Auckland LIGHT RAIL
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Light rail in the City Centre to Māngere Corridor Short List assessment report

Economic Case Appendix 8

Final Version

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SHORT LIST ASSESSMENT REPORT

INTRODUCTION

This report outlines the approach taken and the results of the Short List assessment process for the City Centre to Mangere project, to help identify a preferred option.

As part of the identification of the recommended short list option an assessment of a wide range of options was undertaken. A four-stage process was adopted, being:

This report is for Stage 3, being the assessment of the short list options. The final Stage 4 step which identifies a preferred option is undertaken in the main body of the business case report.

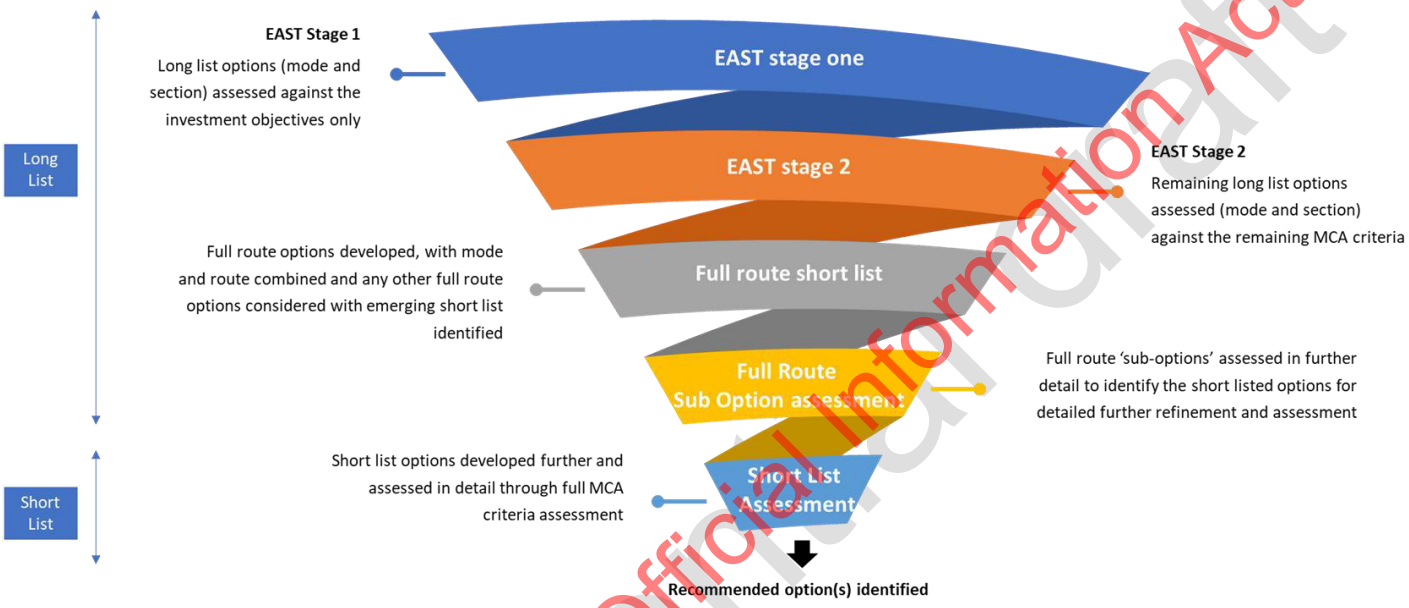
The assessment of options was undertaken by a group of subject matter experts from Waka Kotahi, Auckland Transport, Auckland Council, Kainga Ora and consulting specialists.

ASSESSMENT APPROACH

Options were assessed using a Multi Criteria Assessment (MCA) approach. This allowed for the consideration of a broad range of criteria when considering the options, in order to discard them or retain them in the process for further consideration and development. It is important to note that the MCA approach is a tool to assist in the overall project decision making and not the point at which a final project decision is made.

The MCA criteria were developed specifically for this project, utilising relevant material from previous rapid transit project planning, however were based heavily on the latest Waka Kotahi MCA guidelines for business cases.

This report relates to the Short List component of the diagram below.



