

Suspended Light Rail Presentation

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November 2019



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Topic	Content
Purpose of visit	To seek WCC support for LGWM to consider elevated SAFEGE type light rail as a mass transit solution.
What is suspended light rail and advantages	<p>A monorail is a railway in which the track consists of a single rail or a beam. There are two main types:</p> <ul style="list-style-type: none"> • The most common type is the straddle-beam where the train straddles a steel or reinforced concrete beam. • The SAFEGE system with cars suspended beneath a single beam which the rubber wheels run inside of. <p>To provide mass transit access through existing densely developed areas, Japan has constructed many monorails over roads due to:</p> <ul style="list-style-type: none"> • land scarcity for rail transit, • increase in traffic and congestion, and • narrow roads
Rationale for inclusion in LGWM	<p>LGWM have only considered ground level mass transit solutions of bus rapid transit (BRT) or light rail (LRT), a variation on the existing and escalating competition for access to very limited ground-level road space.</p> <p>As a consequence the resulting mass transit proposals:</p> <ul style="list-style-type: none"> • don't run near the golden mile where people want to go, • require considerable loss of road space and parking, • are limited to surrounding road speed, • pose dangers to people and cyclists crossing the tracks, • require relocation of underground services along the whole route, and • require tunnels <p>A SAFEGE suspended railway would suit Wellington because:</p> <ul style="list-style-type: none"> • Kamakura (a suburb 40 kilometres southwest of Tokyo) which is very similar to Wellington with a population of 174,314, steep hills, narrow congested streets and valleys, built a SAFEGE monorail to ease congestion, 50 years ago from a coastal suburb to the main station 6.6km away. Journey time is 14mins. • Another SAFEGE in Chiba, covers 13 stations along a 12km route. It takes 20 minutes to take the full journey. • Expected construction time of only two years • Simplified line switching unlike straddle monorails where the whole beam has to move. <p>This proposal is timely given Auckland's late consideration of elevated light rail track for the planned shared route down Dominion Rd due to impact on neighbouring businesses and other road users.</p>


Topic	Content
<p>Kamakura SAFEGE Pictures</p>	<p>The content consists of five photographs illustrating the Kamakura Light Rail system. The top row features three images: a train crossing a street, a street view with a support pillar, and a perspective view of the elevated tracks. The bottom row features two images: a panoramic view of a residential town on a hillside and a close-up of a train on a curved elevated track. The text '湘南町屋駅' (Shonan-Chiyo Station) is visible in the bottom-right image.</p>

Topic	Content	Suspended Rail Facts	LRT Facts
Daily Operation	Operating speed	75-80kph	Limited to surrounding road speeds and slowing for people crossing its tracks or shared roads with other vehicles
	Capacity	Similar to LRT with 228 people seated in 3 car train or 496 standing	
	Suited to the Golden mile.	Yes. Could continue running even if traffic slowed or at standstill below.	Not practical with narrow streets shared with other road users and pedestrians; accidents/fires bring traffic to standstill even now.
	Requires loss of road space	No, and 2-way traffic requires no duplication of track.	Yes; and 2-way traffic in some areas requires loss of twice as much road space for track.
	Significant loss of parking on route	One car park every 35 meters	Yes
	Noise	Has rubber tyres so is quiet	Metal wheels on metal rails and vibrations
	Gradients	Can go up and down 10% gradients enabling access to larger areas	Limited to 6%
	Safety issues	Very rare, though any prolonged power outage requires plan for Pax to disembark.	Yes - risk on track to pedestrians and cyclists where they cross track.
	Major disruption to existing streets	None	Significant disruption to Newtown's Riddiford street and requires Daniel St to be made one way.
	Continuity of service issues	Negligible. Rare power outages would not disrupt street traffic.	Significant risk, regularly witnessed, when routes are blocked by traffic accidents, fire callouts, maintenance, and planned events.
Switch lines	Yes - doesn't require track to move like straddle monorails	Yes	

