	0.056	2.6	LOS A	0	0.4	0.23	0.56	0.23	35.6
All Vehicles		476	7.1	476	7.1	0.107	0.4	NA	0	0.4	0.04	0.09	0.04	57

Embleton Ave/ Wotton St Intersection PM Peak

Staged Crossing at Two-Way Sign Control

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Aver. Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Embleton Ave														
3	R2	60	0	60	0	0.057	4.8	LOS A	0.1	0.7	0.39	0.58	0.39	50.2
Approach		60	0	60	0	0.057	4.8	NA	0.1	0.7	0.39	0.58	0.39	50.2
East: Wotton St														
4	L2	97	0	97	0	0.063	5.8	LOS A	0.1	0.8	0.17	0.54	0.17	47.9
5	T1	161	4.3	161	4.3	0.2	7.1	LOS A	0.4	2.8	0.5	0.66	0.5	48.9
Approach		258	2.7	258	2.7	0.2	6.6	LOS A	0.4	2.8	0.38	0.61	0.38	48.5
North: Embleton Ave														
7	L2	85	8.6	85	8.6	0.094	5.7	LOS A	0	0	0	0.3	0	53.7
8	T1	263	0.9	263	0.9	0.094	0	LOS A	0	0	0	0.09	0	57
Approach		348	2.7	348	2.7	0.094	1.4	NA	0	0	0	0.14	0	55.4
All Vehicles		666	2.5	666	2.5	0.2	3.7	NA	0.4	2.8	0.18	0.37	0.18	51.5

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Aver. Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Embleton Ave														
2	T1	682	1.5	682	1.5	0.178	0	LOS A	0	0	0	0	0	60
Approach		682	1.5	682	1.5	0.178	0	NA	0	0	0	0	0	60
East: Median Storage Area														
6	R2	166	2.1	166	2.1	0.126	3	LOS A	0.1	0.9	0.32	0.65	0.32	42.3
Approach		166	2.1	166	2.1	0.126	3	LOS A	0.1	0.9	0.32	0.65	0.32	42.3
All Vehicles		848	1.6	848	1.6	0.178	0.6	NA	0.1	0.9	0.06	0.13	0.06	57.6

Embleton Ave/ Wotton St Intersection - AM Peak

Staged Crossing at Two-Way Sign Control

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Embleton Ave														
3	R2	231	0	231	0	0.533	16.1	LOS C	1.2	8.6	0.83	1.06	1.32	39.1
Approach		231	0	231	0	0.533	16.1	NA	1.2	8.6	0.83	1.06	1.32	39.1
East: Wotton St														
4	L2	43	3	43	3	0.035	6.6	LOS A	0.1	0.5	0.37	0.58	0.37	47
5	T1	72	3	72	3	0.302	23.2	LOS C	0.5	3.6	0.86	0.97	1.01	34.3
Approach		115	3	115	3	0.302	16.9	LOS C	0.5	3.6	0.67	0.82	0.77	38.4
North: Embleton Ave														
7	L2	225	10.9	225	10.9	0.299	5.7	LOS A	0	0	0	0.25	0	53.9
8	T1	877	2.2	877	2.2	0.299	0	LOS A	0	0	0	0.09	0	57.2
Approach		1102	4	1102	4	0.299	1.2	NA	0	0	0	0.12	0	55.8
All Vehicles		1447	3.3	1447	3.3	0.533	4.8	NA	1.2	8.6	0.19	0.33	0.27	49

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Embleton Ave														
2	T1	437	3.8	437	3.8	0.116	0	LOS A	0	0	0	0	0	60
Approach		437	3.8	437	3.8	0.116	0	NA	0	0	0	0	0	60
East: Median Storage Area														
6	R2	74	25	74	25	0.057	2.7	LOS A	0	0.4	0.25	0.57	0.25	35.5
Approach		74	25	74	25	0.057	2.7	LOS A	0	0.4	0.25	0.57	0.25	35.5
All Vehicles		511	6.9	511	6.9	0.116	0.4	NA	0	0.4	0.04	0.08	0.04	57.2

Embleton Ave/ Wotton St Intersection PM Peak

Staged Crossing at Two-Way Sign Control

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Embleton Ave														
3	R2	60	0	60	0	0.059	5	LOS A	0.1	0.7	0.42	0.6	0.42	49.9
Approach		60	0	60	0	0.059	5	NA	0.1	0.7	0.42	0.6	0.42	49.9
East: Wotton St														
4	L2	97	0	97	0	0.064	5.8	LOS A	0.1	0.9	0.19	0.54	0.19	47.9
5	T1	161	4.3	161	4.3	0.21	7.4	LOS A	0.4	3	0.53	0.69	0.53	48.4
Approach		258	2.7	258	2.7	0.21	6.8	LOS A	0.4	3	0.4	0.63	0.4	48.2
North: Embleton Ave														
7	L2	91	8.6	91	8.6	0.105	5.7	LOS A	0	0	0	0.28	0	53.8
8	T1	301	0.9	301	0.9	0.105	0	LOS A	0	0	0	0.09	0	57.1
Approach		392	2.7	392	2.7	0.105	1.3	NA	0	0	0	0.14	0	55.6
All Vehicles		710	2.5	710	2.5	0.21	3.6	NA	0.4	3	0.18	0.36	0.18	51.6