KEY ASSUMPTIONS

As previously noted, there has been considerable work on rapid transit projects in and around this corridor, and the Cabinet paper provided a range of parameters which were able to guide the scope of the project. There were therefore a number of assumptions that underpinned the entire option assessment process, including this Short List assessment. These included:

- The Auckland Rapid Transit Plan (ARTP) provides strategic direction to the long term Rapid Transit Network in Auckland and in terms of this corridor:
- There is a need for this corridor within the wider rapid transit network
- The 'Midtown' area within the City Centre is defined as broadly the area around the planned Aotea Station on Wellesley Street and Queen Street
- The project extent will run from Wynyard Quarter through the Midtown area, then to the Airport (noting that the Wynyard Quarter location could potentially be extended to the North Shore as part of a future project) and pass through Mt Roskill, Onehunga and Mangere
- The Airport connection is a direct link from SH20 under the new runway into the Airport Terminals
- Grade-separated options (where these were considered necessary) were generally considered to be underground rather than above ground unless specifically stated
- Future land use assessments were based on the currently enabled land use development (as set out in Auckland Forecasting Centre's land use option i11.6 used for ATAP) as well as an indicative assessment of potential additional development provided by an option

These assumptions were required to be adopted to enable option assessment for the purpose of the Lon List process. Some of these assumptions (e.g. the Wynyard Quarter connection, or passing under the second runway at Auckland Airport) will be revisited in the Detailed Business Case (DBC) phase of this project, as the design is further developed, however those issues are not anticipated to affect the Short List assessment findings. The focus of the short listing phase will be to confirm (for the purposes of assessment) the optimal version of each option and understand in more detail the benefits, the costs and the key trade-offs of each option. It is recognised that there remain a number of outstanding elements or issues that will require substantial further public consultation before a final project decision can be made, so it should be noted that whilst this Short List process is appropriate for this phase, further more detailed design and assessment work will be undertaken at the DBC phase, to further refine and optimise the option(s).

ASSESSMENT CRITERIA

The Criteria

An MCA was used to assess all options in the short list. This allowed the options to be ranked against each other with the option ranking informing the development of the routes. The assessment was undertaken in August 2021.

The full assessment criteria framework is included in **Appendix A** and a summary of the main assessment categories is shown below in Table 1. The investment objectives were derived directly from the project's Investment Logic Map and associated objectives, whilst the other criteria were informed by the standard Waka Kotahi MCA framework and previous rapid transit investigations.

There are some refinements to the MCA criteria to that used in the Long List process, including:

- Social Cohesion – This was split into construction and operational criteria
- Human Health - This was split into construction and operational criteria
- Value for Money – Was taken out of the impacts section and separate section created
- Climate Change – Embodied carbon and climate change resilience taken from investment objective 2 criteria and new criteria under environmental impacts included
- Reputation – Criteria removed

This changes were considered refinements to assist in the differentiation of options with the core approach and criteria of the MCA remaining consistent (including that used in the Long List process).

Table 1 MCA criteria

Investment Objectives	Objective 1 – Accessibility	Ability of the transport system to enhance accessibility to key destinations and ensure the urban development aspirations (in terms of scale) are achieved
	Objective 2 – Environmental	Reduction in carbon footprint in the corridor and in the wider transport system due to the operation of the project
	Objective 3 – Urban Development	Improved social cohesion and reduced inequality, through the form and location of development enabled
Impacts		
Achievability	Technical	Including implementation, technical risk. Additional criteria to assess the feasibility of achieving the desired land use
	Safety	Will achieve safe outcomes for users, including application of CPTED principles to the scheme and the wider transport system
	Consentability	Level of consenting complexity and risk

Environmental Effects	Climate Change	Impacts of embodied carbon during construction and risk of climate change to option
	Landscape	Extent of effects on the natural environment from a landscape perspective
	Visual	Extent of effects on the natural environment from a visual perspective
	Water quality and wetlands	Extent of effects of operational stormwater (both quantity and quality) on the receiving environment
	Ecology	Extent of effects on flora and fauna, and water ecology
	Natural hazards	Extent of effects on infrastructure and surrounding urban environments during natural hazard events
	Cultural and historic heritage	Extent of effects on Cultural and Historic heritage (as defined in the RMA 1991, HNZPTA 2014 and ICOMOS NZ Charter 2010)
Social and community	Urban design	The extent to which the option supports a quality environment and the amenity and character of the surrounding environment.
	Social cohesion (construction)	Extent of effects on the use, connectivity / accessibility for and to the existing and future communities including use and access to employment, education, retail and recreation opportunities during construction.
	Social cohesion (operation)	Extent of effects on the use, connectivity / accessibility for and to the existing and future communities including use and access to employment, education, retail and recreation opportunities once operational.
	Human Health and Wellbeing (construction)	Extent to which the option will potentially affect any sensitive receivers, particularly related to air quality, contaminated land, noise and vibration during construction.
	Human Health and Wellbeing (operation)	Extent to which the option will potentially affect any sensitive receivers, particularly related to air quality, contaminated land, noise and vibration during operation.

Impacts on Te Ao Maori	Te Ao Maori	Extent of effects on Te Ao Maori, including areas of significance for Maori, Maori land and kaitiakitanga
Property Impacts	Property Impacts	Scale of public / private land (m2 / number of properties / special status of impacted property) required to deliver the option.
Value		
Cost	Cost	CAPEX and OPEX of each option
BCR	BCR	Benefit cost ratio of each option

These assessment criteria were endorsed by the Governance Group of the Establishment Team.

