SWOT Analysis

City of Darwin Movement Strategy

DC2010

Prepared for
City of Darwin

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Cardno

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Executive Summary

The purpose of this report is to develop the Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis for the City of Darwin Movement Strategy, which will lay the foundations to a modern, sustainable, and active city that is accessible and safe for all residents and visitors.

This Movement Strategy consolidates the Darwin Bike Plan, Darwin Parking Strategy and other existing plans, establishing a network performance baseline for transport to and through the Municipality, while identifying its SWOT.

The Movement Strategy will enhance and promote connectivity through a strong focus on multi-modal networks and integrated land uses; harnessing emerging opportunities in technology and development to increase sustainable transport use and reduce the frequency and length of trips by private vehicle.

Investing in high-quality streetscapes designed as functional public places will support the evolution of Darwin's fundamental structure. High levels of mobility and access can be promoted through improvements to public transport service, end of trip facilities and overall network safety and connectivity. The Strategy that emerges from these changes will also support the City's sustainability goals embedded in Climate Emergency Response Plan and other associated work.

1 Introduction

Darwin will be transformed over the coming decades as a result of rapid technological, cultural, social, economic, and climatic changes. The City of Darwin (CoD) has engaged Cardno to develop the **City of Darwin Movement Strategy** (the Movement Strategy) that will lay the foundations for a modern, sustainable, and active city that is accessible and safe for all residents, employees and visitors. The Strategy will enhance connectivity and harness these emerging opportunities to increase active transport use and reduce the frequency and length of trips by private vehicle.

The aim of the Movement Strategy is to:

- Maximise opportunities for public and active transport;
- Provide a safe and accessible city to move around;
- Identify shifts in transport modes and technology that require infrastructure upgrade;
- Decrease the impact of transport on the environment;
- Reduce local traffic and parking demand; and
- Maintain efficient freight networks.

1.1 Movement Strategy

This Movement Strategy will define the existing and future transport requirements for Darwin across all transport modes, according to the needs of the individual land uses, precincts and corridors. It will be consistent with the City of Darwin Strategic Plan "Darwin 2030 City for People. City of Colour", focused on an integrated transport model, which includes land-use decisions, parking, public transport, road and pedestrian/cycling infrastructure.

Determining the ultimate transport provision for Darwin requires an assessment of the existing network at the neighbourhood, district and regional level to ensure that it addresses the residential, employment and recreational needs of Darwin's community.

The Movement Strategy outcomes will be used to define realistic, clear and measurable goals for an integrated transport system throughout Darwin, a list of general principles, and prioritised recommendations for implementation over the next 5, 10 or more years.

1.2 SWOT Analysis

This report explores the current provision for transport, and compares this infrastructure to the current and future needs of the community, as expressed in strategic documentation, across all transport modes. This is intended to identify the infrastructure and policy interventions necessary to support the long-term success and viability of Darwin.

Through this exercise, a series of Strengths, Weaknesses, Threats and Opportunities have been identified, in the context of existing land use and transport conditions across Darwin, as well as best-practice transport planning principles. The results will be used as a baseline for the development of the Movement Strategy, establishing the parameters and barriers to change, and the internal and external factors affecting the achievement of the CoD's Vision.

A SWOT Analysis Summary Matrix showing the relationship between the SWOT area and affected modes is provided later in this document. This condenses and simplifies the main SWOT items identified in the document and shows the positive or negative impact each has on other transport modes.

1.3 Study area

The Movement Strategy study area comprises the entire Darwin Municipality, focusing on roads, shared paths, car parks and public spaces that are owned and maintained by CoD and the NT Government. The extent of the study area is shown in Figure 1-1.

This Study area is bounded by the Litchfield Council area to the east, and Port Darwin and Unincorporated Northern Territory to the south. Connectivity to these adjacent areas is a critical component of the Movement Strategy, and considered across all relevant modes.

Although the Waterfront and Cullen Bay are not managed by CoD, this study considers the importance of connections to these Precincts by all modes.

Figure 1-1 Study area

2 Context

2.1 Population and Housing

Darwin Municipality occupies approximately 112km^2, across 40 suburbs.

Approximate population of 84,613 (ABS 2018).

Around 61,000 people within working age (ABS 2018).

The median age of people in Darwin is 34.4 years with 9.5% of residents being people aged 65+ and 18.5% of residents being children aged 0-14. And 7.4% Indigenous Population (ABS 2018).

25,905 households with an average of 2.6 people per household (2016).

2.2 Transport Environment

2 Bus-interchange stations.

463 Km of Roads and + 590Km of Paths.

Average Distance of commute 13.1 Km (2016).

69,474 vehicles registered (2019).

- 67.06% Passenger vehicles.
- 24.14% Light commercial vehicles.
- 3.88% Motorcycles.
- 1.91% Heavy rigid trucks.
- 1.90% Buses.
- 1.08% Remaining (Campervans, articulated trucks, light rigid trucks, non-freight carrying trucks).

Type of fuel for registered vehicles.

- 46,256 (66.57%) Petrol.
- 23,008 (33.11%) Diesel.
- LPG/Dual/Other 207 (0.30%).
- Electric 14 (0.02%).

2.3 Travel to work (ABS 2016)

80.12% commute by private vehicle.

7.70% commute by Public transport.

3.51% commute by active transport.

2.4 Key Policy Alignment

A number of key statutory and strategic documents have been consulted to inform the SWOT analysis. These will also guide the development of the Transport, Traffic and Parking Strategy. At the local level, the vision and ambitions of the following strategic planning documents are referenced to understand the context of the City and the values the City supports:

- City of Darwin Road Hierarchy.
- Darwin Bike Plan.
- Darwin Regional Land Use Plan 2015.
- Darwin Regional Transport Plan 2018.
- Annual Traffic Report 2019.
- Electric Vehicle – Discussion Paper.
- Strategic Plan – City for People, City of Colour 2019.
- Darwin Central Area Plan.
- Inner suburbs Area Plan.
- Middle Suburbs Area Plan.

3 TransPriority Assessment

3.1 Framework

Darwin's competing transport needs have been investigated through the 'TransPriority' framework (based on the Victorian SmartRoads model). In this methodology, the hierarchy for each road is informed by large-scale land-use planning, within a broad framework. These are outlined, in no particular order of priority, as follows:

- **Road networks** based on appropriate use and connectivity, connecting origins and destinations but not forming barriers to sustainable modes.
- **Parking** as an effective bridge between land-use and transport mode choice, an enabler for private vehicle modes, but not a destination in and of itself.

  Land-uses define the requirements for car parking quantum and location, with different requirements within the CBD, Commercial Centres, industrial areas and low-density suburban neighbourhoods.
- **Public Transport** routes should be designed to fit within the regional context and support sustainable transport access to activity, and particularly employment, whether that employment is located within Darwin or beyond.
- **Cycling** facilities follow primary desire lines across Darwin, create a network for access through Residential Areas and also provide fine-grained access to the CBD and other key destinations. Cycling routes should be considered not only for journeys-to-work, but also local trips to school, shops, community facilities and recreational routes.

  Cycling is unique in that it allows both macro- and micro- levels of access to land-uses. Through the TransPriority framework assessment, cycling facilities are allocated as on-street or off-street, minimising conflict and safety issues for cyclists, cars and pedestrians.
- **Pedestrian** facilities knit the various complementary land uses together to create a single, effective mixed-use community. Of particular importance are the 'Activated Pedestrian Zones' and routes from car parking or bus hubs to primary activity locations. Quality and safety are vital to the effective operation of pedestrian spaces.

3.2 Multi-Modal Road Hierarchy

Road hierarchies are then defined by combining the above requirements with the existing and expected regional traffic demands, as well as the traffic volumes expected to be generated.

By considering the full array of transport needs, a functional and effective transport environment can be built. This environment should be formed from reasonable networks that span the City, allowing user mobility by all modes.

The fundamental premise of TransPriority is that a road should operate under a hierarchy of use, where the infrastructure is provided to support the selected users. There are inevitable discrepancies between the intended function of a road corridor and the infrastructure provided. These conflicts are discussed for each transport mode, in the relevant Sections of this report, along with key observations.

Where multiple transport modes share priority along a given roadway, the TransPriority hierarchy considers each of them based on their precedence. This may change according to the adjacent land uses, or by time of day.

An example of a TransPriority hierarchy for road might look something like this:

Table 3-1 Example TransPriority Hierarchy

High-Frequency Bus Corridor		Activated CBD Street	
Peak	Off-Peak	Peak	Off-Peak
Public Transport	Pedestrians	Pedestrians	Pedestrians
Pedestrians	Public Transport	Public Transport	Parking
Mixed Traffic	Parking	Bikes	Bikes
Bikes	Bikes	Mixed Traffic	Public Transport
Parking	Mixed Traffic	Parking	Mixed Traffic

3.3 Application to Existing Infrastructure

An Existing TransPriority Map has been constructed that reflects the current infrastructure provision for each mode. This designation is ***relative*** to the general standard provided across the Municipality and does not presume that the infrastructure is ***sufficient*** to support that mode.

This evaluation of existing infrastructure is also related to its ***intended*** function, as follows:

- **Private Vehicles**: Considered for inclusion in the Existing TransPriority Map where its classification is given as a Collector Road or higher, or where the road function is not obstructed.

  The Arterial network is formed by Tiger Brennan Drive and Stuart Highway, followed by the distributor network that include roads such as Bagot Road, Trower Road, McMillans Road, Amy Johnson Avenue and Vanderlin Drive. Other important roads that connect the suburbs with the network such as Gilruth Avenue, Dick Ward Drive and Lee point Road are part of the collector road network.

- **Freight**: Considered for inclusion in the Existing TransPriority Map for any road identified as a suggested Road Train or Oversize load route by the Northern Territory Government.

- **Bicycle / Shared paths:** Considered for inclusion in the Existing TransPriority Map where identified as shared path with widths equal or higher than 2.5m or on-road bike lanes, according to the Darwin Shared Path & Bicycle Lane Technical Notes.

  A number of gaps have been identified in this analysis, such as non-existing or non-continuous paths. Some of these are included in the Bike Plan 2015-2020. The identified gaps are listed below:

  - The on-road bike lane on Kitchener Drive ends unexpectedly at the intersection to Anchorage Court. Although Darwin Waterfront is out of the boundaries of CoD, this connection is important for the network.
  - Incomplete crossing facilities at the Stuart Highway / Snell Street / Bagot Road intersection (No pedestrian or cycling connection between the southern Stuart Highway path and Bagot Road).
  - No crossing point at the Bagot Road / Trower Road / Nightcliff Road intersection.
  - The on-road bike lane on Lee Point Road between McMillans Road and the Asche Street doesn't comply with the Shared Path & Bicycle lane Technical notes.
    - There is a lack of connections from the shared path to the on-road facilities – entry and exit ramps as per Technical Notes 3. Figure 3-1

Figure 3-1 Lee Point Road / McMillans Road – start point of on-road bike lane.

Source: Nearmaps

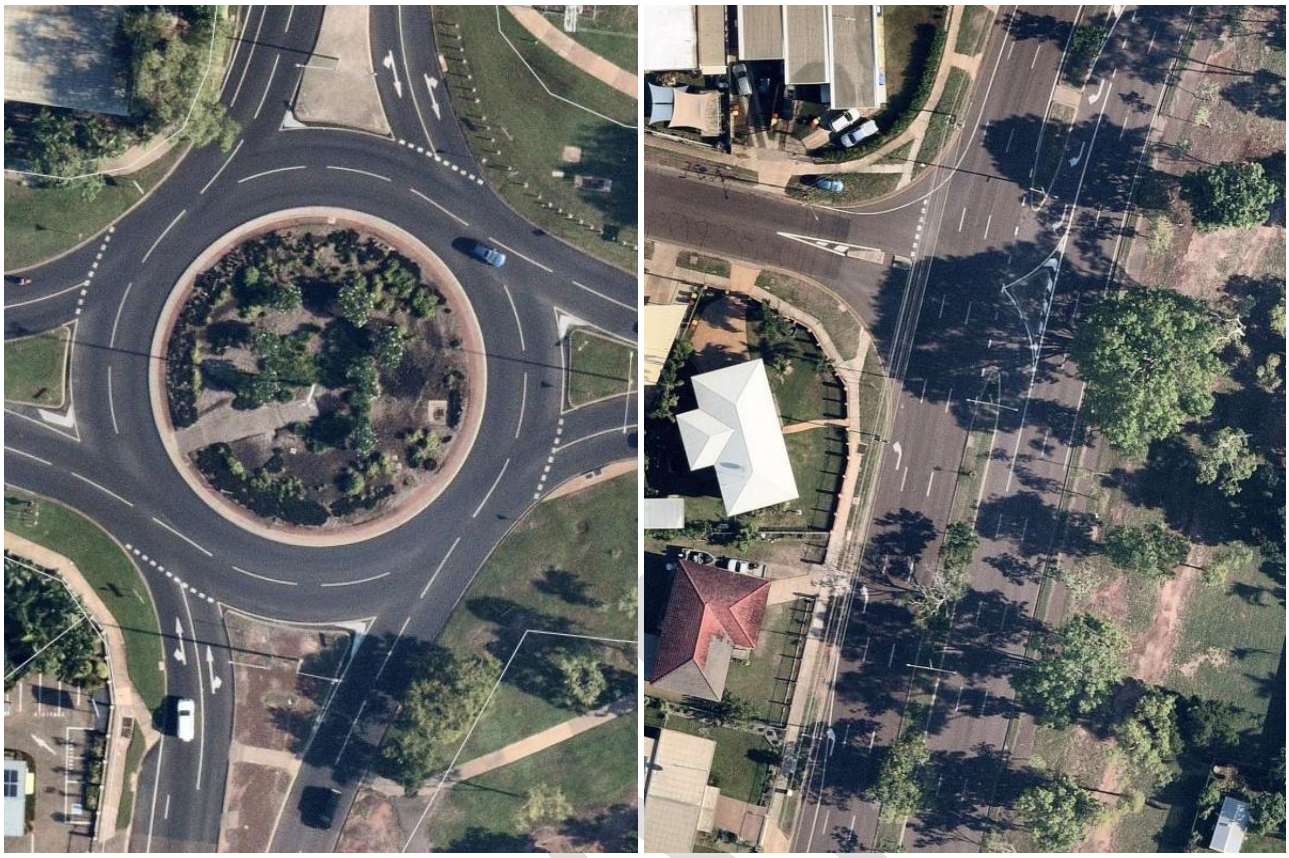
- The kerbside bike lane through the roundabout at Lee Point Road / Asche Street presents a significant risk of conflict with turning vehicles, the southbound lane deviates unexpectedly and without connections to the existing shared path.

Figure 3-2 Lee Point Road / Asche Street Roundabout – on-road bike lane deficiencies.

Source: Nearmaps

- At other locations, the bike lane disappears in high-speed conflict zones, requiring cyclists to mix with traffic at key decision points (e.g. northbound bike lane at the Lee Point Rd / Vanderlin Drive and Lee Point Rd / Moil Cr intersections).

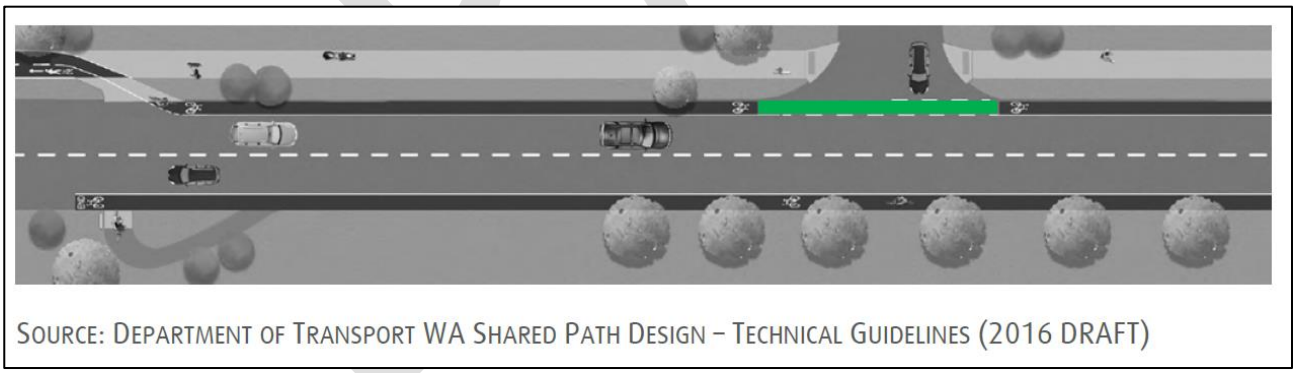
Figure 3-3 Lee Point Road / Vanderlin Drive Roundabout (left) and Lee Point Road / Moil Crescent (right) - on-road bike lane deficiencies.