Movement Performance - Vehicles

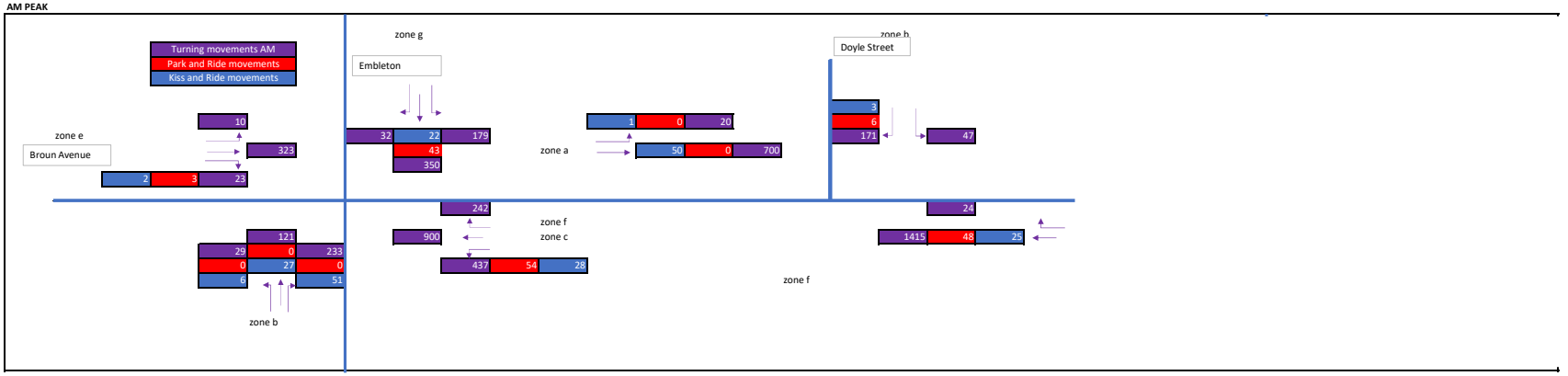
Mov ID	Turn	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	Aver. Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Embleton Ave														
2	T1	738	1.5	738	1.5	0.192	0	LOS A	0	0	0	0	0	60
Approach		738	1.5	738	1.5	0.192	0	NA	0	0	0	0	0	60
East: Median Storage Area														
6	R2	166	2.1	166	2.1	0.13	3.1	LOS A	0.1	0.9	0.33	0.66	0.33	42.1
Approach		166	2.1	166	2.1	0.13	3.1	LOS A	0.1	0.9	0.33	0.66	0.33	42.1
All Vehicles		904	1.6	904	1.6	0.192	0.6	NA	0.1	0.9	0.06	0.12	0.06	57.7

Appendix B – Morley Station future peak period turning movement volumes

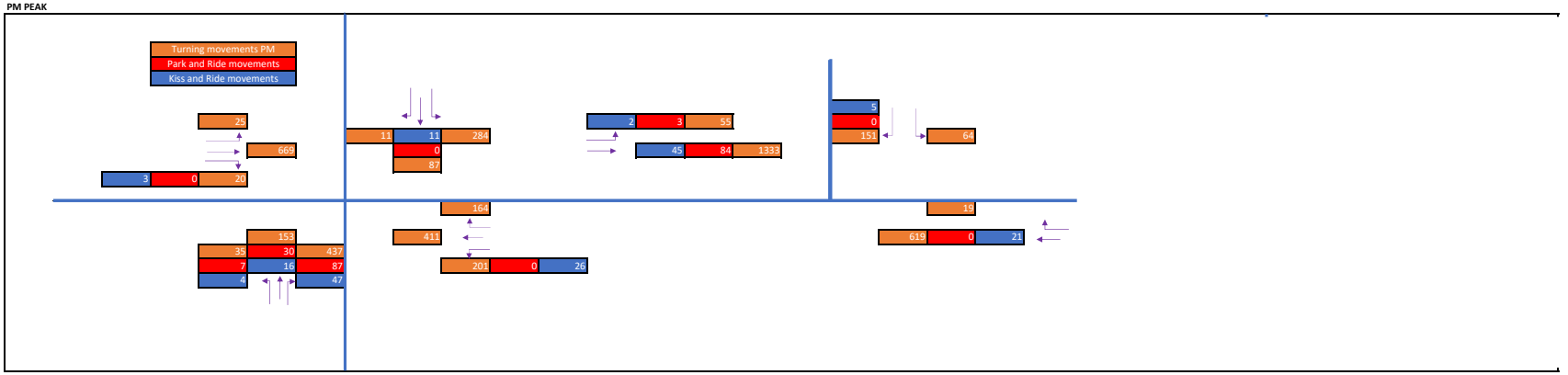
2026 AM/ PM turning volumes - Background traffic (WITH PCU Factor applied), PnR and KnR Traffic

