

LIGHT RAIL TRANSIT BACKGROUNDER – STAGES 1-3



Artist's impression of LRT at Aotea Square, Queen Street

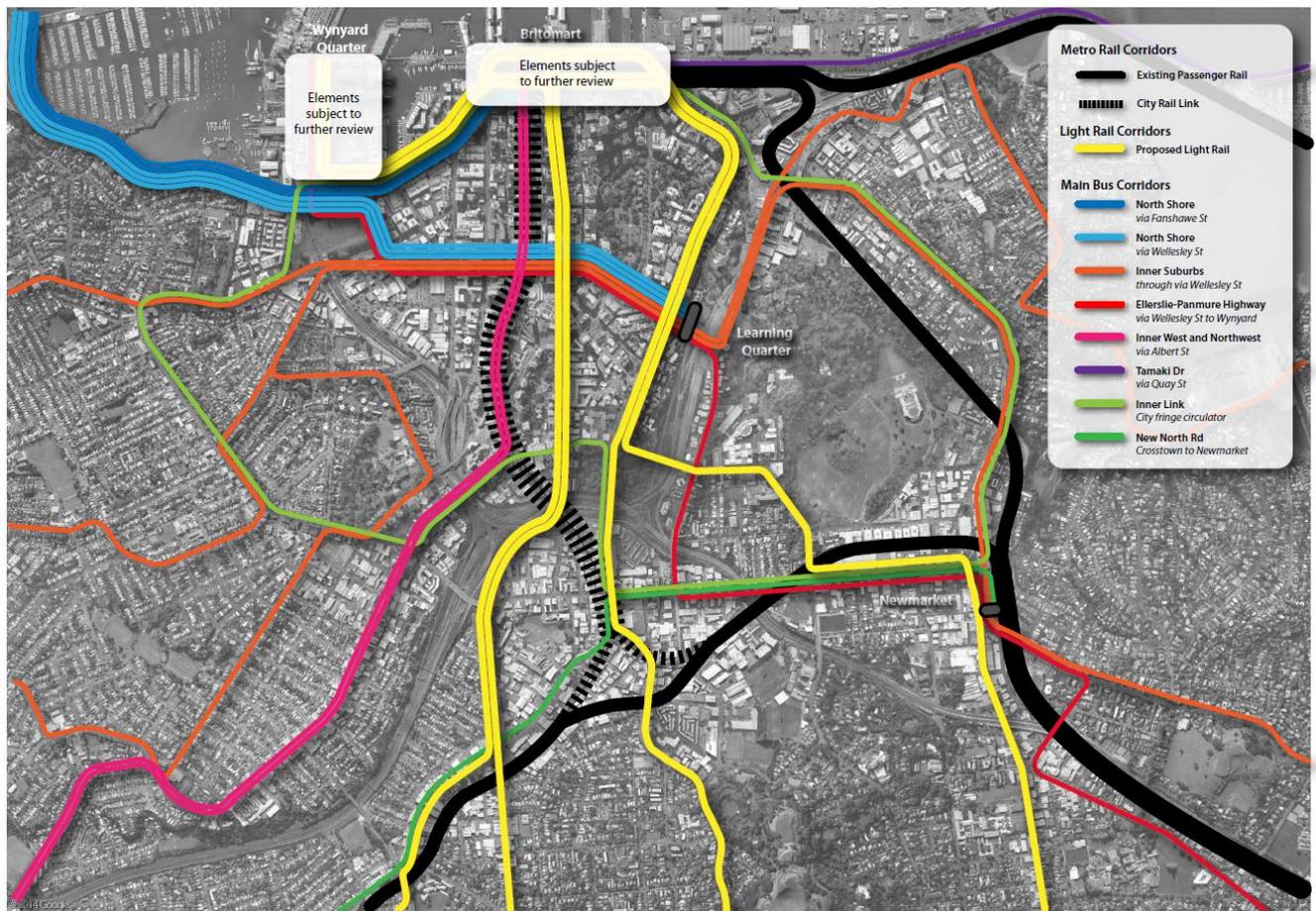
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LRT – OVERVIEW

As part of an integrated transport network, LRT in Auckland will be a step change for the city

Light Rail Transit (LRT) will help relieve congestion, improve amenity and unlock the city’s development potential – it is the only long-term solution to effectively address bus congestion and capacity issues in Auckland’s city centre. The potential LRT network, shown below, is made up of four lines on Dominion, Sandringham, Mt Eden and Manukau Roads, converging into two spines in the city centre – along Queen Street and Symonds Street.



Potential LRT network (shown in yellow)



Artist's impression of LRT in Daldy Street, Wynyard Quarter

LRT – OVERVIEW

What is LRT?

LRT is a public transport system similar to a tramway, but operating primarily along exclusive rights-of-way, with less frequent stops, higher capacity and higher average speeds than local bus services.

Internationally LRT has been a catalyst for urban development and economic growth.

With its significant transport, amenity and wider economic benefits, LRT is a growing mode.

Worldwide 60 LRT networks are under construction and another 200 are planned

There are about 400 cities with LRT currently operational including Sydney, Melbourne, Adelaide, Gold Coast and LRT is currently at tender stage in Canberra.

What are the benefits?

The LRT network in Auckland has a strong focus on developing a reliable network with seamless, convenient interchanges supported by integrated customer information and way-finding. LRT offers significant benefits for commuters, residents, tourists, pedestrians and other road users, including:

- Increased capacity (450 people per vehicle)
- Faster, simpler and more reliable services
- Accelerating urban development
- Reduced operating costs
- Reduced congestion
- Increased productivity and economic growth
- Safety benefits
- Improved pedestrian and urban amenity
- Environmental and health benefits



Artist's impression of LRT along Queen Street

LRT – PROBLEMS, OBJECTIVES AND BENEFITS

Auckland’s transport challenge

Over the next 30 years, the population of Auckland is forecast to grow by over one million people, including an additional 300,000 employees.