Source: Nearmaps

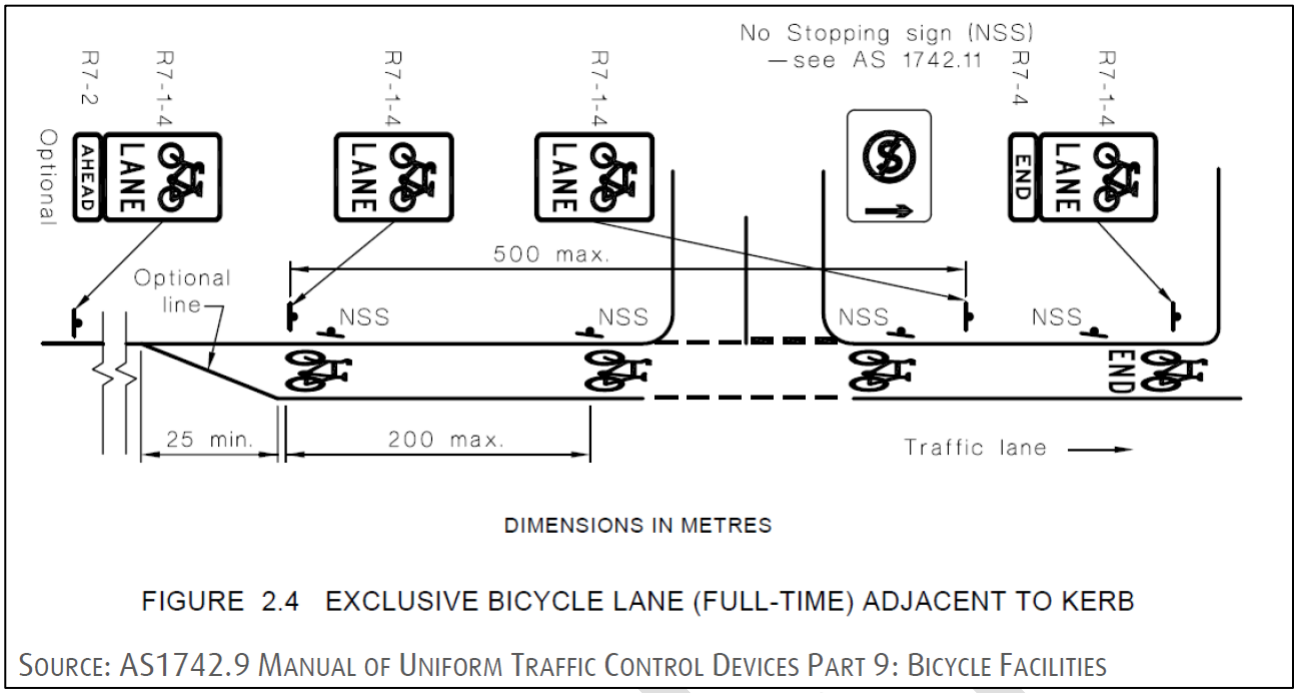
- Line marking and signage is not sufficient to alert drivers of the presence of an on-road bike lane. The recommendations for line marking and signage are replicated below.

Figure 3-4 Line marking and surface treatment for on-road bike treatment



Source: 9. Line marking and surface treatments - **Darwin Shared Path & Bicycle Lane Technical Notes**

Figure 3-5 Line marking and surface treatment for on-road bike treatment



Source: **12. Shared Path & Bicycle Lane Widths – Minimum and Desirable - Darwin Shared Path & Bicycle Lane Technical Notes**

- As per the Darwin bike plan 2015-2020 - implementation plan, on-road cycle lanes were proposed for Esplanade, Daly Street, and Smith Street from Daly Street to Knuckey Street. And the completion of the shared path on Dinah Beach Road.
- There are no appropriated shared paths on the approaches to several of the schools including Larrakeyah Primary School, Nakara Primary School, Leanyer School, etc.
- There are several locations with a lack of safe crossing points, such as Stuart Highway between Bagot Road and Amy Johnson Avenue, where the path is located on the northern side of the Highway.
- There is a lack of shared path on some of the roads with non-motorised users being required to walk along the road.

> **Pedestrians:** Considered for inclusion in the Existing TransPriority Map for streets within the CBD which provide activity function, within two blocks of a school, or where it forms a key corridor for pedestrians accessing destinations from consolidated public transport or parking infrastructure.

Not all the roads within the Municipality provide infrastructure for pedestrians, forcing them to walk along the road. The typical layout of this can be seen on roads such as Leichhardt Crescent and Lampe Street as illustrated in Figure 3-6.

Figure 3-6 Typical Layout of roads without pedestrian provisions - Lampe St.

Source: Nearmaps

Providing paths along the roads of the Municipality should be considered, as it encourages pedestrians to walk along the path instead of the road providing a higher level of safety.

- **Public Transport:** Considered in the Existing TransPriority Map where designated as part of the existing bus network map.

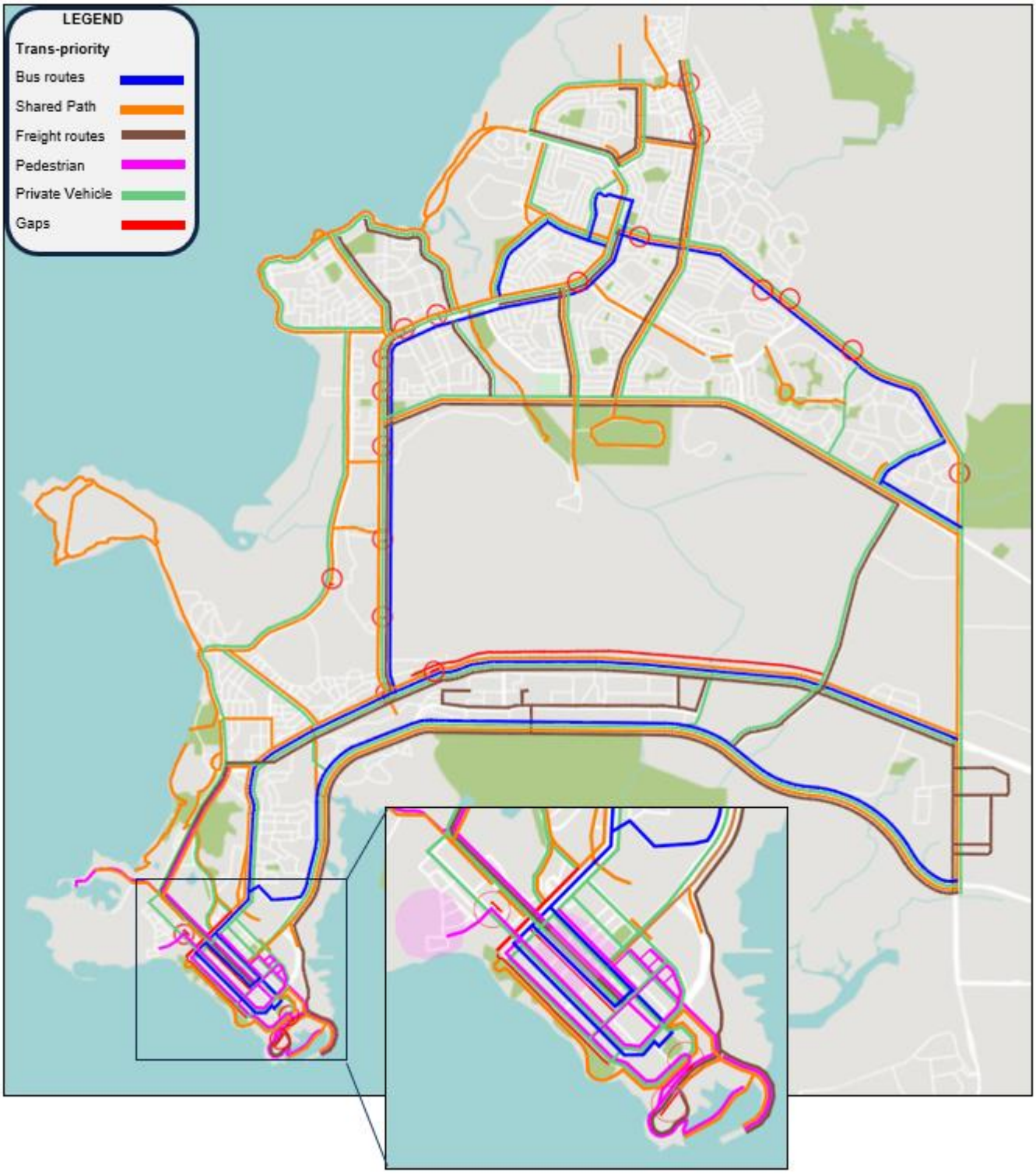
The non-sheltered bus stops were identified as well as some locations with a lack of crossing points for pedestrians.

The location of the non-sheltered bus stops will be discussed further in this report.

Figure 3-7 Layout of non-sheltered bus stop with no crossing provisions – Stuart Hwy.

Source: Nearmaps

Figure 3-8 TransPriority Assessment for Darwin



3.4 Gaps in the network

The identification of the gaps in the network facilitates the recognition of hazard for road users and nomination of proposals for improvements of the network. Stakeholders will engage in this process to try to fully identify the current gaps in the network.

During the desktop analysis, there were no gaps identified for private vehicles nor for freight networks; although continuous assessments need to be performed to guarantee Road specifications and infrastructure are maintained.

For the public transport, the analysis involved the bus network at the roads with a significant number of bus routes. The characteristics of the bus stops and crossing points were evaluated and a lack of infrastructure was identified as a gap.

Pedestrians and cyclists' networks were analysed and the shared paths narrower than 2.5m were also marked as gaps. Crossing points and missing on-road cyclist provisions were also identified.

Some of the identified gaps are described below:

- Esplanade: there are not crossing points for users of active modes. On-road cycle lane suggested by the Darwin bike plan but was removed after initial installation due to conflict with parked vehicles.
- Daly and Smith Street on-road cyclist lane suggested by the Darwin bike plan hasn't been constructed.
- There is no crossing point at the Harry Chan Ave / Hughes Ave intersection to provide links for the shared paths.
- There is a lack of crossing points and on-road cycle lane ends unexpectedly at the Kitchener Drive – CDU campus.
- A lack of crossing points and no continuation of shared path on Mitchell Street in the vicinity of Larrakeyah Primary School.
- A lack of crossing points and no continuation of shared path at the Stuart Highway / Bagot Road intersection.
- Given the configuration of most bus bays, where an indent is created to store the bus outside of the thoroughfare, there is an increased likelihood of delays due to busses having to wait to re-enter the traffic stream.
- The on-road cycle path on Lee Point Road between Vanderlin Drive and Tambling Terrace requires safety improvements.
- Lack of formal crossing points along Stuart Highway between Bagot Road and Amy Johnson Avenue.

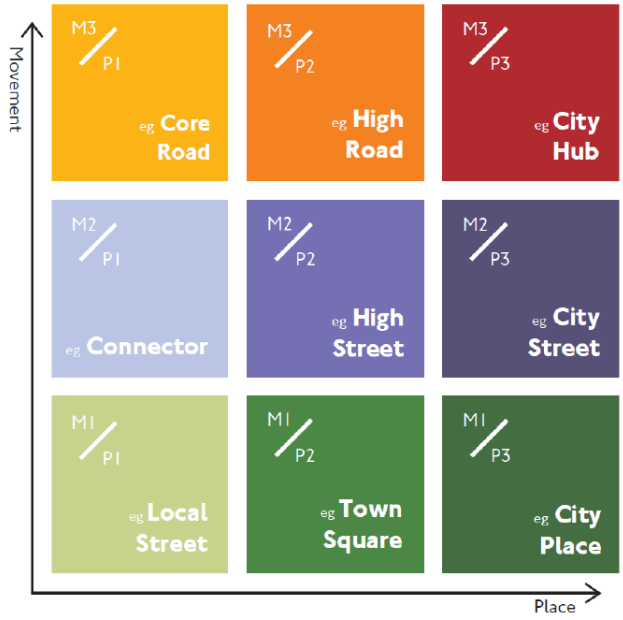
4 Link & Place Analysis

4.1 Link & Place Framework

Activity is a direct result of land use, with the type and intensity of activity defined by the land use choices within each precinct or corridor.

This SWOT analysis uses the 'Link and Place' model (Link and Place: *A Guide for Street Planning and Design, 2009*) to specifically identify the requirements of land use along individual road segments. This evaluation considers the pedestrian amenity, streetscape activation and development accessibility criteria of an area, and uses this to affect the form of the transport infrastructure to better support the desired land use planning outcomes.

Figure 4-1 Link and Place Matrix



Source: Streets for London

Where activity levels are high (i.e. roads have a greater 'place' function), infrastructure is designed to improve pedestrian amenity, street trees, furniture, al fresco dining opportunities, on-street parking etc. The street therefore acts as an extension of the land use. This is typical in activated City Centre streets, such as Mitchell Street between Peel Street and Bennett street.

This segment of Mitchell Street has been classified as an M2/P3 – City Street as per the movement function and the restaurants, pubs and activity spaces that give the opportunity to people to stay and enjoy while in an open area.

The Smith Street mall has been identified as the area within the Municipality that provides the highest place function, as it only provides access for pedestrians and includes shops, cafes, and a playground.

Alec Fong Lim Drive, at East Point Reserve is another example of a road with a greater place function. Although in this case, the activity performed is related to physical and outdoors activities, the road and its infrastructure are guided to provide higher priority to pedestrians.

Conversely, a road that serves primarily to provide mobility would be built to ensure efficient travel for appropriate modes. This might involve bus lanes, access control, bike lanes etc. all of which focus on the movement of people through an area. This is typical of arterial roads ***between*** Activity Centres, including the Stuart Highway and Tiger Brennan Drive.

There are many locations which function as activity corridors as well as mobility corridors. Careful consideration is required to ensure that the transport infrastructure is consistent with the desired environment. This may involve construction of high-capacity but slow-speed traffic lanes, well-defined pedestrian crossing points, and deep footpaths/verges to create pedestrian amenity and shade (where street trees are present). Esplanade and Gardens Road illustrate locations with Mobility and Place function.

In each of these instances, it is primarily the land use that defines the requirements for infrastructure. However, this method also allows us to interrogate land use planning and identify changes that might be required to ensure the corridor performs its necessary function (e.g. relocating highly active land uses away from a traffic-focused mobility corridor).

The resulting Link & Place Map represents an understanding of the existing integrated land use/transport system. It is noted that the function described ***may not be desirable*** and may not reflect the future for the corridor or precinct.

4.2 Areas of Conflict

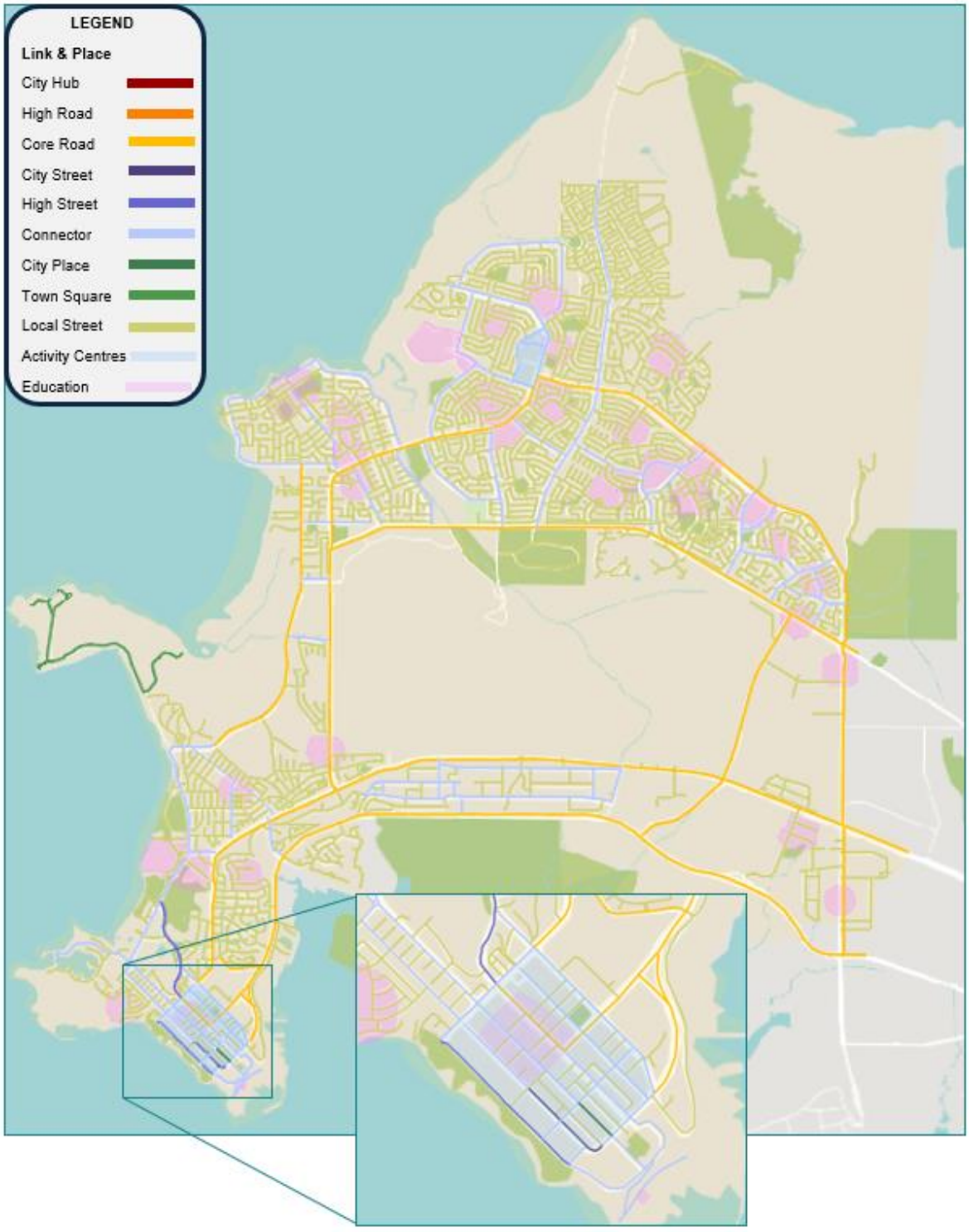
Of particular interest are those streets which perform a significant mobility function, while also being adjacent to high-activity land uses.

These streets include segments of significant north-south and east-west corridors through town centre environments, where high-activity land uses compete with high-volume traffic demands.

Much of the decision-making for transport infrastructure within the City will be determined by the interplay between transport mobility and activity in these areas of conflict.

The CBD is one of the most critical examples of areas with opportunity for conflict within the Municipality. This includes Mitchell Street, Smith Street, Cavenagh Street and minor streets within the CBD.

Casuarina, and the schools in the proximity of major roads such as Ludmilla Primary School, Saint Paul's Catholic Primary School, Alawa Primary School, and Casuarina Senior College are also areas where conflict between the movement and place functions can occur.