2026 Peak hour forecasts for Station Trips and Background Traffic - Splits for Park n Ride, Kiss n Ride and Background

AM PEAK



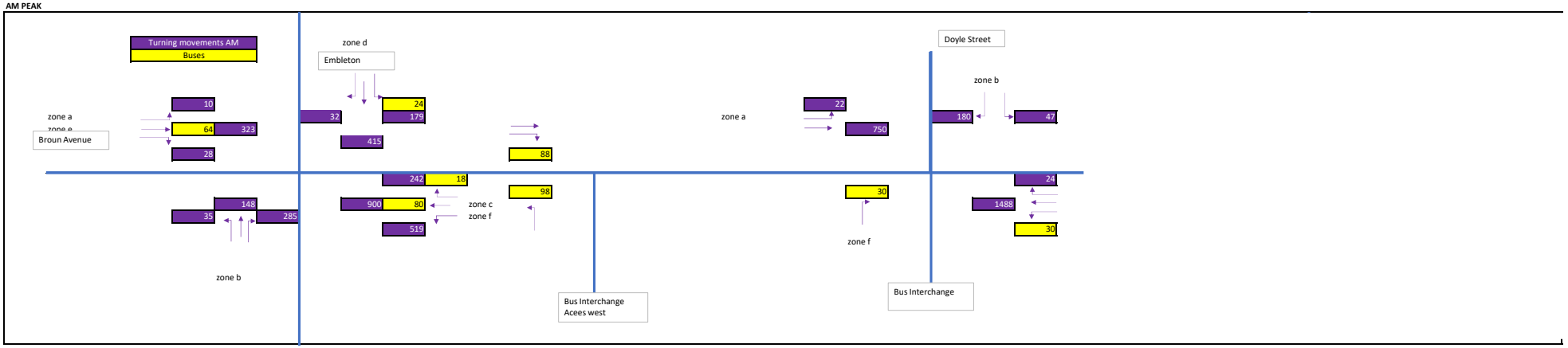
PM PEAK



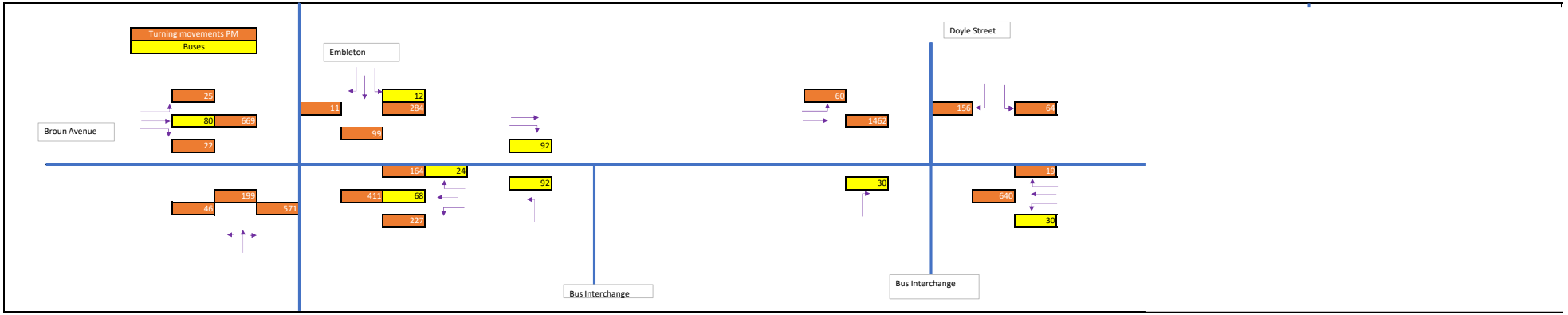
2031 AM/ PM total volume with bus forecasts (and PCU factor applied

