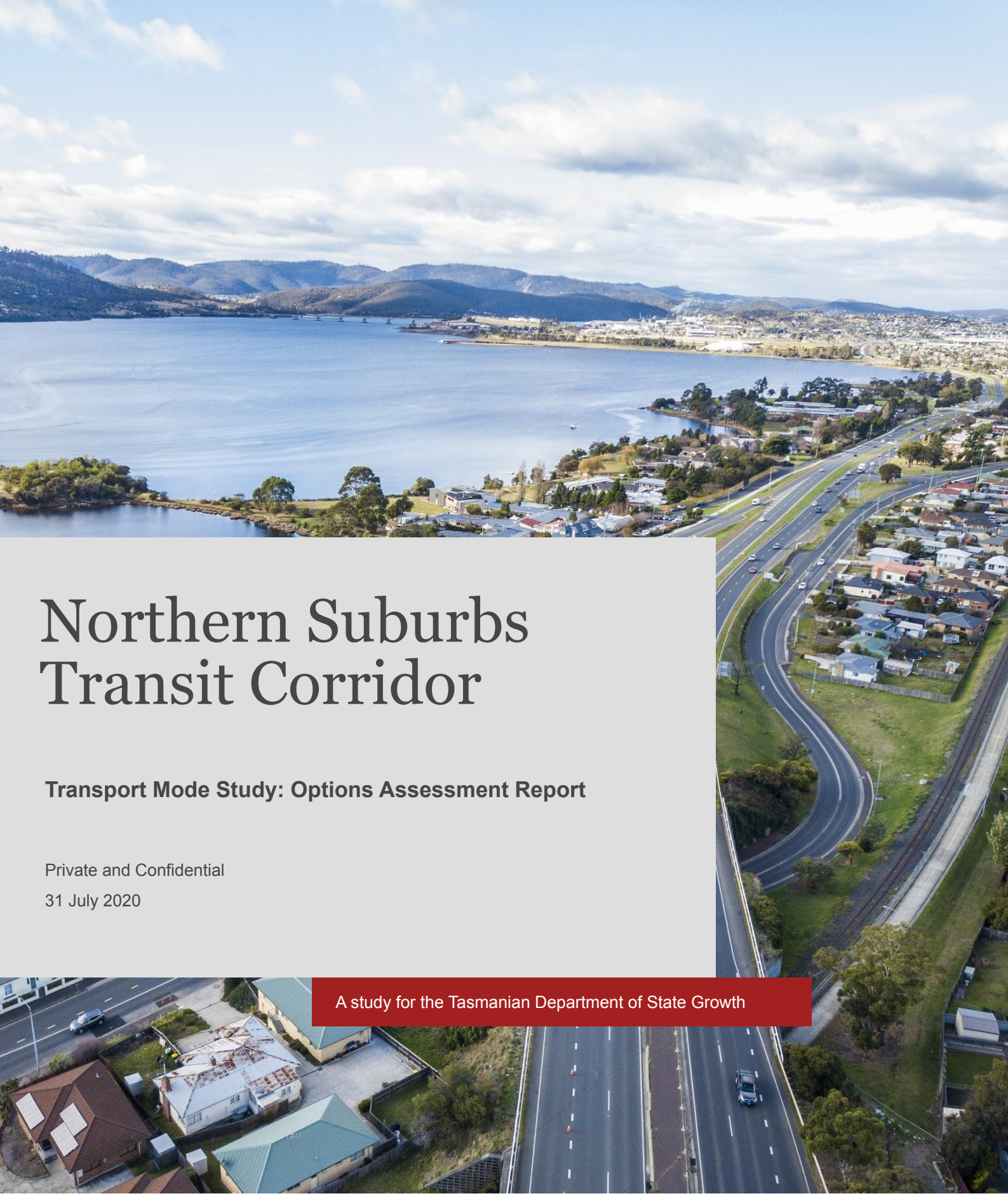

Northern Suburbs Transit Corridor

Transport Mode Study: Options Assessment Report

Private and Confidential

31 July 2020

A study for the Tasmanian Department of State Growth

pwc

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Executive summary

Background

Australia's second oldest capital city, Hobart, is experiencing a significant transformation, with a rapidly growing visitor economy and an increasing number of people being drawn to Hobart's natural amenity, vibrant culture and liveability. Hobart's current population and tourism growth, together with strong economic outlook, are supporting the city's transition into a diverse, vibrant and populated global city.

Embracing the opportunities that this growth presents while addressing emerging challenges, is a key focus for the Tasmanian State Government, supported and endorsed by the Hobart City Deal (2019). While Hobart is growing, so too is the city's urban footprint across a highly dispersed urban area and a growing dependency on private vehicles which rely on a small number of key arterial roads to access central Hobart.

The Northern Suburbs Transit Corridor (the Transit Corridor) lies within the local councils of Glenorchy and Hobart. The Transit Corridor connects key employment, tourism and activity centres, including the Hobart CBD, commercial areas in Moonah and Glenorchy, the Museum of Old and New Art (MONA) and the Royal Tasmanian Botanical Gardens. The Transit Corridor is part of a broader transport corridor which includes Main Road and the Brooker Highway, the Hobart Intercity Cycleway and the disused freight rail line (historically also a passenger rail line). The cycleway and disused freight line linking Claremont and Hobart CBD are surrounded by an area transitioning from predominantly industrial based uses to those more focussed on achieving urban regeneration.

The Hobart City Deal has recognised the opportunity the Transit Corridor presents, with the 10 year shared vision signed by the Australian and Tasmanian Governments and the Hobart, Glenorchy, Clarence City Council and Kingborough Council on 24 February 2019. The Hobart City Deal has committed to activating the Transit Corridor. City Deal Partners have committed to activating the Transit Corridor through transit-oriented development, which prioritises urban renewal and improves housing supply, affordability and diversity. The commitment includes the identification and delivery of a cost effective public transport solution along the Corridor within 5 to 10 years.

Purpose of this document

The Department of State Growth has commissioned PricewaterhouseCoopers Consulting (Australia) Pty Limited (PwC), who has teamed with Aurecon, LUTI Consulting, Cox Architecture and Fission to undertake a transport mode study for the Transit Corridor.

This report presents a strategic options assessment and a multi-criteria analysis (MCA) of potential options for the Transit Corridor. The purpose of this report is to present the analysis and key findings of options for the Transit Corridor.

A set of objectives for the Transit Corridor have been developed by the Hobart City Deal Working Group (including Australian and Tasmanian Governments and the Glenorchy and Hobart councils) and used for this study to support the options assessment.

The strategic options assessment seeks to compare options for the Transit Corridor to support the Hobart City Deal Working Group's objective categories of:

- City shaping
- Transport service
- Deliverability and affordability.

The MCA builds on the outcomes from the strategic options assessment by developing a quantitative evidence base to compare the potential for alternate transport modes to achieve the Hobart City Deal Working Group's objectives. Four core streams of analysis were undertaken to underpin this evidence base:

- Transport modelling
- Land use change and uplift estimation
- Deliverability and implementation assessment
- High level cost estimates.

The analysis presented in this report has been developed in a rapid nature to enable comparison of alternate mode options. This document details the approach to developing a long list of potential options, process to refine this long list through a strategic options assessment, and then method and findings from assessing a set of short-listed options in a MCA.

The findings in this report seek to support the identification of a preferred option/options for further analysis.

Executive summary

Key findings

A strategic options assessment has been undertaken of a long list of options identified with the potential to support transport and city shaping outcomes in the Transit Corridor. This suite of options was developed based on a literature review of previous studies and investigations in the Transit Corridor. The options included capital investments, better asset use reform, and regulatory reform. Capital investment considered transport options for both on corridor (using the disused freight rail line alignment) and off corridor (using Main Road and Brooker Highway).

The strategic options assessment identified light rail (on corridor), bus rapid (on corridor) and trackless tram (on corridor) as the short-listed options. These options were considered to best support the dual transport service and city shaping objectives for the Transit Corridor while balancing cost and deliverability factors.

On corridor options were identified as more beneficial than off corridor options. On corridor options were considered to have a lesser impact on the operation of the broader transport network, improved deliverability, and reduced risks (for instance minimising land acquisition as well underground services infrastructure treatment and relocation). Facilitating mass transit on Main Road and the Brooker Highway (off corridor options) was identified as negatively impacting road network capacity.

The three short-listed options were subjected to further analysis in a quantitative MCA. To inform the MCA a range of technical inputs were developed including indicative estimates of cost, and estimates of induced changes in land use and impacts on the transport network. These inputs were based on assumptions relating to the alignment and operational performance of the three options. The assumptions and inputs were developed for the purpose of a like-for-like comparison of short-listed options.

The MCA revealed positive transport service results for all three mass transit options and showed little variation between options. Each were found to offer a high capacity public transport option and if run at a frequent headway able to reduce Hobart's reliance on cars and improve congestion.

Evaluation of the options against city shaping objectives revealed notable variances between the short-listed options. Light rail was found to have the largest impact on city shaping outcomes followed by trackless tram and bus rapid options. Noting that the assumptions supporting this finding reflects the relativity of impacts from a range of case studies on unlocked land use capacity and market responses associated with each mass transit option.

Light rail was however found to be the highest cost mass transit option, with bus rapid identified as the lowest cost and with the lowest deliverability and implementation risk. The trackless tram was found to be a middle ground in relation to the city shaping and cost impacts. Trackless trams are however associated with increased implementation risk due to not being implemented and manufactured widely internationally.

Next steps

The identification of a preferred transport mode option for the Transit Corridor, requires the following areas to be investigated in more detail:

- A more detailed conceptual engineering design and feasibility study of the preferred option(s). This would help increase the level of certainty regarding cost and the deliverability of the preferred option(s).
- Incorporation of an off corridor option in the MCA and/or economic appraisal, for example bus on Main Road, to enable comparison of a broader spectrum of options and support examination of potential staging of progressive investment.
- Commence the development of a value capture framework to identify potential future funding opportunities and potential contributions across the levels of government and the private sector, as identified in the Hobart City Deal.
- Commence the development of a strategy for urban renewal and activation of the Northern Suburbs Transit Corridor along the existing rail corridor, as identified in the Hobart City Deal. This would help in understanding the opportunity for urban renewal in the Transit Corridor.
- Undertake an economic and financial appraisal of at least two options in line with Infrastructure Australia's (IA's) Assessment Framework.

Contents

1

Introduction

1. Introduction

Greater Hobart is a city experiencing growth and change. As Australia's second oldest and Tasmania's largest city, it sits within the foothills of Mount Wellington and follows the west bank of the River Derwent. Hobart's urban form is characterised by a relatively low density and dispersed built environment. The majority of residential growth continues to occur in outer urban areas, including within Kingborough, Brighton, Sorell and parts of Clarence. This development pattern is placing increasing pressure on key arterial roads, as well as impacting affordability and accessibility outcomes for households.

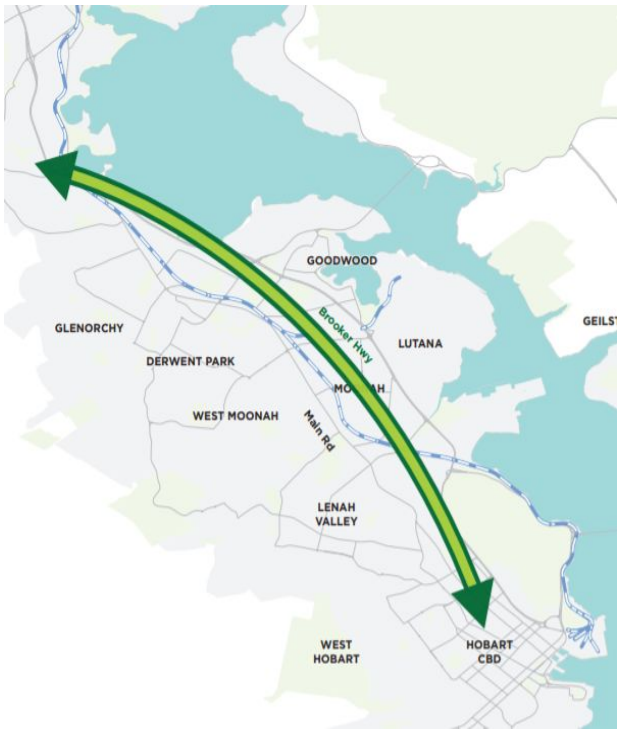
The Northern Suburbs Transit Corridor (the Transit Corridor) lies within the local councils of Glenorchy and Hobart. The Transit Corridor connects key employment, tourism and activity centres, including the Hobart CBD, commercial areas in Moonah and Glenorchy, the Museum of Old and New Art (MONA) and the Royal Tasmanian Botanical Gardens. The Transit Corridor is part of a broader transport corridor which includes Main Road and the Brooker Highway, the Hobart Intercity Cycleway and the disused freight rail line (historically also a passenger rail line). The cycleway and disused freight line linking Claremont and Hobart CBD is surrounded by an area transitioning from predominantly industrial based uses to those more focussed on achieving urban regeneration.

Following the cessation of rail freight services to Hobart Port and the construction of the Brighton Transport Hub, there has been an interest in understanding the opportunity to activate the Transit Corridor for public transport.

Utilisation of the Transit Corridor for public transport provides a unique opportunity to enhance accessibility and alleviate current blockages on the current road network. Public transport also provides opportunities for efficiencies on the existing bus network and provides the opportunity to enhance links with the active transport network in the Transit Corridor.

The Transit Corridor could play a role as a catalyst for urban renewal to the region. Unlocking a higher density mix of residential, commercial and retail activities, and revitalising key employments centres along the Transit Corridor such as Moonah and Glenorchy. The introduction of a mass transit link in the corridor is seen as an important driver of regeneration through activating the proposed station catchments into urban activity centres, increasing housing supply and diversity, and providing improved accessibility to major employment and commercial centres.

Figure 1: Northern Suburbs Transit Corridor



Source: Department of Infrastructure, Transport, Regional Development and Communication (Feb 2019) Hobart City Deal. p.19

Recognising this opportunity, the Hobart City Deal, signed by the Australian and Tasmanian Governments and the Hobart, Glenorchy, Clarence City Council and Kingborough Council on 24 February 2019, committed to activating the Transit Corridor through the existing freight rail corridor. As a step in this commitment is to determine the preferred transport mode with the identified solution to be delivered within 5 – 10 years.[1] The preferred transport mode forms part of a broader activation strategy for the Transit Corridor as outlined in the Hobart City Deal Implementation Plan which includes:

- *A commitment to develop a strategy for urban renewal and activation of the Transit Corridor through transit-oriented development that improves housing supply, affordability and diversity.*
- *An aim to enhance the liveability and connectivity of those living in the Transit Corridor footprint through the provision of successful mixing of uses in higher density forms and high frequency transit. Creating spaces where there is activity, access to services and walkability to reliable and consistent mass transit that allows easy access to work and leisure opportunities allows for a strong sense of place and provides a standard of development where people want to live.*[2]

1. Department of Infrastructure, Transport, Regional Development and Communication (Feb 2019) Hobart City Deal. p.16 ; 2. Department of Infrastructure, Transport, Regional Development and Communication (Feb 2019) Hobart City Deal. p.16

1.