5 Parking

Parking is an essential and inherent component of both the transport and land use system, and is unique in that behaviour can be influenced directly at the planning and policy stage rather than solely through infrastructure provision.

A location's parking requirements are related to a wide range of characteristics including density, land use and mixture, proximity to alternative transport options and location within the broader land use fabric.

- Land use defines the requirement for car parking quantum and location: short stay and on-street parking close to retail precincts, long-stay commuter parking on the periphery of the centres near to employment centres and along regional access routes.
- Development density and land use mix determines the viability of internal trips, which are much more likely to occur by active modes – generating activity without the need for parking infrastructure.
- Accessible, high-frequency public transport presents an alternative to residents living further afield. Providing viable opportunities to forgo driving to work results in a lower vehicle ownership, which translates into an overall change in travel behaviour.

For this reason, this Movement Strategy considers parking requirements to be fundamentally different within the Darwin CBD than in other development precincts, due to the intensity and mix of land uses and the opportunities for internal trip capture and alternative transport.

This Section outlines a range of critical components of the Darwin parking system including:

- Parking supply: private requirements and public facilities, both on-street and off-street; and
- Parking policy: used to both enable and restrict particular forms of parking.

5.1 Parking Function

The demand for parking is intimately related to the type, location, and density of development, summarised generally as follows:

- **Employee parking**: demand is related to the provision of alternative transport modes.

  Employee behaviour is often very elastic: constraining parking can have a big impact on private vehicle mode shares.
- **Residential parking:** demand is equivalent to vehicle ownership and related to the provision of alternative transport modes, and to the density and quality of retail, employment, and entertainment destinations within walking distance.

  Due to self-selection, reducing on-site parking rates has a direct impact on residential vehicle ownership and private vehicle trip generation.
- **Restaurant/Entertainment Visitor parking:** demand is related to the density and mix of development, and particularly the proximity of residents and employment, not so much on transport provision.

  Parking pricing can impact the location and distribution of demand, but mode shift due to parking constraint is likely to be modest.
- **Commuter parking**: demand is related to external factors – the frequency of train service, quality of station amenity, congestion and parking fees at destination.

  Supply constraints within the Station's walkable catchment are highly impactful, since commuters have flexibility to park elsewhere along the train line. Experience suggests that even at high-demand stations, parking is generally limited to a 400m catchment. Although noted Darwin does not currently have a rail network used for regular public transport, the role of this function is relevant to other public transport modes.

Control over the supply of parking (through statutory policy and public parking) can be used to constrain certain types of parking to influence travel behaviour.

5.2 Parking Policy Review

The NT Planning Scheme and NT Planning Act together define the requirements for parking provision within developments.

Specific policies are in place to manage:

- Minimum parking rates for private development by land use (NT Planning Scheme);
- Variations to parking rates (NT Planning Scheme); and
- Contributions for Cash-in-Lieu of car parking (NT Planning Act and Darwin Parking Local Rates Levy System).

These policies are in line with best-practice, but function as procedural rather than strategic guidelines.

5.2.1 NT Planning Scheme (NTPS)

Parking Minimums

The NTPS prescribes the minimum number of parking bays to be provided by a development.

The parking rates provided are the same across all of Darwin, with the exception of the Darwin CBD. This suggests that application of these rates may result in over-supply in some local Activity Centres, as the requirements are blind to local density, public transport and public parking opportunities.

Conversely, parking rates within the CBD may under-supply parking, relying on the public supply to support existing mode shares. This controlled supply of private parking allows CoD to affect office workers travel behaviour through parking management schemes, restricting parking supply through duration restrictions, or reducing demand through paid parking. As such, the existing supply rates are considered consistent with the objectives of the Darwin Car Parking Strategy.

Variations to Parking Supply

Within the Darwin CBD, parking reductions can be supported for qualifying developments based on proximity to alternative transport modes, availability of public parking options, inclusion of vertical landscaping, undergrounding car parking and heritage.

Given that the CBD parking rates are already significantly less than rates outside the CBD, suggests that many of these factors are already presumed. As such, application of these reduction factors may introduce a parking deficit that cannot be sustained by the local transport environment.

5.2.2 NT Planning Act (NTPA)

Cash-in-Lieu of Parking

The cash-in-lieu funds are currently suitable only for the provision and management of parking infrastructure. This limits the capacity for the CoD to accept cash-in-lieu where parking shortfalls exist.

Unbundled and Decoupled Parking

Amendment 537 to the NTPA permits parking owners to sub-lease parking bays without consent. This increases the flexibility of the private component of the parking system and takes advantage of current over-supply of parking within the Darwin CBD. This policy helps to create a more resilient and robust city by reducing the financial burden of parking infrastructure on new development. Better utilization also reduces the space in the CBD dedicated to car parking and reduces/delays the need for CoD to construct new car parking

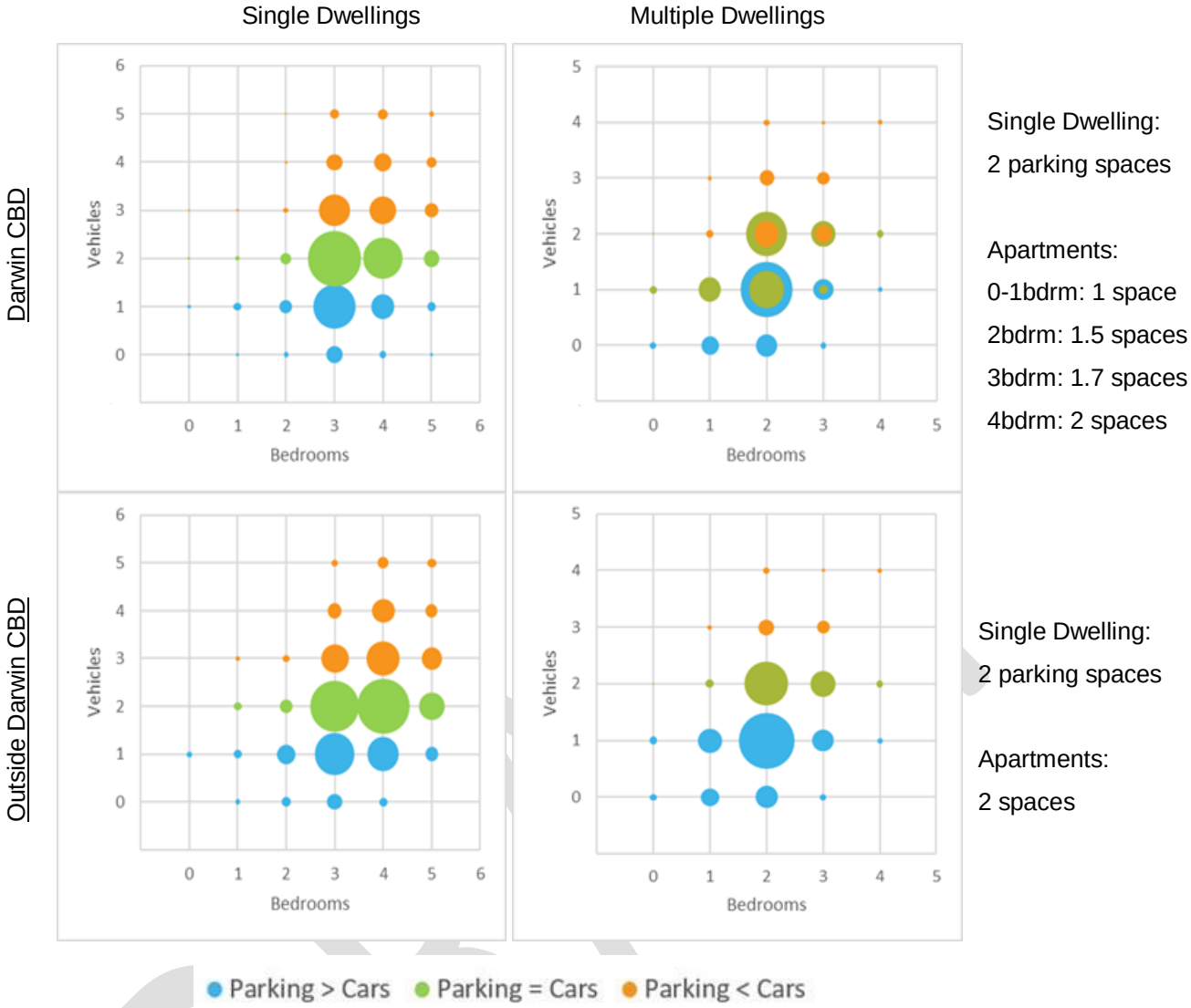
5.3 Residential Parking

As a matter of policy, it is appropriate that vehicle ownership is consistent with residents' capacity for on-site storage. Parking within residential areas is primarily provided on-site, however in many locations, on-street parking is used to supplement or replace car parking on-site.

This has repercussions on the availability of parking for residential visitors, service/delivery and other needs, and prevents repurposing of on-street parking for other mobility or amenity uses. Car parking on-street in residential areas that are not designed for large amounts of on-street car parking can also affect access for waste collection and public transport routes. Sightlines and amenity can also be affected by in appropriate on-street car parking.

While the majority of Darwin residents have access to a private vehicle, household vehicle ownership varies substantially. Data from ABS Census 2016 has been used to demonstrate the relationship between dwelling size and vehicle ownership, with a comparison against the NT Planning Scheme minimum requirements (Figure 5-1).

Figure 5-1 City of Darwin and Darwin CBD Household Characteristics – Bedrooms vs Vehicle Ownership



These graphs show that many households have parking that they aren't using, meaning that they are paying for spaces for little benefit. Other households own more cars than they have spaces to store them, which results in them parking on the adjacent street, shifting the cost of vehicle storage to the Local Government.

There were approximately 25,000 dwellings in the Darwin LGA (Local Government Area) as of the 2016 Census. Of these, 30% were classified as apartments and 50% as single dwellings (the remainder are groups dwellings or other forms of housing).

These two types of accommodation have different parking needs, due to a range of factors including household size, income, demographics and location.

They also, by their nature, have different forms of parking provision:

- Single dwellings have more space for on-site parking, but this space is often converted to other uses (home gym, additional storage, etc.).
- Apartment dwellings tend to share a communal parking structure, but due to strata title requirements, these spaces cannot be repurposed and so are often left empty.

5.4 Commercial Parking

5.4.1 Darwin CBD

Parking within the Darwin CBD is provided in a combination of on-street and off-street public supply (Figure 5-2), and private provision. The Darwin City Centre Master Plan (2015) describes the intent for parking as follows:

- On-street parking in all streets to provide a physical barrier between moving traffic and pedestrian paths; and
- Private Parking should be provided in basements, in buildings above ground floor level or behind buildings.

Figure 5-2 Public Parking in the Darwin CBD

This type of supply is weighed against a general desire for increased canopy cover, street trees and landscaping, which supports “shade, cooling and user comfort”.

Public On-Street Parking

The public supply of on-street parking in Darwin represents a flexible shared resource close to activity. On-street parking in the CBD is therefore the most desirable for parkers, as it allows them to park immediately adjacent to their destination. Outside of the inner CBD environment, on-street parking provides opportunities for public supply without an obvious impact in land requirement (i.e. it does not consume a development parcel), and so traditionally has been very attractive for Local Government.

On-street parking is provided along the majority of streets in the Darwin CBD. This separate moving traffic from pedestrians, but it must be noted that much of the traffic along these streets is trying to access parking. In the City of Oslo (see Figure 5-3), where CBD parking has been removed (with the exception of disabled parking, taxis and service/loading), the significant reduction in vehicle traffic has enabled a complete redesign of the streetscape, improving public transport facilities and traffic safety, increasing activation and allowing the planting of street trees.

Figure 5-3 Downtown Oslo

These bike lanes are now redundant, so this street is slated to be reconstructed with street trees and alfresco dining.

The consequences of a large quantum of on-street parking can be extremely substantial. The ~2,500 on-street parking bays provided in the CBD (Darwin CPS, 2018) consume approximately 40,000sq.m of land, plus the additional road space necessary to service the traffic generated. This area of hardstand limits opportunities for landscaping, street trees, pedestrian paths and cycling infrastructure, and increases the distance between destinations. The parking itself, by maximising the convenience of drivers, reduces the viability of other competing modes of travel.

Public Off-street Parking

Large-scale public off-street parking is provided at the periphery of the CBD, in car parks fed from Daly Street to the west and scattered along the northern boundary. There are also several off-street car parks located closer to the heart of the City, including the China Town, West Lane Car Park, and State Square Car Parks and a host of smaller facilities.

In total, over 2,500 public off-street parking spaces are provided by CoD. The bulk of this supply is located along key arterial approach routes to the CBD, which supports legibility while minimising the impact of traffic on pedestrians and activity.

This structure is ideal for the long-term provision of parking in the area, with opportunities for expansion as necessary to support the development of the CBD. This has been captured in the Darwin CBD *CPS Section 6.3: Suggested Changes*, as follows:

> *"Consideration needs to be given to planning of future public and private mode transport systems and the integration of parking, for example:*
>
> - *consider allocating land on CBD outskirts to future off-street parking (undercover)*
> - *provide quality pedestrian linkages to/from the above car parks, bus stops, bicycle parking"*

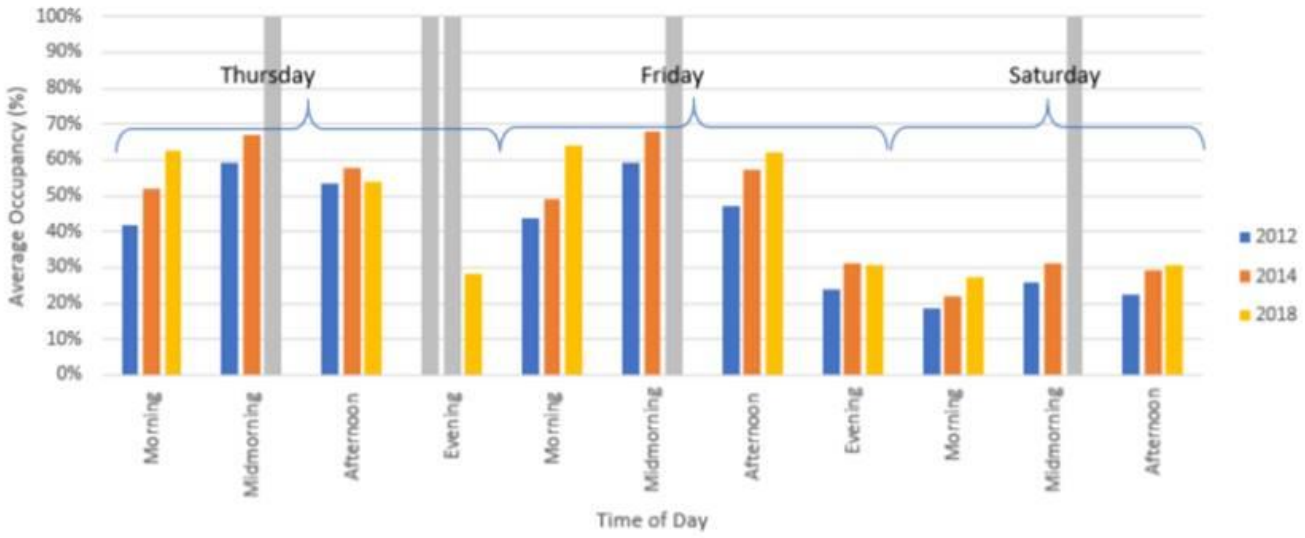
Sufficiency of Car Parking

The existing supply of parking within the CBD is described in the Darwin CBD Car Parking Study. However, the quantum surveys include only public on-street and off-street parking, plus a sample of private supply. As such, the actual provision of parking within the CBD is not currently understood.

Survey data has been collected for parking occupancy within the CBD, for the period between 2012 and 2018, as described in the Darwin Car Parking Study and replicated below in Figure 5-4. This shows peak demand for publicly accessible parking bays has increased relatively consistently over the survey period, reflecting a growth in visitation and employment demand in excess of private parking provision.

Parking availability on the whole is still high, though there are specific locations where demand approaches the practical capacity of parking (85%), such as the Woolworths car park.

Figure 5-4 Parking Demand and Supply in the Darwin CBD



It is noted that public parking is supplied on a fee-paying basis throughout the Darwin CBD, with a price that reflects its proximity to the CBD core. This is consistent with good management practices and represents a starting point for a potential 'demand responsive pricing' strategy in the future.

5.4.2 Outside Darwin CBD

Across the City of Darwin there are a number of smaller Centres, representing a range of different development scales and parking needs. The differences between these Centres should be considered as part of the assessment of parking supply and policy frameworks, as they affect the requirements for supply and management.

Parking needs also vary considerably between the various land uses and precinct areas, with specific requirements for supply, management and enforcement.

Key locations which require consideration include:

- Industrial Areas.
- District Shopping Centres.
- Primary and Secondary Schools.
- Recreation Facilities.
- Royal Darwin Hospital.
- Charles Darwin University.

5.4.3 Impacts of Technological Change

There is a high potential for autonomous vehicles (AVs), shared transport and Mobility-as-a-Service (MaaS) technologies to substantially disrupt the way parking is used. The timeframes for this likely future are not yet resolved, but they be well within the lifetime of the developments and parking structures we build today.

The expected result of the uptake of AVs and MaaS is a significant decline in demand for parking, particularly within the City Centre. Where this parking is provided in private facilities, it represents an ongoing cost to residents and business in the form of higher leasing rates and ownership costs.

This may include requiring a proportion of parking to be 'convertible' to other, more productive, uses. This requires careful consideration at the design stage to increase floor-ceiling heights, provide conduits for future services, check column locations, consider future opportunities for natural light etc. However, this conversion is not effective in basement parking, and is best employed for podium parking. This means that parking policies will need to be related to design guidelines to establish an appropriate built form that can undergo conversion if required.