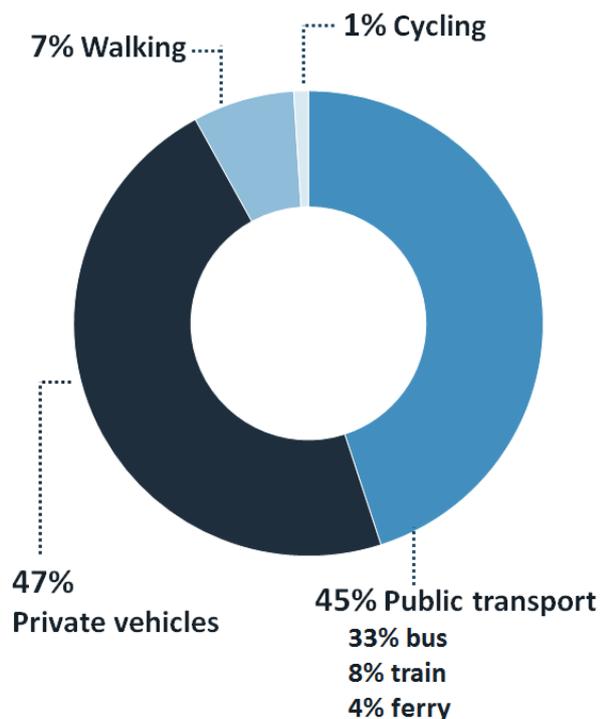
Auckland’s city centre is creating jobs faster than anywhere else in NZ – 20,000 in the last 12 years. One in seven Aucklanders now works there.

Total employees in the city centre and city fringe is forecast to almost double over the next 30 years

These changes will place greater demands on the transport network.

The current transport system does not have sufficient capacity to accommodate the sheer volume of demand that will converge in the city centre on a daily basis.

Current morning peak mode share to the city centre



Bus congestion in Sydney’s city centre

Over the next 30 years the total number of trips made to the city centre in the morning peak will increase by about 85%, from 70,000 to over 130,000.

Public transport trips to the city centre have been growing fast – about 45% of people currently travel to the city centre by public transport, shown in the graph on the left.

With investment such as electric trains, the City Rail Link (CRL) and the New Network, public transport trips around Auckland are forecast to grow even more – from about 70 million trips today to over 230 million trips in 2046.

Currently about 380 buses enter the city centre in the morning peak, with about 120 buses per hour along Fanshawe Street and 140 per hour along Symonds Street. The growing number of public transport trips will see this need to increase to almost 500 buses per hour by 2036.

LRT – PROBLEMS, OBJECTIVES AND BENEFITS

By 2026 Wellesley Street will have 180 buses per hour in the morning peak – the equivalent of one bus every 20 seconds

Key city centre bus corridors are close to or at capacity, resulting in lengthy travel times and poor travel time reliability. A 25% increase in buses alone would be required just to meet the additional demand for travel to the city centre over the next 20 years. The existing city centre transport system cannot accommodate this growth in buses – road and bus terminal capacity is reached at about 400 buses in the city centre.

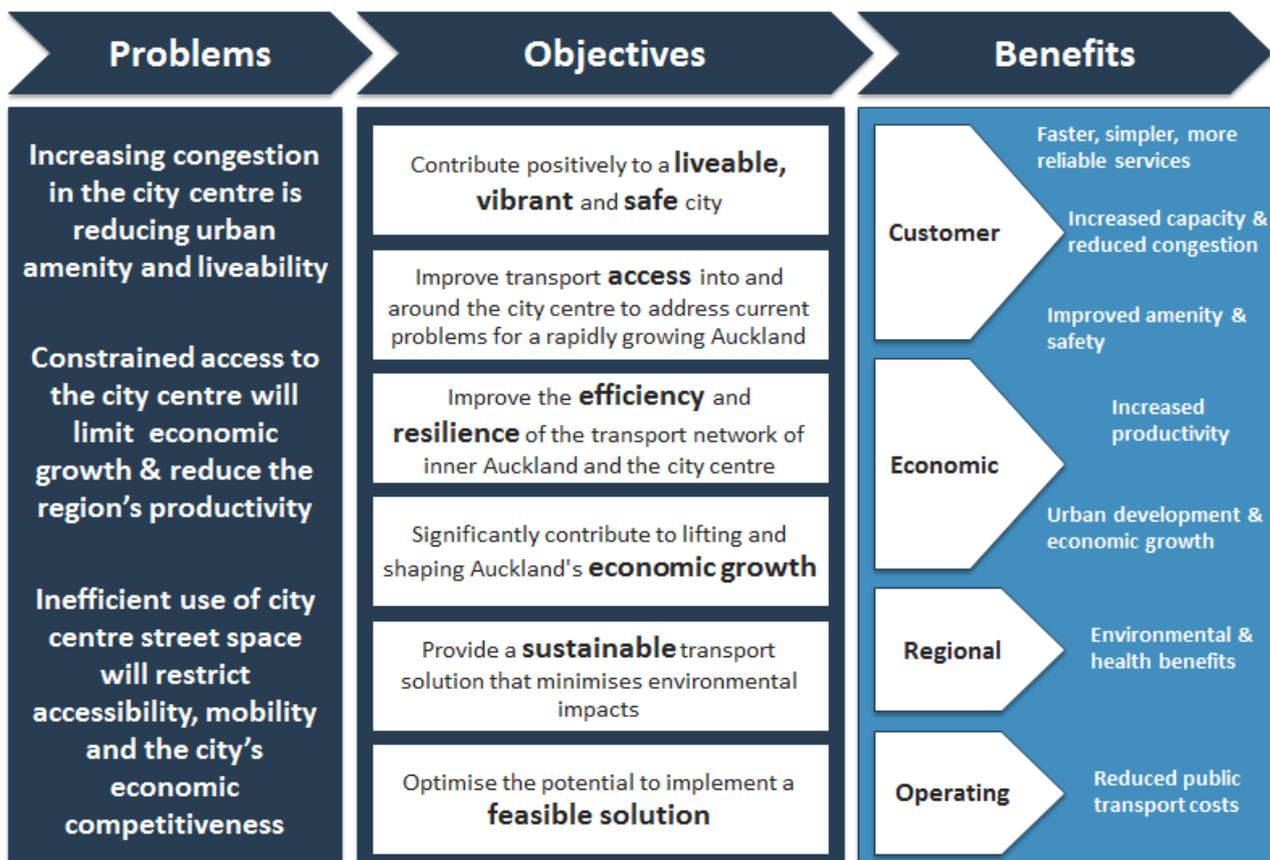
Growth in bus numbers entering the city centre will also impact accessibility to key destinations, pedestrian and urban amenity and ultimately productivity, economic growth and global competitiveness.