The short list options were primarily assessed quantitatively against the main criteria (informed by the more detailed criteria shown in **Appendix A**.

The Scoring

The scoring system used was the same as the Long List assessment, being a 7-point scoring system, as detailed in Table 2 below, was used for this project. It was used to rate quantitative and qualitative measures within the MCA template.

The rating scale comprises a 7-point scale from -3 to +3. The total score or relative ranking of each option was reported as part of the MCA table. The scoring was done based on the scheme assessed. If the effects were able to be mitigated, this mitigation was identified (and if the project team agree this was appropriate), a score with this mitigation in place was provided (and included in costs).

Table 2 : MCA scoring criteria

Magnitude	Definition	Score
Major positive (+ve)	Major positive impacts resulting in substantial and long-term improvements or enhancements of the existing environment.	3
Moderate positive (+ve)	Moderate positive impact, possibly of short-, medium- or long-term duration. Positive outcome may be in terms of new opportunities and outcomes of enhancement or improvement.	2
Minor positive (+ve)	Minimal positive impact, possibly only lasting over the short term. May be confined to a limited area.	1
Neutral	Neutral – no discernible or predicted positive or negative impact.	0
Minor negative (-ve)	Minimal negative impact, possibly only lasting over the short term, and definitely able to be managed or mitigated. May be confined to a small area.	-1
Moderate negative (-ve)	Moderate negative impact. Impacts may be short, medium or long term and are highly likely to respond to management actions.	-2
Major negative (-ve)	Impacts with serious, long-term and possibly irreversible effect leading to serious damage, degradation or deterioration of the	-3

	physical, economic, cultural or social environment. Required major rescope of concept, design, location and justification.

THE OPTIONS

General

Based on the Long List assessment it was recommended that four options were short listed including:

- Option 1A : LRT Option Sandringham
- Option 1B : LRT Option Dominion
- Option 2A : Light Metro Sandringham
- Option 2B : Light Metro Dominion

Following the confirmation of these four options a further option was considered appropriate to consider in the short-listing process, being a hybrid Light Rail and Light Metro option. This option was considered a valuable addition to the option assessment process as the demand profile for the project increases the closer to the Central City and this is also the area where providing segregation for a rail (light or metro) system is more important due to the level of interaction with rest of the transport system.

It was therefore considered that a 'Tunnelled Light Rail' option that provided higher capacity full segregation north of Mt Roskill (effectively a Light Metro option) and lesser capacity south of this point would be worth understanding in more detail. For the purposes of this assessment the Sandringham alignment was chosen as this alignment (for Light Metro) has the higher patronage and this will allow a comparison between the Sandringham Light Rail and Light Metro options to understand the relative benefits/disbenefits of a 'hybrid' option.

Including this option results in five short listed options as set out in Table 3.

For all options, the alignment to the airport is consistent with all options. Further discussions on the exact alignment and connections at the airport are required in the DBC phase. This connection is not considered a differentiator for the options and therefore this approach is considered appropriate.

Fundamentally, a Light Rail based system is a street running system, that requires human drivers to operate and has street level stops more frequently along the route than a Light Metro system.

A Light Metro system is a fully segregated system than can be operated autonomously and therefore operates at a higher speed that Light Rail systems. Stations are generally underground and spaced further apart than the Light Rail options.

The Tunnelled Light Rail options provides a mix of the Light Rail and Light Metro options described above.

Appendix B provides maps of the five short listed options.

Table 3 : Short List options

Option	Option 1A	Option 1B	Option 2A	Option 2B	Option 3
Alignment	s 9(2)(i)	s 9(2)(i)	s 9(2)(i)	s 9(2)(i)	s 9(2)(i)
Urban Outline	A Sandringham Road alignment connects with the Kāinga Ora developments in Wesley and connects with the Kāinga Ora development opportunities around Bader Drive. Light Rail drives a greater level of public realm upgrade, accessibility and connectivity across the whole corridor through having more stops	A Dominion Road alignment provides an opportunity to leverage off the established community including centres and connects with the Kāinga Ora development opportunities around Bader Drive Light Rail drives a greater level of public realm upgrade, accessibility and connectivity across the whole corridor through having more stops	A Sandringham Road alignment connects with the Kāinga Ora developments in Wesley and realises the opportunity of the University connection. Light Metro drives some level of public realm upgrade, accessibility and connectivity particularly around stations	A Dominion Road alignment provides an opportunity to leverage off the established community including centres and realises the opportunity of the University connection. Light Metro drives some level of public realm upgrade, accessibility and connectivity particularly around stations	A Sandringham Road alignment connects with the Kāinga Ora developments in Wesley and connects with the Kāinga Ora development opportunities around Bader Drive. The Tunnelled Light Rail option receives the majority of the benefits of each mode
Cross Section	Street running		Tunnel through urban areas, fully segregated in other areas		2A cross section from north of Mt Roskill and Light Rail cross section south
Service Pattern	15tph Driver operated		20 tph Driverless operation		20 tph Driver operated
Capacity (people per peak hour)	Light Rail : Assumed 6,300, Maximum 8,400 Street : Some reduction in capacity through town centres and movement restrictions along the route		Light Metro: Assumed 11,600, Maximum 23,200 Street: No change, enhanced space for pedestrian and cyclists		Tunnelled Light Raill: Assumed 12,600, Maximum 12,600 Street: Varies between section, where tunnelled, no change, where street running some reductions in capacity through town centres and movement restrictions
Stations	23 Stations	22 Stations	17 Stations	16 Stations	18 Stations
Travel time (Airport to Wynyard)	58min	57min	36min	34min	44min
Indicative (un-escalated) CAPEX Cost (P50)	$7.8Bn	$7.3Bn	$12.8Bn	$15.0Bn	$11.4Bn