Alternatively, parking can be located off-site, either in public facilities funded through developer contributions or cash-in-lieu; or in private facilities with ownership unbundled from the associated development. This form

of parking has the advantage that it can accommodate ongoing future growth as demand declines, or be demolished to make way for new development.

Other impacts likely to be experienced within the streetscape include increased demand for pick-up/drop-off and loading facilities. Coupled with a decline in on-street parking demand this may result in more space becoming available for public amenity (parks, paths, trees and lighting). Alternatively, this may free up space for cycling and public transport infrastructure.

5.5 Parking SWOT Analysis

5.5.1 Strengths

- There is a high degree of flexibility in parking provision within existing policies, including the capacity for unbundled and decoupled parking, supply concessions and cash-in-lieu.
- The Darwin CBD CPS identifies strong objectives for parking, with best-practice policy initiatives that will support robust and resilient growth.
- The Darwin CBD has a large pool of centrally-located publicly accessible parking that can be leveraged to serve further development needs. Ongoing residential development in the vicinity will support increased activity with an overall *reduction* in parking demand.
- Paid parking is already provided in the CBD. This creates a seed for further development of paid parking as a demand management tool as Darwin develops. Future expansion or modifications to this system will not need to overcome the 'zero-cost' hurdle.

5.5.2 Weaknesses

- Currently policies constrain opportunities for developer funding of non-parking infrastructure.
- Darwin remains a city developed on a large footprint, with a high car-as-driver mode share for all trip purposes. This is reflected in high parking rates and large suburban parking facilities.
- The prevalence of free, unrestrained on-street car parking in residential areas means that many residents own more cars than they have garage spaces for, or transfer the cost of vehicle storage to the City by repurposing on-site garages and parking on the street. This limits the effectiveness of vehicle reduction policies.
- Kerbsides consumed by parking reduce the capacity for active transport, either through high-quality pedestrian environments or buffered bike lanes.
- Public CBD parking is located in the heart of the City along the majority of roadside edges. This perpetuates a demand for parking immediately adjacent to the destination, and increases traffic impacts.
- The oversupply of parking has a range of consequences for the environment and public amenity, including urban heat island effects, reduced canopy, greenhouse gas and air pollution, reduced accessibility and activity, and reduced public transport viability.

5.5.3 Opportunities

- Any substantial road upgrade or Centre plan creates the opportunity to modify the parking supply and management regime.
- Investment in safe cycling infrastructure, coupled with ambitious end-of-trip facility requirements, could support short-distance active travel by bikes, scooters and other micro-mobility devices, reducing parking demand.
- Intensification of Activity Centres, including the CBD, creates an environment where development can help fund public parking facilities and alternative transport through a strong and flexible cash-in-lieu scheme.
- Redistribution of parking to the periphery of the Darwin CBD would allow for existing hardstand parking to be redeveloped to increase liveability and amenity.
- Electric vehicle demand is expected to rise substantially, particularly in response to international emissions policies. Facilities for electric vehicle charging will need to become ubiquitous to support that growth. Recent

cost reductions in charging infrastructure improve the viability for provision, but intense demand may overwhelm the local grid.

- Densification allows for further reductions in private parking through shared parking arrangements, unbundled and decoupled parking and managed parking justifications.

5.5.4 Threats

- Businesses and residents still have an extreme emotional attachment to parking at their home and destinations. This sentiment can be difficult to overcome, particularly where on-street parking could be replaced by alternative transport mode provision.
- The cost of parking infrastructure and management can be high, and this burden tends to be borne by the LGA. This can put pressure on the City's budget and delay implementation.
- Future technological changes are likely to impact the viability of parking investments (both public and private). Careful management is vital for the economic, social and environmental health of the City.

6 Private vehicles

6.1 Road Hierarchy

The Northern Territory Government defines a hierarchy for roads (Figure 6-1), based on a functional classification entirely determined by its movement and access function. This is superficially similar to the Link & Place Analysis described in Section 0, but focused exclusively on the movement of vehicles, not people.

As such, the NT road hierarchy is primarily used in this Movement Strategy as an indicator of private vehicle priority. Roads that have been classified as Collector Roads or above are considered to be priority Private Vehicle Roads, with infrastructure expected to be supportive of this mode.

The Movement Strategy adopts this classification of roads and includes the hierarchy identified in the City of Darwin Hierarchy report (Cardno, 2017).

Figure 6-1 NT Road Hierarchy Definitions

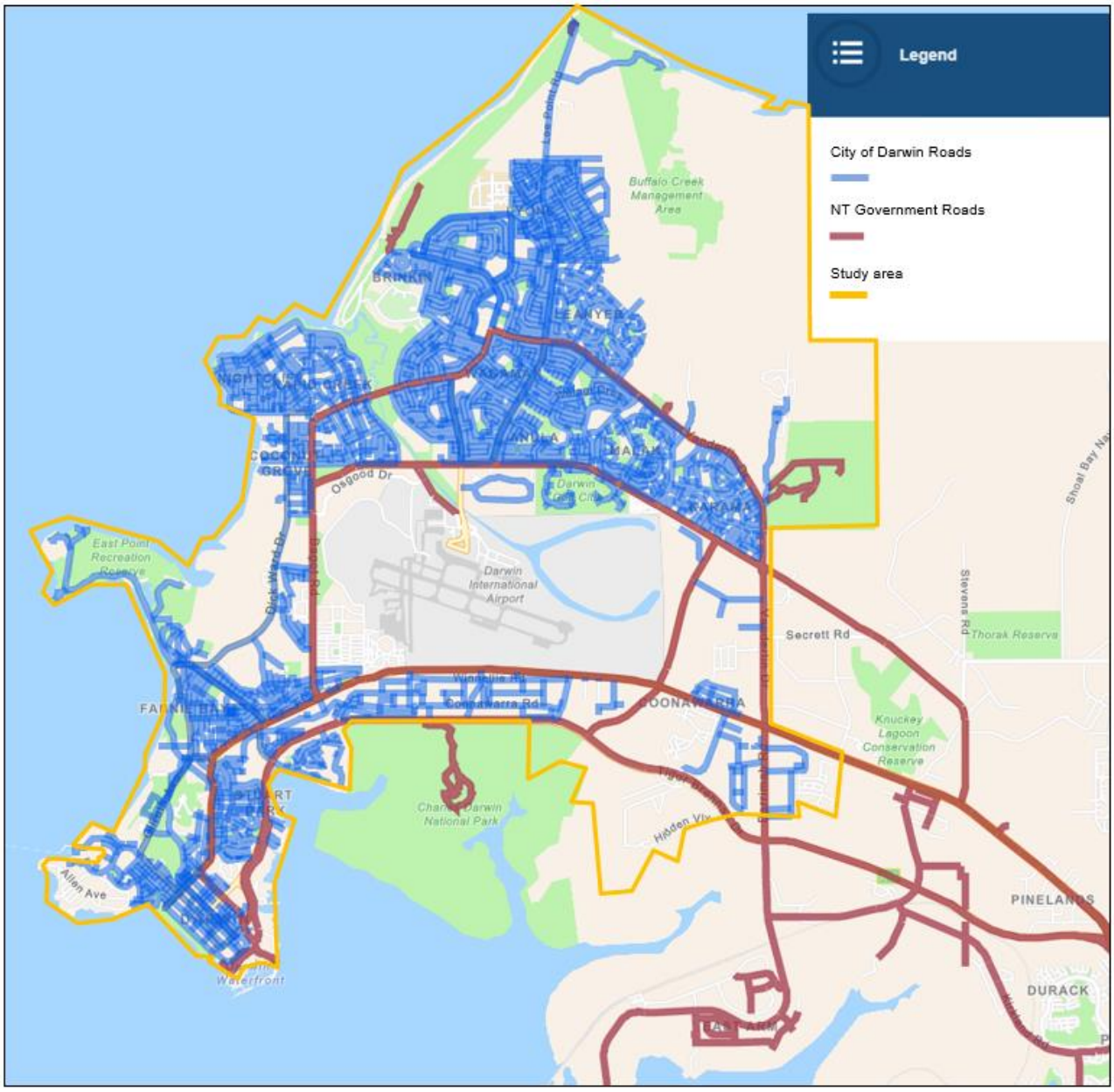
Road class	Function
Freeway	Traffic movement function exclusively
National Highway	Traffic movement function primarily. Principal avenue for communication between two capital cities or major regions of Australia.
Primary Arterial (urban and rural)	Traffic movement function primarily. Primary network of strategic links between important centres in a city, town or rural area.
Sub-arterial/ Rural Secondary or Distributor Road	Combined traffic movement and access function. Connect arterial roads to areas of development and distribute traffic to local street systems.
Collector Road	Access[1] function. Collects and distributes traffic in an area and serves abutting properties. Provides access between local roads/ streets and sub-arterial/ distributor roads.
Local Road	Access[1] function. Used primarily for access to abutting properties.
Pastoral 1	Access[1] function. Provides dry weather access to a single Pastoral property.
Pastoral 2	Access[1] function. Provides dry weather access for up to three Pastoral properties.
Pastoral 3	Access[1] function. Provides partial wet weather access to more than three Pastoral properties.

Note 1: "Access" in this Table refers to an individual property access from a road.

Source: Northern Territory Government

Figure 6-2 shows the ownership of roads within the Study Area.

Figure 6-2 Darwin Road Ownership

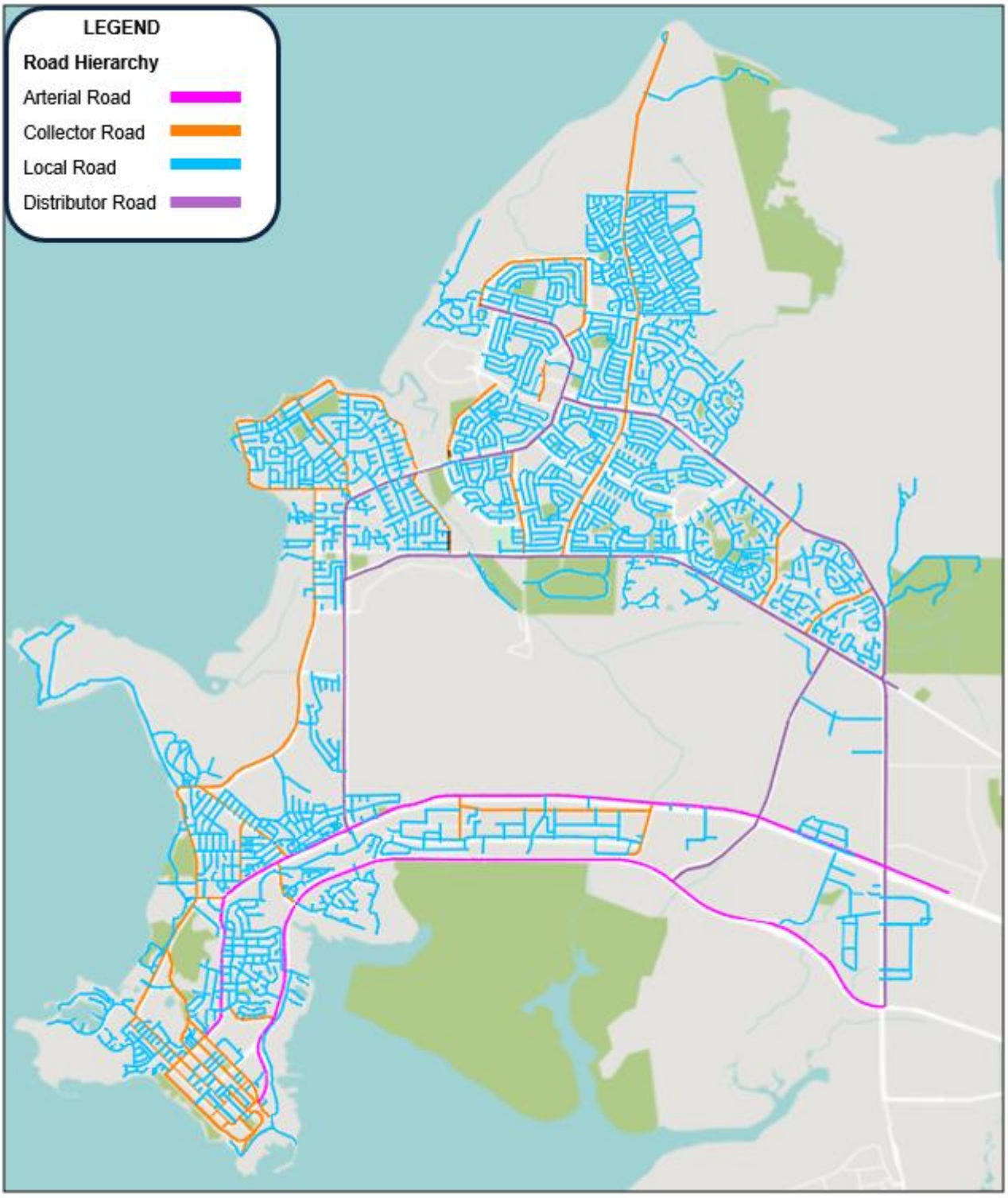


Source: City of Darwin

As this map shows, the NT Government owns and manages the majority of the high-capacity corridors in the Study Area, including all key connections to adjacent Local Government Areas.

Figure 6-3 shows the road network within the Darwin Municipality classified according NT Standards.

Figure 6-3 Road Hierarchy Darwin Municipality



6.2 Traffic Speeds

Posted speed limits tend to relate directly to the road hierarchy, and are a function of safety and convenience.

In the NT, there are different default speed limits depending on the road environment. Within the Darwin Municipality, roads are signposted at speeds up to 100km/hr (e.g. Tiger Brennan Drive) outside of built-up areas, with arterial/distributor roads such as McMillans Road and Trower Road operating at between 70km/hr and 80km/hr.

In several locations, the City has imposed lower traffic speeds to improve pedestrian amenity and safety. This is one key step in creating more effective, navigable spaces for activity. These areas include:

- School zones – 40km/hr for school days; and
- City centre – some roads 40 or 50km/hr limit.

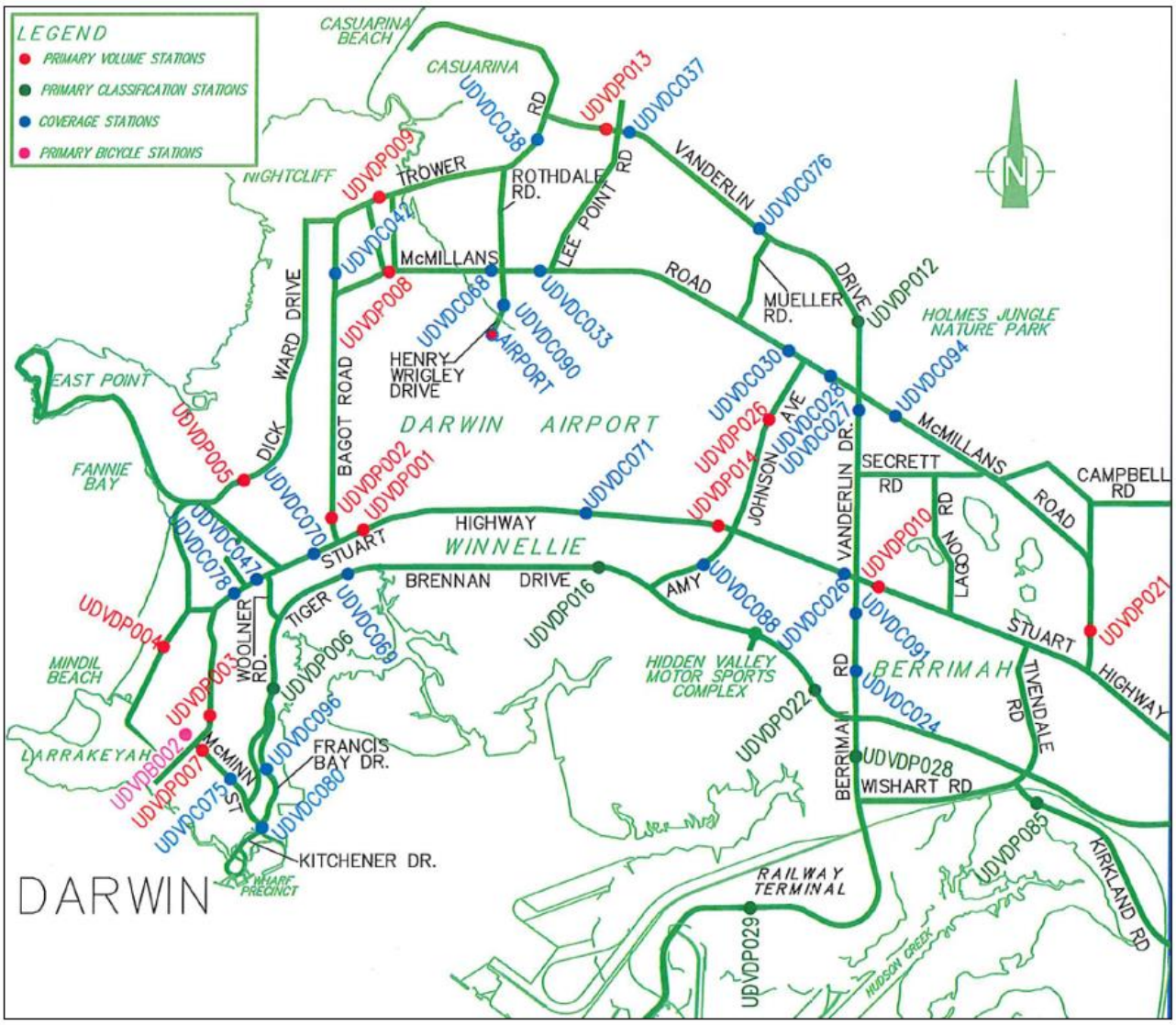
In built-up areas a default speed limit of 50km/hr applies unless there is a gazetted lower speed limit.