Topic	Content	Suspended Rail Facts	LRT Facts
Construction	Construction time	Short - <ul style="list-style-type: none"> • Expected two years • No tunnels and only tower bases and elevated stations 	Long: <ul style="list-style-type: none"> • Requires two tunnels (several years) • Requires major relocation of underground services. • whole route has to be constructed including power supply
	Disruption during construction	Minimal construction disruption to business with offsite construction except for stations and tower bases	Major disruption along whole route which will necessitate WCC funding business for loss as per Auckland
	Cost	Cheaper as no tunnels. Less impact on underground services with careful placement of support columns. NB Columns can be kinked to avoid services	Expensive as requires: <ul style="list-style-type: none"> • Two tunnels • Overhead lines • Relocation of underground services along the entire route, e.g. sewerage, water, power, telecommunications.
	Provides multiple route options to destinations	Yes, opens multiple route options to future destinations as can travel: <ul style="list-style-type: none"> • Over undeveloped land • Across steep hill sides • Across obstacles • Up/down steeper gradients 	Limited route options available as requires flat formed track.
Safety	The implementation of the Health and Safety legislation means GWRC cannot opt out of risk liabilities by engaging service providers.	There's no risk of accidents with people, cycles, etc.	Significant Risk - There's plenty of evidence of overseas accidents involving pedestrians and cyclists crossing the tracks not to mention vehicle accidents with LRT that also block the route.

Topic	Content	Suspended Rail Facts	LRT Facts
Future potential	Ability to service other destinations	Can travel over steep undeveloped land so could reach northern suburbs such as Woodridge, Newlands and Churton park via routes where roads do not exist.	Limited access as requires formed track that will use limited road or parking space if wants to service Island Bay and Karori
	Even shorter journey times	Yes – It is practical to build direct lines to destinations to reduce journey times because it is faster, cheaper and doesn't require a formed trackway.	Not practical due to limited ground access and requirement for longer routes with more stations to attract more commuters to justify the high cost.
Stations	Station design and function	<ul style="list-style-type: none"> • More space for station as can span road • Can be located inside major destinations, e.g. hospital • Space for ticketing machines at platform entry point speeding boarding • Lifts for passengers with mobility issues. • Could be tendered out for private investment sponsorship – limited shopping • No congestion conflict with buses when stopping at bus hubs 	<p>Space limited to footpath</p> <p>Creates issues at existing hubs such as Kilbirnie as may have to wait for buses to clear platform before stopping and via versa</p> <p>No ticket machines for platform entry to speed boarding other than prepay.</p> <p>Not able to enter key destinations easily</p> <p>Potential conflict where dedicated cycleways and stations meet to ensure passenger safety.</p>

Kamakura Suspended Light Rail Technical Information

Topic	Content	Suspended Rail Picture
Construction	<p>Guide beam is 1.54m wide and 1.4m tall, and can handle 2-way train traffic.</p> <p>Columns ~ 1.6m wide and max 36.3 meters between columns and 14m tall</p> <p>Minimum curve radius = 50m</p> <p>The Shonan monorail was built by Mitsubishi Heavy Industries.</p> <p>Construction started June 1968 and the line opened March 7, 1970 between Ōfuna and Nishi-Kamakura. The rest of the line opened on July 1, 1971.</p>	

Cars

3 Car Trains

228 people seated in 3 car train or 496 standing

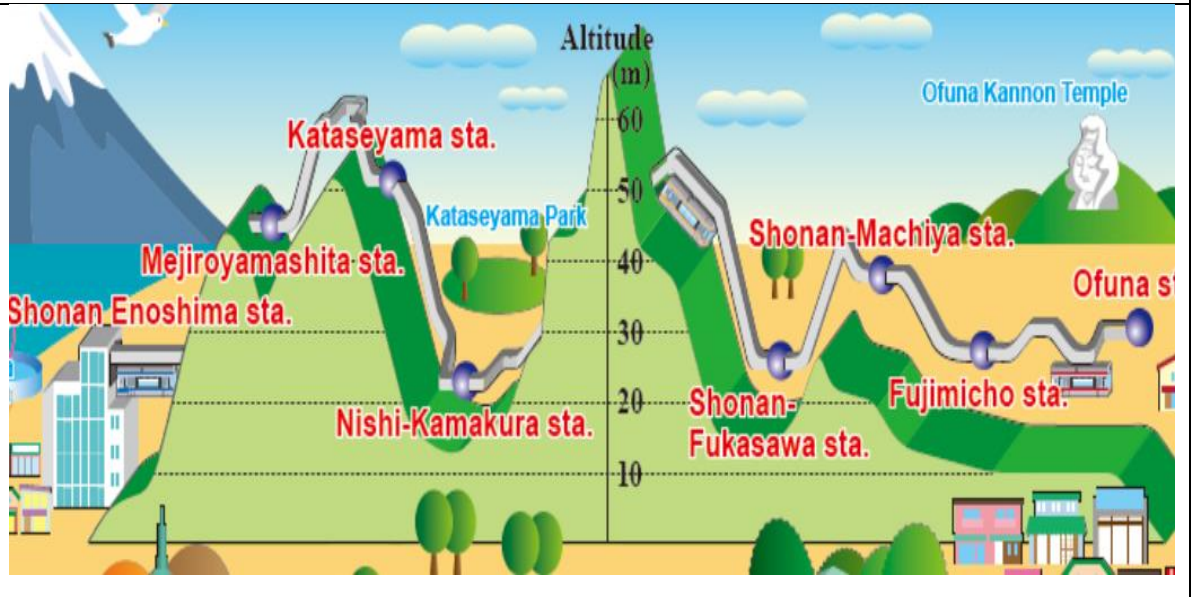
Each individual car L12,750mm × W2,650mm × H3,094mm (1 car)