Key Option Design Elements

An important element of each of the options is the interface with the existing transport network. For both short listed modes (Light Rail and Light Metro) this means different things.

Light Rail options

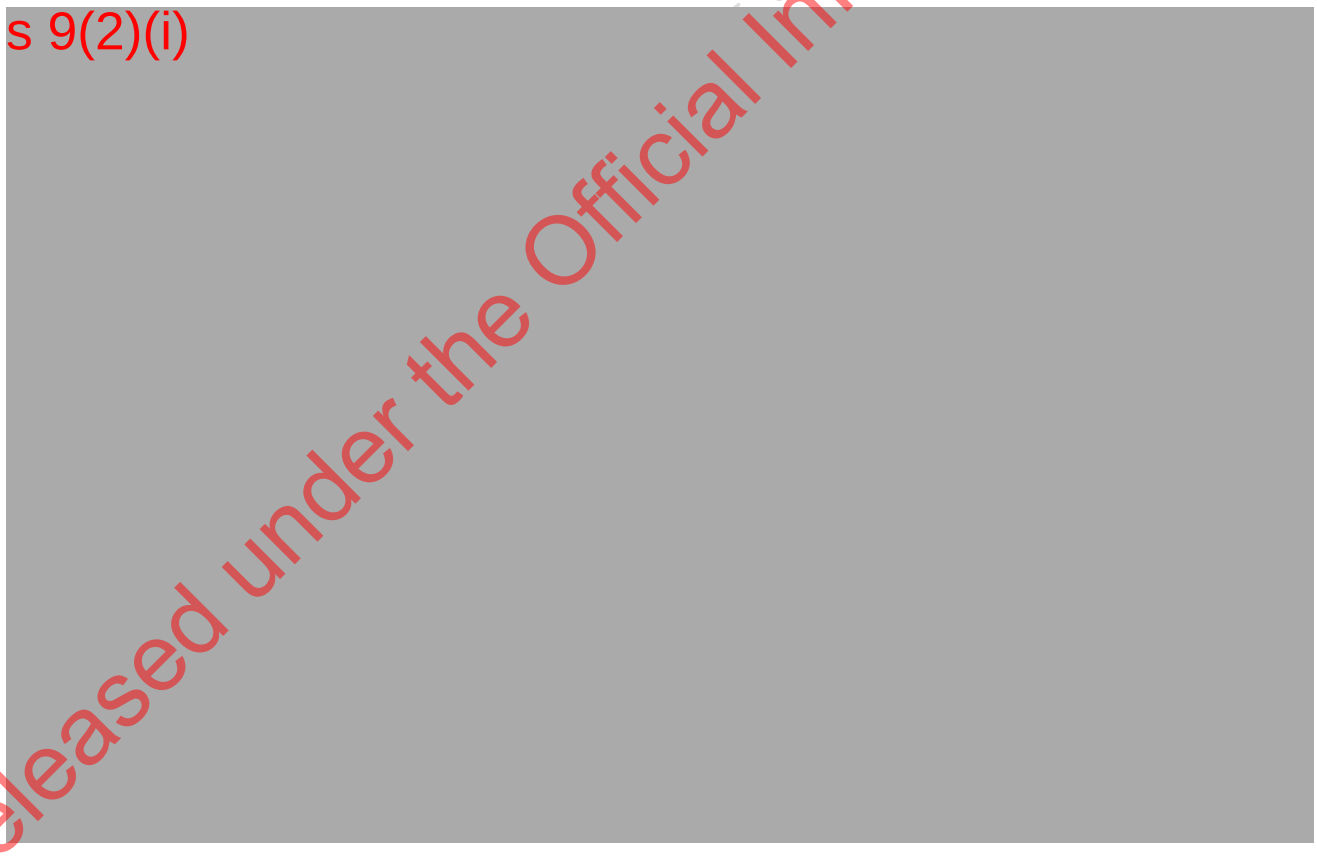
Different cross sections for the street running Light Rail options were considered. This included cross sections that were fully compliant with the current Transport Design Manual (TDM) from Auckland Transport, through to reduced widths for elements such as footpaths and cycle lanes[1].