6.3 Traffic Volumes

The Annual Traffic Report 2019 presents traffic statistics pertaining to roads managed by the Northern Territory Government. The data is collected from a variety of locations at urban and rural primary and coverage stations throughout the Northern Territory.

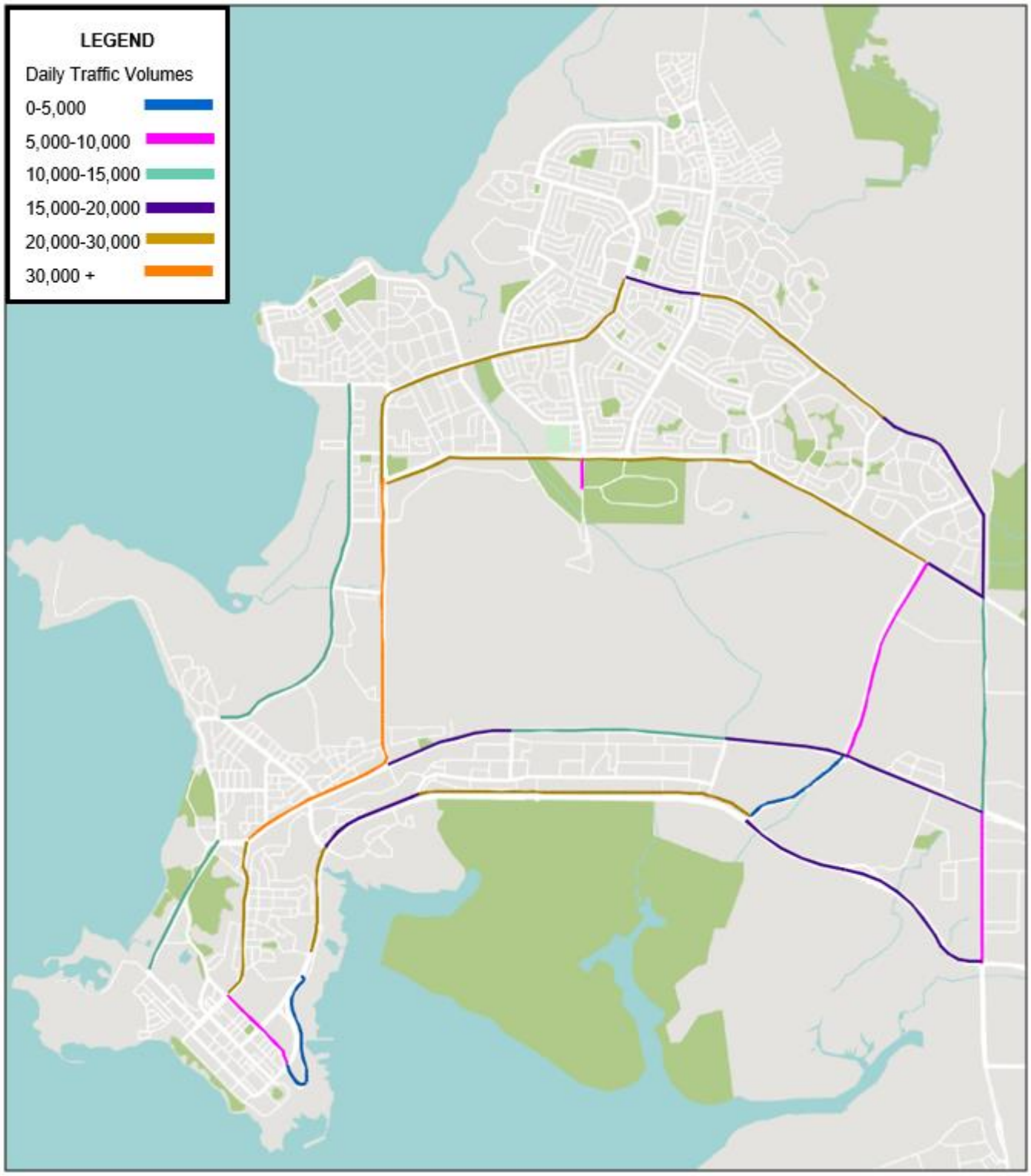
Figure 6-4 depicts the location of the counting stations within the Darwin Municipality, and Figure 6-5 presents Daily Traffic Volumes along the surveyed roads. The high traffic volumes along the primary road network is reflective of the few route options available for regional travel. In effect, the Darwin CBD is served by a total of three approach routes, which implies that any further growth outside of the CBD will result in increasing traffic congestion along these roads. Given that the capacity of these roads is restricted, this limitation points to a need for diversification of mode choice by residents and employees of Darwin, so as to maintain the function of the key corridors of Tiger Brennan Drive, Stuart Highway, Bagot Road and (to a lesser extent) Dick Ward Drive/Gilruth Avenue.

Figure 6-4 Darwin Urban Count Stations – 2019



Source: Annual Traffic Report 2019

Figure 6-5 Daily Traffic Volumes Darwin Municipality



6.4 Private Vehicles SWOT Analysis

6.4.1 Strengths

- Primary Roads within the Darwin Municipality are designed to accommodate large volumes of traffic with minimal disruption.
- Given the relatively small developed area of Greater Darwin, commuting distances by private vehicle are relatively short (average 13.1km), and hence commute times are low.
- The Darwin CBD and wider Municipality provides a large quantum of accessible parking which facilitates the use of private vehicle.
- Lower speed limits in school zones and within the CBD result in improved safety outcomes for vulnerable users.

6.4.2 Weaknesses

- Relatively few approach routes concentrate traffic onto only a few roads.
- The opportunities for further duplication of these roads is limited.
- Private vehicle transport is inherently space-inefficient. That is, cars take up more space (per person) than any other mode of transport.
- The requirement to accommodate large combination vehicles alongside cars and buses reduces the available options for improvement, particularly in the context of control and safety performance.
- The scale of the primary road network is not consistent with the function of approach roads to the Darwin CBD. This creates a conflict between place function and mobility function (as defined through Link & Place analysis).

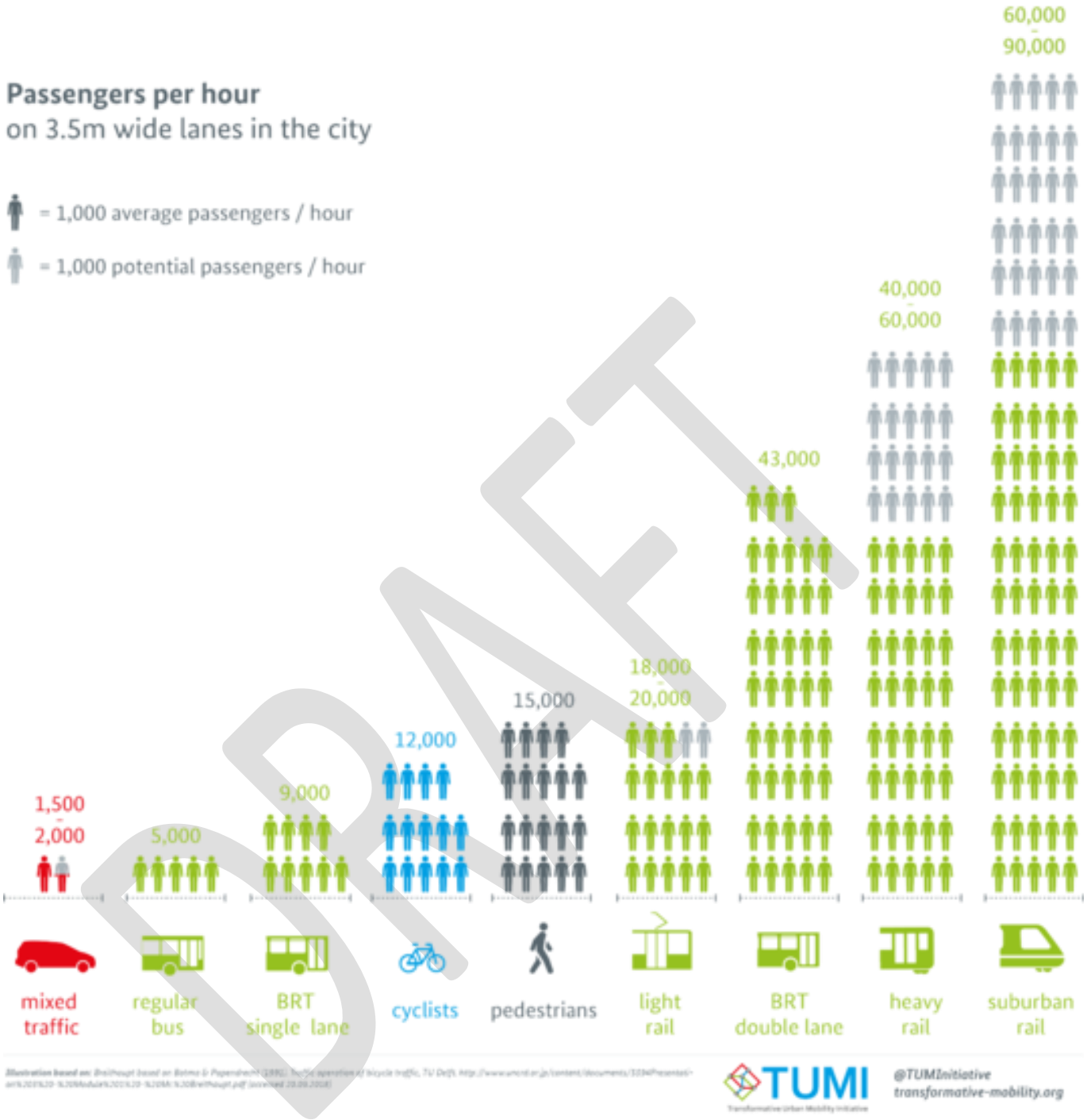
6.4.3 Opportunities

- The lack of opportunities for road expansion will support further improvements in sustainable transport to accommodate the movement of people.
- The future of private vehicle travel is likely to be in electric vehicles, with European regulations acting as a forcing factor in the lead up to 2040. Electric vehicle charging stations will be required, with likely requirements for additional baseload power.
- Autonomous vehicle transport (when it is realised) will have a fundamental impact on the way people travel. Current projections suggest that overall traffic demand will increase, but that public and private parking demand will fall dramatically. This presents opportunities for better streetscapes and reclaiming land formerly used for parking for transit, bike lanes, pedestrians and street trees.
- Jurisdictions across the world have adopted a 30km/hr residential speed limit, which allows for integration of mixed-traffic cycling and greatly improved road safety outcomes.
- In combination with low-ownership policies, car sharing schemes have been shown to be extremely effective in providing mobility to residents while heavily reducing kilometres travelled.
- Removal of inner-CBD parking would result in much lower traffic volumes along these streets, with resulting opportunities for shared zones.

6.4.4 Threats

- As congestion increases, traffic will likely redistribute to minor streets, resulting in greater levels of ‘rat-running’ in suburban locations, and potentially through the industrial zone. Additional traffic calming measures will become necessary to retain resident amenity and road safety.
- Autonomous vehicles have the potential to affect travel choices, change perceptions of travel time, and increase VKT, while simultaneously removing the primary pricing signal Local Government uses to manage demand (parking pricing).
- The impacts of autonomous vehicles are not yet well understood, but efforts will need to be made to manage any transition towards autonomous vehicles in a sustainable manner, for the economic, social and environmental health of the Town.

Figure 6-6 Passenger Capacity of Different Modes



Source: TUMI

7 Freight

The movement of freight is a vital function for the road network, providing connectivity between the port and various commercial/industrial destinations. Much of the primary industries/resources sector is serviced by the freight rail, with intermodal transfer of containerised goods taking place in the East Arm peninsula and Wishart areas, with connection to the Primary road network via Wishart Road and Berrimah Road.

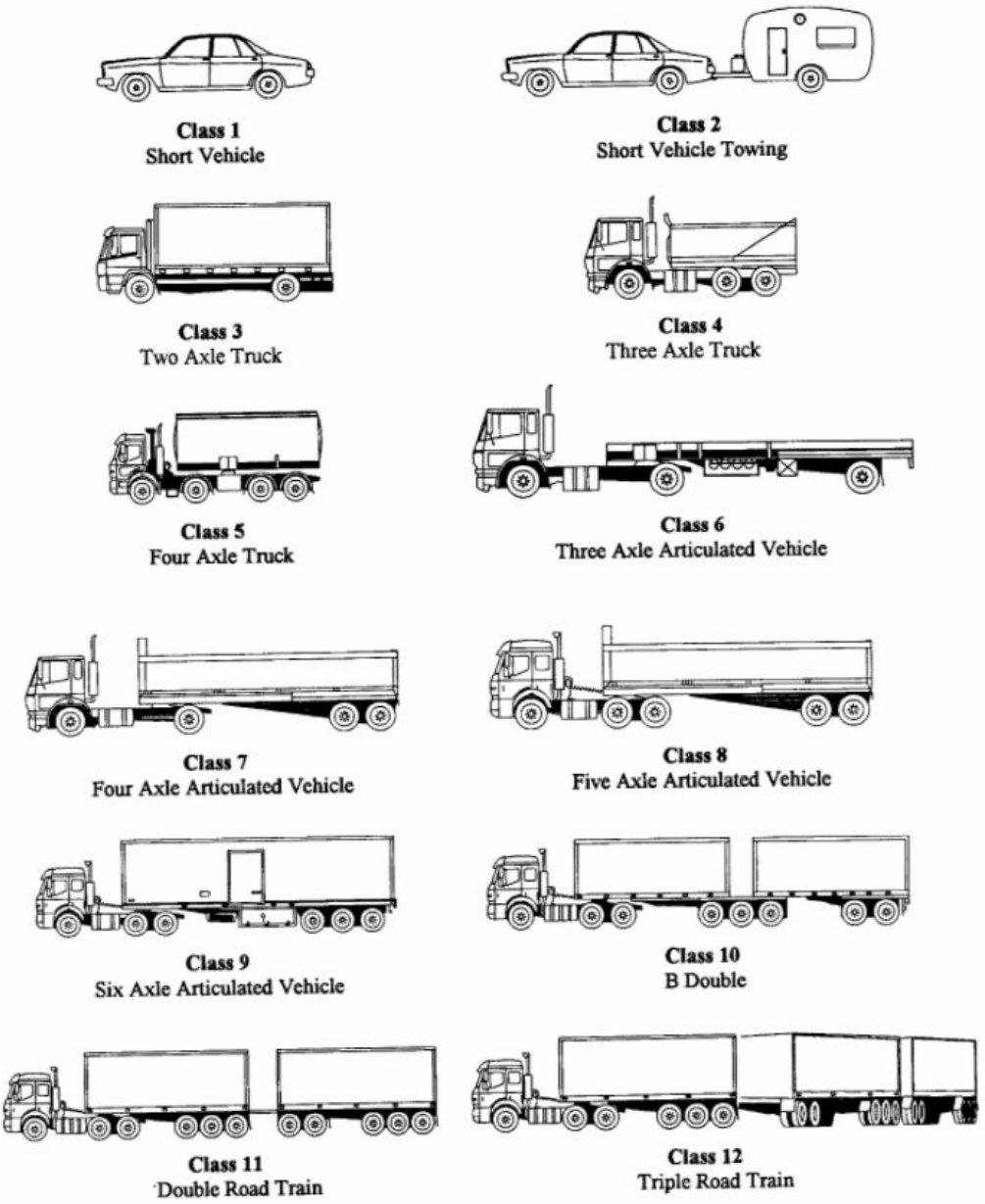
7.1 Definition

Freight traffic can include service/delivery and heavy vehicle combinations larger than a passenger vehicle. These vehicles have a wide range of performance characteristics, but generally the larger the vehicle the slower they are to accelerate and brake, and the more restricted their use.

Within the Darwin Municipality, heavy vehicle combinations up to four-trailer road trains 53.5m in length, and 127T fully-laden, as well as over-size and over-mass vehicles are permitted under certain conditions.

The following Figure 7-1 depicts an exemplar from each of the Austroads Classes.

Figure 7-1 Austroads Classifications (Class 1 to 12)



Source: Austroads

7.2 Road Train Routes

The Northern Territory Government specifically defines legal travel routes for road trains within Berrimah and Winnellie and travel routes for oversized vehicles as shown in Figure 7-2. These roads must be specifically designed to accommodate the needs of these heavy vehicle combinations, which characteristics such as larger radius bends, fewer obstructions and more generous green-times at signals.

Figure 7-2 Freight Routes

Annual traffic reports (2018-2019) are prepared using collected information which has been extracted from NT Government count stations.

The name and location of these counting stations and their respective percentage of vehicle classification is presented in Table 7-1.