2031 Peak hour forecasts for Station Trips and Background Traffic - Combined volume + Buses

AM PEAK



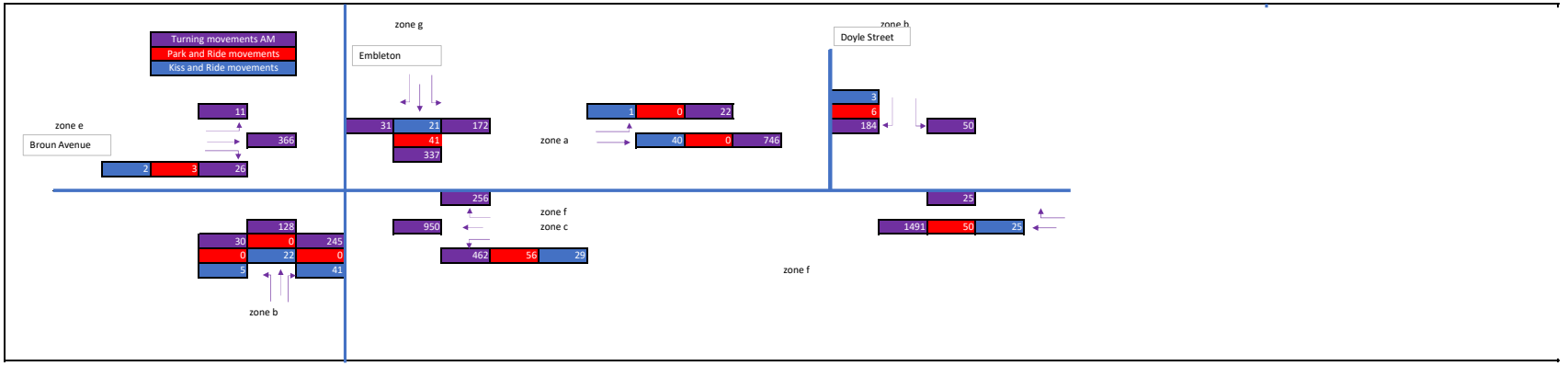
PM PEAK



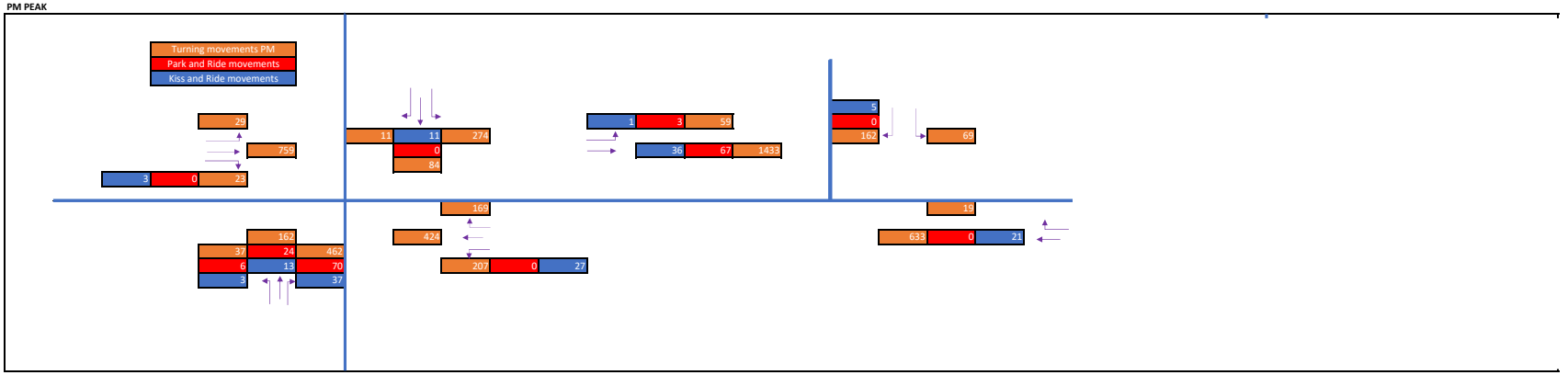
2031 AM/ PM turning volumes - Background traffic (WITH PCU Factor applied), PnR and KnR Traffic

2031 Peak hour forecasts for Station Trips and Background Traffic - Splits for Park n Ride, Kiss n Ride and Background

AM PEAK



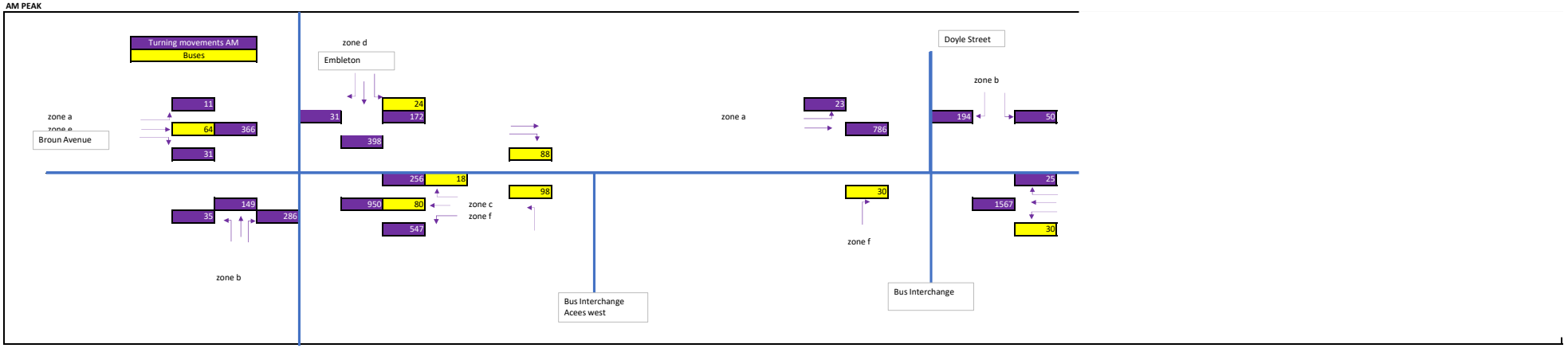
PM PEAK



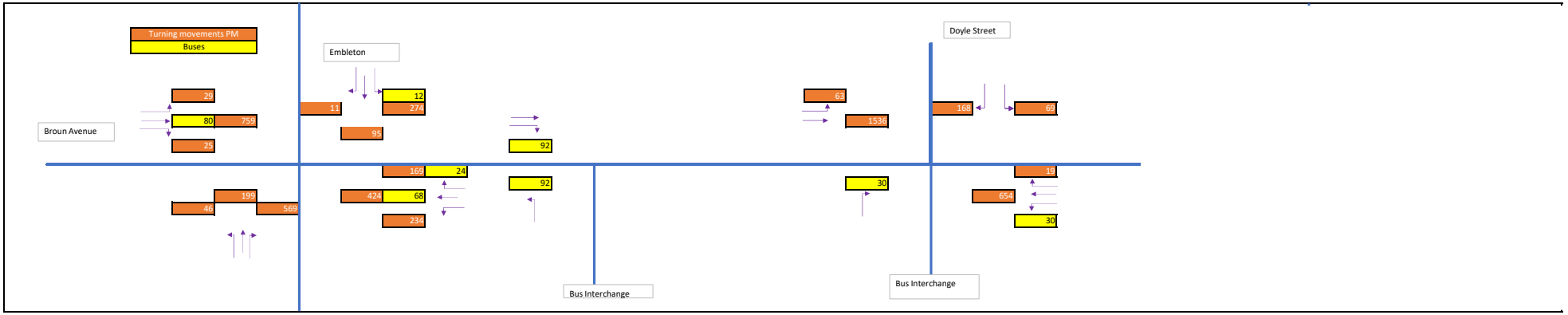
2031 AM/ PM total volume with bus forecasts (and PCU factor applied