A step change in the capacity of the transport system is needed to address these problems and facilitate urban development and economic growth. LRT has been identified as the best option to achieve this.

One LRT vehicle has the capacity to move up to 450 people – by comparison a standard bus can move about 60

In terms of street capacity, 16 LRT vehicles is the equivalent of 65 buses. LRT has the potential to remove over 160 buses from Auckland’s inner city streets by 2036 and allows planned bus improvements on Wellesley Street, termini at Wynyard and the Learning Quarter to be delivered in a spatially compact, efficient way.

The figure below summarises the alignment between the problems, objectives and benefits.



LRT – PROBLEMS, OBJECTIVES AND BENEFITS

Carrying capacity of different modes

Modal characteristics	Bus shared path	Bus lane separate	Busway priority	LRT shared path	LRT priority	Metro rail
	2,500	4,000	6,000	12,000	18,000	20/25,000
Maximum capacity (people/hr)						

EXPECTED TRAVEL TIMES FOR STAGE 1 (QUEEN ST SPINE)

- 6.5 minutes from Britomart to K-Road – *2.4 times faster*
- 6 minutes from Wynyard Quarter to Britomart – *1.6 times faster*
- 12.5 minutes from Wynyard Quarter to K-Road – *2 times faster*



Artist's impression of LRT at Aotea Square, Queen Street

LRT – STRATEGIC CONTEXT

Strategic Alignment

The City Centre Future Access Study 2012 (CCFAS) identified the need for the CRL and surface bus improvements. The study showed that Auckland’s growth will outstrip its road capacity and maximising rail (CRL) is an essential part of an integrated access solution.

However, even with CRL and planned bus improvements there will still be significant access issues to the city centre by 2021. The need for LRT in Auckland was identified through an objective assessment of options in the follow up study.

The following documents provide the strategic context to the city centre:

- Auckland Plan
- Waterfront Plan
- City Centre Masterplan
- Downtown Framework
- Integrated Transport Programme
- Regional Public Transport Plan

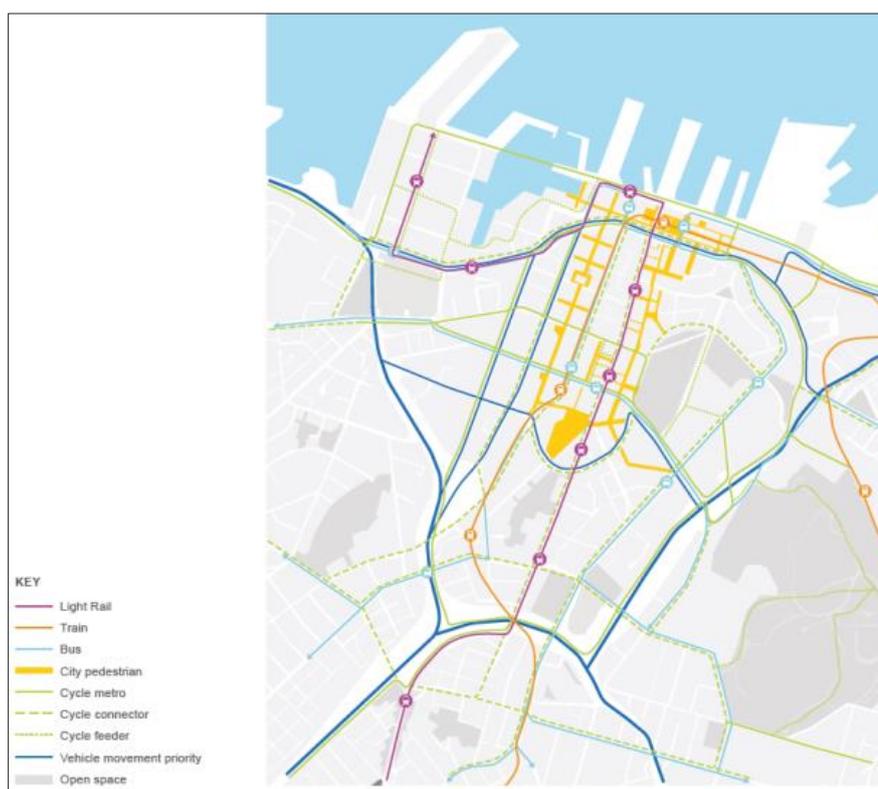
The introduction of LRT will provide significant benefits that support the intent of these documents.