The two cross sections considered in detail (see Figure 8), were a fully compliant cross section and a reduced width cross section (that still provided continuous active mode facilities). It was found that the higher the level of compliance with the optimal design standards, the better the outcome for users. However there was more property impact because the required width was beyond the typical road reserve along the corridor and the wider TDM corridor may not be practical in some parts of the CC2M corridor.

For the purposes of costing and consideration of outcomes, the use of the wider cross section has been assumed.

Given the scale of the implications of either cross section, if the Light Rail option (Option 1B) is preferred this issue will need to be explored further in the DBC before a final decision is made. Whilst there are areas where neither cross section would be applied, for example through constrained town centres in the central isthmus, where customised layouts would be required, these cross sections would be generally sought along as much of the corridor as possible.

s 9(2)(i)



s 9(2)(i)

[1] Note that much of Auckland's existing street network is noncompliant in one way or another, having been built prior to the TDM adoption

s 9(2)(i)

Light Metro

For the Light Metro options different forms of segregation were investigated, including open trenches and bored tunnels. Elevated options had previously been discounted due to adverse visual, shading and amenity impacts. Based on this assessment, it was determined that all the Light Metro options should be tunnelled through the more densely populated areas, such as the city centre, central isthmus, Onehunga and Māngere town centre, and generally follow the motorway corridor on the surface in other areas. This approach was preferred for the following reasons:

it minimises impacts upon the greatest population densities during construction

it provides highest level of amenity in the final form of the street above the tunnels

it removes any operational impacts at the surface, except at stations

tunnels could be built at a similar cost to a trenched option, once the full construction requirements of both options were known

Figure 3 shows the typical cross section that was adopted for Light Metro (and, where appropriate, the Tunnelled Light Rail option).

s 9(2)(i)

SHORT LIST ASSESSMENT

Approach

The approach to the short list assessment undertaken included:

- Subject matter expert team being briefed on the options
- Subject matter expert team being provided with briefing pack of the different options and their attributes and characteristics
- Subject matter expert assessment team completing the assessment of options against the Do Minimum
- Group presentation of individual assessors' findings and rationale
- Group moderation on scoring limited to ensuring consistent application of scale of differences within the different criteria
- Assessments finalised

The individual assessments are included in the following appendices to this document:

- Appendix C – Investment Objective 1 assessment
- Appendix D – Investment Objective 2 assessment
- Appendix E – Investment Objective 3 and Urban assessment
- Appendix F – Technical and Natural Hazards assessment
- Appendix G – Safety assessment
- Appendix H – Consentability assessment
- Appendix I – Social assessment
- Appendix J – Te Ao Maori assessment
- Appendix K – Property assessment

Table 4 summarises the outcome of the assessment.


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Table 4 : Short List option assessment summary