Table 7-1 Vehicle classification per counting station

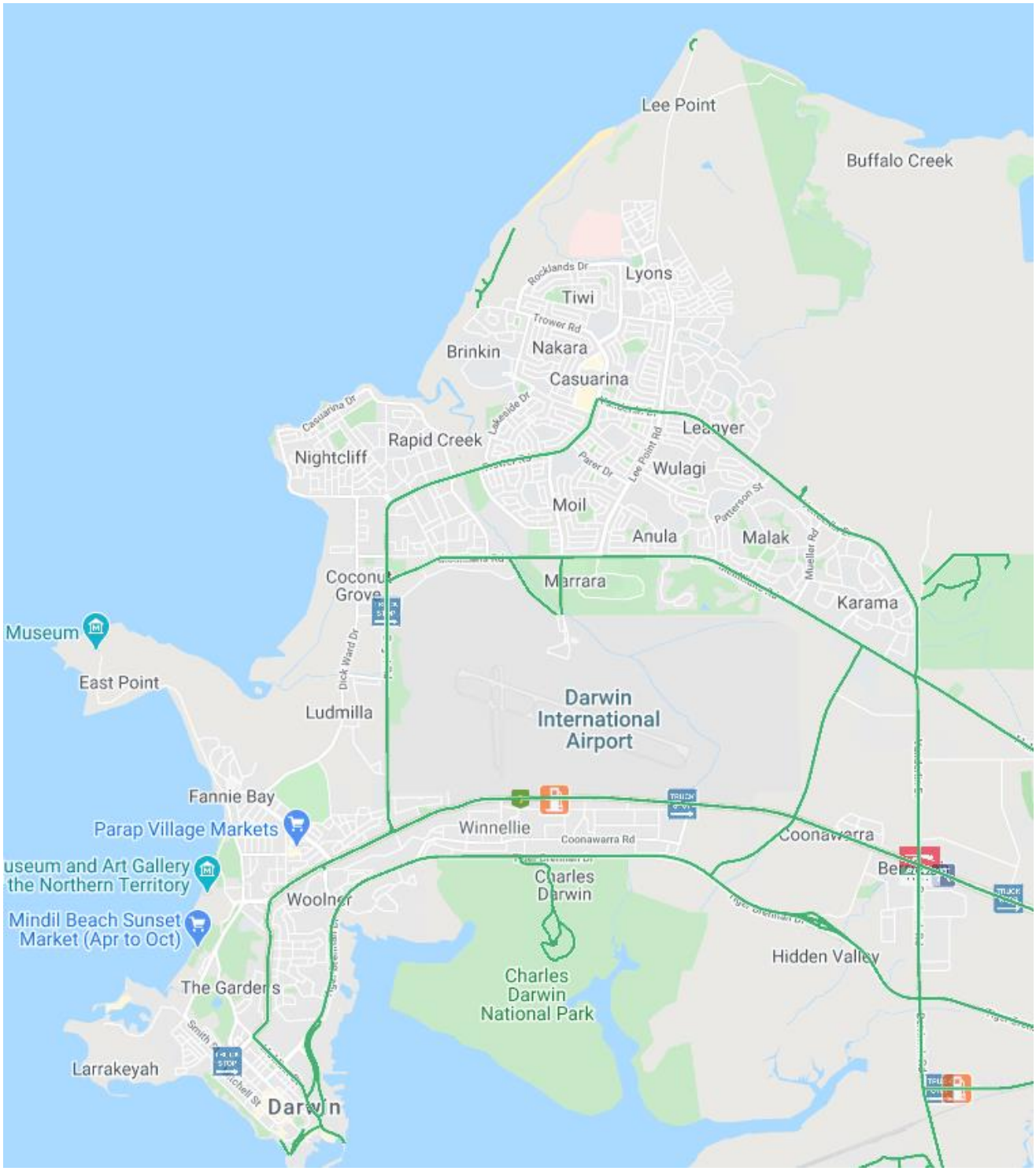
Code	Road Name	Classes (%)					
		1	2-5	6-9	10	11	12
UDVDP003	Stuart Highway	93.96	5.78	0.25	0.01	0	0
UDVDC075	McMinn Street	93.87	5.95	0.13	0	0	0
UDVDC080	McMinn Street	91.2	7.83	0.26	0	0.01	0
UDVDC096	Francis Bay Drive	88.22	10.3	1.28	0.11	0.07	0
UDVDP006	Tiger Brennan Drive	91.5	7.9	0.54	0.03	0.02	0.01
UDVDP002	Bagot Road	93.37	6.33	0.29	0	0	0
UDVDP016	Tiger Brennan Drive	94.26	5.74	0	0	0	0
UDVDC088	Amy Johnson Avenue	87.61	11.4	0.94	0.02	0.03	0
UDVDP022	Tiger Brennan Drive	94.33	5.68	0	0	0	0
UDVDP028	Berrimah Road	77.16	17.59	3.92	0.19	0.41	0.72
UDVDC024	Berrimah Road	75.33	21.31	2.68	0.21	0.28	0.19
UDVDC091	Berrimah Road	83.45	14.38	1.76	0.17	0.2	0.05
UDVDC027	Vanderlin Drive	90.48	8.87	0.54	0.04	0.06	0
UDVDP012	Vanderlin Drive	91.1	8.89	0	0	0	0
UDVDC090	Airport Access Road	93.79	5.78	0.35	0	0.09	0

**Year surveyed 2018*

This data illustrates that only a small fraction of vehicles represent the largest combinations (Class 12, three- or four-trailer road trains), but that some roads carry an appreciable number of freight vehicles (e.g. 5% of traffic Berrimah Road north of Tiger Brennan Drive is a 19m semi-trailer or larger).

The National Heavy Vehicle Regulator (NHVR) also includes some roads within the municipality as heavy vehicle routes. The Route planner tool provides information regarding the route network for various combinations, as well as truck stops, rest areas, service centre etc. These routes are presented in Figure 7-3.

Figure 7-3 Route network Heavy vehicles NHVR



Source: Route Planner Tool NHVR Portal

7.3 SWOT Analysis

Strengths

- The primary road network is designed specifically to accommodate large vehicle combinations.
- The extent of this network allows for efficient access to destinations across the Darwin Municipality.
- Congestion effects do not currently impact freight operations to a significant degree.

Weaknesses

- Freight routes coincide with all of the key arterials connecting to the Darwin CBD. This implies that as development continues, conflicts with large vehicle combinations, including significant safety and congestion impacts will become more frequent.
- Freight function conflicts with safe pedestrian movements along Mitchell Street and in the vicinity of the schools (school zones 40 km/h 7:00am-5:00pm).

Opportunities

- The strength of connection to Stuart Highway, which provides high-quality links to destinations across the NT and into South Australia, makes Darwin an attractive port for a range of freight activities.

Threats

- The operational characteristics of heavy vehicles are not consistent with those of passenger vehicles. Therefore, a road network that is optimised for private cars will impinge upon the efficiency of freight operations, and vice versa.
- Heavy vehicle movements along high-speed corridors reduce safety outcomes for vulnerable users wherever space is shared.

8 Public Transport (Bus service)

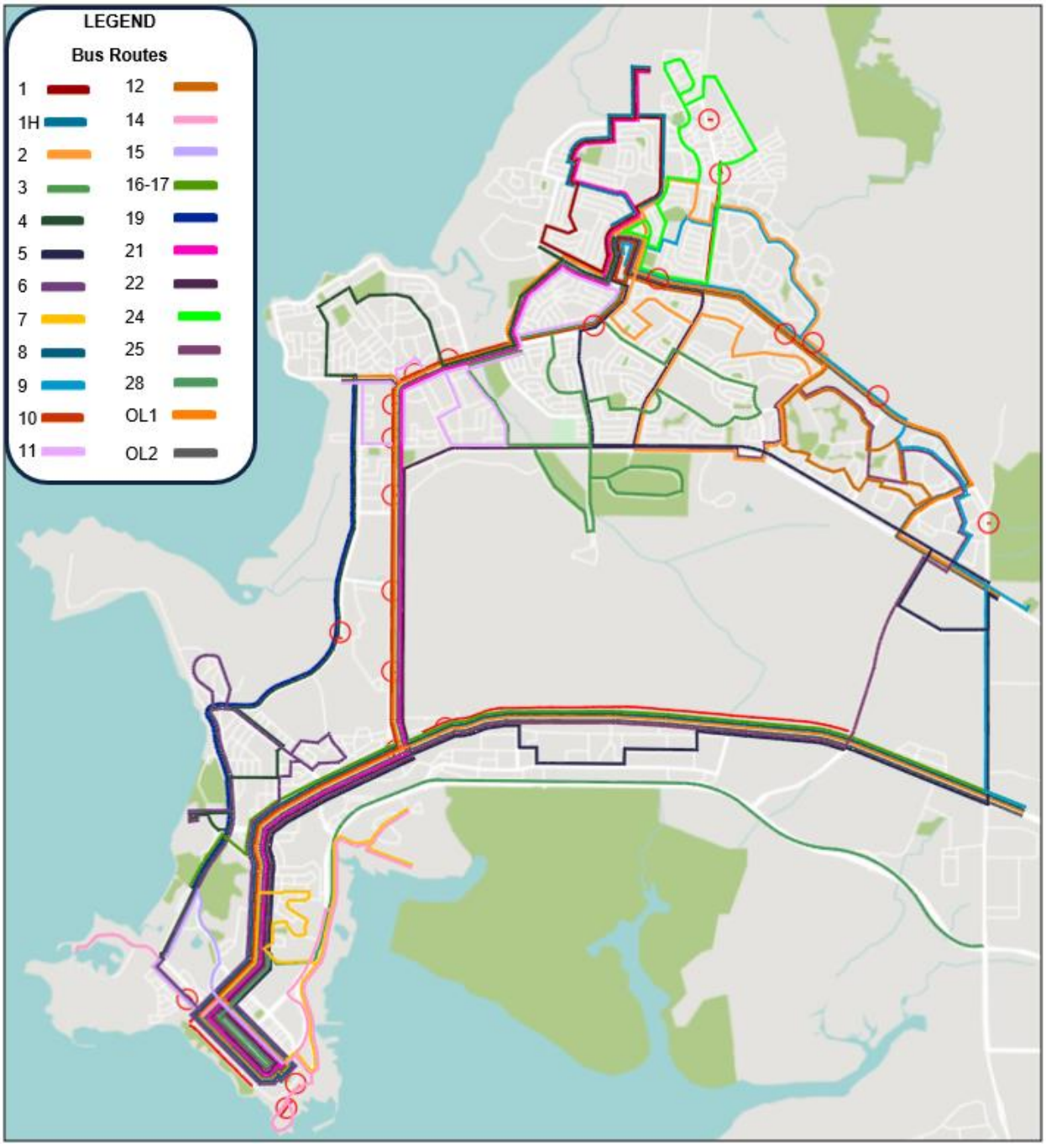
8.1 Public Transport Context

Public transport is a critical enabler for many in the community, particularly seniors, for access to health services, education and employment. In order to provide quality service, the NT Government has set the main goals for the Public Transport system as: fast, frequent, reliable, accessible and comfortable.

Public transport in the Darwin Municipality is provided by bus transit along 21 routes, as depicted in Figure 8-1. Of these, 4 services operate only on market days (Route 15-16-17-19).

Proposed development of public transport is defined by the Darwin Regional Transport Plan 2018, but as mentioned in the Regional Transport Plan, commuter use of public transport is still low. At around five per cent, Darwin has the lowest public transport mode share of any Australian capital city.

Figure 8-1 Public Bus Network map



Source: Adapted from the NTG website – Public transport Timetables and maps

8.2 Bus infrastructure

A desktop assessment of the bus stop infrastructure along the arterial and distributor roads routes has been undertaken, identifying the location of the bus stops and their type (sheltered or not sheltered), and is illustrated in Figure 8-2. Predominantly, bus stops in Darwin are along these roads are provided in the form of indented bus bays with a very low incidence of in-lane stopping.

This type of infrastructure tends to indicate that buses are considered a lower priority than other forms of traffic, as indented bays require buses to leave and enter the stream of traffic multiple times along the journey. This increases route duration and variability, when compared to in-lane stopping.

However, it is understood that interactions between large vehicle combinations and stopped traffic remain a consideration along many roads in the network.

Figure 8-2 Public Bus Network map

Beyond the bus stop itself, the most important infrastructure component in support of public transport is the pedestrian facilities associated with the stop. This includes path infrastructure along the approach route, connections to the nearby residential/employment catchment or key destinations and critically, safe and legible crossing points.

The provision of such facilities is currently lacking in many locations, creating safety issues at either the start or end of the trip for every user of the stop.

8.3 Service Frequency

The existing bus services and frequencies have been determined from bus route timetables available on the NTG website and are summarised in Table 8-1. Frequencies vary between weekdays, Saturdays and Sundays/ Public Holidays. Some services only operate during market days or Friday nights.

Table 8-1 Bus routes information

Route	Description	Frequencies (min)		
		Mon-Fri	Sat	Sun / Pub. Holidays
1	Casuarina to Casuarina - via Hospital Precinct, Tiwi, Brinkin and Nakara	34	54	54
1h	Casuarina to Casuarina via Hospital Precinct and Diabetes Australia Clinic	47	N/A	N/A
2	Casuarina to Casuarina via Wanguri, Leanyer, Wulagi and Wagaman	46	57	58
3	Casuarina to Casuarina via Alawa, Jingili, Marrara, Moil and Anula	40	57	59
4	Darwin to Casuarina via Fannie Bay, Nightcliff, Rapid Creek, Alawa and University	27	36	31
4	**Friday Night Only** Darwin to Casuarina via Fannie Bay, Nightcliff, Rapid Creek, Alawa and University	29	N/A	N/A
4	Casuarina to Darwin via University, Alawa, Rapid Creek, Nightcliff and Fannie Bay	24	N/A	N/A
4	**Friday Night Only** Casuarina to Darwin via University, Alawa, Rapid Creek, Nightcliff and Fannie Bay	25	36	32
5	Casuarina to Darwin via Moil, Marrara, Berrimah and Winnellie	50	N/A	N/A
6	Darwin to Darwin via Museum, Fannie Bay and Parap	63	N/A	N/A
7	Darwin to Darwin via Stuart Park and Bayview	60	N/A	N/A
8	Darwin to Palmerston via Winnellie, Berrimah and Pinelands	33	59	58
8	Palmerston to Darwin via Pinelands, Berrimah and Winnellie	34	57	57
9	Palmerston to Casuarina via Pinelands, Berrimah and Karama	36	56	57
9	Casuarina to Palmerston via Karama, Berrimah and Pinelands	32	56	58
10	Casuarina to Darwin via Alawa, Rapid Creek, Ludmilla, Parap and Stuart Park	22	32	30
10	**Friday Night Only** Casuarina to Darwin via Alawa, Rapid Creek, Ludmilla, Parap and Stuart Park	10	N/A	N/A
10	Darwin to Casuarina via Stuart Park, Parap, Ludmilla, Rapid Creek and Alawa	20	35	32

10	**Friday Night Only** Darwin to Casuarina via Stuart Park, Parap, Ludmilla, Rapid Creek and Alawa	23	N/A	N/A
11	Casuarina to Casuarina via Millner, Rapid Creek and Alawa	41	N/A	N/A
12	Casuarina to Casuarina via Malak and Karama	39	49	N/A
14	Darwin to Darwin via Cullen Bay and Darwin Waterfront	48	55	N/A
15	**Thursday market days only** Darwin to Mindil Beach Sunset Market via Mitchell St (and return)	19	N/A	N/A
16	**Thursday market days only** Palmerston to Mindil Beach Sunset Market	40	N/A	N/A
17	**Thursday market days only** Mindil Beach Sunset Market to Palmerston	60	N/A	N/A
19	**Thursday market days only** Mindil Beach Sunset Market to Casuarina	43	N/A	N/A
21	**Semi express** Hospital Precinct to Darwin via Casuarina	Once per day (am)	N/A	N/A
21	**Semi express** Darwin to Hospital Precinct via Casuarina	20	N/A	N/A
22	**Semi express** Leanyer to Darwin	Twice per day (pm)	N/A	N/A
22	**Semi express** Darwin to Leanyer	23	N/A	N/A
24	Casuarina to Casuarina via Wanguri, Lyons and Muirhead	52	61	64
25	**Semi express** Karama to Darwin	Once per day (am)	N/A	N/A
25	**Semi express** Darwin to Casuarina via Karama	20	N/A	N/A
28	**Semi express** Humpty Doo Park and Ride to Darwin via Coolalinga Park and Ride and Palmerston	28	N/A	N/A
28	**Semi express** Darwin to Humpty Doo Park and Ride via Palmerston and Coolalinga Park and Ride	20	N/A	N/A
OL1	Casuarina, Palmerston and Darwin to Casuarina	58	N/A	N/A
OL2	Casuarina, Darwin and Palmerston OL2 to Casuarina	58	N/A	N/A

Generally, service frequencies are low, with multiple deviating routes providing coverage, rather than efficient connection. However, it is noted that many different routes combine along key corridors of Stuart Highway (particularly west of Bagot Road), Bagot Road itself and Vanderlin Drive.