Scope of work

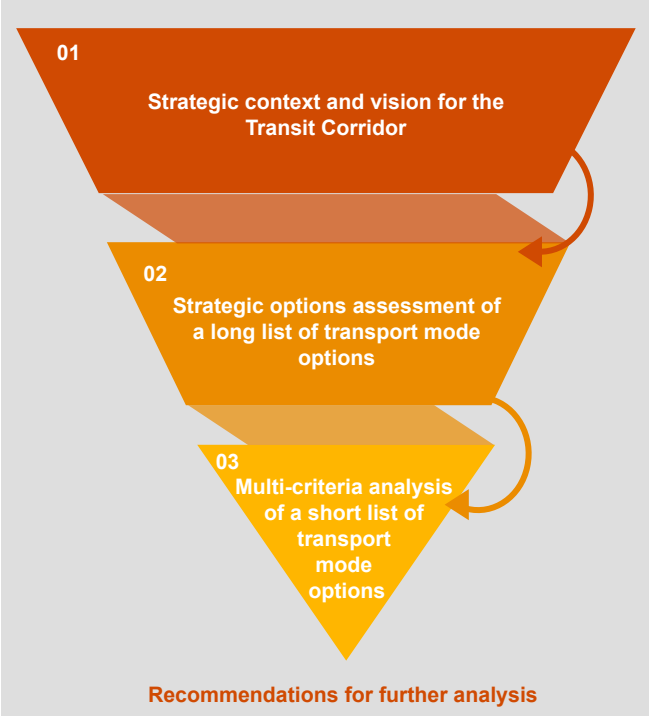
This study focuses on developing and collating evidence to inform decision making to support the identification of a preferred option/options for further analysis.

Purpose of this document

The Department of State Growth has commissioned PwC, teamed with Aurecon, LUTI Consulting, Cox Architecture and Fission, to undertake a preferred transport mode study for the Transit Corridor.

The study has been conducted following three stages of analysis:

Figure 2: Approach to the study



Source: PwC analysis (2020)

This report presents the analysis and outcomes relating to the three stages above to support the identification of recommendations for further analysis.

Stage 1: Strategic context and vision for the Transit Corridor identifies the opportunity for public transport. This stage defines the vision and objectives for the Transit Corridor and maps these to a broader set of policy reforms and strategies.

Stage 2: Strategic options assessment identifies and assesses a long list of possible solutions to improve transport and land use outcomes. The strategic options assessment draws on prior research and an understanding of the existing Transit Corridor to assess each option's ability to improve transport services and land use, and then compares them against a series of qualitative criteria. The outcome was the identification of a short list of three mode options.

Stage 3: Multi-criteria analysis (MCA) involves the application of a quantitative assessment framework to assess and compare the short-listed mode options. To support the MCA, a number of operating assumptions were aligned across the modes to enable a focus on the differentiating factors as opposed to definitively making a decision on all aspects of scope and implementation.

For this reason the MCA has not involved a comprehensive analysis of all elements of value for money or implementation of the options. The MCA involves applying a range of criteria based on a set of strategic objectives, drawing on technical analysis of transport impacts, potential for land use change, and deliverability factors including estimates of cost.

The analysis presented in this report has been developed in a rapid nature to enable comparison of alternate mode options. With the findings in this report supporting the identification of a preferred option/options for further analysis.

Consultation

The study has been undertaken with the Department of State Growth, and has been informed by engagement with wider stakeholders including the Hobart City Council, Glenorchy City Council and the Hobart City Deal Working Group.[1] This has involved:

- A project inception workshop
- Corridor virtual tour led by Glenorchy City Council
- A workshop to present the options assessment method and MCA objectives and criteria.

1. Hobart City Deal Working Group includes Australian and Tasmanian Governments and the Glenorchy and Hobart councils

1.

Structure of this document

This report presents the strategic options assessment and the multi-criteria analysis of potential options. The report therefore documents the approach, assumptions and outcomes from each stage of the transport mode study. The technical documentation has been attached as appendices to this document containing the supporting cost, land use, design and engineering, and transport modelling analysis. The structure of the report is as follows:

- **Section 2: Strategic context and vision** - summarises the opportunity for public transport, the vision and objectives for the Transit Corridor, and the strategic context
- **Section 3: Strategic options assessment** of a long list of transport mode options - discusses the process taken to develop a long list of potential options and the analysis conducted to short list the modal options
- **Section 4: Multi-criteria analysis** of a short-listed of transport mode options - sets out a definition of each short-listed option, the approach to the MCA, the key outcomes and limitations to note.

2

Strategic context and vision

2.1 Strategic context

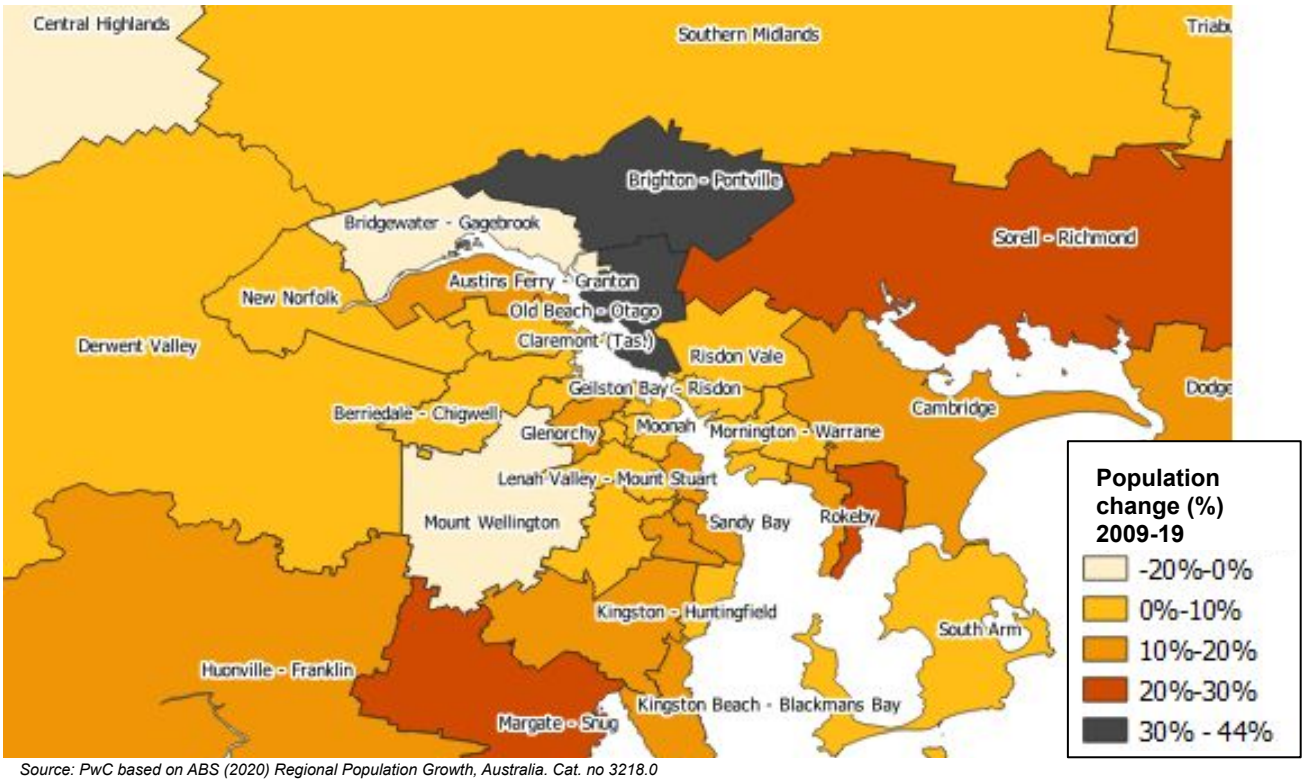
Land use context

Hobart is growing and changing. Australia's second oldest capital city is experiencing a significant transformation, with a rapidly growing visitor economy and an increasing number of people drawn to Hobart's natural amenity, vibrant culture and liveability. Approximately 1.9 million tourists and other visitors arrived in Hobart in 2019, with Tasmania experiencing the biggest growth in international visitor numbers in the country.[1] The population of Greater Hobart increased by 3,400 (1.5%) in 2019, compared to 2,700 (0.9%) for the remainder of the state.[2]

While Hobart is growing, so too is the city's urban footprint, with a highly dispersed urban area and a growing dependency on private vehicles. A small number of key arterial roads provide access to and through central Hobart. Congestion is experienced these key arterials during morning and afternoon peaks when compared to general traffic flows throughout the day.

The current pattern of growth when coupled with a car dependent population has the potential to increase congestion and lack of accessibility. Ultimately, this could impact the long term productivity of Hobart's economy and liveability, and have affordability implications for the city.

Figure 3: Hobart population growth pattern 2009-2019



Source: PwC based on ABS (2020) Regional Population Growth, Australia. Cat. no 3218.0

Managing growth and development in a sustainable way has been on the agenda for some time for the Tasmanian Government and the five local councils that make up Greater Hobart, as reflected in the 2010 - 2035 Southern Tasmanian Regional Land Use Strategy. While the 2010 Strategy is planned for update, the core objectives of this and other subsequent planning documents have identified the need for infill. Infill development has been identified along key corridors and nodes to encourage urban renewal to meet the transport and lifestyle needs of future generations, and provide a greater level of diversity of housing choice.

The Hobart City Deal represents a shared 10 year vision between the Australian and Tasmanian Governments and the Clarence, Glenorchy, Hobart and Kingborough councils. The City Deal recognises the important strategic opportunity currently faced by Hobart to build on its position as a vibrant, liveable and connected city.

1. ABS (2020) Regional Population Growth, Australia. Cat. no 3218.0
2. Austrade (2020) National Visitor Survey (NVS) Results, Year Ending December 2019

2.1

Transport context

Hobart's urban development pattern has resulted in relatively car dependent dispersed suburban and peri-urban communities. This has implications for the provision of public transport, travel reliability, the productivity of the local economy, accessibility and social inclusion. The growth pattern in Hobart has resulted in a lack of scale and diversity which has implications for encouraging economic activity and employment centres through Hobart's northern suburbs.

Hobart's residents are highly dependent on private cars, with car (including car as passenger) accounting for 71 percent of mode share in 2016, with public transport and active travel contributing significantly less. The table below shows the journey to work mode share of Hobart in 2016.

Table 1: Journey to work mode share in Greater Hobart

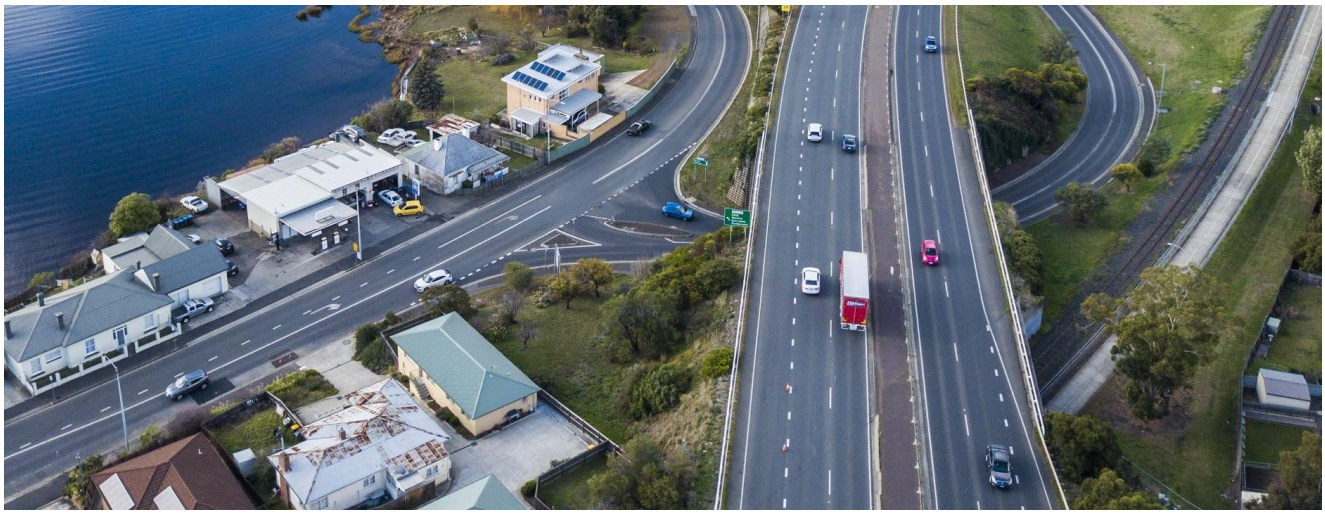
Transport mode	Mode share (%)
Car (including car as passenger)	71%
Active transport	7%
Public transport	6%

Source: ABS (2018) Census of Population and Housing: Commuting to Work. Commuting distance from Place of Usual Residence by Mode of Travel to Work (MTW06P) (Selected Geographies) - 2016

The bus network in Hobart is primary form of public transport in the city, it covers a significant area and includes the Transit Corridor. However, due to the urban geography of Hobart and development pattern it is difficult for buses to compete with the convenience of private cars, as bus routes are often lengthy and indirect, based on the need to provide adequate coverage across dispersed suburbs. This has played a role in Hobart having the second-lowest public transport patronage amongst Australia's Capital Cities.[2]

The high car dependency in Hobart has resulted in transportation congestion pinch points in the road network. Travel time analysis conducted by the Department of State Growth has demonstrated traffic delays in periods during the morning peak and to a lesser extent the evening peak during school days. At a network level, congestion pinch points can be found within the Transit Corridor, where the Brooker Highway demonstrated the greatest delays and slowest travel speeds of urban arterials within Greater Hobart.[3]

The Transit Corridor provides an opportunity to catalyse mixed use transit oriented development. A preferred transport mode through the Transit Corridor would represent a solution to the accessibility issues by providing residents with greater transportation choice (public transport, cycling and walking) for a variety of trips which reduces overall congestion.