Continual upgrades of trains. The 5000 series 3-car sets (since 2004). As of July 2016, the line is operated using a fleet of seven three-car aluminium-bodied 5000 series trainsets.



Gradients

Grades – Up to 10%, so Constable St is a good option for access to the Eastern Suburbs instead of using multiple tunnels. Hence, full implementation could be sooner than for light rail.



<p>Lack of Noise</p>	<p>Silent - Has rubber tyres so is quiet (70db at 15 meters – equivalent to normal conversational level)</p>	
<p>Switching</p>	<p>It can switch lines easily as it doesn't require track to move like straddle monorails.</p>	

END

Questions and Answers

Other Information

Shonan Monorail Other

small station over half a street



Ticketing before boarding



Kinked column



Elevated railway entering building at second floor



Chiba Suspended Monorail

Opened in 1988, Chiba Line 2 covers 13 stations along a 12km route. It takes around 20 minutes to take the full journey

The Chiba Urban Monorail was constructed as a response to the worsening traffic situation in Chiba City. The construction of the monorail started in 1987, and its operations began on March 1988. It currently holds the Guinness World Record of the longest suspended monorail train system at 15.2 km.

<https://www.jnto.go.jp/ph/spot-activity/kanto/chiba/chiba-urban-monorail/>



Cost Information for comparison to proposed LGWM cost and sources

Chiba Monorail construction cost

Source <https://onlinelibrary.wiley.com/doi/pdf/10.1002/atr.567022010>
3

Monorail Development and Application In Japan

Currency conversion 1984 exchange rate on 1/7/1984

<https://fxtop.com/en/historical-currency-converter.php?A=1&C1=NZD&C2=USD&DD=01&MM=07&YYYY=1984&B=1&P=&I=1&btnOK=Go%21>

1 USD = NZD\$ 1.577287
1 NZD = USD\$ 0.634
1 USD = JPN\$ 236.9532
1 JPN\$ =USD\$ 0.00422
1 NZD = JPN\$ 150.2283
1 JPN\$ =NZD\$ 0.006657

1NZD\$ in =NZD\$ in
1984 2019 3.16 <https://www.rbnz.govt.nz/monetary-policy/inflation-calculator>

Construction Description	Cost per KM JPN Yen in 1984 \$\$	Cost per KM USD\$ in 1984 \$	Cost per KM NZD\$ in 1984 \$	Chiba Cost per KM NZD\$ in 2019 \$	Total Chiba Cost in 2019 NZD\$		
					For 10km	For 13km	for 15.2km
Guideway includes guideway and station construction costs	\$4,680,000,000	\$19,750,736	\$31,152,581	\$98,442,156	\$984,421,559	\$1,279,748,027	\$1,496,320,770
Non-guideway incl vehicles, maintenance facilities, control systems and power supply	\$4,710,000,000	\$19,877,344	\$31,352,277	\$99,073,195	\$99,073,195	\$99,073,195	\$99,073,195
Total	\$9,390,000,000	\$39,628,080	\$62,504,858	\$197,515,351	\$1,083,494,755	\$1,378,821,223	\$1,595,393,966