2031 Peak hour forecasts for Station Trips and Background Traffic - Combined volume + Buses

AM PEAK



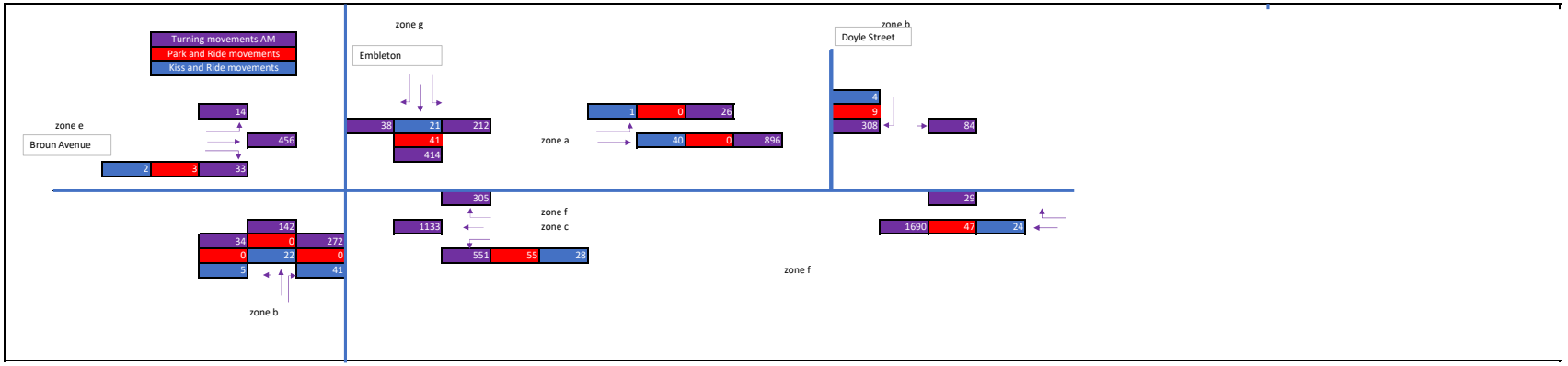
PM PEAK



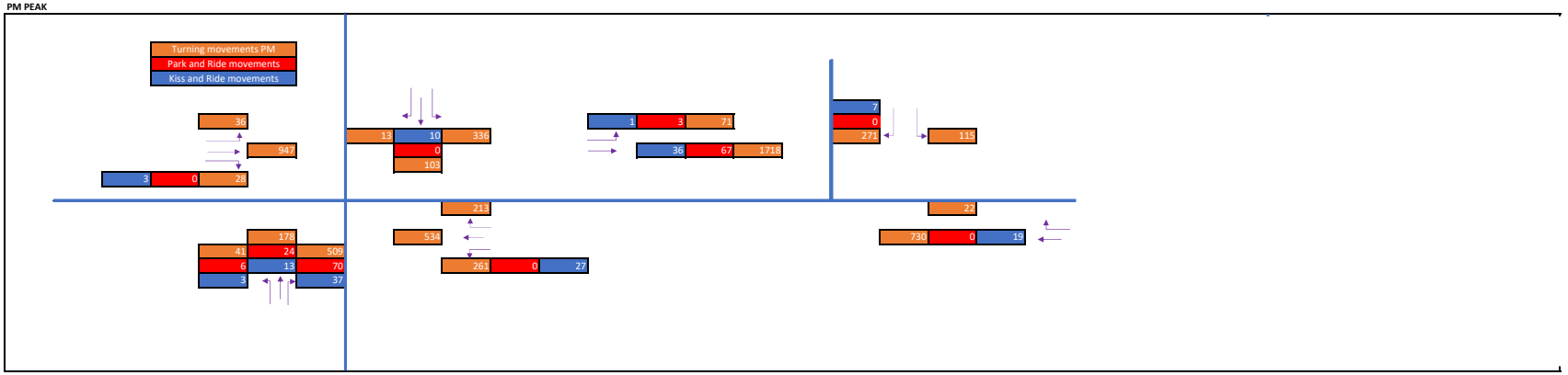
2036 AM/ PM turning volumes - Background traffic (WITH PCU Factor applied), PnR and KnR Traffic