1. ABS (2018) Census of Population and Housing: Commuting to Work. Commuting distance from Place of Usual Residence by Mode of Travel to Work (MTW06P) (Selected Geographies) - 2016 and ABS (2019) Australian Demographic Statistics Cat. no 3101.0.
2. ABS (2018) Census of Population and Housing: Commuting to Work. Commuting distance from Place of Usual Residence by Mode of Travel to Work (MTW06P)
3. Tasmanian Government, Department of Infrastructure, Energy and Resources (2011), Congestion in Greater Hobart

2.1

Social and economic context

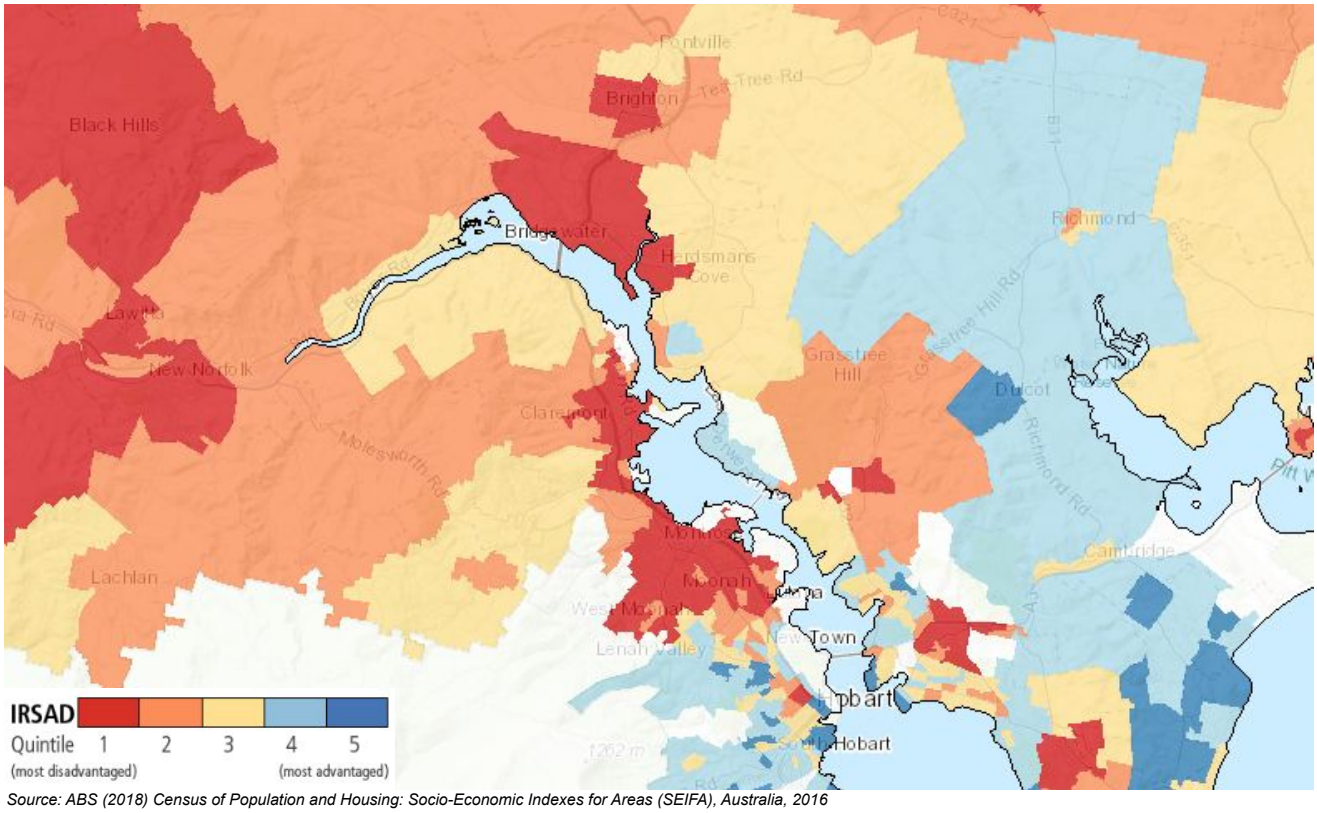
Ensuring Hobart is a liveable, productive and equitable capital city is essential to the economic and social prosperity of its residents and also the State of Tasmania. Hobart's growth pattern facilitated through low density and detached housing has resulted in a lack of scale to support productivity and liveability of the city. In 2019, Hobart had the second smallest economic activity (GVA) per square kilometre of Australia's Capital Cities.[1]

Despite a land use strategy to promote infill in Hobart, there remains a significant preference for detached dwellings in Hobart.[2] Increasing the density and mix of land use has the potential to increase employment, education and social opportunities. In order to leverage economies of scale and move towards a more competitive global economy Hobart needs to catalyse urban development, including higher rates of infill housing.

The development pattern of Hobart coupled with a car dependent transport network has social implications for the City. This is emphasised and compounded by an ageing population and cost of living challenges. A lack of access to quality mass transit system generally hits hardest on lower socioeconomic groups and those with specific accessibility needs. These groups are often the most reliant on public transport to access employment, services and other daily needs.[3] A lack of access to transport can have significant impacts on an individual's wellbeing and quality of life.

Socio Economic Indexes for Areas (SEIFA) is the main indicator of comparative disadvantage used in Australia. The Index covers a range of socio-economic indicators including low income, low levels of qualifications, unemployment and private dwellings without a car; and compares the relative social and economic conditions of population across different locations. Greater Hobart is the most disadvantaged capital city in Australia.[4] The figure below shows where pockets of these disadvantaged communities adjacent to the Transit Corridor.

Figure 4: Hobart Relative Socio-economic Advantage and Disadvantage (IRSAD) 2016



Source: ABS (2018) Census of Population and Housing: Socio-Economic Indexes for Areas (SEIFA), Australia, 2016

1. PwC's Geospatial Economic Model (GEM)
2. Southern Tasmania Regional Councils Authority, Southern Tasmania Regional Land Use Strategy, 2010-2035
3. Australian Institute for Family Studies (2011) The relationship between transport and disadvantage in Australia
4. Australian Institute of Health and Welfare (2009) The geography of disability and economic disadvantage in Australian capital cities

2.2 Policy context and alignment

A range of transport and land use planning measures has been previously identified as potential solutions to support accessibility, economic and social outcomes along the Transit Corridor. Over the past decade, there has been a range of strategic documents and commissioned reports with a focus on the Transit Corridor relating to planning, transport and housing.

A number of planning documents and strategies have supported encouraging urban infill to improve affordability, accessibility, economic and social measures for the Transit Corridor and Greater Hobart. This includes the Southern Tasmanian Councils Authority Southern Regional Land Use Strategy (2010-2035) which introduced infill targets for Greater Hobart.

A number of studies have explored the potential for a transport solution to support the Transit Corridor. However, the focus of these past evaluations has largely been on the transport benefits, rather than the ability to catalyse the urban regeneration and city shaping opportunities.

The Hobart City Deal has brought both of these objectives into focus, with an understanding of the city shaping potential of public transport. This acknowledges that Greater Hobart has seen a sustained demand for housing, but a lack of diversity in housing types and a focus on new housing in fringe urban areas. This has increased the reliance on private vehicles and contributing to a lack of affordable housing options, particularly within inner to middle suburbs.

This study builds upon the Hobart City Deal by presenting a comparison of a range of transport options and solutions to meet both strategic city shaping and transport service objectives. This report has drawn on the goals and objectives of several Tasmanian State Government and Greater Hobart policies and strategies. A summary of key Federal. State, and Local Government strategies and their objectives, which informed this study, is shown in table below.

Table 2: Key relevant Federal, State and Local Government strategies

Strategy	Strategy objectives
The Hobart City Deal, 2019	The Hobart City Deal is a shared 10 year vision between the Australian and Tasmanian Governments and the Clarence, Glenorchy, Hobart and Kingborough councils. The City Deal will focuses on: • establishing a reliable, sustainable and cost effective transport system • delivering a diverse range of affordable housing options • establishing governance to support better strategic planning for the city • investing to support Hobart as a smart, liveable and investment ready city
Tasmanian Urban Passenger Transport Framework, 2010	The Tasmanian Urban Passenger Transport Framework 2010 (the Framework) sets out future actions to develop the passenger transport system. The vision for the Framework is a safe and responsive passenger transport system that supports improved accessibility, liveability and health outcomes.
Southern Regional Land Use Strategy, 2010	The Strategy guides the direction for land use planning in Greater Hobart. The strategy outlines: • A 25 year infill development target within the Greater Hobart area of around 13,900 dwellings in existing urban areas, to achieve a 50/50 ratio of greenfield to infill with the following targets • A 20 year urban growth boundary. The Strategy targets the areas around the Transit Corridor and Primary Activity Centres (Glenorchy and Hobart CBD) for increased density.
Glenorchy to Hobart Public Transport Corridor Study, 2016	Glenorchy City Council and Hobart City Council collaborated to investigate the potential activation of the Glenorchy to Hobart public transit corridor as a catalyst for broader city shaping and urban renewal activity.

Source: PwC analysis (2020) of the following documents: Glenorchy to Hobart Public Transport Corridor Study for the Glenorchy & Hobart City Council Joint Steering Committee (GHD, 2016); Department of Infrastructure, Transport, Regional Development and Communication (Feb 2019) Hobart City Deal; Tasmanian Urban Passenger Transport Framework, 2010; Southern Tasmania Regional Land Use Strategy, 2010-2035

2.3 The opportunity for the Transit Corridor

Hobart's current transport network and urban form presents both issues and opportunities to addressing the emerging challenges of housing affordability, encouraging infill and access to public transport.

Current issues

The following four broad issues were identified as the primary problems that need to be addressed by the identified preferred transport mode in the Transit Corridor:

- The dispersed nature of Greater Hobart's population means fast and reliable public transport is difficult to provide. In 2019, Hobart was the second least densely populated Capital City in Australia.[1]
- Greater Hobart's lack of population and employment density outside the CBD has the potential to limit Hobart's future economic success. In 2019, Hobart had the second smallest amount of economic activity (GVA) per square kilometre of Australia's Capital Cities.[2]
- Greater Hobart is heavily reliant on private vehicles for travel to work leading to concentrated peak travel demand in the morning and evening commutes. In 2019, Hobart had the lowest public transport mode share of Australia's Capital Cities.[3] Congestion analysis conducted by the State Government indicates pinch points in the road network in the Transit Corridor.[4]
- Greater Hobart's housing market has been experiencing unprecedented demand, which combined with a lack of diversity in housing supply has contributed to affordability issues. According to the Parliament of Tasmania inquiry into Housing Affordability, Hobart was the least affordable city to rent in 2018, with an average of 29% of annual household income spent on rent in 2018.[5]

The opportunity for a public transport solution

The Hobart City Deal references the role of a connected city in two (of seven) focus areas:

- ***Greater Hobart Transport Vision*** *- Establish a reliable, sustainable and cost effective transport system with a focus on active and public transport as well as efficient private car travel*
- ***Affordable Housing/ Urban Renewal*** *- Deliver a diverse range of affordable housing options close to work, play, transport and services.*[6]

The Hobart City Deal also identifies the Transit Corridor as a key initiative:

> *The Northern Suburbs Transit Corridor is a priority area for urban renewal. A greater diversity of housing solutions will be encouraged along the corridor. As well as providing housing outcomes, this will support the delivery of the most effective public transport solution.*[7]

A public transport solution in the Transit Corridor has the ability to improve the connectivity between Hobart's northern suburbs and the CBD. A high quality, frequent, reliable, fast public transport option has the potential to reduce car dependency by providing an alternative to road corridors at Main Road and Brooker Highway.

More compact and accessible future residential development within close proximity to services would be an attractive option for Hobart's ageing population as well as providing a reliable and efficient public transport service for vulnerable communities located in the Transit Corridor. Providing public transport through the unutilised rail corridor could also be used to stimulate economic development along the Transit Corridor. Public transport could also encourage transit oriented development supporting key employment centres through the Transit Corridor.

1. ABS (2020) Regional Population Growth, Australia, 2018-19. Cat no 3218.0
2. PwC's Geospatial Economic Model (GEM)
3 ABS (2018) Census of Population and Housing: Commuting to Work. MTW06P
4 Tasmanian Government Department of Infrastructure, Energy and Resources (2011), Congestion in Greater Hobart
5 Parliament of Tasmania (2020) House of Assembly Select Committee on Housing Affordability
6. Department of Infrastructure (Feb 2019) Hobart City Deal. p.3
7. Department of Infrastructure (Feb 2019) Hobart City Deal. p.4

2.4 Objectives for the Transit Corridor

A set of objectives for the Transit Corridor have been developed by the Hobart City Deal Working Group and used for this study to support the options assessment. During the course of the study an accompanying vision statement and set of criteria were developed and presented to State Growth and the Hobart City Deal Working Group for feedback and comment. The Hobart City Deal Working Group comprises representatives from the Australian and Tasmanian Governments and Glenorchy and Hobart Councils.

Vision Statement

The vision statement has been developed to capture the broad objectives the study in a concise form. The vision statement is as follows:

Activation of the Northern Suburbs Transit Corridor through urban renewal (increased housing supply and diversity), transit-oriented development, and improved modal choice, while supporting a reduction in congestion.

Objective categories

To achieve the vision, three objective categories have been identified for this study. The categories are outlined below.

Transport Service

Public transport services delivered in the corridor will be effective (safe, efficient and reliable) for transport customers. A focus will be on alleviating growing congestion issues along Main Road and Brooker Avenue, and encouraging mode shift to public transport.

City Shaping

Intervention in the corridor will be city shaping through activating urban renewal in the corridor. A focus on optimising land uses, increasing the productivity of businesses and residents through supporting the development of employment precincts, and facilitating housing supply and diversity.

Deliverability and affordability

Deliverability and affordability are important considerations to ensure a value for money solution. Implementation will ideally reduce risk and disruption.

Objectives

The following objectives have informed the development of a set of criteria used to compare, assess and measure each option within the study.

Table 3: Objectives for this study

Category	Objectives
Transport service	Ensure a transport service that is safe, efficient and reliable
City shaping	Facilitate housing supply and diversity
	Support development of employment precincts
	Optimise land use and supporting development
Deliverability & affordability	Deliver value for money
	Deliverable and implementable

Source: Department of State Growth

2.5 Alignment of objectives, problems and opportunities

In line with Infrastructure Australia's approach to goal definition and options identification[1], this section maps the objectives, problems and opportunities for the Transit Corridor to a broader set of policy reforms and strategies. The alignment between objectives, problems, opportunities and policy has been used to align the study objectives with Hobart's economic, social and transport context. It also ensures that options identified in this analysis are founded in an understanding of the policy objectives for the Transit Corridor.

Identification of problems, opportunities, and policy alignment for each objective of this study have been documented in the table below.

Table 4: Objectives, policy, problems and opportunities alignment

Policy alignment	Objectives	Problems	Opportunities
The Hobart City Deal, 2019 Tasmanian Urban Passenger Transport Framework, 2010	Ensure a transport service that is safe, efficient and reliable	The current public transportation system does not sufficiently meet the changing needs of Hobart's population, this is reflected in the high car dependency. A reliable transport service is particularly important for servicing the needs of an ageing population and people from lower socio economic backgrounds who need access to the services located in the corridor and Hobart CBD.	The unutilised rail corridor could be leveraged to improve access to the CBD through public transport in the northern suburbs which could decrease the overall cost of transportation for commuters.
The Hobart City Deal, 2019 Southern Tasmania Regional Land Use Strategy, 2010-2035 Glenorchy to Hobart Public Transport Corridor Study, 2016	Facilitate housing supply and diversity	Hobart's growth has predominantly been facilitated through suburban sprawl. This development pattern has created a lack of diversity of housing to support the diverse housing needs of the community.	Due to the historical use the Transit Corridor, there is significant capacity to attract higher density forms of development and offer a greater mix of housing supply.
	Support development of employment precincts	Hobart's growth pattern has created a lack of density to support the productivity of employment centres through encouraging mix use development.	The corridor could also be used to stimulate development in the Hobart CBD and in the ageing industrial areas adjacent to the rail corridor. This would improve the CBD's chances of generating employment opportunities in the future which would improve the economy.
	Optimise land use and supporting development	A lack of density to support and attract high value employment opportunities and offer high quality education opportunities. The lack of highly accessible public transit through the northern suburbs has made it difficult to optimise land use.	The region surrounding the Transit Corridor has small population and low density nature with the commercial land use in close proximity to employment provides an opportunity for value uplift.
Tasmanian Urban Passenger Transport Framework, 2010	Deliver value for money	The dispersed nature of Hobart's population means public transport is costly to provide.	The existing rail infrastructure, dedicated corridor and availability of land potentially provides a value for money opportunity.
	Deliverable and implementable	The dispersed nature of Hobart's population means fast and reliable public transport is difficult to provide.	The Transit Corridor provides a dedicated corridor for fast and reliable transport service.