Wellington Light Rail expected costs

LGWM - 2017

<https://getwellymoving.co.nz/assets/Uploads/153717A-ITP-REP-001-WMT-Summary-Report-v2-16-10-17-final-PT1.pdf>

\$87M cost per
Km one tunnel
Total \$938M
No distance
stated

**Direct
Comparison**

LGWM – 2019: <https://www.transport.govt.nz/land/lqwm/>

\$2.2 Billion

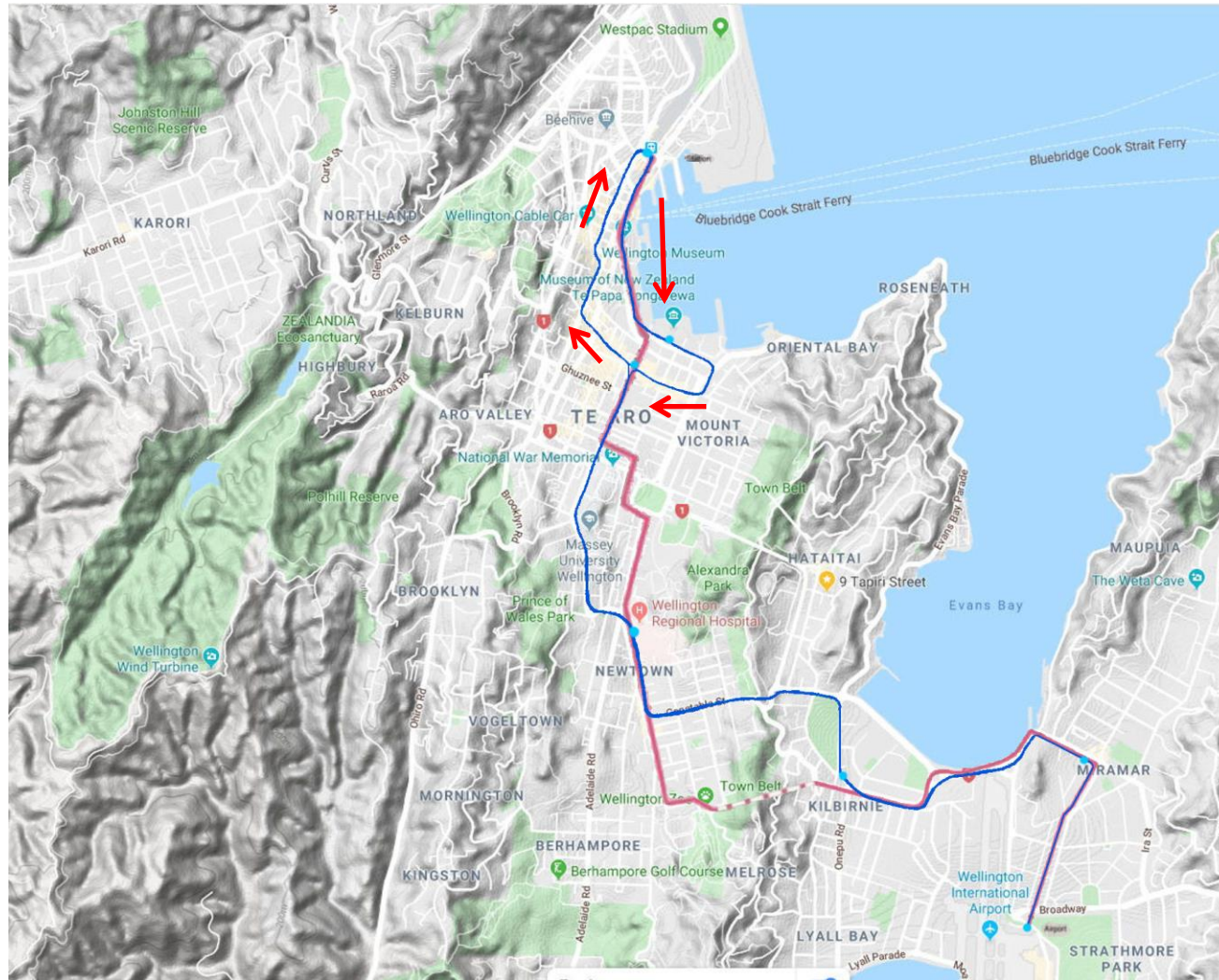
FIT LRT Proposal as at Jan 2019 <https://www.stuff.co.nz/national/109863020/what-is-light-rail-and-how-would-it-work-in-wellington>