2036 Peak hour forecasts for Station Trips and Background Traffic - Splits for Park n Ride, Kiss n Ride and Background

AM PEAK



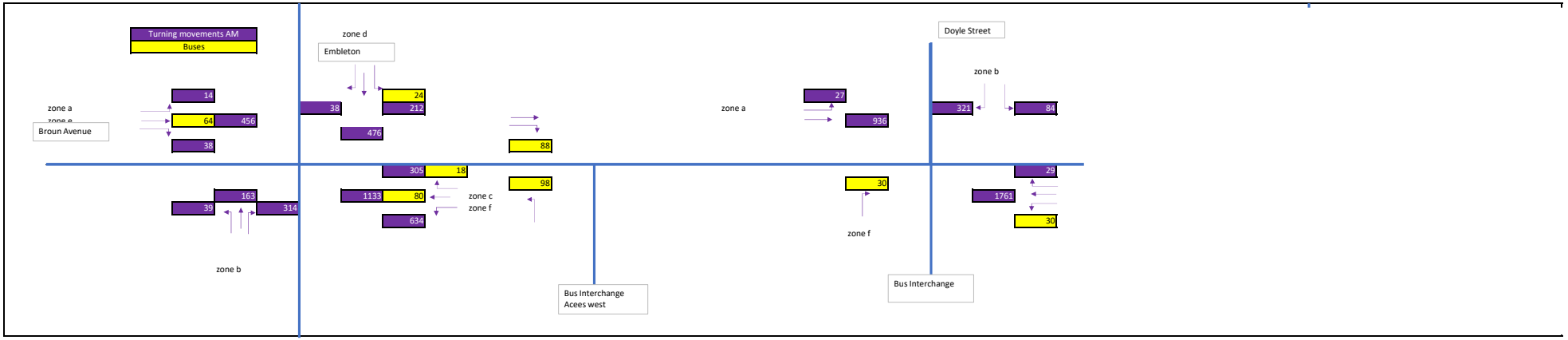
PM PEAK



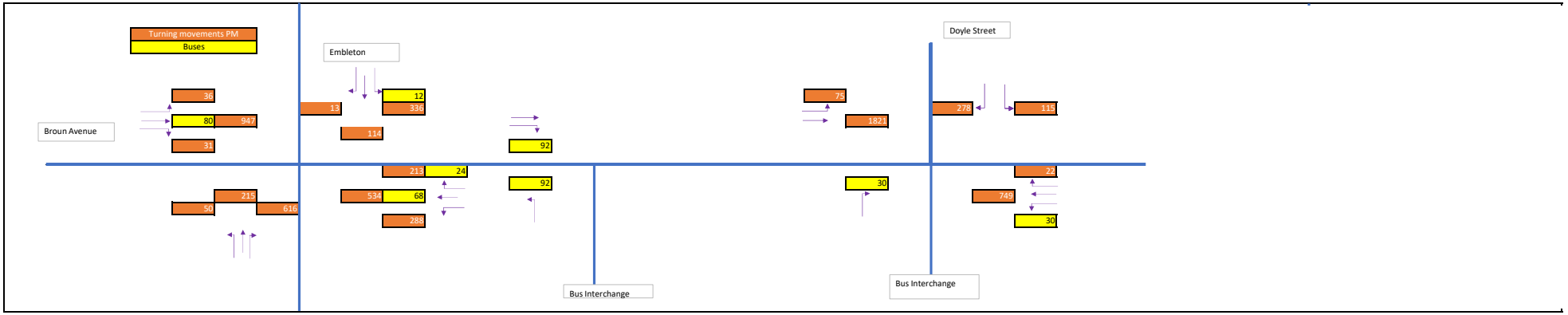
2036 AM/ PM total volume with bus forecasts (and PCU factor applied

2036 Peak hour forecasts for Station Trips and Background Traffic - Combined volume + Buses

AM PEAK



PM PEAK



Appendix C – Traffic forecast agreement with Main Roads Road Planning and Development branch

From: VAN DEN DRIES David (URPM) <david.vandendries@mainroads.wa.gov.au>
Sent: Monday, 7 September 2020 2:07 PM
To: John Samineeni Jesudoss
Cc: FOURIE Paul (DRPD/A); Jeremy Millar; Du Toit, Willem; Raul Used; Scott Arbon; Marsh, Brendan; Quinton Taylor; 276887-00@qeep.arup.com
Subject: [External] RE: TRAFFIC VOLUMES malaga.pdf, TRAFFIC VOLUMES morley.pdf

Good afternoon John,

Many thanks for your email and the mark up of your turning traffic volumes onto the two pdf's which I have supplied.

YES NOTED regarding the southbound left and right turn volume to the approach of Broun Ave/ Embleton Ave intersection. I have amended my drawing.

I SUPPORT THE PROJECT NUMBERS TO BE USED IN THE TRAFFIC ASSESSMENT FOR BOTH MORLEY AND MALAGA RAILWAY STATION. Please be mindful, the turning volumes DO NOT INCLUDE KISS'N'Ride demands. Those trips are in addition.

Best wishes

David Van Den Dries

-----Original Message-----
From: John Samineeni Jesudoss <John.Samineeni-Jesudoss@arup.com>
Sent: Thursday, 3 September 2020 2:52 PM
To: VAN DEN DRIES David (URPM) <david.vandendries@mainroads.wa.gov.au>
Cc: FOURIE Paul (DRPD/A) <paul.fourie@mainroads.wa.gov.au>; Jeremy Millar <jeremy.millar@pta.wa.gov.au>; Du Toit, Willem <Willem.DuToit@pta.wa.gov.au>; Raul Used <raul.used@pta.wa.gov.au>; Scott Arbon <scott.arbon@arup.com>; Marsh, Brendan <Brendan.Marsh@pta.wa.gov.au>; Quinton Taylor <quinton.taylor@pta.wa.gov.au>; 276887-00@qeep.arup.com
Subject: RE: TRAFFIC VOLUMES malaga.pdf, TRAFFIC VOLUMES morley.pdf

Good Afternoon David,

Really appreciate your time over the last few days regarding Morley and Malaga station background traffic forecasts.

I have attached to this email a mark-up my final numbers in blue. Just noting the your numbers for the southbound approach of Broun Ave/ Embleton Ave seem to have the LT and RTs switched for the 2034 PM peak.

We will be updating our SIDRA models with these finalised numbers, however, there will subtle changes to ensure the network traffic flows are balanced within our models.

Please let me know if there is any further information you require, happy to discuss further if required.

Many Thanks,

John Samineeni Jesudoss
Transport Engineer | Advisory, Planning & Design AUS BSc MPEng (Civil) | MAITPM | MIEAust

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t: +61 8 9327 8300 d: +61 8 9327 8428 m: +61 433 007 243
https://aus01.safelinks.protection.outlook.com/?url=http%3A%2F%2Fwww.arup.com%2F&data=02%7C01%7Cdavid.vandendries%40mainroads.wa.gov.au%7Cd841401d341a4806ac0108d84fd5e29c%7Cced71ed676dd43d09acccf122b3bc423%7C0%7C0%7C637347127535377864&sdata=HD7xL4fNBcTqf7USwwBINPd2nWUbITefDUFS3sBvJ0k%3D&reserved=0

-----Original Message-----
From: VAN DEN DRIES David (URPM) <david.vandendries@mainroads.wa.gov.au>
Sent: Thursday, September 3, 2020 12:04 PM
To: John Samineeni Jesudoss <John.Samineeni-Jesudoss@arup.com>
Cc: FOURIE Paul (DRPD/A) <paul.fourie@mainroads.wa.gov.au>; Jeremy Millar <jeremy.millar@pta.wa.gov.au>; Du Toit, Willem <Willem.DuToit@pta.wa.gov.au>; Raul Used <raul.used@pta.wa.gov.au>
Subject: [External] TRAFFIC VOLUMES malaga.pdf, TRAFFIC VOLUMES morley.pdf

Good afternoon John,

Many thanks for our extensive telephone discussions over the last couple of days related to estimating forecast turning traffic for both Morley and Malaga Railway Stations.