Source: PwC analysis (2020)

1. *Infrastructure Australia (2018), Assessment Framework, page 18*

3

Strategic options assessment

3.1 Strategic options assessment approach

A strategic options assessment has been conducted to qualitatively evaluate a long list of potential solutions for the Transit Corridor. The options have considered capital investment, better asset use and regulatory solutions. The outcomes from this assessment short-listed the three options for more detailed analysis in a MCA. This section details the approach taken to develop the strategic options assessment, the assumptions used, as well as key findings and outcomes.

Overview of the assessment

The approach to the strategic options assessment involved two stages:

1. a **literature review** which identified the range of options for the Transit Corridor including capital investment, better asset use reform and regulatory reform options
2. a **qualitative strategic options assessment** to understand the merits and tradeoffs of a long list of options and refine options to a shorter list for more detailed analysis in a MCA.

Development of a long list of options

A literature review of previous technical studies supported our identification of a long list of options. The key studies considered in this literature review includes:

- Hobart to Northern Suburbs Light Rail Business Case prepared for the Tasmanian Department of Infrastructure (ACIL Allen Consulting, 2011)
- Hobart Light Rail Business Case: Optimal operating service models (Hyder Consulting, 2011)
- Hobart Northern Suburbs Light Rail: Business Case Peer Review prepared for the Tasmanian Department of Infrastructure (AECOM, 2012)
- Stage 1 Light Rail Business Case: Hobart to Glenorchy (ACIL Allen Consulting, 2013)
- Riverline - Hobart Light Rail: Preliminary Plan; Strategic Assessment and Economic Evaluation prepared for the Tasmanian Department of Infrastructure (PwC, 2014)
- Review of Proposed Light Rail System: Final advisory report (Infrastructure Tasmania, 2016)
- Glenorchy to Hobart Public Transport Corridor Study for the Glenorchy & Hobart City Council Joint Steering Committee (GHD, 2016).

Based on the literature review a long list of options are shown in Table 5.

Table 5: Long list of options

Capital Investment
1. Heavy rail
2. Light rail (on corridor)
3. Light rail (off corridor)
4. Bus rapid (on corridor)
5. Bus rapid (off corridor)
6. Trackless tram (on corridor)
7. Trackless tram (off corridor)
8. Dedicated bus lane on Main Road (off corridor)
9. Dedicated bus lane on Brooker Highway (off corridor)
10. Expansion of existing road capacity
11. Expansion of active transport (micro-mobility) network
Better Asset Use Reform
12. Improvement of existing bus services (off corridor)
Regulatory Reform
13. Road (congestion) pricing
14. Legislative solutions

Source: PwC analysis (2020) based on Northern Suburbs Transit Corridor Options Technical Report Aurecon (2020)

Each option was considered relative to a base case, defined as a no intervention scenario, which serves as a reference point from which the options will be assessed. The base case assumes population and employment growth in Greater Hobart (based on ABS Census and Tasmanian Department of Treasury and Finance forecast demographic data), the road and public transport network in 2016, and additional transport projects expected to be completed between 2016 and 2027 (see Section 4 for more detail).

Options considered both on corridor and off corridor alignments, where:

- On corridor refers to use of the disused freight rail line to facilitate the mass transit options
- Off corridor refers to the use of the Main Road and Brooker Highway to facilitate the mass transit options. The off corridor option is partially on corridor assuming the alignment starts on the disused freight rail line and then diverts on to the existing road network (south of New Town to follow New Town Road and Elizabeth Street).

The following sections set out the methodology adopted and key findings.

3.1

Qualitative scoring framework

A long list of options were qualitatively assessed based on their ability to meet the strategic objectives for the Transit Corridor. Options were assessed and scored on a 5-point scale (++, +, 0, -, --), ranging from most beneficial (++) to the least beneficial (--) against four unweighted criteria.

Scoring criteria developed were aligned to the strategic objective categories, transport service and city shaping, and criteria informing the affordability and deliverability of the options. The criteria and description of scoring is set out in the table below.

Table 6: Strategic options assessment framework

Criteria / Score	+ +	+	0	–	– –
Transport Service: Potential to achieve mode shift towards public transport, reduce congestion and improve access, compared against the base case scenario	• High mode shift potential • High improvement of access • High reduction congestion in network	• Mode shift potential • Improvement of access • Reduction congestion in network	No significant impact	• Potential mode shift towards car • Reduction of access • Increase congestion in network	• High potential mode shift towards car • High reduction of access • High increase congestion in network
City Shaping: Potential to catalyse urban renewal and facilitate housing supply and diversity, compared to a 'do minimum' scenario	High potential catalyst for urban renewal	Potential catalyst for urban renewal	No significant impact	Potential deterrent for urban renewal	High potential deterrent for urban renewal
Affordability: Capital and operational cost relative to other options	Lowest expected cost	Relative to other options			Highest expected cost
Deliverability: Ease and risk of Implementation relative to other options	Lowest expected risk / hardest to implement	Relative to other options			Highest expected risk / easiest to implement

Source: PwC and Aurecon analysis (2020) based on Northern Suburbs Transit Corridor Options Technical Report Aurecon (2020)

The highest scoring options across all criteria were short-listed for further analysis in a MCA. The steps involved in selecting the short-listed options included:

- Step 1: the options were ranked by the expected positive impact (+ + or +) on the 'Transport service' and 'City shaping' scoring criteria
- Step 2: the options that ranked highest on these strategic objectives were assessed on their affordability and deliverability, and those with the most beneficial impact were then short-listed.

The following section details the outcomes and key findings from the assessment of each option. For further detail and technical assumptions please refer to Appendix B.

3.2 Strategic options assessment key and outcomes findings

The table below presents a summary of the strategic options assessment using a 5-point scale (++, +, 0, -, --). A more detailed summary of each option and relevant scoring is documented in Appendix B.

Table 7: Summary of strategic options assessment scoring

	Transport Service	City Shaping	Affordability	Deliverability
Capital Investment				
1. Heavy rail	++	++	--	--
2. Light rail (on corridor)	++	++	-	-
3. Light rail (off corridor)	0	+	--	--
4. Bus rapid (on corridor)	++	+	-	-
5. Bus rapid (off corridor)	0	0	--	--
6. Trackless tram (on corridor)	++	+	-	-
7. Trackless tram (off corridor)	0	0	--	--
8. Dedicated bus lane on Main Road (off corridor)	-	0	+	+
9. Dedicated bus lane on Brooker Highway (off corridor)	-	0	+	+
10. Expansion of existing road capacity	-	--	-	-
11. Expansion of active transport (micro-mobility) network	+	0	++	++
Better Asset Use Reform				
12. Improvement of existing bus services (off corridor)	0	0	++	+
Regulatory Reform				
13. Road (congestion) pricing	+	-	-	--
14. Legislative interventions	0	0	0	0

Source: PwC analysis (2020) based on Northern Suburbs Transit Corridor Options Technical Report Aurecon (2020)

The primary consideration in the strategic options assessment were the criteria that focused on the core outcomes for the Transit Corridor (ie city shaping and transport service). Options that did not impact these criteria were considered ineligible for the short list. Affordability and deliverability criteria were then considered to compare the remaining options and determine a short list. The key findings from the strategic options assessment were:

- The on corridor light rail, bus rapid, trackless tram and heavy rail were the only options to meet both the transport service and city shaping criteria. The on corridor light rail, bus rapid, trackless tram and heavy rail have the potential to offer a high capacity public transport option. This has the potential to improve congestion and activate significant urban development without being prohibitively costly or difficult to implement relative to other options assessed.
- On corridor mass transit was identified as more beneficial than off corridor options. On corridor options increased the potential for activation of urban renewal, improved the deliverability and reduced risks (mostly relating to potential land acquisition). For the transport service objective, off corridor options all scored worse than the on corridor alternatives due to the need for road network capacity to facilitate mass transit.
- Despite heavy rail scoring amongst the highest public transport options, it scored poorly on affordability and deliverability objectives. It was assessed as the most costly public transport option due to the capital works and the ongoing operational cost. Heavy rail tends to cost more than other mass transit options, and in the case of the corridor would like require additional capital works including removal of sections of the active transport network and potential tunneling to facilitate access to the CBD. This option was also found to have a lower impact on city shaping objectives due to the need for fewer stations and as a result fewer opportunities for urban development when compared to the light rail and bus rapid options.
- The expansion of the active transport corridor and road (congestion) pricing options were assessed as beneficial to the transport service objective. However, expansion of the active transport corridor was found to have a neutral impact on the city shaping objective. Road (congestion) pricing was found to negatively impact on the city shaping objective. As a result these options were not included in the short list.

3.2

Short-listed transport mode options

In considering the dual objectives of land use and transport service for corridor the strategic options assessment identified light rail (on corridor), bus rapid (on corridor) and trackless tram (on corridor) as appropriate for further analysis. The three options were assessed as the highest scoring transport service and city shaping categories balancing cost and deliverability factors. The high level findings for each of these options is summarised in the table below. The options were taken forward for more detailed analysis as part of an MCA.

Table 8: Short list of transport mode options and rationale for inclusion in the MCA

Option	Transport Service	City Shaping	Affordability	Deliverability
3. Light rail (on corridor)	Offers a high capacity public transport option, and if run at a frequent headway will reduce Greater Hobart's reliance on cars and reduce congestion	Light rail is seen as a modern high-class transport option that will be a catalyst for urban renewal increasing incentives for residents and investors	Light rail will likely be more costly than a bus option but less costly than heavy rail	There would need to be modifications to the existing network to accommodate at-grade crossings, traffic signalling and new light rail vehicles
4. Bus rapid (on corridor)	Ability to improve speed and reliability of bus services connecting CBD and the northern suburbs, with priority over cars at intersections	An efficient and reliable transit corridor is likely to provide greater incentives for people to move closer to the corridor, with potential for higher density living due to increased accessibility	A bus rapid system is expected to be less costly to construct than rail options, as the vehicles could be run on pavement	bus rapid has a relatively low level of risk for construction and is more flexible in implementation than rail options, as adjusting capacity to meet demand is more simple
6. Trackless tram (on corridor)	Similar to bus options, offering improved speed and reliability of mass transit connecting the CBD and the northern suburbs	An efficient and reliable transit corridor is likely to provide greater incentives for people to move closer to the corridor, with potential for higher density living due to increased accessibility. However, technology is untested so land market response is difficult to determine	Vehicles run on pavement requiring less capital cost. However no existing manufacturing of vehicles in Australia requiring purchase of units from overseas suppliers.	Australia has no operational experience with this technology, as it remains largely untested outside of China. In addition, very few manufacturers of vehicles posing significant risk.

Source: PwC analysis (2020) based on Northern Suburbs Transit Corridor Options Technical Report Aurecon (2020)

4

Multi-criteria analysis of the short-listed transport modes

4.1 Approach to the MCA

An MCA involving application of a quantitative assessment framework has been used to assess and compare the short-listed mode options. The MCA evaluated short-listed options using set criteria to analyse the impacts of the options.

The MCA assessment criteria were based on the strategic objectives, technical analysis of transport impacts, potential for land use change, deliverability factors and affordability. Four areas of analysis were undertaken to underpin the MCA evidence base:

- Transport modelling
- Land use change and uplift estimation
- Deliverability and implementation assessment
- High level cost estimates.

The findings from this analysis demonstrates the ability of each option to support the strategic objectives identified for the study.

To support the MCA, a number of operating assumptions were aligned across the modes to enable a focus on the differentiating factors as opposed to definitively making a decision on all aspects of scope and implementation.

For this reason the MCA has not involved a comprehensive analysis of all elements of value for money or implementation of the options.

Overview of the MCA

The development of the MCA criteria and indicators were developed from the vision and objectives for the Transit Corridor, and in consultation with the Department of State Growth and key stakeholders.

High-level estimates were prepared as inputs into the MCA. This included transport service, land use and cost estimates for the base case (the scenario without intervention) and the impact of the options against the base case to identify the potential impacts associated with each option.

To perform the MCA, a comparative assessment of options was conducted to support the identification of preferred option/s for further analysis. Each option assessed was considered relative to a base case which serves as a reference point from which the options will be assessed.

The base case is a no intervention scenario which assumes population and employment growth in Greater Hobart (based on Census and forecast demographic data from the Department of Treasury and Finance, and other government sources), a transport network incorporating the road and public transport network in 2016 and road and public transport projects expected to be completed between 2016 and 2027.

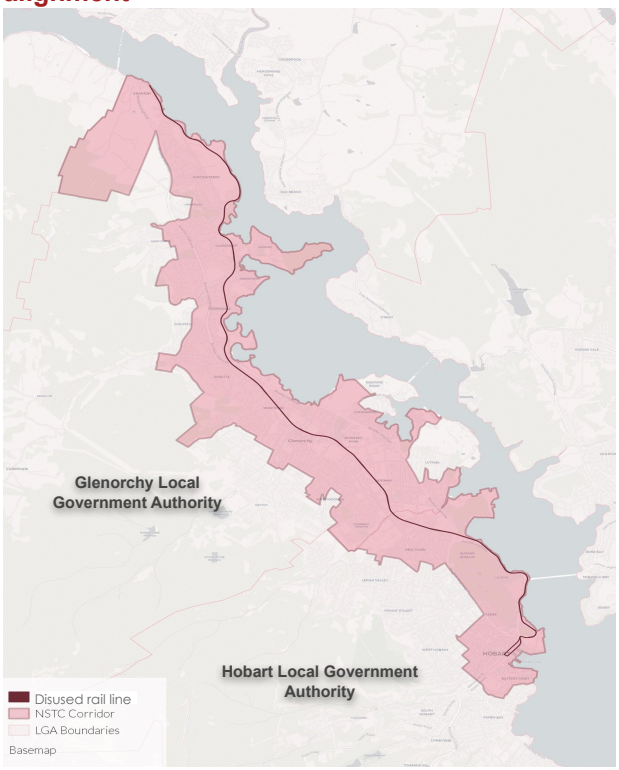
This section documents the study corridor; the technical specification of the short-listed options; the overarching MCA methodology and approaches to developed to estimate the base case and short-listed options land use, transport and cost estimates; and the key findings.

Definition of the Transit Corridor

The Transit Corridor lies within the local councils of Glenorchy and Hobart and contains a disused freight rail line (historically a passenger rail line). The figure below, presents the study corridor, the alignment and the administrative boundaries of the local councils.

The Transit Corridor has been defined in this study as the travel zones (transport model boundaries defined by Census Collector District boundaries split into smaller areas) intersecting walking catchments around potential stations/stops.