\$1 - 1.5billion
for 9.7km
route

Other Information – Comparison of proposed LRT Route in Red with Suspended Rail in Blue

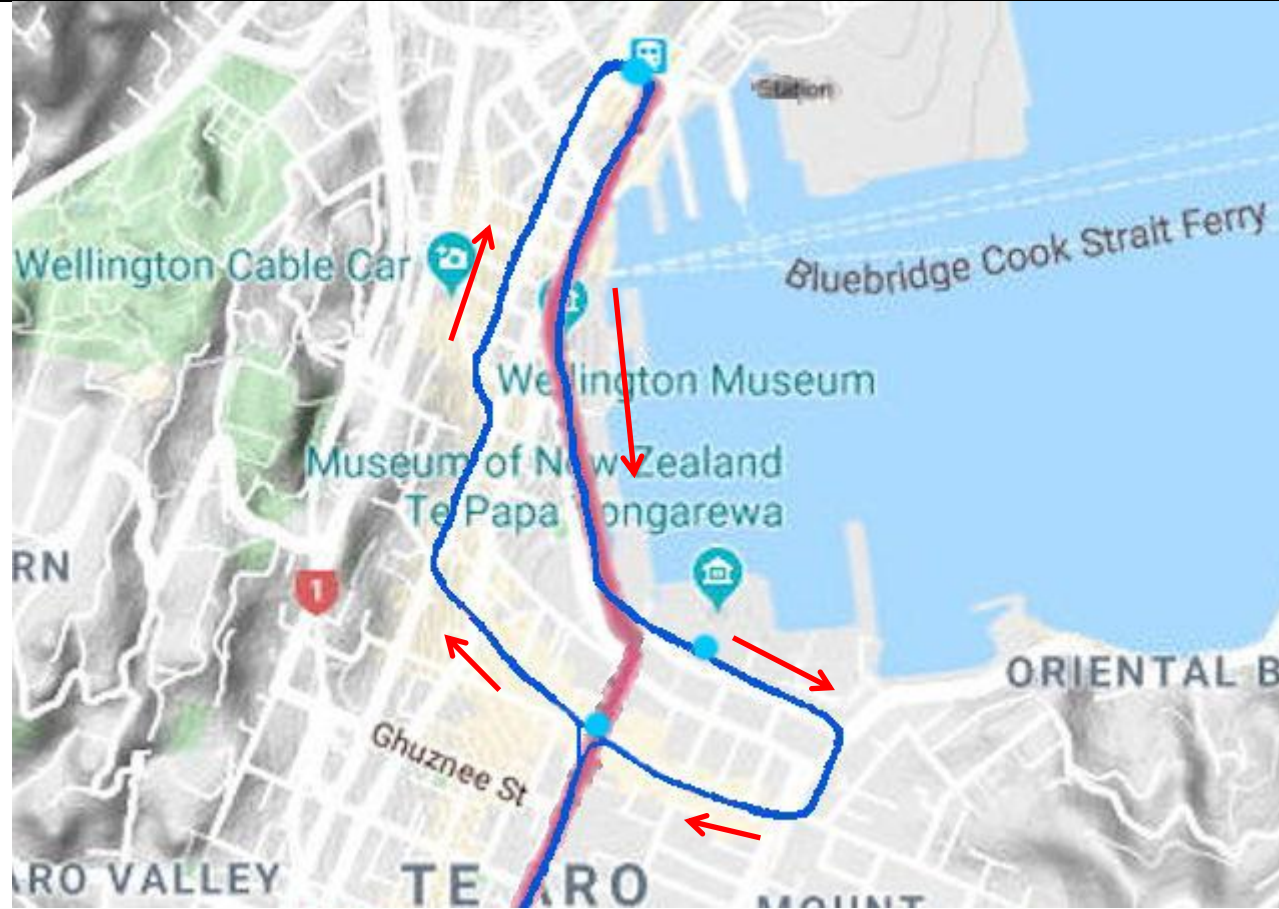
Alternative CBD route consideration

If dual tracks or shared track is not desirable down the golden mile, the track could be one-way down the golden mile, looping back to Taranaki St via the waterfront and Courtney Place.