It appears we are getting close in our estimations of traffic which is good. I have attached for you two pdf's which are my calculations.

When you have finalised your calc's, can you please transpose those numbers on the attached pdf.

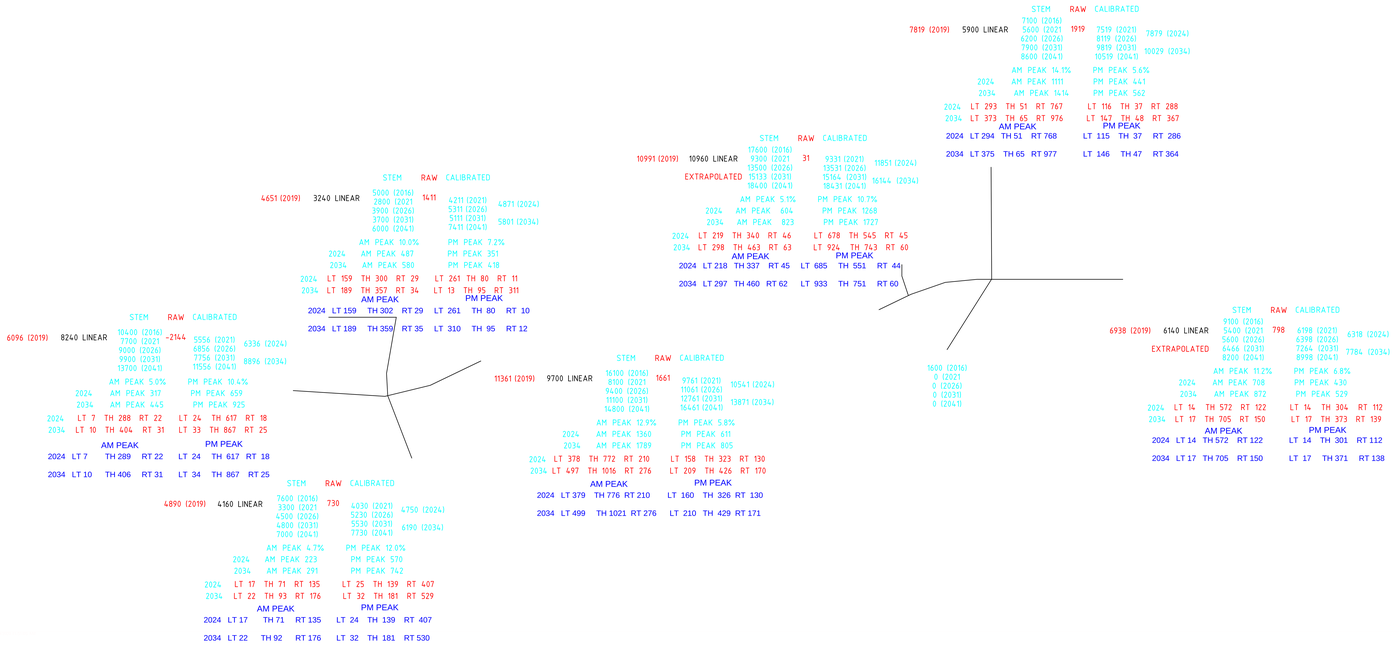
If the numbers are similar to the one's that I have calculated, I will then authorised it.

Many thanks for your assistance. Very much appreciated.

Best wishes

David Van Den Dries
Urban Road Planning Manager
Planning and Technical Services Directorate
p: +61 Telephone (08) 93234917 | m: +61 438969981
w: https://aus01.safelinks.protection.outlook.com/?url=http%3A%2F%2Fsecure-web.cisco.com%2F1OI_umcCpgetVvJx7ekDfM7T44WYbRGH_q8ok_hG2sG9Ibh6jDp2AHW_MYRBaYhjB2NLisAATmAes_ShS4chn3ry1ELsrzEUm1WNhJgiq3L7TMGu3eZaz7GpTAqyw792yyXddNn66QNphmpkeuMdYzZFDIJ8c1ZUE9cA94pOsigd3rplwMEDiYtnYwdTpRiHzJfVWCshpyuVhDCPmGmTvWU3J8Zqy-Sg-9mSoCOieLs8WfAP4Gw9_ptxOdcgM13UTDIahEafthw8Puf0d7-ak08SDrHOleK1uGCBNCAv3xfoHLO_jKOoRibpLZfWN8m-xFldm3-X-

QdxcRugvbwebng%2Fhttp%253A%252F%252Fwww.mainroads.wa.gov.au&data=02%7C01%7Cdavid.vandendries%40mainroads.wa.gov.au%7Cd841401d341a4806ac0108d84fd5e29c%7Cced71ed676dd43d09acccf122b3bc423%7C0%7C0%7C637347127535377864&sdata=wk6U%2BciHiC4jM%2FuEzsBsTFn46zt4SMOSXQtl2bAcMMg%3D&reserved=0