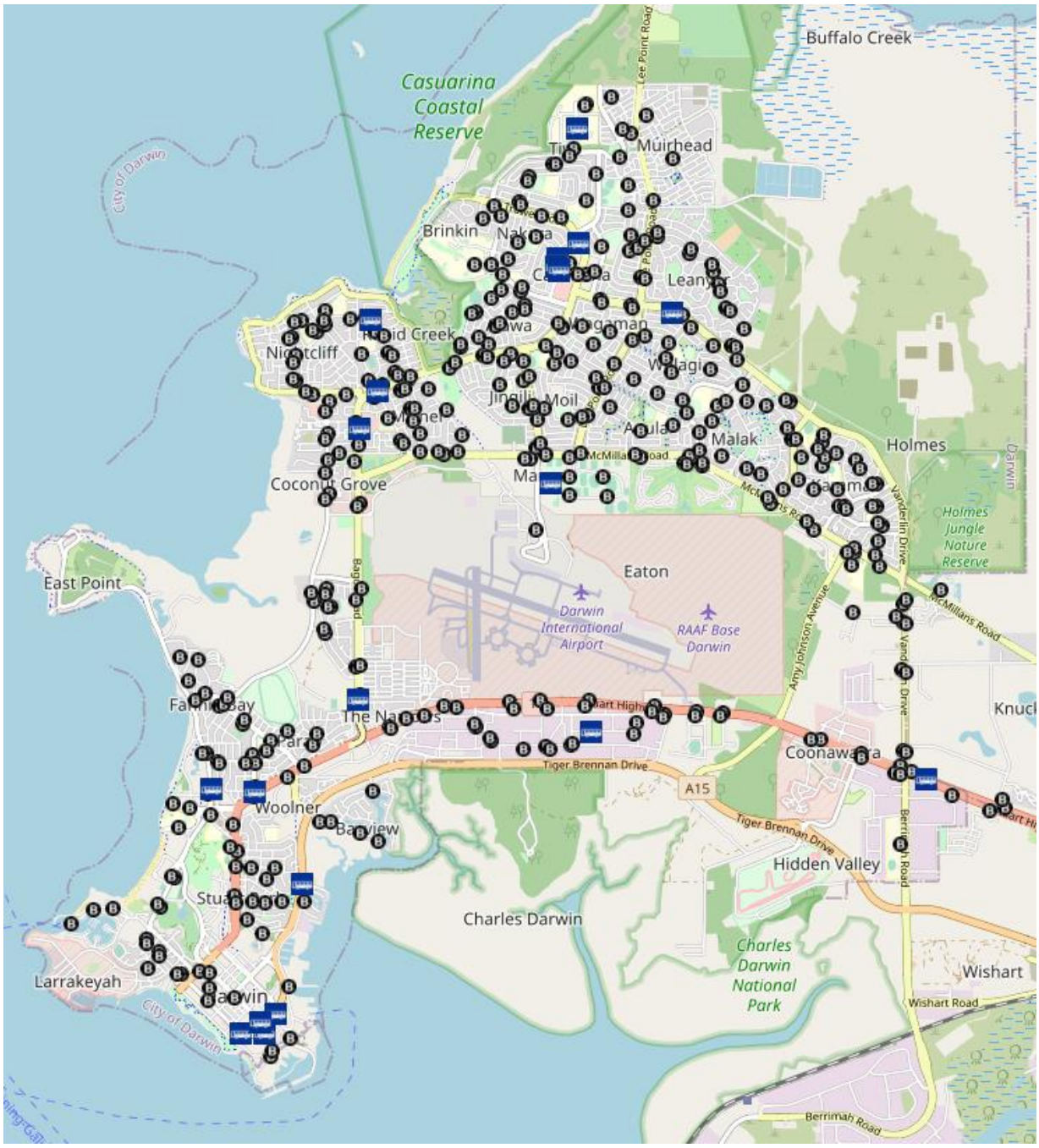
Residents able to access these key corridors have the opportunity to catch multiple services operating at very high frequencies, particularly during peak periods. However, these are precisely the locations where crossing issues are prevalent and pedestrian infrastructure is deficient. The distance of these key roads from residential zones also creates an additional barrier, exposing commuters to environmental effects (heat, rain, wind etc.).

8.4 Bus Tracking

The NT Government provides real-time information about Darwin buses throughout the bus tracker app which includes the routes, bus stops and real-time location of the buses. The information can be filtered by suburb, address or bus stop number. This service greatly improves the accessibility of bus services, particularly where frequencies are low. The live bus tracking enables users to minimise waiting times and improves the attractiveness of the public transport to a substantial degree.

Figure 8-3 shows the layout of the app with the location of the bus stops and the buses at the time of the image capture.

Figure 8-3 Bus Tracker app layout



Source: Northern Territory Real Time Bus Tracking Page

8.5 SWOT Analysis

8.5.1 Strengths

- Bus route coverage is comprehensive, with relatively short distances to the nearest stop.
- There are express routes that provide efficient regional connection to Palmerston, Casuarina, Humpty Doo etc.
- The Real-Time bus Tracking app tool provides quality information for users.

8.5.2 Weaknesses

- The frequency of some routes is very low, increasing waiting times and introducing additional risk to commuters.
- Weekend service is relatively poor in many locations.
- Payment methods are limited to cash, or pre-paid tickets at interchanges.
- Many stops do not provide adequate shelter or shade.
- Many stops do not provide adequate path connection or safe crossing points.
- Buses share key roads with large freight combinations and high-volume private vehicle movements. All buses operate in mixed traffic.
- The majority of bus stops are provided in the form of indented bus bays which introduce additional delays and schedule variability.

8.5.3 Opportunities

- Amendments to NT road rules allow for dedicated bus-only lanes and queue jump facilities as key intersections. This creates opportunities to establish corridors for buses, improving travel time and consistency as well as separating buses and heavy freight vehicles.
- Improving bus stop infrastructure and path connections will remove current disincentives. These improvements can be incorporated into the Cycle Network improvements.
- Modifications to rolling stock to allow buses to carry bicycles and scooters, provides opportunity for multi-modal trips. This could even create opportunities to consolidate some service, increasing frequency along important routes.
- Including electronic payment in-vehicle, or pre-payment by app, will provide users with more payment options.
- The high people-capacity of bus transit can forestall or even eliminate serious congestion without further road duplication, particularly with the conversion of some lanes to bus only.

8.5.4 Threats

- Expansion of the public transport service will need to occur in constrained corridors, potentially consuming space currently used by mixed traffic.
- Congestion along the key approach routes will further impact public transport function.
- Extreme weather conditions will continue to discourage users of public transport.

9 Pedestrians

9.1 Pedestrian Context

Pedestrian travel is much more localised than other transport modes, but vital for the function of land use and transport systems. Outside of centres, high quality pedestrian facilities support residential travel to shopping and schools, connection to public transport facilities and recreation. An attractive and safe pedestrian realm results in improved health and social outcomes for residents. Attractive pedestrian environments also improve economic outcomes, attracting more residents and businesses to the area.

Pedestrian activity and connectivity are critical factors in the effectiveness and vitality of Centres. For this reason, the pedestrian environment must be carefully considered, particularly along primary pedestrian routes. This includes construction of high-quality paths, shade trees and street furniture to provide amenity. By allocating suitable resources to the pedestrian environment, the use of pedestrian modes will grow, reducing the demand for other modes as well as the requirement for parking.

Parking location can be key to determining both traffic and pedestrian movement. The location of car parking towards the periphery of a Centre limits the impact of parking on trip volumes and land consumption, and requires parkers to travel an additional distance to their destination. The acceptance of peripheral car parking will be significantly improved where attractive legible pedestrian facilities are provided.

A pedestrian Level of Service (LoS) approach considers the *quality* of the pedestrian experience across the length of the trip. Higher-traffic areas with a concentration of pedestrians require good quality, connected, covered and shaded paths, but so do paths which connect areas of high demand across relatively long distances, approaching or exceeding the nominal 400m or 800m walkable catchment.

9.2 Pedestrian Level of Service

Pedestrian LoS is a key measure of the distance pedestrians are willing to walk depending on the type of activity (shopping, commuting, recreation) and the quality of the built environment.

Table 9-1 below presents the serviceability matrix outlining the distance and relevant LoS associated with the pedestrian environment. What is apparent is the greater the environmental control along the path (e.g. shade) the further pedestrians are willing to walk to get to the activity node.

As an example, a commuter would be happy to walk 400m to the destination from their drop off point in a climate- controlled situation, however in an uncontrolled environment such as a car park that distance decreases to 100m due to inferior safety and environmental conditions.

Table 9-1 Pedestrian Level of Service

Conditions	Distance Pedestrians are Happy to Walk			
	LoS A	LoS B	LoS C	LoS D
Climate controlled (inc tree canopy)	400m	800m	1200m	1600m
Covered walkway (e.g. awnings)	250m	400m	500m	750m
Unprotected path	150m	300m	400m	500m
Through car park	100m	200m	300m	400m

This consideration is particularly important in Darwin, where environmental impacts of heat, wind and rain significantly reduce the propensity for people to walk any appreciable distance (if they can avoid it).

9.3 Pedestrian Desirelines

Areas of key pedestrian movement need have been identified for the existing network and consist of:

- Within Activity Centres and from peripheral parking to employment destinations.
- Along and across key activated or transit Corridors, and along adjoining minor streets within a 200m walking distance.
- Within a 400m walking catchment of schools, shopping precincts and recreation venues, oriented towards the destination.
- Within 400m of a high-priority transit, oriented towards the node.

These pedestrian desirelines should correspond with a higher Level of Service, particularly with respect to crossing opportunities.

9.4 SWOT Analysis

9.4.1 Strengths

- Pedestrian priority is well developed in parts of the Municipality including school zones and some areas in the CBD, where slow posted speed limit supports safe crossing.
- The pedestrian network throughout the Municipality is comprehensive, with paths available on at least one side of the street throughout the CBD and suburban areas
- Recent improvements along Cavenagh Street in the Darwin CBD point to an emphasis on pedestrian comfort and attraction.

9.4.2 Weaknesses

- The City's Arterial, Collector and Distributor Roads often lack sufficient safe crossing infrastructure, in the form of signalised intersections or pelican (pedestrian crossings), pram ramps and median islands.
- The Municipality currently provides ~1m wide paths along some roads. Shared paths narrower than 2.5m are not considered sufficient to accommodate bi-directional cycling, and path widths less than 2m do not easily permit comfortable passing by prams, wheelchairs or gophers.
- The common alignment of shared paths along the property boundary creates conflicts between pedestrians/cyclists and vehicles exiting properties. This is exacerbated where walls, fences and vegetation obscure the path (e.g. Bagot Road).
- Lighting is inconsistent, predominantly relying on street light spill to illuminate paths. This is often insufficient to provide a feeling of security, and this effect is exacerbated where tree cover obscures the lighting.

9.4.3 Opportunities

- 'Tactical urbanism' can be used to trial treatments that improve safety and encourage behavioural change for road users, in an inexpensive and less controversial manner.
- Modification of shared path guidelines in the Darwin Municipality can support improved pedestrian safety and priority.
- Street trees provide shade and cooling, and can be used to both slow traffic and support active mode shares.
- The growth of activity along corridors provides opportunities for shelter in the form of awnings. Where bus shelter spaces can be integrated into adjacent buildings this can reduce the impact of verge clutter on pedestrian and cycling modes.
- Within the CBD there is an opportunity to extend pedestrian priority, including within minor streets and lanes, through the use of shared space design.
- 'Safety at Night' programs could be used to encourage road users to include walking as their preferred mode of transportation.

9.4.4 Threats

- Inappropriate street trees can be a hazard during the wet season due to cyclones creating flying debris and felling trees.
- Pedestrian environments are often squeezed by the demands of other transport modes with easy to define dimensions. In the search for a more efficient road network, verges are diminished to accommodate turning pockets, central median islands, parking bays and on-street bicycle facilities.

  This in turn creates a space that must provide for road signage, street furniture, above-ground utilities, land use activation, street trees and pedestrian paths.

  To combat this pressure, the needs of pedestrians must be considered in the context of their priority.

10 Cycling and Micro-mobility

10.1 Cycling Context

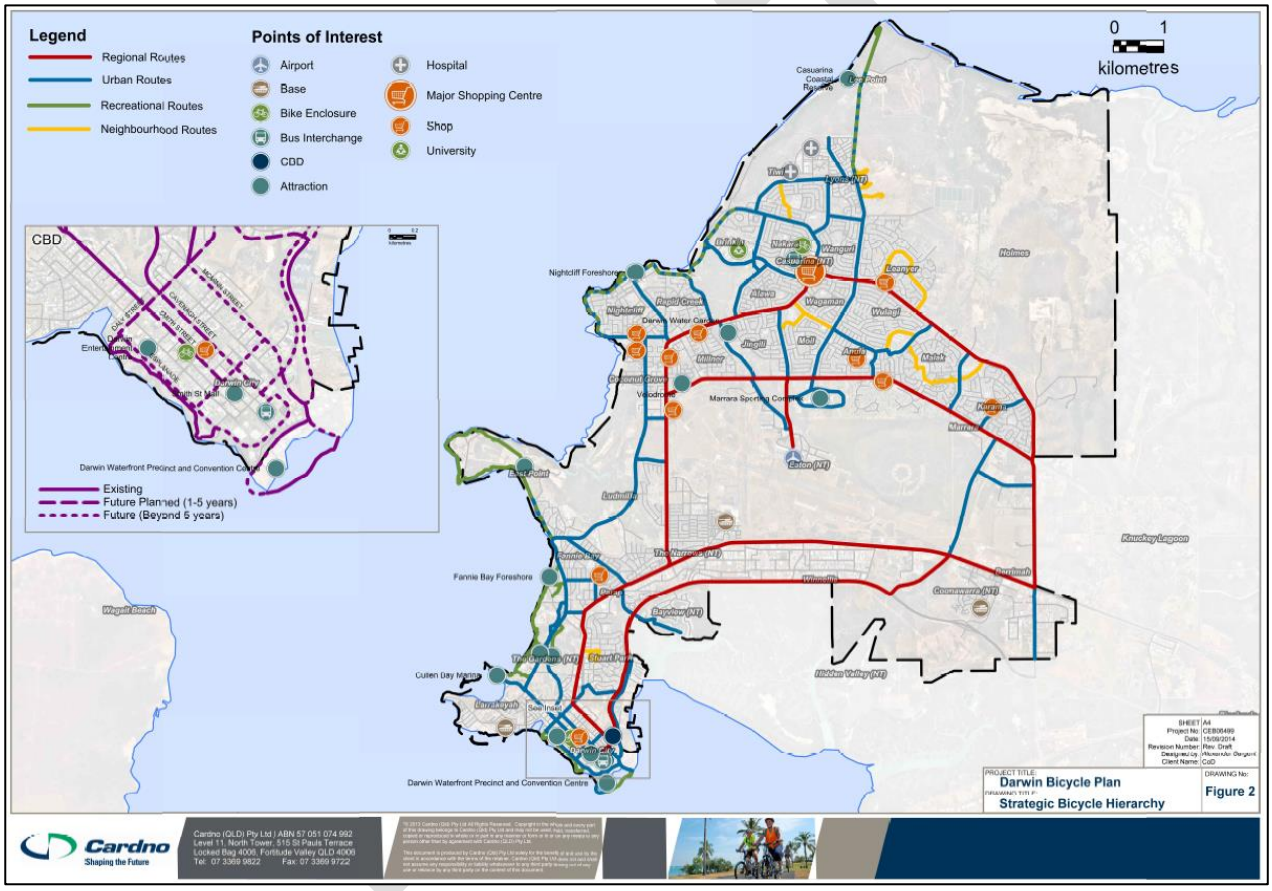
The infrastructure provided within the City of Darwin is primarily focussed on an off-road network, with the majority of cycling facilities provided by shared paths. CoD has been working on various bike projects aligned to the following vision for cycling in Darwin:

> *'Darwin is recognised for its safe, accessible and attractive bicycle network that connects our community and invites everyday participation in bike riding'.*

The most recent strategic cycling document is the 'Darwin Bike Plan 2015-2020', which reviewed the extent and sufficiency of bicycle infrastructure and recommended projects to create a cycling network which improved safety and connectivity by linking communities and facilities for all types of cyclists.

The plan proposed a mix of on-road and off-road routes and classified the bike network hierarchy into regional, urban, recreational and neighbourhood routes as shown in Figure 10-1.

Figure 10-1 Strategic bicycle hierarchy network



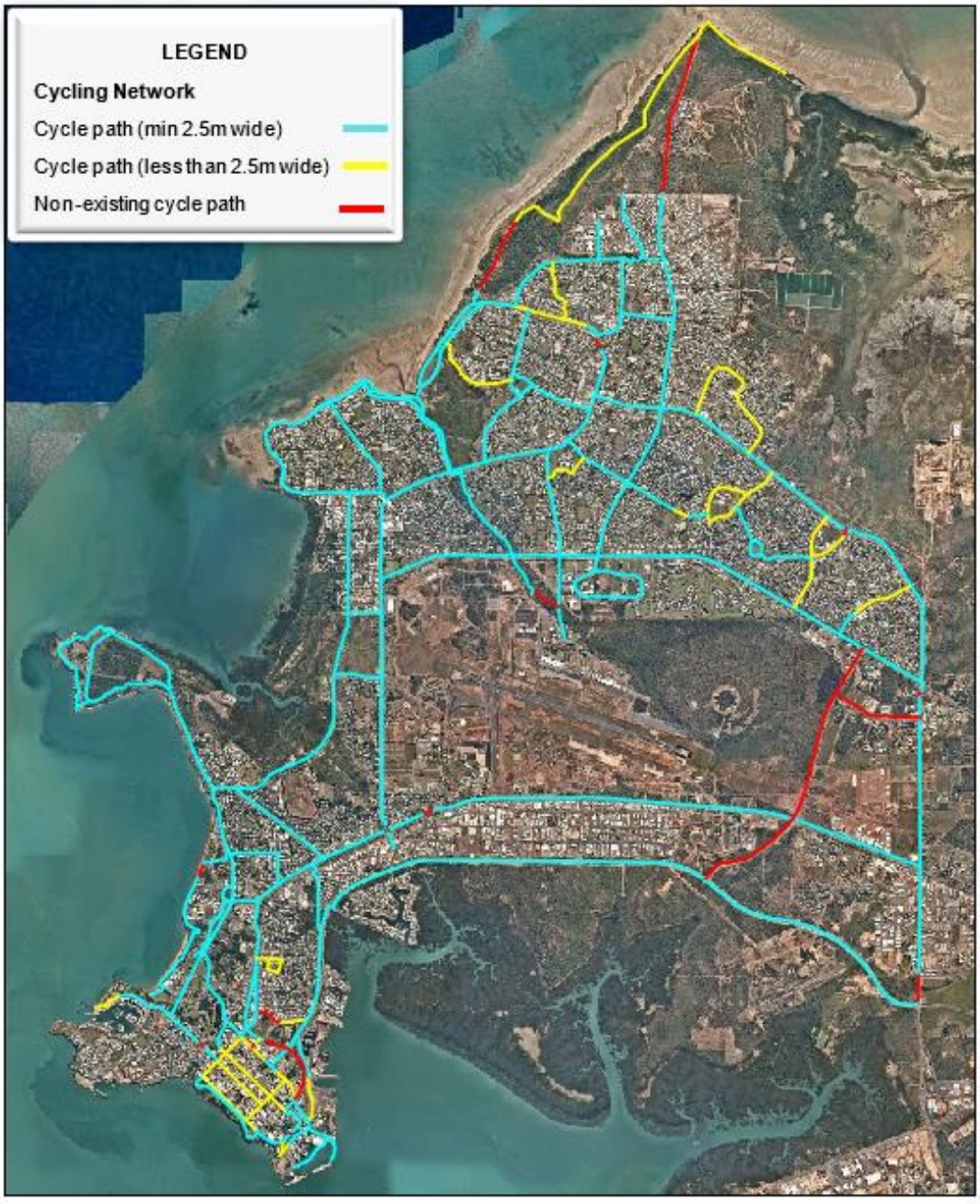
Source: Darwin Bike Plan 2015-2020

An evaluation of the network in 2015 showed that there were areas with limited coverage and connectivity both within the CBD and the Northern suburbs. It recognised that the crossing points and intersections required attention along the majority of routes and highlighted the importance of wayfinding signage and end of trip facilities to improve the experience for users.