Figure 5: Overview of study corridor and alignment



Source: LUTI Consulting and Aurecon (2020)

4.2 Alignment assumptions

Alignment considerations for the MCA

An alignment was defined and applied to each option to support the development of MCA inputs and supporting technical analysis. The definition of the alignment has not been based on a detailed engineering design and is reflective of the strategic nature of the study and the overarching purpose to support comparison.

The following aspects of the alignment were considered and defined in turn:

- Route termination points
- Staging between termination points
- Station locations
- Alignment between Macquarie Point and Hobart Central
- Infrastructure specification and integration with existing transport networks.

The following section outlines each consideration.

Route termination points

Termination points were considered in the northern and southern ends of the alignment.

At the northern end Granton Bridge, Claremont, Berriedale/Mona and Glenorchy Central were considered. Granton Bridge and Claremont were taken forward as termination points. Berriedale / MONA and Glenorchy were considered unfavourable due to the appetite for multi-modal interchange at those areas.

At the southern end Macquarie Point and Hobart Central were considered. With Hobart Central taken forward as the termination point, as it is a key attractor and destination for commuters.

Staging between termination points

To consider potential staging, the alignment has been split into two sections:

- Stage 1 which links Hobart Central to Berriedale Bay / MONA with the length of the alignment of approximately 12 km
- Stage 2 which extends the alignment from Berriedale Bay / MONA to Granton Bridge with the length of the alignment of approximately 9km.

The staging was defined by the key trip attractor on the line i.e. MONA. The full length of the alignment from Hobart Central up to Granton Bridge is approximately 21km.

Station locations

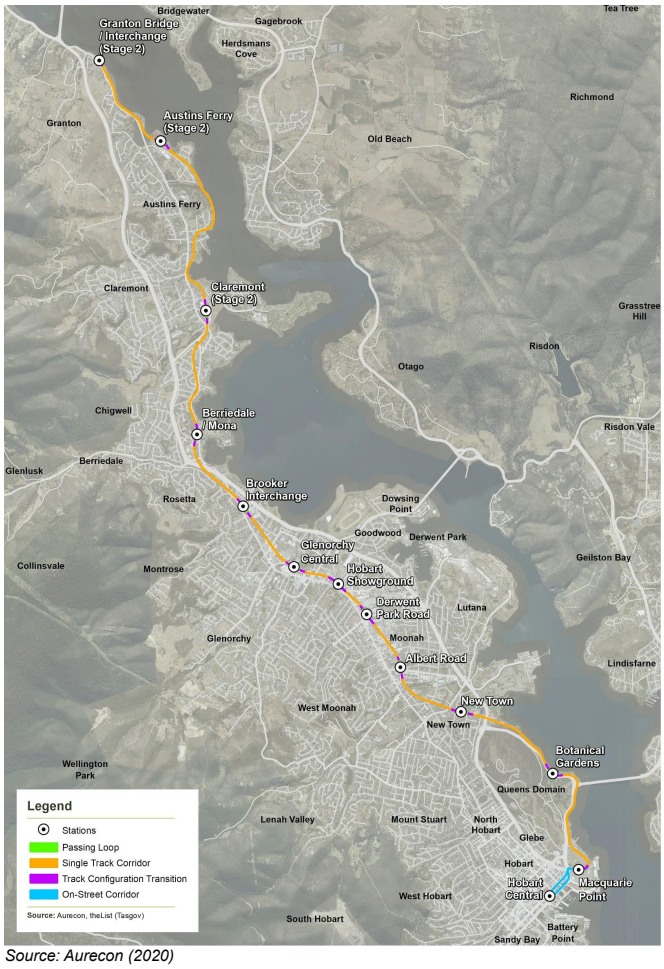
Along the alignment 13 stations/stops were considered for the MCA with 10 stations/stops forming Stage 1 and 3 stations/stops in Stage 2.

The proposed location of stations and stops has been informed by *Glenorchy to Hobart Public Transport Corridor Study for the Glenorchy City Council & Hobart City Council Joint Steering Committee (GHD, 2016),* with two exceptions:

- Granton Bridge station shifting southwards to the old station location to include existing access roads, space for bus turning, etc.
- Addition of Hobart Showgrounds station as a key trip attractor.

From Granton Bridge Station to Macquarie Point Station the alignment is along the dedicated rail corridor. From Macquarie Point Station to Hobart Central Station the alignment is assumed to move from the dedicated corridor to 'on-road'.

Figure 6: Station locations



Source: Aurecon (2020)

4.2

Infrastructure specification and integration with existing transport networks

The three short-listed options were developed into high-level concept designs to inform the MCA. The options assume the same alignment, assumptions and station/stop locations. The key assumptions regarding the infrastructure specification and integration of mass transit options included:

- The alignment will be a single track corridor with provisions at stations to allow for passing of vehicles i.e. passing loops
- Level crossings will remain functional with traffic signals installed or adjusted if already signalised
- The existing Inner City Cycleway will remain functional and safe - maintaining a width of 4.0 metres for the cycleway including a 1.0 metre reservation for safety measures
- For security and safety at crossings, stations, intersections, and transitions additional lighting will be added. Within the corridor itself, no additional lighting has been considered that is additional to the existing street lighting on the Inner City Cycleway
- The designs include a safety zone on either side of the transit lanes / carriageway which includes a 1.2m high fence/barrier to prevent ease of access into the transit pathway and reduce potential conflicts.

These assumptions are described in Appendix B: Concept design technical report.

4.3 Design and operational assumptions

Concept design for the light rail option

The light rail option assumes the construction and operation of light rail services along the existing rail corridor.

The option assumes:

- The corridor will be constructed as ballasted track, with the on-road section between Macquarie Point and Hobart Central designed as an embedded rail in concrete trackform
- Light rail assumes a corridor width of 14.0m for dual-track and 10.0m for single-track configurations, with a lane width of 4.0m
- Standard gauge rail with considerations for reuse of existing ballast, rails and earthworks
- Stations will have side platforms with minimum widths of 3.0m and platform lengths up to 35m
- Rolling stock will have capacity to operate wire free running with an on-board energy storage system (substations are assumed every 3km).
- The light rail vehicle specification is assumed to be 33m in length, two double and two single doors on each side, maximum service speed of 80km per hour and a total capacity of 266 pax. An example of this type of vehicle is the Bombardier Flexity 2.

Figure 7: Example light rail vehicle

Source: Fission - Northern Suburbs Transit Corridor MCA Options Cost Estimate Report (2020) Image from Bombardier Transportation, Blackpool June 2013

Concept design for the bus rapid option

The bus rapid option assumes the construction and operation of rapid bus services along the existing corridor.

The option assumes:

- The corridor will be designed with pavement suitable for bus lanes, with the section between Macquarie Point and Hobart Central designed as on-road. At turning locations and stations concrete pavements would be constructed
- The bus rapid assumes a corridor width of 13.0m for dual-track and 9.5m for single-track configurations, with a lane width of 3.5m
- The stations assume a proposed bay width of 3.5m, platform widths of a minimum of 3.0m and platform lengths of 20.0m
- The bus rapid vehicle specification is assumed to be a single articulated bus, with a length of 18.6m with three double doors on kerbside only, with a total capacity of 113 pax and a maximum speed of 80km per hour. An example vehicle is the Van Hool Exquicity 18.

Figure 8: Example bus rapid vehicle

Source: Fission - Northern Suburbs Transit Corridor MCA Options Cost Estimate Report (2020) Image from TPG Van Hool Exquicity

4.3

Concept design for the trackless tram option

The trackless tram option involves the construction and operation of tram services along the existing corridor. Trackless tram is currently an untested transport solution in Australia, combining features of a light rail and bus.

The option assumes:

- The corridor will be designed with pavement suitable for bus lanes, with the section between Macquarie Point and Hobart Central designed as on-road. At turning locations and stations concrete pavements would be constructed
- The trackless tram option assumes a corridor width of 13.0m for dual-track and 9.5m for single-track configurations, with a lane width of 3.5m
- The stations assume a proposed bay width of 3.5m, platform widths of a minimum of 3.0m and platform lengths of 20.0m
- Two vehicle specifications are proposed for the trackless tram vehicle option - a double articulated bus and an emerging technology trackless tram. The trackless tram is assumed to be a three section double-ended road vehicle, with a length of 31.6m with six double doors on each side, with a total capacity of 160 pax and a maximum speed of 70km per hour. An example vehicle is the CRRC ART 31m.

Figure 9: Example trackless tram vehicle

Source: Fission - Northern Suburbs Transit Corridor MCA Options Cost Estimate Report (2020) Intelligent Transport Systems New Zealand

Operational assumptions

A high-level operational assessment was conducted to investigate the travel durations, potential operational frequencies, headways and the number of vehicles to services on the corridor.

The operational assumptions are assumed to be consistent across the light rail, bus rapid and trackless tram options, including:

- Average transit speeds of 30 km per hour in urban areas and 50 km per hour along the dedicated corridor
- A dwell time of 30 seconds is allowed for at each station, and an assumed 3 to 5-minute change over at the end of each south to north trip for driver relief and vehicle turn-around
- The public transit mode and corridor will receive full prioritisation at level crossings and intersections
- An operational headway of 10 minutes could be achieved with the number of passing loops currently proposed
- 8 vehicles are assumed to be required to ensure a satisfactory level of service while accounting for scheduled maintenance services and flexibility in the system in the event that of increased demand, unforeseen breakdowns, etc. The staged vehicle configuration requires 4 vehicles in operation at all times with 2 vehicles on standby for Stage 1; and 6 vehicles in operation at all times with 2 vehicles on standby for Stage 1 and 2.

The following section sets out the MCA assessment criteria and the methodologies used in the estimation of indicative transport, land use and cost estimates considering the assumptions taken in specifying the three short-listed options.

4.4 MCA criteria and indicators

Drawing on the objectives defined for this study, several criteria have been developed along with associated indicators in order to quantitatively compare each option relative to a base case. The criteria and indicators were prepared in consultation with the Department of State Growth and presented to the Hobart City Deal Working Group for feedback.

The MCA assessment criteria have been developed from the vision and three identified objective categories for the study (as discussed in Section 2):

- Transport service
- City Shaping
- Deliverability and affordability.

Working from the objectives developed by the Hobart City Deal Working Group, PwC developed the responding criteria and indicators and criteria for each category, with the overarching MCA framework combining these categories, objectives and criteria - as set out in the table below.

Table 9: MCA assessment framework

Category	Objectives	Criteria
Transport service	1. Ensure a transport service that is safe, efficient and reliable	Congestion on Main Road and Brooker Avenue
		Public transport efficiency
		Improved network safety
	2. Alleviate network wide transport congestion	Network wide transport congestion
		Population connected to key centres
City shaping	3. Facilitate housing supply and diversity	Housing diversity in the corridor
		Increased capacity for dwellings on the corridor
	4. Support development of employment precincts	Increased number of jobs along the corridor
	5. Optimise land use and supporting development	Enable changes in land use zoning and density
Deliverability and affordability	6. Deliver value for money	Indicative whole of life cost estimates
	7.Deliverable and implementable	Ease and risk of delivery
		Ongoing operation

Source: PwC analysis (2020) based on discussions with the Department of State Growth

Following this, a range of indicators were developed within each criteria to score options quantitatively (where possible with the deliverability and affordability objectives assessed qualitatively). In order to develop the indicators, there was a need to consider the methodologies developed to estimate impacts with a bespoke methodology developed for each category of benefits.

An important consideration in the methodology and estimation of indicators is the development of the base case. The base case represents a “business-as-usual” scenario assuming committed and funded infrastructure investment. Each indicator have been measured against the base case providing a counterfactual underpinning for results presented. The base case is defined in terms of the assumed transport network and changes in land use within the Transit Corridor. The three short-listed options have been assessed relative to the base case to measure the incremental change. As part of the methodology sections, we have included the base case assumptions in the transport network as well as the land use assumptions.

The following section discusses the technical analysis used to develop each indicator - transport service, city shaping, and deliverability and affordability.

4.5 Transport service methodology

Transport modelling is used to understand and assess the likely impacts of changes in the drivers of transport services such as transport supply, demographics or land use. The transport modelling for this study has been conducted by PwC with the aim to assess the impact of the short-listed options on the future performance of the transport network across Greater Hobart.

This section has been structured to provide an overview of the transport model, key assumptions, the definition of the base case and the indicators used in the MCA. For more detail on the assumptions, modelling processes and outputs please see the *Appendix C*.

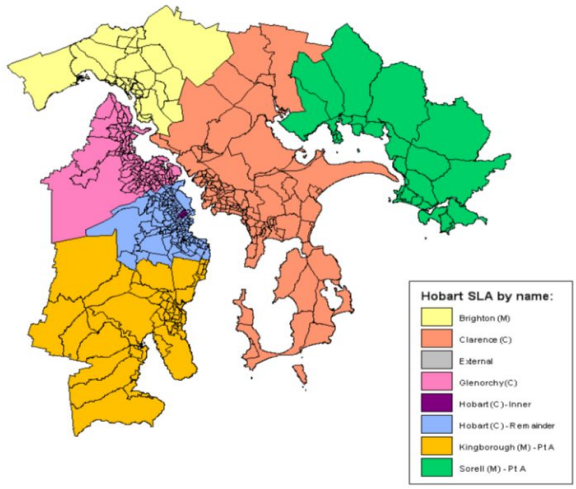
Overview of the transport model

The transport modelling was conducted using the Greater Hobart Urban Travel Demand Model (GHUTDM). The GHUTDM is a strategic transport model encompassing the Local Government Areas of Hobart, Glenorchy, Clarence and Brighton, whilst partially covering the LGAs of Kingborough and Sorell.

GHUTDM was originally developed in 2011 for the Department of Infrastructure, Energy and Resources and in 2016 it went through an update commissioned by the Department of State Growth. The 2016 version of the GHUTDM has been used and has the following characteristics:

- **Modelled years:** base year of 2016 and forecast years of 2027 and 2037
- **Modelled periods:** AM peak (7am to 9am), the PM peak (4pm to 6pm) and off peak (9am to 4pm and 6pm to 7am)
- **Modelled travel modes:** car, freight and bus
- **Geographic coverage:** Greater Hobart split across 500 separate travel zones which align to Census Collector District boundaries disaggregated into smaller zones (figure 10 below shows the zoning system)
- **Modelled behaviour:** GHUTDM considers different types of behaviour including changes in route, changes in destination, changes in mode, changes in travel times and the impact of changes in travel times on the public transport and road networks.

Figure 10: GHUTDM zoning system



Source: GHD (2016), Greater Hobart Transport Modelling Strategic Model Update

GHUTDM specification for this study

In order for the model to estimate the impacts of the short-listed options, the model was modified from the 2016 model provided by the Department of State Growth, to include:

- Scenarios representing the **project-specific base case and the response to mass transit options**
- Updates to **demographic scenarios** to represent the project-specific land use scenarios
- Updates to **mode choice parameters** for incorporating new transport modes (light rail and trackless tram) and for consistency with Australian Transport Council Guidelines (2006)
- Updates to the **components of generalised cost** including travel times, direct user costs (parking costs and public transport fares)

The assumptions underlying these changes are set out below.