An integrated transport network

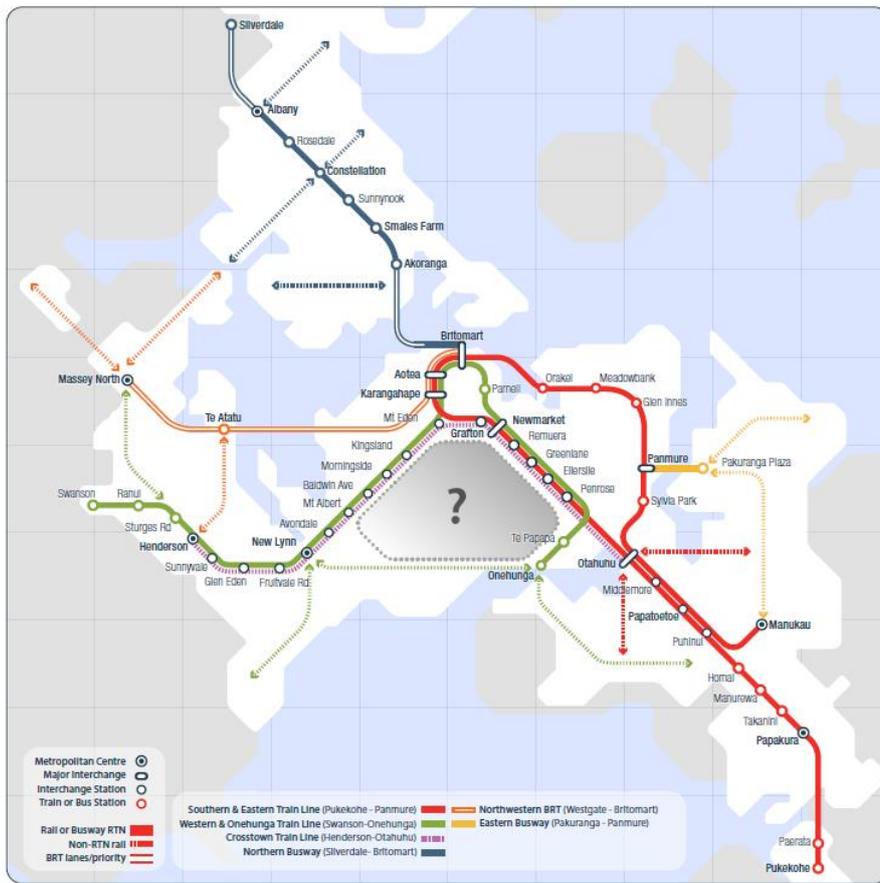
While the CRL will address regional needs it will not provide the total answer – CRL does not address access from the north, the central and southern isthmus or University and Wynyard Quarter. Buses from non-rail served areas will create significant congestion and affect economic growth.

An LRT network serving the central isthmus has been identified as the optimal way to overcome the constraints and support economic growth

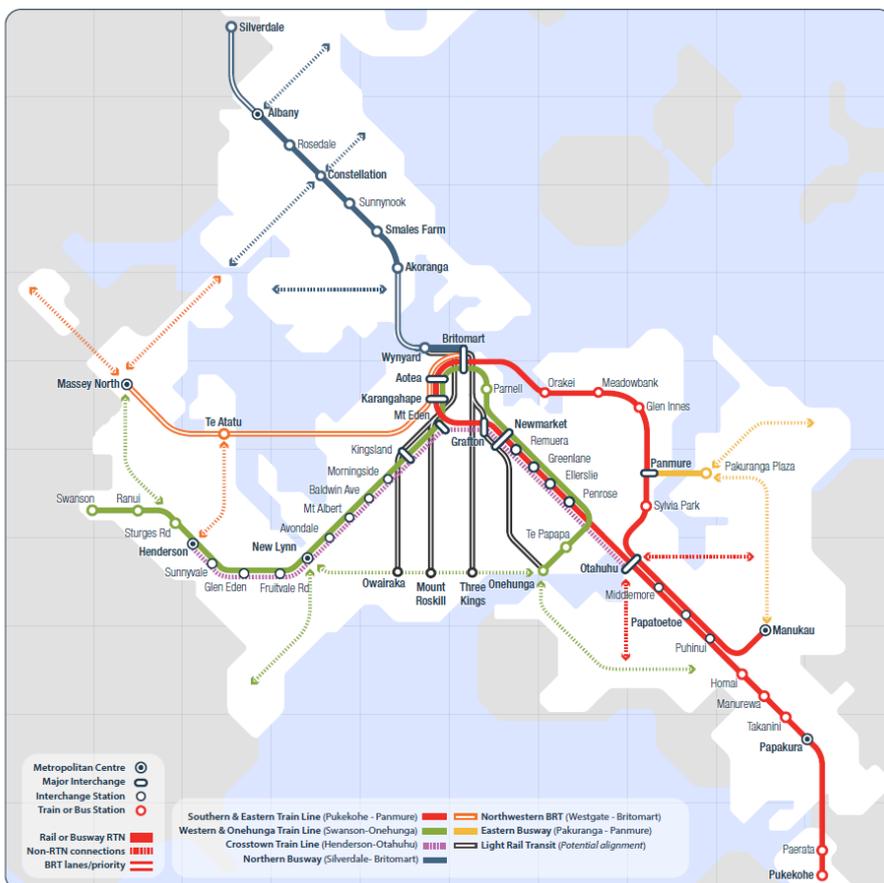
Various initiatives are underway to revitalise and strengthen the city centre. LRT will integrate easily with existing traffic and pedestrian spaces, and will be supported by seamless interchanges with other modes. The figure below shows LRT as part of an integrated transport network, complementing metro rail, bus and ferry services to provide an integrated access solution to and within the city centre.



LRT – STRATEGIC CONTEXT



The current Rapid Transit Network plan has a large gap in the network encompassing the central isthmus – the city centre being the dominant destination



Metro rail – CRL – links what exists
A regional solution to optimise rail for an efficient transport network

LRT – a new solution
Optimises transport within the road network

LRT – STRATEGIC CONTEXT

Alternatives considered

As summarised above, previous studies have shown that even with CRL and planned bus improvements, Auckland will experience significant issues with access to the city centre by 2021.

A 2014 study involved a comprehensive review of urban arterials and city centre corridors, focusing on those with significant public transport patronage and connections to key destinations – such as Dominion Road, Symonds Street and Wellesley Street.

Different combinations of corridors and modes were developed.

The following modal options were assessed:

- LRT
- Bus Rapid Transit (BRT)
- Metro rail extensions
- High capacity bus
- Combinations of the above

The table below shows the relative performance of the options against the study assessment criteria.

An LRT solution was identified as the best solution to address access issues to the city centre, performing strongly against the objectives of the study – particularly in terms of accessibility, urban amenity and supporting economic growth.

Outcomes of the study also showed that LRT is the only solution to effectively address bus congestion and capacity issues in the city centre.