		Option 1A Sandringham Light Rail	Option 1B Dominion Light Rail	Option 2A Sandringham Light Metro	Option 2B Dominion Light Metro	Option 3 Tunnelled Light Rail
Investment Objectives	**Investment Objective One** **ACCESSIBILITY**	• Minor improvement in accessibility (sample measures) • 60,000 daily boardings • Trips within 45mins of employment: o Mangere 114,000 o Mt Roskill 109,000	• Minor improvement in accessibility (sample measures) • 60,000 daily boardings • Trips within 45mins of employment: o Mangere 115,000 o Mt Roskill 58,000	• Significant improvement in accessibility (sample measures) • 105,000 daily boardings • Trips within 45mins of employment: o Mangere 335,000 o Mt Roskill 159,000	• Moderate improvement in accessibility (sample measures) • 111,000 daily boardings • Trips within 45mins of employment: o Mangere 353,000 o Mt Roskill 123,000	• Moderate improvement in accessibility (sample measures) • 99,000 daily boardings • Trips within 45mins of employment: o Mangere 197,000 o Mt Roskill 103,000
	Investment Objective Two **CARBON (Enabled)**	• 204,000 tonnes of carbon reduced due to the option	• 157,000 tonnes of carbon reduced due to the option	• 321,000 tonnes of carbon reduced due to the option	• 314,000 tonnes of carbon reduced due to the option	• 249,000 tonnes of carbon reduced due to the option
	Investment Objective Three **URBAN DESIGN**	• Medium Urban Development opportunity with a reasonable certainty of delivery • Connects to Kāinga Ora development in Mt Roskill and Bader Drive • 4400 additional households and 4100 additional jobs	• Medium Urban Development opportunity with some certainty of delivery • Connects to Kāinga Ora development in Bader Drive • Dominion corridor provides an opportunity to leverage off the established community including centres • 4100 additional households and 3700 additional jobs	• High Urban Development opportunity with a reasonable certainty of delivery • Connects to Kāinga Ora development in Mt Roskill but misses Bader Drive • Realises the opportunity of the University connection • 5100 additional households and 5300 additional jobs	• Medium Urban Development opportunity with some certainty of delivery • Connects to some of the Kāinga Ora development in Mt Roskill but misses Bader Drive • Realises the opportunity of the University connection • 5000 additional households and 5000 additional jobs	• High Urban Development opportunity with a reasonable certainty of delivery • Tunnelled Light Rail option receives the majority of the benefits of each mode • 5000 additional households and 5100 additional jobs
Achievability	**Technical**	• Predominantly at grade and inflicts widespread traffic and business disruption along the route, including relocation of a strategic Vector utility from Sandringham Road into Dominion Road	• Predominantly at grade and inflicts widespread traffic and business disruption along the route • Less impact in contrast to option 1A Sandringham Road since the existing Vector 110kV cables do not require relocation	• Underground solution for City Centre and Isthmus much reduces the disruption to traffic and business. Mt Roskill to Airport section is generally at grade which causes traffic disruption along parts of SH20. Trenched solution at Onehunga has potential to cause considerable traffic disruption at the Neilson St intersection.	• Underground solution for City Centre and Isthmus much reduces the disruption to traffic and business. Mt Roskill to Airport section is generally at grade which causes traffic disruption along parts of SH20. Trenched solution at Onehunga has potential to cause considerable traffic disruption at the Neilson St intersection.	• The hybrid solution combines the best of the underground section in the City Centre and Isthmus, whilst removing the need to trench in Onehunga.
	Safety	• More people on safer system is positive, it will be designed safely. Street running is an added mode complication. However, as driveways and most side streets are LILO, with all right turns signalised, the transport system as a whole will be safer.	• More people on safer system is positive, it will be designed safely. Street running is an added mode complication. However, as driveways and most side streets are LILO, with all right turns signalised, the transport system as a whole will be safer.	• Fully segregated, more people using system, so very safe, minor score down due to CPTEED and also down as isthmus corridor remains busy at surface with unsignalized right turns available.	• As with Option 2B	• Scores the same as has the same pluses and minus's for both options above.
	Consentability	• Very significant risk in Central City due to duration and impact during construction • Avoids key constraints (or can be avoided in detailed design) • Issues will be with digging up Dominion for Vector shift	• Very significant risk in Central City due to duration and impact during construction • Very little to differentiate with Sandringham, Avoids key constraints and don't have to dig up Sandringham as well (distinct from LRT S where have to shift Vector Cable)	• More tunnel, easier (generally) to consent, some disturbance at portals and station construction sites	• More tunnel, easier (generally) to consent, some disturbance at portals and station construction sites	• Avoids Central City and Isthmus issues, but captures issues with LRT through Onehunga and Mangere (including
Environmental Effects	**Landscape**	• There are some areas of ONL impacted but these are relatively minor	• There are some areas of ONL impacted but these are relatively minor	• There are some areas of ONL impacted but these are relatively minor	• There are some areas of ONL impacted but these are relatively minor	• There are some areas of ONL impacted but these are relatively minor
	Visual	• Once in place the impact will be minor along entire route	• Once in place the impact will be minor along entire route	• Tunnel with offer improvement, but not considered substantial	• Tunnel with offer improvement, but not considered substantial	• Most similar to option 2A
	Water Quality and wetlands	• Small areas of wetlands, however not considered significant and likely to be able to be designed to minimis impact	• Small areas of wetlands, however not considered significant and likely to be able to be designed to minimis impact	• Small areas of wetlands, however not considered significant and likely to be able to be designed to minimise impact	• Small areas of wetlands, however not considered significant and likely to be able to be designed to minimise impact	• Most similar to option 2A
	Ecology	• Will be minor issues along route, but not seen as significant	• Will be minor issues along route, but not seen as significant	• Will be minor issues along route, but not seen as significant	• Will be minor issues along route, but not seen as significant	• Will be minor issues along route, but not seen as significant
	Natural Hazards	• Some challenges with trees on tracks and overhead lines • Lesser impact on infrastructure during major earthquake	• Some challenges with trees on tracks and overhead lines • Lesser impact on infrastructure during major earthquake	• Tunnel reduces overhead interference • Tunnel harder to fix in earthquake, but higher level of design, so generally more robust	• Tunnel reduces overhead interference • Tunnel harder to fix in earthquake, but higher level of design, so generally more robust	• Balance between Ligtht Rail and Light Metro, on balance neutral
	Cultural & historic heritage	• Will be minor issues along route, but not seen as significant	• Will be minor issues along route, but not seen as significant	• Will be minor issues along route, but not seen as significant	• Will be minor issues along route, but not seen as significant	• Will be minor issues along route, but not seen as significant