Project specific base case

The base case transport network contains road and public transport of projects expected to be completed regardless of investment in the project. Definition of the base case built on the existing assumptions within the GHUTDM and projects requested by the Department of State Growth.

4.5

The projects included in the base case were determined together with State Growth. The list of key projects in base case is included below.

Table 10: Base case projects

Base case projects included in the transport model	
Project	**First model year included**
Kingston, Brighton and Richmond Bypass	2016
Brooker Highway junction upgrades at Elwick, Goodwood and Howard Roads	2027
Tasman/East Derwent Highway interchange improvements	2027
Richmond Road Master Plan – Cambridge Link Road and lowering speed limit to 80 km/h	2027
Huon Highway/Summerleas Road grade separation	2027
Tasman Highway/Holyman Avenue grade separation	2027
Holyman Avenue extension to Surf Road and removal of Surf Road between Holyman Avenue and Pittwater Road	2027
Cambridge Link Road	2027
Additional base case projects included	
Project	**First model year included**
Brooker Highway northbound off ramp at Berriedale– installation of roundabout	2027
Bridgewater Bridge widening (from 1 lane to 2 lanes each direction)	2027
East Derwent Highway widening (from 1 lane to 2 lanes in each direction between Gielston Bay and Risdon Vale)	2027
Tasman Highway Airport Interchange	2027
Duplication of the Tasman Highway from Airport Roundabout to Western Causeway	2027
Duplication of the Tasman Highway across Midway Point	2027
Sorell Bypass	2027
Macquarie St bus lane	2027
Firthside Park n Ride	2027
Huntingfield Park n Ride	2027
Kangaroo Bay to Sullivans Cove (Brooke St Pier) Ferry service, with a 30 minute peak and 60 minute off peak	2027

Source: PwC analysis (2020) based on GHUTDM (2016) and list of projects determined with Department of State Growth 5 April 2020

The definition of the light rail, bus rapid and trackless tram mass transit options were developed based on the specifications agreed with the Department of State Growth, Aurecon and PwC.

Demographic scenarios

Demographic scenarios base case and mass transit options were developed based on the existing GHUTDM and inputs provided by land use advisors.

The forecasts for population, education and employment used were consistent with those established by within the 2016 version of the GHUTDM.

Land use change scenarios were developed in a separate analysis outlined below in Appendix D to represent a potential land use response.

PwC undertook a redistribution of the land use where any increase in housing, population and employment within the study corridor was offset by a reduction within Greater Hobart. This was to ensure that planning control totals are held constant in the base case and in the response to mass transit options.

The scenarios with land use change were not however used in the MCA assessment.

Mode choice parameters

To enable comparisons across modes, GHUTDM has been updated to incorporate modal preference factors. These are based on the Australian Transport Council Guidelines and benchmarked against stated preference surveys conducted by PwC. The resulting mode choice parameters are:

- Bus 1.0
- Light rail 0.85 plus 2 minute mode specific constant (MSC)
- Bus rapid 0.90 plus a 2 minute MSC
- Trackless tram 0.875 plus a 2 minute MSC.

These parameters represent an in-vehicle time weighting to adjust the model preferences of users choice between which mode to take in the model.

Components of generalised cost

The generalised cost of travel encompasses the travel time and user costs of a journey. The travel time used in the scenarios developed for the GHUTDM to estimate travel times of mass transit modes nationwide.

User costs in the model were considered through public transport fares and parking charges. Public transport fares for all modes were assumed to follow the existing urban fare system, and a parking model has been applied to specify the parking supply and demand in each travel zone.

4.5

Transport service MCA criteria and indicators

The transport service category assessed the improved connectivity in the Transit Corridor enabled by provision of the new public transport infrastructure. Quantitative indicators were identified for each of the criteria set out in Section 4.3. The table below sets out the key indicators.

Table 11: Transport service objectives, criteria and quantitative indicators

Objectives	Criteria	Indicator
1. Ensure a transport service that is safe, efficient and reliable	Congestion on Main Road and Brooker Avenue	Per vehicle car travel time savings in minutes between Granton and Hobart travel zones (AM Peak 2037) - corridor measure
	Public transport efficiency	Per trip perceived public transport travel time saving in minutes from Granton to Hobart Central (AM Peak 2037) - corridor measure
	Improved network safety	Reduction in car vehicle kilometres travelled (VKT) across the network (Daily, 2037) supporting fewer road incidents - network measure
2. Alleviate network wide transport congestion	Network wide transport congestion	Reduction in car vehicle hours travelled (VHT) across the network for (Daily 2037) - network measure
		Increase in in public transport passenger hours travelled (PHT) across the modelled network for (Daily 2037)- network measure
	Population connected to key centres	Increase in population within a 30 minute public transport journey of key centres Hobart, Moonah, Glenorchy, Berriedale and Claremont (2037) - corridor measure

Source: PwC analysis (2020) based on discussions with the Department of State Growth, Aurecon, Fission and LUTI Consulting

The results from the transport modelling and indicators are discussed in Section 4.8.

4.6 City shaping methodology

The city shaping analysis examines the potential impacts of improved connectivity provided by the mass transit options on land use and value. For each transport mode option LUTI Consulting with Cox Architecture undertook a land use assessment and estimated the associated uplift in land value. The methodology used looks to ensure that the links between land use dependence, planning, forecasting and the potential resulting urban development benefits are maintained.

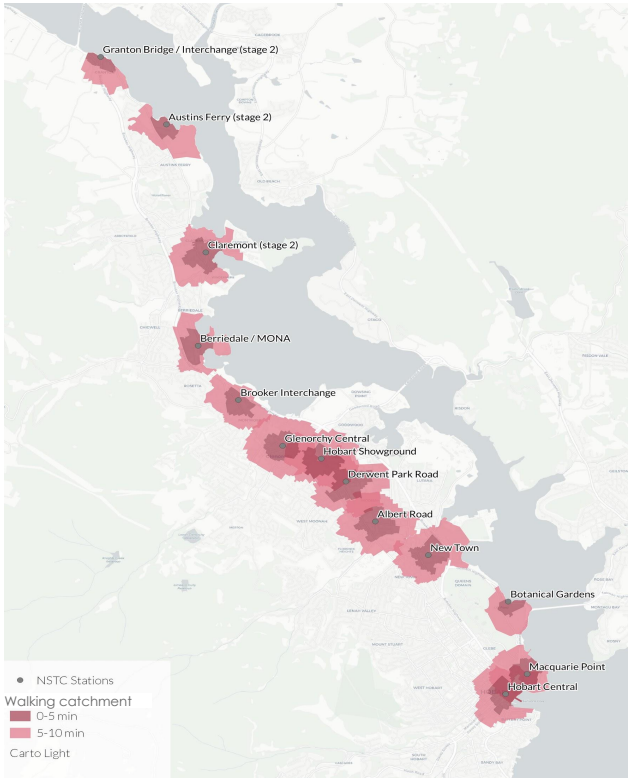
This section provides an overview of the approach, assumptions in the land use base case and indicators quantified as part of the MCA. For more detail on the assumptions, modelling processes and outputs please see Appendix D: Land use technical report.

Overview of the approach

To investigate urban renewal opportunities in the Transit Corridor, the land use advisors developed a base case and a range of project case land use scenarios representing the market response to the introduction of mass transit options. The approach developed and applied is set out below.

- **Step 1:** Develop an understanding of the study corridor and urban renewal opportunities. The land use team obtained Valuer General, reviewed prior studies, and participated in a virtual tour with councils to understand current development appraisal applications, future potential land uses and potential density.
- **Step 2:** Develop definitions of station catchments to measure the accessibility of each station and assumptions on land use typologies. The station catchments have been developed based on walking distances from stations based on isochrones generated by two walking catchments: 5 and 10 minutes (approximately 400m and 800m) - these have been set out in Figure 11.
- **Step 3:** Develop assumptions and land use typologies for the base case and future land use considering the vision and infrastructure assumptions for each transport mode option.
- **Step 4:** Review of constraints and opportunities by station catchment (e.g. heritage items, flood prone land, etc) to determine the capacity for renewal or growth. This review focused on the 800m walking catchment to inform an understanding of potential future land use typology in the station catchments.

Figure 11: Stations and walking catchments



Source: LUTI Consulting (2020)

- **Step 5:** Development of the base case through an assessment of dwelling and employment capacity within walking catchments informed by stakeholder engagement (Department of State Growth, Hobart and Glenorchy councils) and existing planning controls.
- **Step 6:** Development of the project case through an assessment of project case dwelling and employment capacity within walking catchments. This assessment was conducted based on existing planning controls and observations on built form responses to various transit modes.
- **Step 7:** To identify the development that could reasonably be supported by each of the transit mode options, LUTI Consulting applied their Transit Induced Development Capacity Model (TIDCM) to identify the proportion of dwelling and employment capacity unlocked associated with each transport mode. Transport capacity is then translated into number of dwellings, based on approx. 2.5 people per dwelling.
- **Step 8:** Take up analysis was conducted to refine the station catchment rezoning and lots to estimate the potential amount of unlocked development realised in each year and by mode over time.

4.6

The dwelling and job take up rates were estimated based on benchmarking analysis of other light rail and bus rapid examples calibrated to Greater Hobart annual dwelling growth.

- **Step 9:** Development of corridor land use forecasts for both the base case and project cases. The project case considered take-up rates and development capacities established for each of the project options in earlier steps.
- **Step 10:** Estimation of land values and uplift. LUTI Consulting developed a hedonic price model (HPM) for Hobart to estimate land value uplift associated with planning control changes for each short-listed option using the forecast scenarios developed in the earlier steps. The HPM estimates land values based on a wide range of land attributes, enabling land value impacts associated with planning control changes to be monetised for the MCA. This modelling pivoted from the most recent land valuations data and controlled for accessibility to avoid double-counting other transport user benefits.

Definition of the base case

The Transit Corridor is characterised by low density residential and commercial development with significant areas of industrial activity. Cox Architecture and LUTI Consulting conducted an assessment of the base case dwelling and employment capacity in the corridor for a selection of travel zones that intersect the walking catchments of the proposed transit corridor stations.

Table 12: Base case dwellings and employment projections for 2037 within the Transit Corridor (as defined in Figure 5)

Land use	Dwellings	Jobs
2027	21,437	51,325
2037	23,208	52,886

Source: LUTI Consulting, and COX Architecture (2020).

The distribution of base case dwellings within station catchment and their typology is shown in Figure 12.

Figure 12: Base case land use scenario (2037)

Source: LUTI Consulting, and COX Architecture (2020)

4.6

City shaping MCA criteria and indicators

The city shaping objectives focus on the impacts of improved connectivity provided by the mass transit options on land uses and value uplift. Taking the objectives of the category, the methodology used to capture the impacts of land use change and scenario specifications described in sections above, a quantitative indicator was developed for each of the criteria set out in Section 4.4. The table below sets out the key indicators.

Table 13: City shaping objectives, criteria and quantitative indicators

Objectives	Criteria	Indicator
3. Facilitate housing supply and diversity	Housing diversity in the corridor	Change in the proportion of Greater Hobart dwelling growth able to be delivered in the station catchments to support infill mixed use development - corridor capacity measure
	Increased capacity for dwellings on the corridor	Change in the number of dwellings able to be accommodated in the corridor due to increased peak period public transport capacity - 2037 - corridor capacity measure
4. Support development of employment precincts	Increased number of jobs along the corridor	Change in the number of population serving jobs along the corridor in 2037 due to change in land use - corridor take up measure
5. Optimise land use and supporting development	Enable changes in land use zoning and density	Number of lots rezoned due to investment in the project along the corridor by 2037 - corridor capacity measure
		Land value uplift attributable to changes in zoning by 2037 - corridor capacity measure

Source: PwC analysis (2020) based on discussions with the Department of State Growth, Aurecon, Fission and LUTI Consulting

The results for these indicators are discussed in Section 4.9.

4.7 Deliverability and affordability methodology

A deliverability and affordability assessment of the short-listed options was conducted as part of the MCA. Fission conducted the affordability assessment considering the cost of constructing and operating each of the three short-listed options. Aurecon conducted the deliverability assessment using qualitative indicators to measure likely delivery risk.

This section has been structured to provide an overview of the methodology and key assumptions used in the development of cost estimates, and the method used to assess deliverability. For further detail on the methodology and assumptions taken please see Appendix E: Cost estimates technical report.

Overview of the affordability assessment

High level cost estimates have been developed for each of the short-listed options based on the typical concept design cross sections for each transit mode, allowances for civil infrastructure and extrapolated along the length of the corridor dependent on the carriageways proposed.

The cost estimates were developed using a benchmarking assessment of unit rates for each element of the works. These unit costs are based on Fission's database of current industry prices (labour, materials, plant and subcontract costs) using either unit rates or global rates.

Cost estimates has been prepared for capital cost and ongoing operating cost. The overall assumptions and those specific to components of cost are set out below.

Capital cost key assumptions

Capital cost includes construction, risk allowance and allowance associated with the infrastructure.

The timing assumptions include:

- Scoping Phase from January 2021 to June 2022
- Development phase from July 2022 to December 2023
- Construction phase from January 2024 to December 2025 for Stage 1 and December 2026 for Stage 2.

The specification of the infrastructure is consistent with the assumptions stated in Section 4.3, with a number of additional assumptions by stage in Table 13.

Table 14: Assumptions by Stage

Stage 1	Stage 1 and 2
New depot and stabling yard at a location yet to be decided	
Fleet consisting of 6 vehicles	Fleet consisting of 8 vehicles
Reconstruction of the road pavements and intersections	
Traction Power Substations (TPS) at each station and one in the depot	
1 New bridge	
11.8 km Cycleway	14 km Cycleway

Source: Fission (2020) Northern Suburbs Transit Corridor MCA Options Cost Estimate Report. Note, Cycleway cost assume full reconstruction of kms stated

Construction cost includes:

- Direct cost involve contractors cost associated with each physical work item.
- Indirect cost involve allowances that a contractor requires to manage the project and cover any indirect job cost i.e. staff allowances, supervision, site vehicles, etc.
- Project profit allows for off-site overheads and company profit. The profit on off-site overheads is assumed to be 6% of the contract value and the company profit is assumed to be 4%.

Other capital cost considerations include:

- Property acquisition costs have not been included due to an assumed availability of state-owned land to accommodate stabling/maintenance yards and also within any future CBD alignment where it is assumed that the corridor stays within the existing road reserve.
- Allowances for removal, relocation or protection of existing public utility plant within the corridor are included in the contract works in the direct cost schedule.
- A high-level deterministic assessment of the risk associated with each option was undertaken using the Strategic Contingency / Risk Table as applied in NSW and also used by Queensland Department of Transport for the early assessment of transport infrastructure projects. The matrix requires the assessment of a list of project characteristics. Each option was assessed and the percentage allowance included has been set out in the table below:

Table 15: Risk allowance summary

Option	% Allowance for Stage 1, and Stage 1 and 2
Light rail	56%
Bus rapid	53%
Trackless tram	56%

Source: Fission (2020) Northern Suburbs Transit Corridor MCA Options Cost Estimate Report

4.7

Operating cost key assumptions

Operational costs were developed based on high-level concept designs by Aurecon. The assessment estimated key components of operating costs and made allowances for asset life to maintain the service operating efficiently. The following key assumptions underpin the operating assumptions:

- 15 drivers
- 3.75 support staff
- rolling stock and vehicle maintenance costing 3% of capital investment
- infrastructure maintenance costing 1% of capital investment.