Criteria	LRT	BRT	High capacity bus	Combination - Metro rail / LRT
Improve city centre accessibility	●	●	●	●
Improve city centre mobility	●	●	●	●
Improve regional movement & connectivity	●	●	●	●
Support economic growth & productivity	●	●	●	●
Environmental impacts	●	●	●	●
Support the built environment	●	●	●	●

Negative effects	●	●	●	●	●	Positive effects
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Artist's impression of LRT along Dominion Road

LRT – NETWORK STAGING OVERVIEW

Stage 1 forms the platform of a wider LRT network in Auckland

The initial LRT network is made up of four lines on Dominion, Sandringham, Mt Eden and Manukau Roads, converging into two spines in the city centre – along Queen Street and Symonds Street. The Queen Street spine (under investigation) is fed by Sandringham and Dominion lines; the Symonds Street spine is fed by Mt Eden and Manukau lines. As Symonds Street is Auckland’s busiest bus corridor and congested in the peak, there are no practical options to redistribute buses and construct LRT on Symonds Street first. The Queen Street spine needs to be implemented before Symonds Street can go ahead.

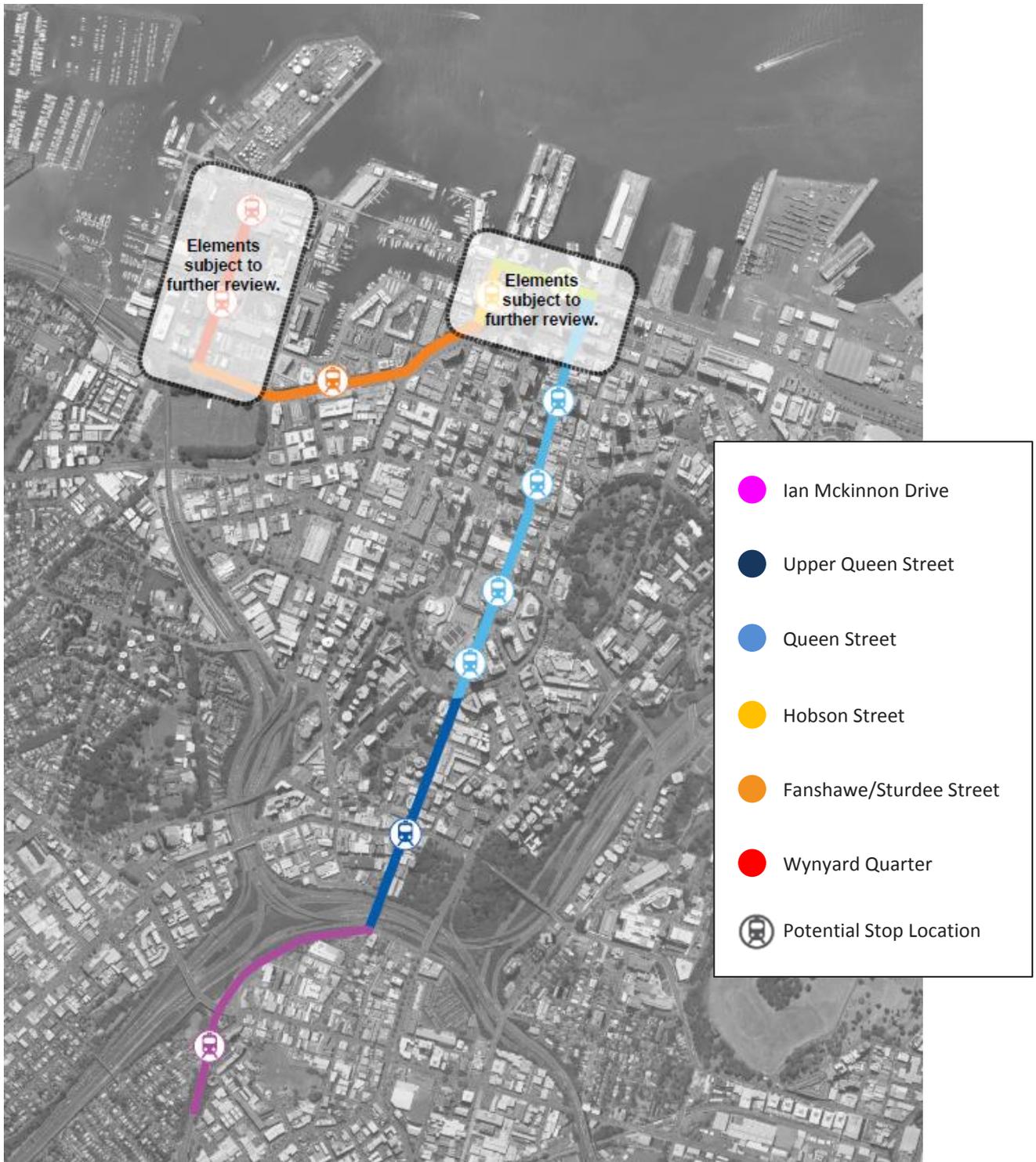
Based on current analysis and projections, Dominion Road reaches bus corridor capacity in 2019, shortly followed by Sandringham Road. By implementing the Dominion and Sandringham LRT lines, the number of buses on Symonds Street will reduce to acceptable levels to enable the construction of LRT. The Queen Street spine is required first to serve the two feeder lines, being mindful of other city centre initiatives.