The existing bike network shown in Figure 10-2 below compares the bike network proposed by the Plan with the current status of the network. Some of these paths present missing links or do not have the requirements to cater for shared paths users as the path width is less than 2.5m.

While progress has been made since 2015, there is still a substantial body of work to realise the CoD's stated objective. Of particular note are the Plan's proposed on-road cycle lanes along Daly Street, Esplanade and Smith Street, intended to complete connections into the CBD. This was an ambitious project, and while design work has been completed, the associated infrastructure is not yet in place - these routes remain primarily as narrow (<2.5m) off-road paths shared with pedestrians and cluttered with verge planting.

Figure 10-2 Existing bike network



10.2 E-scooters

In January 2020, City of Darwin permitted the company Neuron to conduct a 12-month trial of electric scooters, made available for hire in the CBD, Waterfront and Cullen Bay areas. An extension of the trial for another 12 months has been approved. At the time of writing, an average of more than 1600 trips using these e-scooters are recorded per day with approximately 400,000 trips completed between January and November 2020.

There is currently a proposal to incorporate 150 e-bikes to the scheme (to be in December 2020), to complement the e-scooters program.

There are a number of restrictions regarding where e-scooters can be ridden, including the mall, around Parliament house and on Mitchell Street between Peel and Knuckey Streets, from 8pm to 6am. This is intended to ease the introduction of this new form of micro-mobility transport, and to minimise the risks and perceptions of safety impacts.

Figure 10-3 shows the location of the main e-scooter parking stations and the ‘no riding’ zones.

Figure 10-3 Main E-scooter Parking stations

Source: City of Darwin – E-scooters

10.3 SWOT Analysis

10.3.1 Strengths

- The city has a well-established active riding culture, especially for recreational trips and fitness riding. This is created by the infrastructure provided, the proximity of activities and the location of the Municipality.
- Darwin has the highest participation rates in riding across all the Australian metropolitan centres.
- Having the majority of bike routes as off-road paths give riders a sense of separation from traffic and safety/
- The introduction of the e-scooters has proved a success during the first 12-months of the trial.

10.3.2 Weaknesses

- There are many gaps in the network, with some paths deemed insufficient to cater for users.
- There is limited wayfinding signage in place for the cycling network, and limited supply of end-of-trip facilities in the Municipality.
- There are conflicts between pedestrians and cyclists related to the narrow form, and lack of on-road cycling facilities.
- Where sealed shoulders are provided, these are often occupied by parked vehicles, resulting in the need for dangerous weaving movements. Many on-street cycle lanes are compromised by their proximity to moving vehicles as there are not physical separation between bikes and vehicles. The utility of cycling facilities that are located within the ‘door zone’ will always be affected by the perceived and actual safety impacts of this compromise.

- Crossing points and intersections often do not cater for safe movements by cyclists or other wheeled transport.
- Restrictions to e-scooters and other PMDs limits their utility and prevents a complete network from being established.

10.3.3 Opportunities

- There are ongoing opportunities to encouraging cycling through additional behaviour change programs and initiatives. This can be tied to school programs, work incentive schemes or infrastructure construction.
- The implementation of education campaigns to support and promote messages such as Share the Road and Share the Path targeting at all users and developing information regarding rider etiquette and appropriate conduct.
- Ensure bicycle riders are considered in the planning and design of new developments, particularly through the development approval process and existing communities through urban renewal projects and maintenance.
- Update the cycle network on platforms such as Google maps to allow users for a fast and easy way to plan their journeys.
- Continuation of the current e-scooter and e-bike programs (or equivalent) will contribute to supporting a sustainable city.
- Implement an extensive street tree policy to provide shade and cooling for cyclists.
- Consider the impact of diminished traffic in CBD streets on cycling accessibility in shared roadways.

10.3.4 Threats

- The continued growth in private vehicle demand for road space and parking poses an ongoing threat to cycling. The City's continued advocacy for cycling as a viable and valued transport mode is necessary to achieve sustainable outcomes.

  Opposition is likely to come from both community and Government stakeholders, requiring a strong and consistent response in policy and planning.

11 SWOT Analysis Summary Matrix

The following tables provide a summary of the strengths, weaknesses, opportunities and threats associated with each transport mode, identified in the previous sections. Each item identified has been applied to the other transport modes to identify whether that item impacts in a positive (identified in green) or negative (identified as red) way on that mode. This reveals which items are having a positive or negative outcome in other areas; and how the strengths, weaknesses, opportunities and threats are affecting the transport network as a whole.

Strengths

Category	Item	Impact on Other Modes (Positive Impact / Negative Impact)					
		Parking	Private Vehicles	Freight	Public Transport	Pedestrian	Cycling
Parking	There is a high degree of flexibility in parking provision within existing policies, including the capacity for unbundled and decoupled parking, supply concessions and cash-in-lieu.						
	The Darwin CBD CPS identifies strong objectives for parking, with best-practice policy initiatives that will support robust and resilient growth						
	The Darwin CBD has a large pool of centrally-located publicly accessible parking that can be leveraged to serve further development needs. Ongoing residential development in the vicinity will support increased activity with an overall *reduction* in parking demand.						
	Paid parking is already provided in the CBD. This creates a seed for further development of paid parking as a demand management tool as Darwin develops. Future expansion or modifications to this system will not need to overcome the 'zero-cost' hurdle.						

Category	Item	Impact on Other Modes Positive Impact Negative Impact					
		Parking	Private Vehicles	Freight	Public Transport	Pedestrian	Cycling
Private vehicle	Vehicles are the priority on Darwin's municipality roads and due to the total area of the Municipality, commuting times by private vehicle are relatively low.						
	The Municipality provides accessible and sufficient parking which facilitates the usage of private vehicle.						
	There are no tolls within the Municipality roads						
	According the ABS (2016) the average distance of commute within the Municipality is 13.1Km						
	Levels of congestions within the Municipality are low						
	Lower speed limits in school zone and in some roads in the CBD result in safety improvements for all road users.						
Freight	No movement of oversized vehicles in peak hours.						
	Lower speeds in Mitchell Street and in the vicinity of the schools (school zones 40 km/h 7:00am-5:00pm)						
	Congestion is not a significant issue in the roads of the Municipality.						
Public Transport	Bus stops are evenly distributed along the Municipality.						
	Express routes that connects to Palmerston, Casuarina, Humpty Doo etc.						
	Wide coverage of routes along the Municipality.						
	The Real-Time bus Tracking app tool provides quality information for users.						
	Accessible fares.						

Category	Item		Impact on Other Modes Positive Impact Negative Impact				
		Parking	Private Vehicles	Freight	Public Transport	Pedestrian	Cycling
Pedestrian	Pedestrian priority is well developed in parts of the Municipality including school zones and some areas in the CBD where slow posted speed limit supports a safe shared zone.						
	The pedestrian network throughout the Municipality is comprehensive, with paths available on at least one side of the street across most of the study area.						
Cycling	The city has a well-established active riding culture, especially for recreational trips and fitness riding. This is created by the infrastructure provided, the proximity of activities and the privilege location of the Municipality.						
	Darwin has the highest participation rates in riding across all the Australian metropolitan centres.						
	Having the majority of bike routes as Off-road paths give riders a sense of safety.						
	The introduction of the e-scooters proved a success during the first 12-months of the trial.						

Weaknesses

Category	Item	Impact on Other Modes (Positive Impact / Negative Impact)					
		Parking	Private Vehicles	Freight	Public Transport	Pedestrian	Cycling
Parking	Currently policies constrain opportunities for developer funding of non-parking infrastructure.						
	Darwin remains a city developed on a large footprint, with a high car-as-driver mode share for all trip purposes. This is reflected in high parking rates and large suburban parking facilities.						
	The prevalence of free, unrestrained on-street car parking in residential areas means that many residents own more cars than they have garage spaces for, or transfer the cost of vehicle storage to the City by repurposing on-site garages and parking on the street. This limits the effectiveness of vehicle reduction policies.						
	Kerbsides consumed by parking reduce the capacity for active transport, either through high-quality pedestrian environments or buffered bike lanes.						
	Public CBD parking is located in the heart of the City along the majority of roadside edges. This perpetuates a demand for parking immediately adjacent to the destination, and increases traffic impacts.						
	The oversupply of parking has a range of consequences for the environment and public amenity, including urban heat island effects, reduced canopy, greenhouse gas and air pollution, reduced accessibility and activity, and reduced public transport viability.						
Private vehicle	In fully developed areas there is limited or not allowance for duplication.						
	Petrol price is elevated in comparison to other major cities in Australia.						

Category	Item	Impact on Other Modes (Positive Impact / Negative Impact)					
		Parking	Private Vehicles	Freight	Public Transport	Pedestrian	Cycling
Freight	The mentioned routes are proposed only, unless specifically prohibited, there are not enforcements to avoid heavy or oversized vehicles from transit along the Municipality.						
	The information provided in different portals varies and could be confusing for road users or route planners on which roads and which restrictions apply for the movement of heavy vehicles.						
Public Transport	A low percentage of the population uses the bus services.						
	The frequency of some routes exceeds acceptable waiting times.						
	Not all the routes provide service on weekends.						
	Payment methods only include cash or at bus interchanges.						
	Not all the bus stops provide shade for the users.						
	Not all the bus stops provide adequate path connection nor crossing points.						
	There are no current bus-only lanes.						
	The great majority of Bus stops are indented bus bays which could delay the schedule of the route while trying to incorporate to the traffic.						
Pedestrian	The City's Arterial, Collector and Distributor Roads often lack sufficient safe crossing infrastructure, in the form of signalised intersections or pelican (pedestrian crossings), pram ramps and median islands.						
	The Municipality currently has one-meter wide shared paths along some roads. Shared paths narrower than 2m don't provide enough space for users, especially those travelling by bicycle or scoter or users with disabilities.						
	Lighting is inconsistent, predominantly relying on street light spill to illuminate paths. This is often insufficient to provide a feeling of security, and this effect is exacerbated where tree cover obscures the lighting.						

Category	Item		Impact on Other Modes Positive Impact Negative Impact				
		Parking	Private Vehicles	Freight	Public Transport	Pedestrian	Cycling
Cycling	The gaps in the network and the paths with insufficient width to cater for users can disincentive bike usage.						
	There is limited signage in place for the cycling network as well as end-of-trip facilities in the Municipality.						
	There are conflicts between pedestrians and cyclists in the off-road network; as for pedestrians, cyclists are riding to fast on the path.						
	Where sealed shoulders are provided, these are not dedicated for cyclists and often occupied by vehicle parking. Many on-street cycle lanes are compromised by their proximity to traffic and parking. The utility of cycling facilities that are located within the door zone will always be affected by the perceived and actual safety impacts of this compromise.						
	Crossing points and intersections required attention on most routes.						
	There are complaints of e-scooter riders riding too fast on the shared path and parking the e-scooters blocking other road users.						

Opportunities

Category	Item	Impact on Other Modes (Positive Impact / Negative Impact)					
		Parking	Private Vehicles	Freight	Public Transport	Pedestrian	Cycling
Parking	Any substantial road upgrade or Centre plan creates the opportunity to modify the parking supply and management regime.	■	■	■		■	■
	Investment in safe cycling infrastructure, coupled with ambitious end-of-trip facility requirements, could support short-distance active travel by bikes, scooters and other micro-mobility devices, reducing parking demand.				■	■	■
	Intensification of Activity Centres, including the CBD, creates an environment where development can help fund public parking facilities and alternative transport through a strong and flexible cash-in-lieu scheme.	■	■	■	■	■	■
	Redistribution of parking to the periphery of the Darwin CBD would allow for existing hardstand parking to be redeveloped to increase liveability and amenity.				■	■	■
	Electric vehicle demand is expected to rise substantially, particularly in response to international emissions policies. Facilities for electric vehicle charging will need to become ubiquitous to support that growth. Recent cost reductions in charging infrastructure improve the viability for provision, but intense demand may overwhelm the local grid.	■					
	Densification allows for further reductions in private parking through shared parking arrangements, unbundled and decoupled parking and managed parking justifications.				■	■	■

Category	Item	Impact on Other Modes Positive Impact Negative Impact					
		Parking	Private Vehicles	Freight	Public Transport	Pedestrian	Cycling
Private vehicle	The lack of land for road expansion will support further improvements in sustainable transport to accommodate the movement of people.				■	■	■
	The future of private vehicle travel is likely to be in electric vehicles, with European regulations acting as afforcing factor in the lead up to 2040. Electric vehicle charging stations will be required, with likely requirements for additional baseload power.	■					
	Autonomous vehicle transport (when it is realised) will have a fundamental impact on the way people travel. Current projections suggest that overall traffic demand will increase, but that public and private parking demand will fall dramatically. This presents opportunities for better streetscapes, reclaiming land formerly used for parking, for transit, bike lanes, pedestrians and street trees.	■	■		■	■	■
	Jurisdictions across the world have adopted a 30km/hr residential speed limit, which allows for integration of mixed-traffic cycling and greatly improved road safety outcomes.					■	■
	In combination with low-ownership policies, car sharing schemes have been shown to be extremely effective in providing mobility to residents while heavily reducing kilometres travelled.						
Freight	The Municipality, connects to Stuart Highway, which is one of the most important roads in the territory and connects to South Australia.			■			
	The network for oversize vehicles covers the majority of the Municipality.			■			
Public Transport	With the new regulation in place regarding bus-only lanes the service will be more efficient. Providing the Right of way (ROA) on key intersections and improving bus stop infrastructure and path connections could be an incentive for new users.				■	■	■
	By allowing buses to carry bicycles and scooters will provide an incentive for users to include buses into their options for mode of transport.					■	■
	Including electronic payment in-vehicle will provide users with more payment options.				■	■	■

Category	Item	Impact on Other Modes Positive Impact Negative Impact					
		Parking	Private Vehicles	Freight	Public Transport	Pedestrian	Cycling
Pedestrian	Including Tactical urbanism projects would improve safety and encourage behavioural changes for road users.						
	Growth of activity along corridors provides opportunities for shelter in the form of awnings. Where bus shelter spaces can be integrated into adjacent buildings this can reduce the impact of verge clutter on pedestrian and cycling modes.						
	Within the CBD there is an opportunity to extend pedestrian priority, including along side streets and lanes. This may include reduced traffic speeds (both design speeds and posted speeds).						
	Providing Safety after night programs could encourage road users to include walking within they mode of transportation.						
Cycling	There is an opportunity to encouraging cycling through additional behaviour change programs and initiatives. In particular, commitment to Travel Smart initiatives are used effectively.						
	The implementation of education campaigns to support and promote messages such as Share the Road and Share the Path targeting at all users and developing information regarding rider etiquette and appropriate conduct.						
	To ensure bicycle riders are considered in the planning and design of new developments, particularly through the development approval process and existing communities through urban renewal projects and maintenance.						
	To update the cycle network on platforms such as Google maps to allow users for a fast and easy way to plan their journeys.						
	The continuation of the e-scooter program and the introduction of e-bikes contributes to a sustainable city.						

Threats

Category	Item		Impact on Other Modes Positive Impact Negative Impact				
		Parking	Private Vehicles	Freight	Public Transport	Pedestrian	Cycling
Parking	Businesses and residents still have an extreme emotional attachment to parking at their home and destinations. This sentiment can be difficult to overcome, particularly where on-street parking could be replaced by alternative transport mode provision.						
	The cost of parking infrastructure and management can be high, and this burden tends to be borne by the LGA. This can put pressure on the City's budget and delay implementation.						
	Future technological changes are likely to impact the viability of parking investments (both public and private). Careful management is vital for the economic, social and environmental health of the City.						
Private vehicle	Ac congestion increases, traffic will likely redistribute to minor streets, resulting in greater levels of 'rat-running'. Additional traffic calming measures will become necessary to retain resident amenity.						
	Autonomous vehicles have the potential to affect travel choices, change perceptions of travel time, and increase VKT, while simultaneously removing the primary pricing signal Government uses to manage demand (parking pricing).						
	The impacts of autonomous vehicles are not yet well understood, but efforts will need to be made to manage any transition towards autonomous vehicles in a sustainable manner, for the economic, social and environmental health of the Town.						
Freight	Heavy vehicles, high speeds and a lack of pedestrian provisions is a hazard for non-motorised road users.						

Category	Item	Impact on Other Modes (Positive Impact / Negative Impact)					
		Parking	Private Vehicles	Freight	Public Transport	Pedestrian	Cycling
Public Transport	Expansion of the public transport service will need to occur in constrained corridors, potentially consuming space currently used for parking or by mixed traffic.	Negative	Negative			Positive	Positive
	For the land use and transport systems to work together, access and parking constraint policies will be required along transit corridors.	Negative	Negative			Positive	Positive
	Extreme weather conditions can discourage users of choosing public transport.				Negative		
Pedestrian	Street trees that creates cool and shady environment could be a hazard during the wet season due to the risk of Cyclones.						
	Pedestrian environments are often squeezed by the demands of other transport modes with easy to define dimensions. In the search for a more efficient road network, verges are diminished to accommodate turning pockets, central median islands, parking bays and on-street bicycle facilities.					Negative	
Cycling	The continued growth in private vehicle demand for road space and parking poses an ongoing threat to cycling. The Town's continued advocacy for cycling as a viable and valued transport mode is necessary to achieve sustainable outcomes.					Negative	Negative