Deliverability assessment

Aurecon provided technical engineering advice to undertake comparative analysis of each mode relative to a range of delivery factors. The qualitative factors are intended to represent the potential disruption and ongoing impacts of the short-listed options. This is to allow elements such as construction risk and previous domestic and international experience of the transport modes are considered in the MCA scoring. These qualitative factors are benchmarked against domestic and international examples to assess the delivery and operational risks of the mode options.

Deliverability and affordability MCA criteria and indicators

The deliverability and affordability assessment focuses on the cost and ease of delivery of the different mass transit options. Taking the objectives, the assumptions for developing the assessment and scenario specifications, a combination of quantitative and qualitative indicators were developed for each of the criteria. The table below sets out the key indicators estimated as part of this assessment.

Table 16: Indicators considered in the deliverability analysis

Objectives	Criteria	Indicator
6. Deliver value for money	Indicative whole of life cost estimates	Estimate of capital costs including estimate of contingency (real, undiscounted, $2018/19)
		Estimate of annual operational costs (real, undiscounted, $2018/19)
7.Deliverable and implementable	Ease and risk of delivery	Qualitative indicator on the ease and risk of delivery considering scope of works, remaining within existing corridor, reuse of ballast, impact on structures, etc
		Qualitative indicator representing the disruption during construction
		Qualitative indicator representing planning procedure risks
		Qualitative indicator representing international and local implementation experience of required technology
	Ongoing operation	Qualitative indicator representing the ability to safely continue active transport corridor
		Qualitative indicator representing the requirement for supporting transport services eg feeder bus operations, active transport, etc
		Qualitative indicator representing ease of maintenance eg the availability of vehicles and spare parts

Source: PwC analysis (2020) based on discussions with the Department of State Growth, Aurecon, Fission and LUTI Consulting

The results from the deliverability and affordability assessment are discussed in Section 4.10

4.8 Transport service MCA outcomes and key findings

The transport service assessment seeks to understand the improved connectivity in the study corridor enabled by the provision of a new transit mode. To isolate these impacts on the transport network the results are presented absent of any forecast changes in land use.

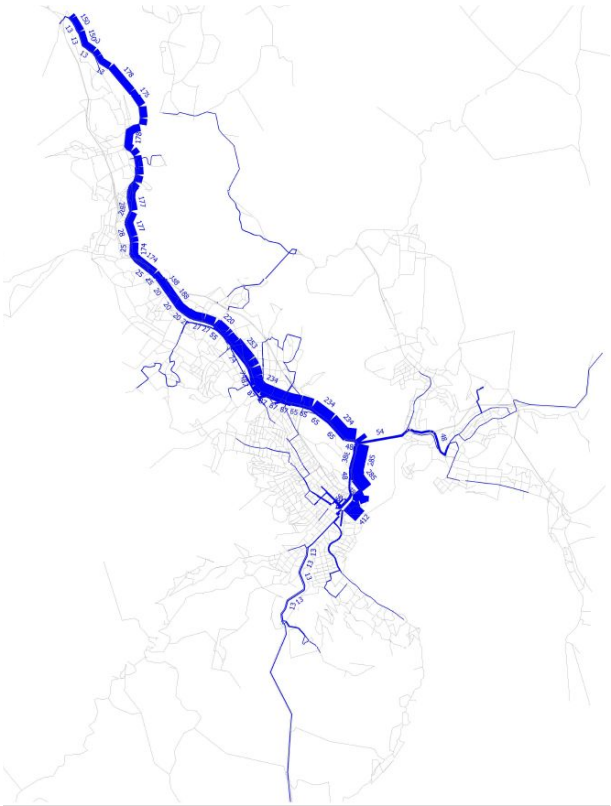
Table 17 (on the following page) sets out the results for each of the indicators assessed as part of the transport service category.

Key findings

The results from the transport modelling indicate that each of the short-listed options result in an increase in public transport demand and a mode shift away from private vehicles. To illustrate this impact, analysis of the light rail option is presented below:

- The inclusion of the light rail (Stage 1 and 2) during 2037 in comparison to the base case indicates a 40% increase in public transport patronage in Greater Hobart (this can be seen in the volume-to-capacity analysis of the light rail option in the figure below).[1]

Figure 13: New public transport line loads for light rail option (AM peak - 2037)

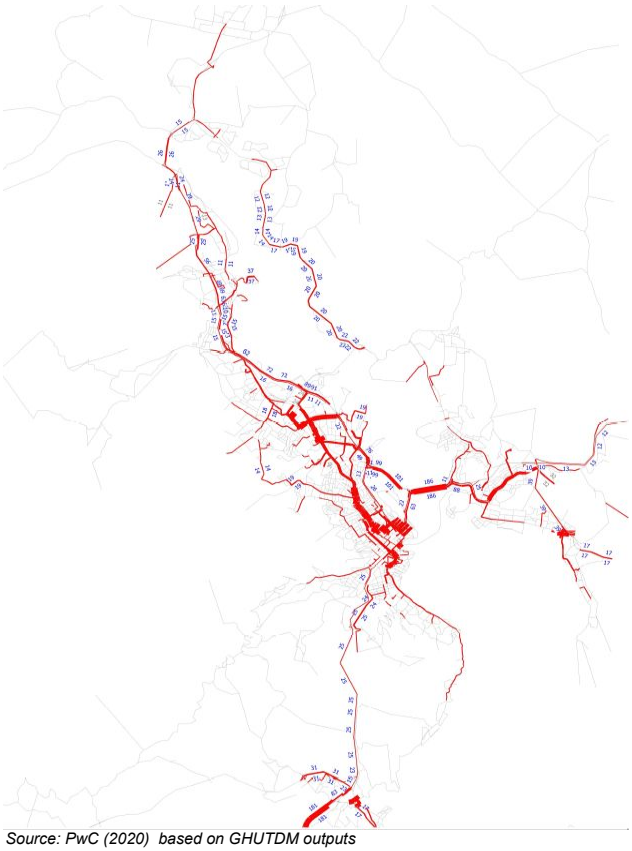


Source: PwC (2020) based on GHUTDM outputs

1. This 40% increase in public transport patronage is a result of changes in the transport network and land use redistribution

- The introduction of light rail reduces traffic volumes along neighbouring local streets within the study corridor. Traffic volumes from these local streets are either shifting from car trips to public transport trips or diverting back onto the Brooker Highway. The figure below illustrates where car volumes have decreased with the inclusion of the light rail (Stage 1 and 2) from the base case during 2037.

Figure 14: Reduction in vehicle demand for light rail option (AM peak - 2037)



Source: PwC (2020) based on GHUTDM outputs

Table 17 sets out the results for the short-listed options for each of the indicators. In terms of the impacts on the indicators, the key findings are discussed below:

- Travel time impacts indicate the level of congestion between Granton and Hobart mainly along Brooker Highway and Main/New Town Road per vehicle slightly improves (approximately 1 minute saving) with the inclusion of the short-listed options.
- The perceived public transport travel time per person drastically improves, in the magnitude of approximately a 100 minute saving from Granton to Hobart, with the inclusion of the short-listed options.

4.8

- The results also indicate that connectivity to metropolitan and strategic centres via public transport vastly improved with the inclusion of the short-listed options.

Overall the results show relatively little variability between the options. The bus rapid option performs best in the road travel time savings and reduced road vehicle kilometres travelled the most. By contrast the light rail option results in the largest public transport perceived travel time savings. The trackless tram consistently produces results in between the light rail and bus rapid.

Table 17: Transport service MCA indicators and results without changes in land use in 2037

Objectives	Criteria	Indicator	Option 1: Light rail	Option 2: Bus rapid	Option 3: Trackless tram
1. Ensure a transport service that is safe, efficient and reliable	Congestion on Main Road and Brooker Avenue	Per vehicle road travel time savings in minutes between Granton and Hobart travel zones (AM Peak 2037) - corridor measure	0.3	0.3	0.3
	Public transport efficiency	Per trip perceived public transport travel time saving in minutes from Granton to Hobart Central (AM Peak 2037) - corridor measure	95.7	93.7	94.7
	Improved network safety	Reduction in car vehicle kilometres travelled (VKT) across the network (Daily 2037) supporting fewer road incidents - network measure	29,984	34,417	32,588
2. Alleviate network wide transport congestion	Network wide transport congestion	Reduction in car vehicle hours travelled (VHT) across the network for (Daily 2037) - network measure	511	707	495
		Increase in in public transport passenger hours travelled (PHT) across the modelled network for (Daily 2037)- network measure	1,783	1,827	1,815
	Population connected to key centres	Increase in population within a 30 minute public transport journey of key centre Hobart (Daily 2037) - corridor measure	12,000	9,000	10,000
		Increase in population within a 30 minute public transport journey of key centre Glenorchy (Daily 2037) - corridor measure	7,000	4,000	4,000

Source: PwC (2020) Northern Suburbs Transit Corridor Transport Modelling Technical Report

4.9 City shaping MCA outcomes

The city shaping assessment seeks to estimate the impact of the short-listed options on unlocking development capacity in the Transit Corridor. This is reflected in the change in density (measured in terms of changes in jobs and dwellings) and land value uplift as a result of changes in zoning enabled by a mass transit solution. Table 19 provides a summary of results for each of the indicators assessed.

Key findings

The light rail, bus rapid and trackless tram options are all estimated to induce changes in the rezoning of the corridor to more productive transit-oriented land uses. A summary of the changes in dwellings and jobs has been set out in the table below.

Table 18: Estimated incremental change in dwellings and employment in the study corridor by option for Stage 1 and Stage 2

	2027		2037	
Land use	Dwellings	Jobs	Dwellings	Jobs
Bus rapid	174	37	1,043	223
Trackless tram	353	88	2,119	529
Light rail	776	180	4,657	1,082

Source: LUTI Consulting and Cox Architecture (2020)

The city shaping objectives showed the largest estimated variance between the three mass transit modes assessed, where all options supported the rezoning of land uses to a more productive use.

Both the scale and nature of development in response to mass transit are significantly different across the three options. A larger degree of increasingly dense development is seen on the corridor. This change in land use supports the study objectives by enabling a larger amount and more diverse selection of housing, increased employment in the corridor, optimised zoning, and subsequent increases in land values.

The light rail option has been estimated to have the largest land use response across the options. There is an opportunity under this mode to unlock medium density residential and mixed use development around station catchments, and significant potential to support the turnover of existing industrial land to residential and mixed uses. Dwelling capacity is also estimated to be unlocked to support land use change with the light rail option, along with moderate potential for increased jobs in mixed use areas. Mixed use developments are identified for their potential to support an activated streetscape while providing essential retail facilities and local services.

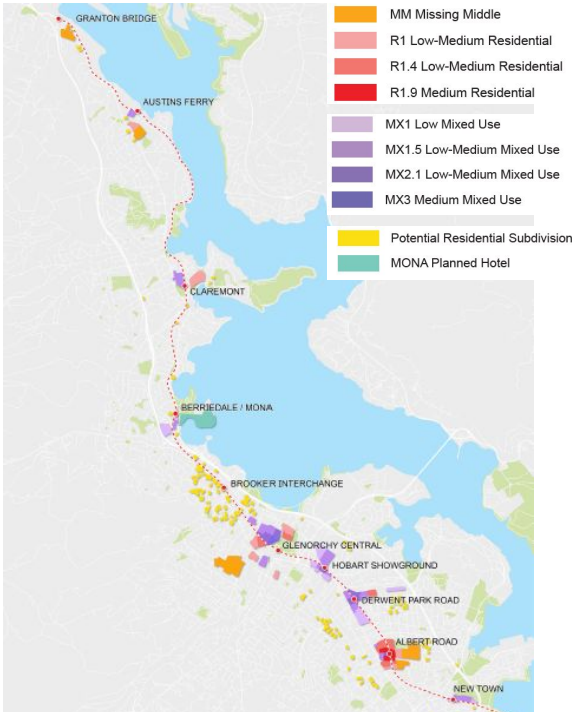
The bus rapid option has been estimated to have low to moderate opportunity for development within the station catchments. The proposed land uses under this modelled scenario are largely low density mixed uses and missing middle semi-detached residential development.

The trackless tram option, is anticipated to have a more moderate opportunity for development within the station catchments. The proposed land uses under this scenario range from missing middle semi-detached residential development to low-medium residential and mixed uses in the southern stations of the corridor. There is moderate potential for turnover of existing industrial land to mixed use and residential uses.

The land value uplift associated with each mass transit option has been measured by the monetisation of planning controls changes, reflecting the rezoning of land while adjusting for the development capacity supported by each mode. The light rail option had the most significant change to land value uplift, this is due to the high number of estimated lots that are rezoned to a more productive use.

The anticipated distribution of land use zoning within station walking catchments has been set out in the figure below. It shows there is a higher concentration of medium density residential and mixed use development in this scenario.

Figure 15: Light rail land use scenario (2037)



Source: LUTI Consulting and Cox Architecture (2020)

4.9

Overall the Light Rail option has a significantly larger city shaping impact than the other options. This is a function of the perceived permanence of the investment, enabling greater certainty for property developers and residents along the Transit Corridor. The light rail option has the largest number of rezonings, increase in jobs and increase in land values in the corridor.

The trackless tram option was found to be a middle ground however but there is uncertainty around the impact of this option on land markets this option due to the lack of national and international evidence.

The bus rapid had the smallest impact on city shaping objectives. This is due to a variety factors including the comparative lack of integration bus rapid offers with surrounding land markets and revealed preference (public sentiment) towards bus when compared to the other competing modes.

Table 19: City shaping MCA indicators and results

Objectives	Criteria	Indicator	Option 1: Light rail	Option 2: Bus rapid	Option 3: Trackless tram
3. Facilitate housing supply and diversity	Housing diversity in the corridor	Change in the proportion of Greater Hobart dwelling growth able to be delivered in the station catchments to support infill mixed use development - corridor capacity measure	38%	9%	18%
	Increased capacity for dwellings on the corridor	Change in the number of dwellings able to be accommodated in the corridor due to increased peak period public transport capacity - 2037 - corridor capacity measure	4,657	1,043	2,119
4. Support development of employment precincts	Increased number of jobs along the corridor	Change in the number of population serving jobs along the corridor in 2037 due to change in land use - corridor take up measure	1,082	223	529
5. Optimise land use and supporting development	Enable changes in land use zoning and density	Number of lots rezoned due to investment in the project along the corridor by 2037 - corridor capacity measure	646	156	269
		Land value uplift attributable to changes in zoning by 2037 ($M, real 2019/20) - corridor take up measure	268	68	138

Source: PwC (2020) based on inputs from LUTI Consulting and COX Architecture.