Initial LRT network in Auckland under investigation

LRT – STAGE 1 OVERVIEW

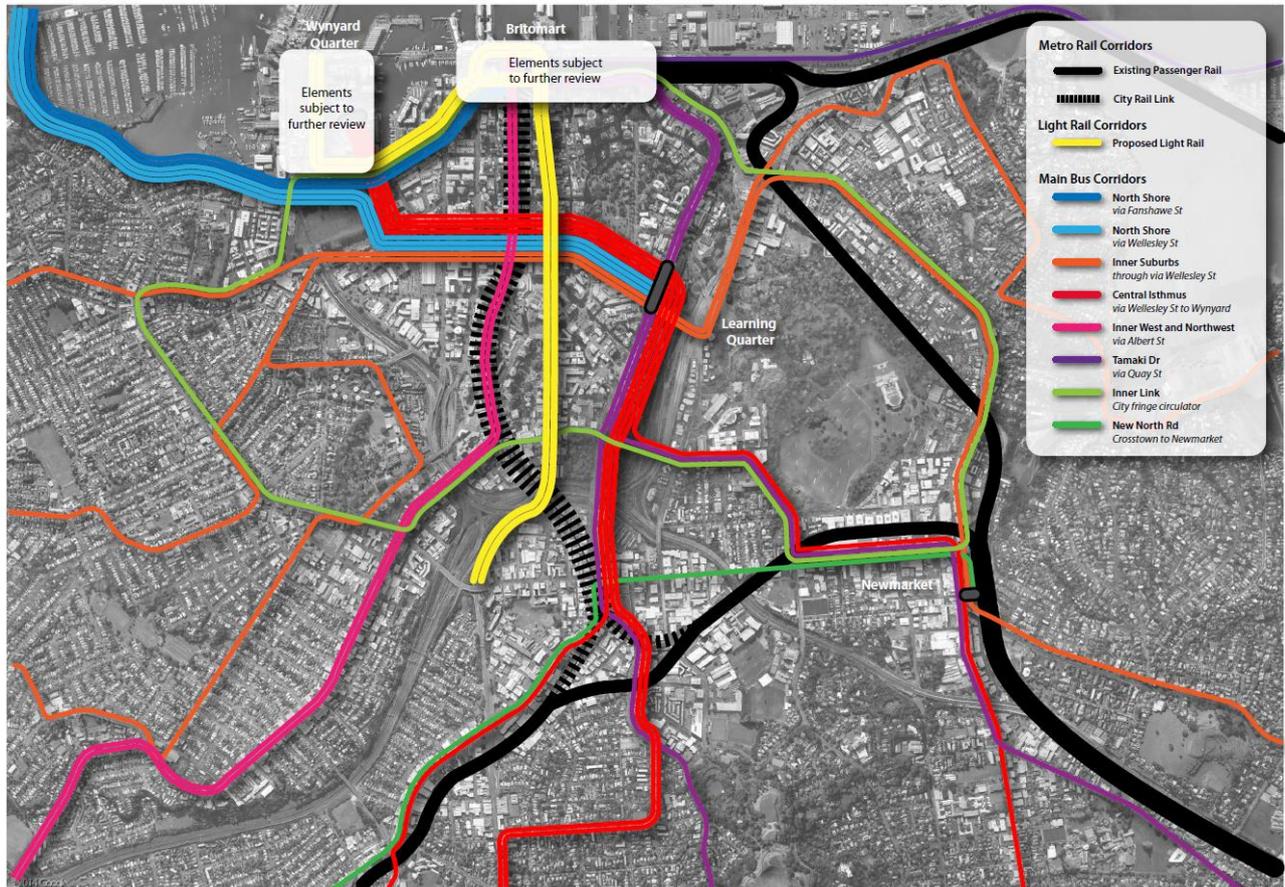
Stage 1 comprises the design and construction of the Upper Queen Street to Downtown spine



Proposed route for Stage 1 of Auckland's LRT network. The connection to Wynyard Quarter is currently being assessed against the benefits of extending southward to Kingsland station.

LRT – STAGE 1 OVERVIEW

Stage 1, shown in yellow below, illustrates LRT integrating with bus, ferry and metro rail services. The extent of Stage 1 is under review and may include a spur off Dominion Road to Kingsland Station as a higher priority than a connection to Wynyard Quarter.



LRT Stage 1 (shown in yellow)

STAGE 1 – Key facts and features

- **Five kilometre** route along a dedicated corridor with a **12.5 minute journey time**
- **10 stops** along the route
- **High frequency** services – turn up and go
- Travel times **twice as fast** as current bus services from K-Road to Wynyard
- Service **reliability close to 100%** within 2 to 3 minutes of timetable
- Very **high catchments** by world standards – about 15,000 residents and 48,000 job places within a 500m walk of an LRT stop
- Major **interchanges** with ferry, metro rail and bus services at Wellesley Street/Queen Street and in the Downtown vicinity
- A fleet of **six electric-powered LRT Vehicles** with air conditioning and accessible low-floor design with **capacity for up to 450 people each**
- **Pedestrian zones** proposed in the Downtown vicinity and Customs Street to Wellesley Street
- **Patronage uplift** of up to 30% from current bus patronage

LRT – STAGE 1 OVERVIEW

Design and physical features

The main spine of the route, from Upper Queen Street to Downtown, will comprise a civic boulevard with pedestrian and LRT priority and dedicated cycleways provided where possible.

Stage 1 will be segregated from general traffic

Stop locations along the route are designed to support key destinations, passenger catchments and maximise interchange opportunities with bus, ferry and metro rail.

The proposed design and physical features of Stage 1 (under investigation) are summarised in the table below.



Artist's impression of an LRT stop and platform

Route	Stage 1 is under investigation and comprises the Queen St spine from Upper Queen Street to the Downtown vicinity, with potential connections to Wynyard Quarter or Kingsland Station.
Alignment	Median alignment (centre of the road) with side platform stops is proposed throughout most of the route. Median alignment is the simplest and fastest solution for LRT operations, as it: <ul style="list-style-type: none"> – Reduces interaction with cyclists and pedestrians – Allows for higher operating speeds – Eliminates the impact of road traffic decelerating to turn left – Minimises congestion and parking impacts.
Stops	The 10 proposed stops will be similar to the City Link bus route: <ul style="list-style-type: none"> – Daldy Street North (Wynyard terminus) – Daldy Street South / Fanshawe Street – Fanshawe Street (between Halsey and Nelson Streets) – Lower Hobson Street – Downtown – Vulcan Lane – Victoria Street – Wellesley Street – Mayoral Drive / Town Hall – K-Road Stops will be located to support easy interchange with bus and metro rail services.
Interchanges	Major points of interchange with bus and metro rail services are proposed at Wellesley Street / Queen Street, Downtown and potentially Kingsland station on the Western line. Secondary points of interchange are proposed at Fanshawe / Daldy Street and K-Road.
Signalling	The main spine of the route, from Upper Queen Street to Downtown will comprise LRT and pedestrian signal priority to ensure fast and punctual LRT services. Changes at intersections will be designed to minimise impacts on other road users and pedestrians.
Depot	A Stage 1 depot will be required for up to five years for maintenance, stabling and cleaning of the LRT vehicle fleet.
Vehicles	Proposed fleet of six LRT vehicles up to about 66m long – with five in service and one spare.