	Climate Change	• Considerable embedded carbon due to construction and operation • Climate change risks at Wynyard, Onehunga and also generally related to increased wind events	• Considerable embedded carbon due to construction and operation • Climate change risks at Wynyard, Onehunga and also generally related to increased wind events	• Significant embedded carbon due to construction and operation • Climate change risks due to flooding at Wynyard and Onehunga harder to recover from when event strikes	• Significant embedded carbon due to construction and operation • Climate change risks due to flooding at Wynyard and Onehunga harder to recover from when event strikes	• This option performs closer to Option 1A than Option 2A
Social and community	**Urban design**	• Delivers form of development sought	• Delivers form of development sought	• Overall positive, however concern around motorway stop around Favona and resultant reduction in urban outcomes	• Overall positive, however concern around motorway stop around Favona	• Closer aligned to Option 1A
	Social cohesion (Construction)	• Length and duration of construction above ground – greater business disruption and severance • Severance during construction	• As with option 1A, slightly less due to only one corridor, but overall considered to be moderate still	• Less above ground construction • Quicker travel time therefore access to more jobs	• Less above ground construction • Quicker travel time therefore access to more jobs	• Slower trip for above ground section between Onehunga and Airport impacting access to jobs • Above ground construction between Onehunga and Airport creating severance
	Social cohesion (Operation)	• Accessibility benefits • Off set by severance for tight turning traffic ongoing social issue	• Accessibility benefits • Off set by severance for tight turning traffic ongoing social issue	• Accessibility benefits significant, particularly for southern end of the study area	• Accessibility benefits significant, particularly for southern end of the study area	• Closer to Option 2A, however access in Mangere not as strong
	Human Health and Wellbeing (construction)	• Length of construction considerable • Requires considerable noise and dust in both Sandringham and Dominion Roads	• Length of construction considerable • Results in considerable noise and dust in Dominion Roads	• Construction through Onehunga and Mangere (schools) impactful • Tunnel construction impacts through most densely populated area at tunnel portal only	• Construction through Onehunga and Mangere (schools) impactful • Tunnel construction impacts through most densely populated area at tunnel portal only	• This option performs closer to Option 1A than Option 2A due to number of sensitive receivers around Mangere and in particular the schools
	Human Health and Wellbeing (operation)	• Mode shift results in health benefits due to increase walking and cycling and less vehicles polluting • Some localised noise issues on bends	• Mode shift results in health benefits due to increase walking and cycling and less vehicles polluting • Some localised noise issues on bends	• Highest level of mode shift would drive health benefits due to increase walking and cycling and less vehicles polluting	• Highest level of mode shift would drive health benefits due to increase walking and cycling and less vehicles polluting	• Closer alignment to Option 2A
Impacts on Te Ao Maori	**Te Ao Maori**	• s 9(2)(i) • Wai o horotiu runs in queen street and there is an associated Pā around the town hall	• s 9(2)(i) • Wai o horotiu runs in queen street and there is an associated Pā around the town hall	• Most iwi have been engaged with CRL so understand the technology and the positives and negatives of boring • two main concerns are around Aquafer and potential lava caves when boring close to Mangere bridge or when close to Puketapapa	• Most iwi have been engaged with CRL so understand the technology and the positives and negatives of boring • two main concerns are around Aquafer and potential lava caves when boring close to Mangere bridge or when close to Puketapapa	• Closer to Option 2A, but there is still Mangere disruption
Property Impacts	**Property Impacts**	• **Very significant** number of businesses affected in terms of partial acquisitions and temporary occupation ranging through the Viaduct Harbour, Queen Street, Sandringham Road, Onehunga and Mangere Town Centre Areas. • Very significant disturbance to commercial properties in the above areas for lengthy periods of time. The potential cost is difficult to estimate and is similar to the issues being experienced by the CRL project. • Moderate potential for businesses to require relocation with this option. • Significant number of property interests to be acquired to facilitate this option.	• **Significant** number of businesses affected in terms of partial acquisitions and temporary occupation ranging through the Viaduct Harbour, Queen Street, Sandringham Road, Onehunga and Mangere Town Centre Areas. • Very significant disturbance to commercial properties in the above areas for lengthy periods of time. The potential cost is difficult to estimate and is similar to the issues being experienced by the CRL project. • Moderate potential for businesses to require relocation with this option. Significant number of property interests to be acquired to facilitate this option.	• Localises the impact upon property owners for both residential and commercial property substantially to the locations surrounding the stations. • Significantly reduces the potential disturbance to residential and commercial property owners during construction. • Property acquisitions are significantly less onerous as the surface based acquisitions predominantly occur around the stations and the other acquisitions are subterranean or are acquired from other requiring authorities.	• Localises the impact upon property owners for both residential and commercial property substantially to the locations surrounding the stations. • Significantly reduces the potential disturbance to residential and commercial property owners during construction. • Property acquisitions are significantly less onerous as the surface based acquisitions predominantly occur around the stations and the other acquisitions are subterranean or are acquired from other requiring authorities.	• Localises the impact upon property owners for both residential and commercial property substantially to the locations surrounding the stations. • Significantly reduces the potential disturbance to residential and commercial property owners during construction. • Property acquisitions are significantly less onerous as the surface based acquisitions predominantly occur around the stations and the other acquisitions are subterranean or are acquired from other requiring authorities.