STEM RAW CALIBRATED
7100 (2016)
7819 (2019) 5900 LINEAR 1919 7519 (2021) 7879 (2024)
6600 (2021
6200 (2026)
7900 (2031)
8600 (2041)
8119 (2026)
9819 (2031) 10029 (2034)
10519 (2041)
AM PEAK 14.1% PM PEAK 5.6%
2024 AM PEAK 1111 PM PEAK 441
2034 AM PEAK 1414 PM PEAK 562
2024 LT 293 TH 51 RT 767 LT 116 TH 37 RT 288
2034 LT 373 TH 65 RT 976 LT 147 TH 48 RT 367
AM PEAK PM PEAK
2024 LT 294 TH 51 RT 768 LT 115 TH 37 RT 286
2034 LT 375 TH 65 RT 977 LT 146 TH 47 RT 364
STEM RAW CALIBRATED
17600 (2016)
10991 (2019) 10960 LINEAR 31 9300 (2021 9331 (2021) 11851 (2024)
13500 (2026) 13531 (2026)
EXTRAPOLATED 15133 (2031) 15164 (2031) 16144 (2034)
18400 (2041) 18431 (2041)
AM PEAK 5.1% PM PEAK 10.7%
2024 AM PEAK 604 PM PEAK 1268
2034 AM PEAK 823 PM PEAK 1727
2024 LT 219 TH 340 RT 46 LT 678 TH 545 RT 45
2034 LT 298 TH 463 RT 63 LT 924 TH 743 RT 60
AM PEAK PM PEAK
2024 LT 218 TH 337 RT 45 LT 685 TH 551 RT 44
2034 LT 297 TH 460 RT 62 LT 933 TH 751 RT 60
1600 (2016)
0 (2021)
0 (2026)
0 (2031)
0 (2041)
STEM RAW CALIBRATED
9100 (2016)
6938 (2019) 6140 LINEAR 5400 (2021 798 6198 (2021) 6318 (2024)
5600 (2026) 6398 (2026)
EXTRAPOLATED 6466 (2031) 7264 (2031) 7784 (2034)
8200 (2041) 8998 (2041)
AM PEAK 11.2% PM PEAK 6.8%
2024 AM PEAK 708 PM PEAK 430
2034 AM PEAK 872 PM PEAK 529
2024 LT 14 TH 572 RT 122 LT 14 TH 304 RT 112
2034 LT 17 TH 705 RT 150 LT 17 TH 373 RT 139
AM PEAK PM PEAK
2024 LT 14 TH 572 RT 122 LT 14 TH 301 RT 112
2034 LT 17 TH 705 RT 150 LT 17 TH 371 RT 138
STEM RAW CALIBRATED
5000 (2016)
4651 (2019) 3240 LINEAR 1411 4211 (2021) 4871 (2024)
2800 (2021
3900 (2026)
3700 (2031)
6000 (2041)
5311 (2026)
5111 (2031) 5801 (2034)
7411 (2041)
AM PEAK 10.0% PM PEAK 7.2%
2024 AM PEAK 487 PM PEAK 351
2034 AM PEAK 580 PM PEAK 418
2024 LT 159 TH 300 RT 29 LT 261 TH 80 RT 11
2034 LT 189 TH 357 RT 34 LT 13 TH 95 RT 311
AM PEAK PM PEAK
2024 LT 159 TH 302 RT 29 LT 261 TH 80 RT 10
2034 LT 189 TH 359 RT 35 LT 310 TH 95 RT 12
STEM RAW CALIBRATED
10400 (2016)
6096 (2019) 8240 LINEAR 2144 5556 (2021) 6336 (2024)
7700 (2021
9000 (2026)
9700 (2031)
13700 (2041)
6856 (2026)
7756 (2031) 8896 (2034)
11556 (2041)
AM PEAK 5.0% PM PEAK 10.4%
2024 AM PEAK 317 PM PEAK 659
2034 AM PEAK 445 PM PEAK 925
2024 LT 7 TH 288 RT 22 LT 24 TH 617 RT 18
2034 LT 10 TH 404 RT 31 LT 33 TH 867 RT 25
AM PEAK PM PEAK
2024 LT 7 TH 289 RT 22 LT 24 TH 617 RT 18
2034 LT 10 TH 406 RT 31 LT 34 TH 867 RT 25
STEM RAW CALIBRATED
16100 (2016)
11361 (2019) 9700 LINEAR 1661 9761 (2021) 10541 (2024)
8100 (2021
9400 (2026)
11100 (2031)
14800 (2041)
11061 (2026)
12761 (2031) 13871 (2034)
16461 (2041)
AM PEAK 12.9% PM PEAK 5.8%
2024 AM PEAK 1360 PM PEAK 611
2034 AM PEAK 1789 PM PEAK 805
2024 LT 378 TH 772 RT 210 LT 158 TH 323 RT 130
2034 LT 497 TH 1016 RT 276 LT 209 TH 426 RT 170
AM PEAK PM PEAK
2024 LT 379 TH 776 RT 210 LT 160 TH 326 RT 130
2034 LT 499 TH 1021 RT 276 LT 210 TH 429 RT 171
STEM RAW CALIBRATED
7600 (2016)
4890 (2019) 4160 LINEAR 730 4030 (2021) 4750 (2024)
3300 (2021
4500 (2026)
4800 (2031)
7000 (2041)
5230 (2026)
5530 (2031) 6190 (2034)
7730 (2041)
AM PEAK 4.7% PM PEAK 12.0%
2024 AM PEAK 223 PM PEAK 570
2034 AM PEAK 291 PM PEAK 742
2024 LT 17 TH 71 RT 135 LT 25 TH 139 RT 407
2034 LT 22 TH 93 RT 176 LT 32 TH 181 RT 529
AM PEAK PM PEAK
2024 LT 17 TH 71 RT 135 LT 24 TH 139 RT 407
2034 LT 22 TH 92 RT 176 LT 32 TH 181 RT 530