LRT – STAGE 2 OVERVIEW

Stage 2 extends the first stage down Dominion Road to Mt Roskill

From Mt Roskill, Stage 2 turns onto Denbigh Avenue and Stoddard Road, terminating at the proposed depot near the Sandringham Road / Stoddard Road intersection.

STAGE 2 – Key facts and features

- **Seven kilometre** route along a dedicated corridor
- **12 proposed stops** along the route
- **High frequency** services – turn up and go
- **Significant improvements** in travel times expected
- Service **reliability close to 100%** within 2 to 3 minutes of timetable - achieved through segregated running and signal priority
- Very **high catchments** – about 14,000 residents within a 500m walk of an LRT stop
- **Opportunity interchanges** at New North Road/Dominion Road for New North Road bus services to LRT, potentially Mt Eden metro rail station connectivity
- **Major point of interchange** near the end of the Stage 2 line
- **Proposed new depot** built on Stoddard Road, west of Sandringham Road
- A fleet of **ten electric-powered LRT Vehicles** with air conditioning and accessible low-floor design with **capacity for up to 450 people each**



Artist's impression of LRT along Dominion Road

LRT – STAGE 2 OVERVIEW

Design and physical features

Stage 2 is currently envisaged with LRT lanes on a raised central median that physically prevents traffic from driving over, except at major intersections.

Stage 2 achieves significant improvements in reliability through segregated running and signal priority



Artist's impression of a typical raised side platform

Similar to Stage 1, stop locations are designed to support key destinations, passenger catchments and maximise interchange opportunities. Dedicated cycleways and pedestrian zones will be provided where possible.

The proposed design and physical features of Stage 2 are summarised in the table below.

Route	Stage 2 extends the first stage down Dominion Road to Mt Roskill (Denbigh Avenue) where it turns onto Denbigh Avenue and Stoddard Road, terminating at the proposed depot near the Sandringham Road / Stoddard Road intersection.
Alignment	The current proposed alignment is a median alignment (centre of the road) with side platform stops. Central island platforms are envisaged, adjacent to main intersections and accessed by signalised crossings.
Stops	<p>The 12 proposed stops are envisaged at:</p> <ul style="list-style-type: none"> - Piwakawaka Street - Dominion Road / New North Road - View Road - Valley Road - Elizabeth Street - Balmoral Road - Kensington Avenue - Kings Road / Hazel Avenue - Mt Roskill shops - Denbigh Avenue - Stoddard Road - Sandringham / Stoddard Road <p>Stops will be located to support easy interchange with bus and metro rail services.</p>
Interchanges	<p>Major point of interchange with Mt Roskill bus services and LRT services near the end of the Stage 2 line.</p> <p>Opportunity interchange at New North Road / Dominion Road for New North Road bus services to LRT, potentially also Mt Eden metro rail station connectivity.</p>
Signalling	LRT signal priority will be given to ensure fast and punctual LRT services. Changes at intersections will be designed to minimise impacts on other road users and pedestrians.
Depot	A Stage 2 depot is proposed to be built on Stoddard Road (west of Sandringham Road) for maintenance, stabling and cleaning of the LRT vehicle fleet.
Vehicles	Proposed fleet of ten LRT vehicles up to about 66m long.

LRT – STAGE 3 OVERVIEW

Stage 3 completes the Sandringham Road line, joining the Dominion Road line at New North Road

It is proposed to travel along New North Road, turning down Sandringham Road (past Eden Park) and then along the length of Sandringham Road, turning onto Stoddard Road and into the proposed Stage 2 depot.

STAGE 3 – Key facts and features

- **Five kilometre** route along a dedicated corridor
- **Seven proposed stops** along the route
- **High frequency** services – turn up and go
- **Significant improvements** in travel times expected
- Service **reliability close to 100%** within 2 to 3 minutes of timetable - achieved through segregated running and signal priority
- Very **high catchments** – about 11,000 residents within a 500m walk of an LRT stop
- **Opportunity interchange** at Kingsland metro rail station
- **Major point of interchange** at Stoddard Road/Sandringham Road for bus-LRT interchange
- **Utilises the Stage 2 depot** at Stoddard Road
- A fleet of **15 electric-powered LRT Vehicles** with air conditioning and accessible low-floor design with **capacity for up to 450 people each**

Route	Stage 3 completes the Sandringham Road line, leaving the Dominion Road line at New North Road. It travels along New North Road, turning down Sandringham Road (past Eden Park) and then travels down the length of Sandringham Road, turning onto Stoddard Road and into the proposed depot.
Alignment	The current proposed alignment is a median alignment (centre of the road) with side platform stops. Central island platforms are envisaged, adjacent to main intersections and accessed by signalised crossings.
Stops	<p>The seven proposed stops are envisaged at:</p> <ul style="list-style-type: none"> – New North Road / George Street – Eden Park (near Kingsland rail station) – Burnley Terrace – Balmoral Road – Halesowen Avenue – Mt Albert Road – Wesley Community Centre (O'Donnell Avenue) <p>Stops will be located to support easy interchange with bus and metro rail services.</p>
Interchanges	Major point of interchange at Stoddard Road / Sandringham Road for interchange of bus and LRT services (currently the Sandringham Road bus service termination point). Opportunity interchange at Kingsland metro rail station.
Signalling	LRT signal priority will be given to ensure fast and punctual LRT services. Changes at intersections will be designed to minimise impacts on other road users and pedestrians.
Depot	Stage 3 is proposed to utilise the Stage 2 depot at Stoddard Road.
Vehicles	Proposed fleet of 15 LRT vehicles up to about 66m long.