Assessment Summary

Following the above assessment, more detailed assessments of the benefits, impacts and issues of the five short list options were undertaken against the MCA criteria.

Table 4 summarises the outcome of the assessment. The key conclusions from this assessment are set out below.

- All short-listed options deliver well against the investment objectives, increasing accessibility, mode shift to public transport, unlocking urban potential and reducing carbon emissions.
- Patronage on the options ranged from 15M to 28M boardings per annum by 2051
- Carbon reduction (enabled) is in the order of 350,000 to 700,000 tonnes
- Urban uplift is in the order of 10%-12%, with associated place, people and spatial economy gains

The Light Metro options deliver greater benefits and lesser impacts generally. However they have the highest cost, at approximately $13Bn[2]. The Benefit Cost Ratio (BCR) is approximately 1.

The Light Rail options deliver fewer benefits and has greater impacts predominantly due to the scale of surface disruption during construction along the routes. But the costs are lower - approximately $7Bn. They have a BCR of approximately 1.

The Tunnelled Light Rail option's performance is between the Light Metro and Light Rail options, closer in performance to the Light Metro option. It has a BCR of approximately 1.

Light Rail route assessment

Of the two Light Rail options, the Dominion Road alignment performs better for the following reasons:

There is a major power cable beneath the Sandringham Road corridor that would need to be relocated (potentially to Dominion Road) if Sandringham Road was chosen, resulting in an additional period of disruption for two years whilst this cable is relocated.

The Dominion Road corridor travel time is marginally shorter and would attract a slightly greater overall patronage as a result

The capital cost is slightly smaller

Most other assessment criteria are similar

However, as it is slightly further away, this option does not capitalise as well on the urban development opportunities presented by the Crown housing initiative undertaken by Kāinga Ora in Mt Roskill.

Light Metro route assessment

Of the two Light Metro options, the Sandringham Road alignment performs better for the following reasons:

Both route options have similar patronage, carbon, urban uplift and accessibility outcomes. There is also little differentiation between the options from a travel time perspective

Unlike Light Rail, there are no significant differentiators between the two Light Metro routes. This is less of a concern for Light Metro given the option is assumed to be in a tunnel, so the alignment does not necessarily need to follow a road corridor. At the DBC stage, a bespoke alignment which serves key locations in both Dominion and Sandringham Roads could be considered.

However, one Light Metro alignment option needed to be selected to allow a complete assessment of the project outcomes, and for benefits and costs to be undertaken. Based on the assessment of investment

[2] Unescalated expected estimate

objectives, the Sandringham Road alignment achieved slightly better patronage and urban uplift, primarily based on being closer to the Kāinga Ora developments in Mt Roskill, so was chosen as the preferred alignment.

Note on community engagement

Whilst community feedback on specific options has not been undertaken during this phase, through the broader engagement undertaken (that sought general feedback on the concept of Light Rail in the corridor and what it would mean for communities) there has been feedback provided which aligns well with the areas of investigation, including:

Construction disruption is a key concern of businesses and communities along the route

A university connection was highly valued

A stop within Māngere town centre is highly valued by the local community

Maximisation of community interface (e.g. Bader Drive) in southern sections of the corridor was considered important

Protecting and enhancing heritage value along the corridor was seen as important. The civic and heritage value of places like Queen Street, and homes and other buildings along the corridor (including on Dominion and Sandringham Roads), is perceived to be at risk with this project.

The overall community feedback will be a key contribution to the scoping of the DBC phase, where further (more detailed) public consultation will occur.

The critical next stage of the assessment was considering the trade offs of the different options. Further assessments were therefore focussed on the best performing Light Rail and Light Metro options as well as the Tunnelled Light Rail option, effectively reducing the number of short listed options to three. These trade offs are set out in the main body of the business case.