4.10 Deliverability and affordability MCA key findings and outcomes

The deliverability and affordability category represent both an estimated cost associated with the investment in the transport infrastructure and potential risks associated with construction and operation. This section discusses the key findings and outcomes from the assessment conducted by Aurecon and Fission. Table 21 (on the following page) provides a summary of results for each indicator assessed.

Affordability assessment key findings

Cost estimates have been based on the typical concept design cross sections for of the modes and extrapolated along the length of the corridor dependent on where single or dual carriageways have been proposed. The indicative cost of each option including risk contingency is shown in the table below.

Table 20: Indicative total capital and operational cost estimates ($M, real, undiscounted, 2018/19, excluding escalation)

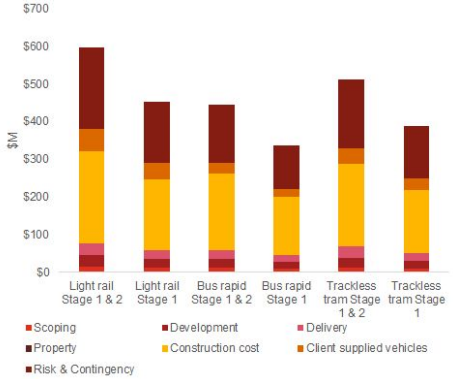
	Light rail	Bus rapid	Trackless tram
Stage 1			
Capital cost	454	338	388
Stage 1 and 2			
Capital cost	596	445	512
Operational cost	8	7	7

Source: Aurecon (2020) Transit Corridor Options - Technical report and Fission (2020) Northern Suburbs Transit Corridor MCA Options Cost Estimate Report
Note: Separate operating cost estimates have not been prepared for Stage 1 only. However, they would likely be in a similar range when prorated against the length of the alignment and vehicles required.

Overall the light rail option had the highest capital cost estimate, bus rapid had the lowest capital cost estimate with trackless tram a mid point between the two. The operational cost associated with each option reflects a similar trend.

Figure 16 below highlights the composition of capital cost, where the largest component of cost are construction cost and risk contingency.

Figure 16: Capital cost by option ($M, real, undiscounted, 2018/19)



Deliverability assessment key findings

The deliverability assessment involved the assessment of the ease and risk of delivery and the ongoing operation. A summary of the key findings has been summarised below.

Ease and risk of delivery findings

- For prudence it is assumed that new infrastructure (i.e. ballasts, rails and pavements) would be constructed for all of the points. With the design assumed not to significantly impact on other transport infrastructure.
- The disruption during construction is likely to be the highest for the light rail option (e.g. due to the need to construct level crossings). In all cases there will be disruption to the transport network and commuters.
- Planning procedure risks are limited and consistent across all options, which assume that no land and property acquisition is required.
- The international and local implementation experience of light rail and bus rapid systems are well practiced in Australia with a number of projects to draw on for local expertise. Trackless trams are not extensively practiced internationally apart from in China and have never been implemented in Australia, presenting more risk than the other modes.

Ongoing operation findings

- The ability to safely continue operating the active transport corridor can be achieved relatively easily across all options. A safety zone along with a separation barrier has been assumed in the specification of the options to ensure operational safety and usage of both corridors concurrently.
- All three options would require the same level of supporting transport services, such as bus feeder services and improved active transport connectivity, to ensure sufficient accessibility of the network to the surrounding areas.
- For ease of maintenance, both light rail and bus rapid options can access vehicles and parts relatively easily. Trackless tram does however have very few manufacturers which would pose a challenge in acquiring parts.

Source: Fission (2020) Northern Suburbs Transit Corridor MCA Options Cost Estimate Report

4.10

Overall in terms of affordability, light rail has the highest cost, trackless tram the second highest and bus rapid the lowest cost of the options. When combining this with the deliverability assessment, the light rail and bus rapid scores are similar, with the only variance being the disruption during construction. The trackless tram option produces the lowest score for the deliverability assessment. This is due to the limited domestic and international track record and the limited number of manufacturers associated with the mode.

Table 21: Deliverability and affordability MCA indicators and results

Objectives	Criteria	Indicator	Option 1: Light rail	Option 2: Bus rapid	Option 3: Trackless tram
6. Deliver value for money	Indicative whole of life cost estimates	Estimate of capital costs including estimate of contingency (real, undiscounted, $2018/19)	$596m (56% contingency)	$445m (53% contingency)	$512m (56% contingency)
		Estimate of annual operational costs (real, undiscounted, $2018/19)	$8.3m	$6.6m	$7.3m
7.Deliverable and implementable	Ease and risk of delivery	Qualitative indicator on the ease and risk of delivery considering scope of works, remaining within existing corridor, reuse of ballast, impact on structures, etc (Scoring 1 - 10)	6	6	6
		Qualitative indicator representing the disruption during construction (Scoring 1 - 10)	4	6	6
		Qualitative indicator representing planning procedure risks (Scoring 1 - 10)	6	6	6
		Qualitative indicator representing international and local implementation experience of required technology (Scoring 1 - 10)	8	8	2
	Ongoing operation	Qualitative indicator representing the ability to safely continue active transport corridor (Scoring 1 - 10)	8	8	8
		Qualitative indicator representing the requirement for supporting transport services eg feeder bus operations, active transport, etc (Scoring 1 - 10)	4	4	4
		Qualitative indicator representing ease of maintenance eg the availability of vehicles and spare parts (Scoring 1 - 10)	8	8	4

Source: Aurecon (2020) Transit Corridor Options - Technical report and Fission (2020) Northern Suburbs Transit Corridor MCA Options Cost Estimate Report

4.11 Summary of the MCA key findings and outcomes

Transport service

The MCA revealed positive transport service results for all three mass transit options. The results for transport service outcomes showed little variation between options. Each were found to offer a high capacity public transport option and if run at a frequent headway able to reduce Hobart's reliance on cars and improve congestion. It is important to note that for the purpose of the MCA, the transport service indicators assume no land use response relative to the base case.

Bus rapid and trackless trams demonstrated the largest per vehicle travel time savings between Granton and Hobart travel zones during the AM Peak in 2037. While light rail offered the greatest perceived public transport travel time savings from Granton to Hobart Central during the AM Peak in 2037.

All mass transit options assessed reduced congestion on Main Road and Brooker Avenue. However, across all options this was a marginal reduction in the AM peak congestion in the 2037 modelled year.

City shaping

The city shaping objectives revealed the most significant variance between the short-listed options, where all options supported the rezoning of land uses to a more productive use but at different rates.

Light rail was found to have the greatest impact of the city shaping objectives, unlocking the largest number of dwellings in the corridor through increased peak period public transport capacity.

The trackless tram option was found to be a middle ground however but there is uncertainty around the impact of this option on land markets this option due to the lack of national and international evidence.

The bus rapid had the smallest impact on city shaping objectives. This is due to a variety factors including the comparative lack of integration bus rapid offers with surrounding land markets and revealed preference (public sentiment) towards bus when compared to the other competing modes.

The assumptions supporting this finding reflects the relativity of impacts from a range of case studies on unlocked land use capacity and market responses associated with each mass transit option.

Deliverability & affordability

The capital cost varies by option, with light rail being the most expensive and bus rapid the least expensive.

For all modes it has been assumed that no land and property acquisition required along the transit corridor, including within the CBD where it is assumed that the corridor stays within the existing road reserve.

The application and implementation of trackless tram systems as a public transport has not been seen widely internationally. While there has been some experience in China it has never been implemented in Australia. There are very few manufacturers which will make procuring and maintaining the vehicles more costly and risky.

Overall assessment

Given the strategic level of the cost estimates and the relatively similar transport service outcomes revealed for bus rapid and light rail, it is recommended that these two options be considered further. While light rail was found to have the greatest impact on city shaping objectives, it also had the highest cost with a relatively similar transport service outcome.

The trackless trams are a middle ground in relation to the city shaping impacts of the options. However, due to the similar transport service outcomes and significant increased risk associated with its delivery it is not recommended this option progress for further analysis.

4.12 Key limitations

Given the nature of this analysis, there are a number of areas of the methodology, assumptions and findings that could be further refined with stages following this report. A set of key limitations have been summarised below.

Specification of options

- In the MCA the operational assumptions and alignment have been designed to enable comparison between options, eg single track, station locations, staging, service frequency, construction timeframe. Further analysis of each of these factors may offer the potential to improve/change costs and benefits.

Transport modelling

- The 2016 version of the GHUTDM was used in this analysis, though we understand State Growth is currently updating the model.
- The modifications incorporated into the GHUTDM for the purposes of this analysis were kept to a minimum, with no formal model calibration or validation undertaken.
- A subset of key modelling assumptions provided within the GHUTDM has been reviewed by PwC and amended where necessary noting that not all modelling assumptions were reviewed, validated or benchmarked.
- The evidence base contained in the GHUTDM (demographic profile, transport network assumptions, etc.) is based on the 2011 Census and recalibrated to the 2016 Census. The Department of State Growth are currently undergoing a process to refresh the model to 2018, which was not available at the time of this analysis.
- Refinement of the supporting infrastructure through improving assumptions on the feeder bus service through truncation, removal or redistribution of service kilometres would likely improve transport service findings.

Deliverability and affordability

- The design is currently at strategic stage and based on typical concept design cross sections for each transit mode.. Further design development will reduce the uncertainty in the scope and estimate quantum specifically in refining the risk allowance. Further refinements to the cost estimates could be incorporated into next stages of this analysis.
- Future comparisons with this estimate should only be performed considering any design changes, the contract delivery method, cost rates prevailing at the time, construction program and the current risk profile associated with the construction market at the time.
- As the planning process matures to procurement, it is likely that the procurement and staging of works will change. Currently it is assumed to be delivered as a single package between 2024 and 2027.
- The detailed timing of the project delivery is not yet defined and for the purposes of producing an escalation value the cost has been spread uniformly across the months with escalation applied per month for each option.

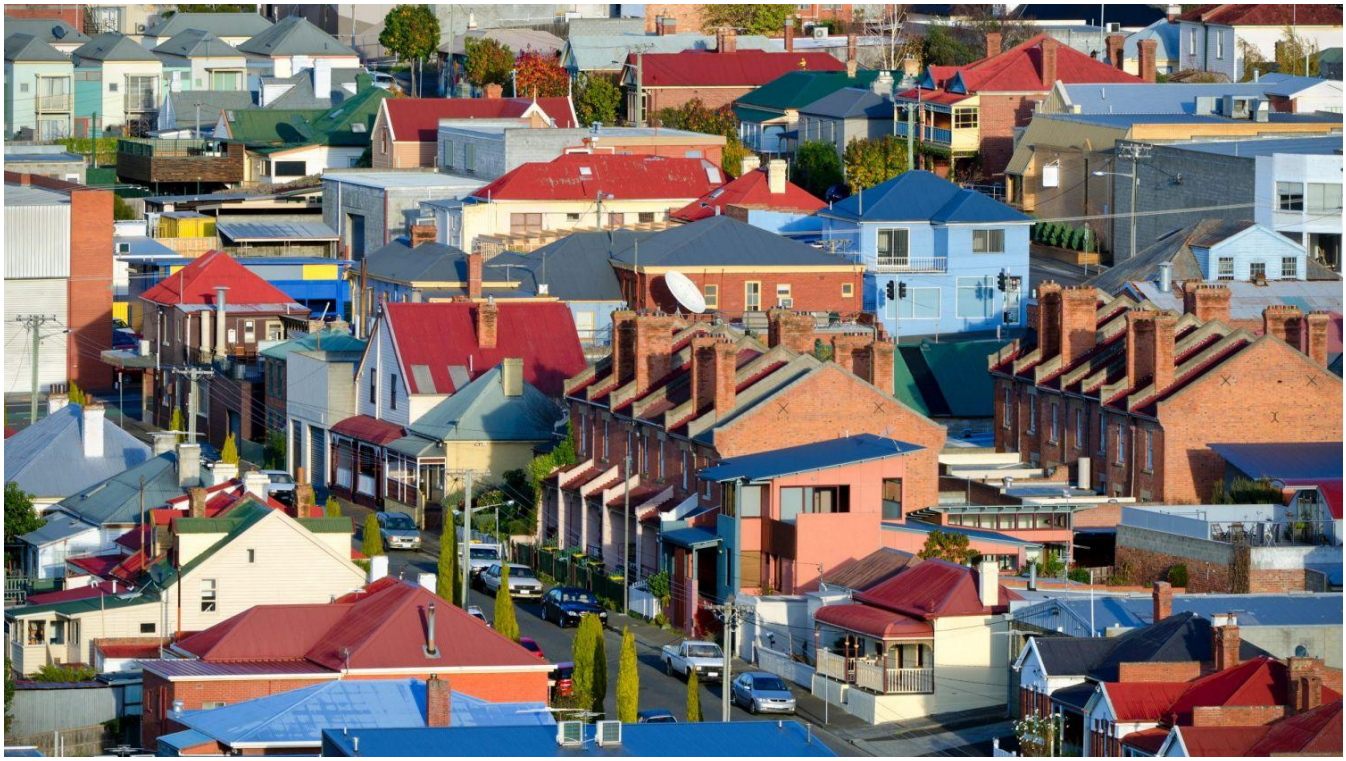
Land use

- The land use planning analysis was conducted using case studies and corridor context planning demand in response to each mass transit option. The planned development capacity was capped at the amount of development supportable by each short-listed option. As the operating model for each option was consistent, the supportable development was determined using LUTI Consulting's Transit induced Development Capacity Model and influences by the individual modes carrying capacity.
- With regard to the trackless tram, the same approach was applied with respect to the capacity of each mode, but the demand for take up in response to the mode is less certain as it is yet to be implemented outside China.
- There is uncertainty in the bus rapid take up demand response. In the Australian context there is limited evidence to suggest there is a positive land market price, or demand response to the investment in bus rapid. An optimistic view of the take up rates has been taken, where additional capacity was applied and the majority of the capacity was taken up over the project assessment period.
- A simplified land use redistribution approach was taken whereby the short-listed options were seen to drive an infill program for Greater Hobart, and small portions of the future growth from the peri urban areas was redistributed into the study corridor.

4.13 Next steps

The identification of a preferred transport mode option for the Transit Corridor, requires the following areas to be investigated in more detail:

- A more detailed conceptual engineering design and feasibility study of the preferred option(s). This would help increase the level of certainty regarding cost and the deliverability of the preferred option(s).
- Incorporation of an off corridor option in the MCA and/or economic appraisal, for example bus on Main Road, to enable comparison of a broader spectrum of options and support examination of potential staging of progressive investment.
- Commence the development of a value capture framework to identify potential future funding opportunities and potential contributions across the levels of government and the private sector, as identified in the Hobart City Deal.
- Commence the development of a strategy for urban renewal and activation of the Northern Suburbs Transit Corridor along the existing rail corridor, as identified in the Hobart City Deal. This would help in understanding the opportunity for urban renewal in the Transit Corridor.
- Undertake an economic and financial appraisal of at least two options in line with Infrastructure Australia's (IA's) Assessment Framework.



Appendix

Appendix A
Strategic options assessment

Appendix B
Concept Design Technical Report

Aurecon

Appendix C
Transport Modelling Technical Report

Appendix D
Land Use Analysis Technical Report

LUTI Consulting

Appendix E
Cost Estimates Technical Report

Fission

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