LRT CASE STUDY – AUSTRALIA

LRT IN AUSTRALIA

LRT is a rapidly growing mode in Australia - there are a number of LRT projects in Australia at various stages from conception to completion. A selection of projects which have similarities to the size and scale of the potential Auckland LRT network are highlighted in the table below.

Initiative	Status	Dates	Vehicles	Overview
Gold Coast	Operational	Construction began 2010, Open 2014	14 vehicles 43.5m long	<ul style="list-style-type: none"> • Cost - \$1.6b • \$1.3b economic benefits
Sydney inner west extension	Operational	Construction began 2012, Open 2014	12 additional vehicles	<ul style="list-style-type: none"> • Cost - \$176m • Improved connectivity • Enhanced amenity • Sustainable travel options
Sydney CBD and SE	Contract awarded	Planned to open in 2019	67 coupled pairs	<ul style="list-style-type: none"> • Cost - \$2.1b (projected) • \$4b economic benefits • 10,000 jobs created • 15% increase in capacity on day one, rising to 50%
Canberra Capital Metro	Tender	EOI Oct 2014 Construction in 2016	14 vehicles 33m (provisional)	<ul style="list-style-type: none"> • Cost - \$0.8b (projected) • \$1b economic benefits • 3,000 construction jobs • 50,000 jobs longer term

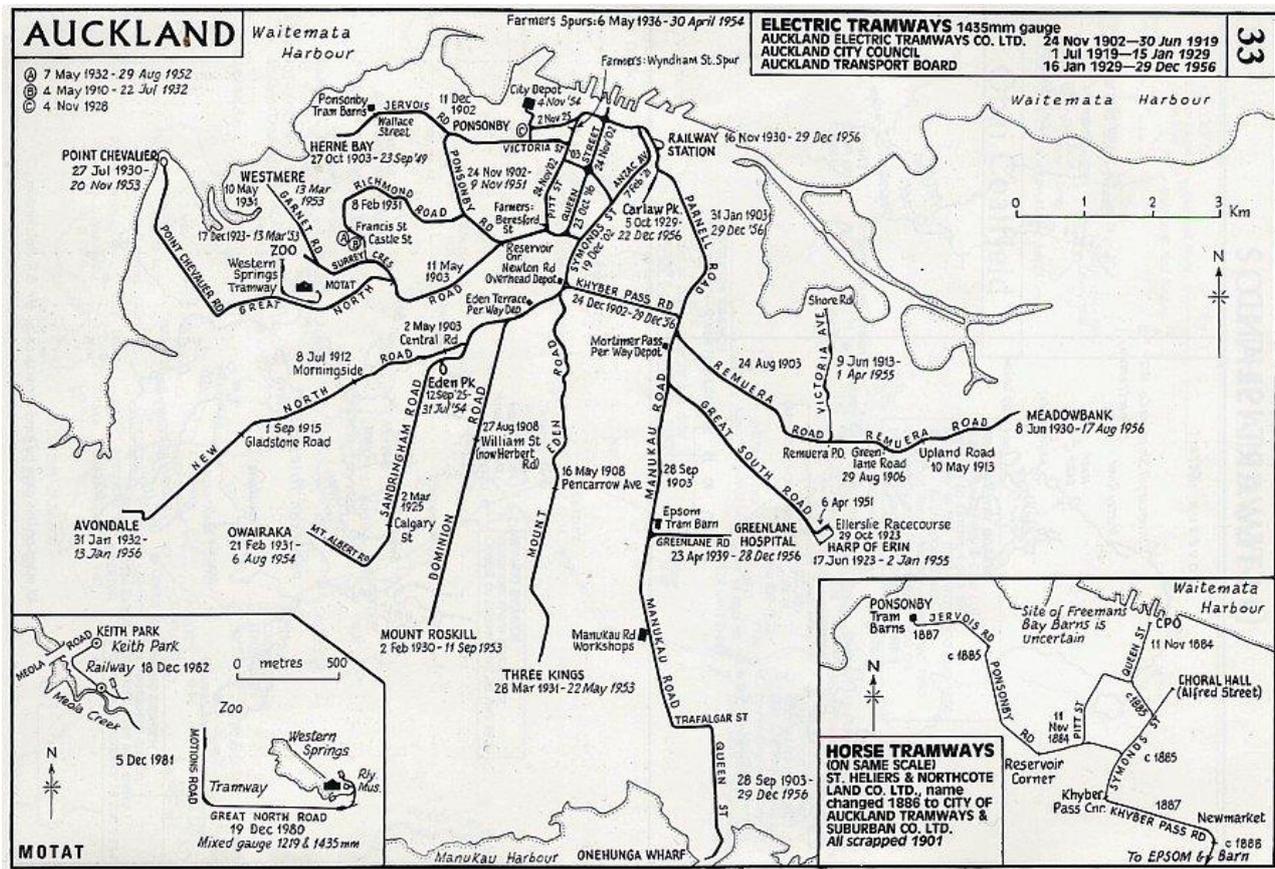
G:link - Gold Coast LRT

As noted above, the Gold Coast LRT is projected to provide \$1.3b in economic benefits. As the first project of this nature in Australia, the City of Gold Coast will monitor and measure the benefits of LRT; base-lining for benefit realisation was undertaken in 2013.

The City of Gold Coast also anticipates a broad range of qualitative benefits that will not be fully captured through cost benefit analysis, including;

- Improved access to educational, service, retail and leisure facilities
- Deterring drivers from 'rat running' on tertiary roads, thereby increasing suburban amenity and reducing accident rates
- Better environmental outcomes, including reduced greenhouse gas emissions
- Encouraging concentration of commercial activity, providing agglomeration benefits
- Enhancing the image of the Gold Coast, leading to increased tourism activity
- Reduced reliance on cars and car parking
- Managing natural disasters/ crisis situations through increasing capacity in the transport network





Historic tram network in Auckland

For more information visit:
<https://at.govt.nz/projects-roadworks/light-rail-network/>