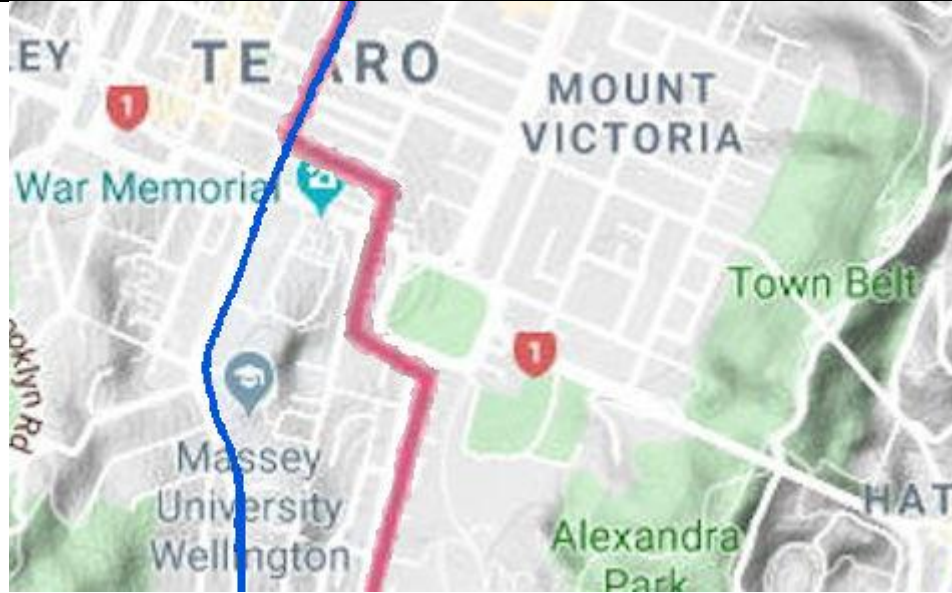


This one-way portion of the track could also form a Tourist sightseeing loop through the CBD.

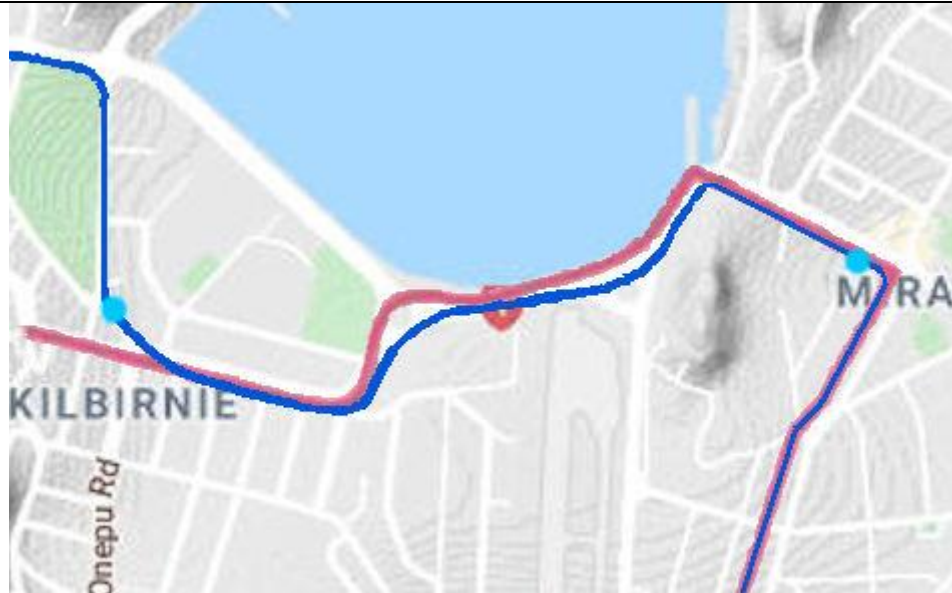
It would NOT need to bypass the key Golden Mile route.



The route could traverse Taranaki and Wallace Streets where the majority of the passengers are located rather than LRT which is restricted to travelling up lower Adelaide Road which is mostly an industrial area. Its construction would bypass/avoid worsening the present pinch point at the Basin Reserve roundabout.



Unlike LRT, the elevated track route would use & enhance the Kilbirnie Bus Hub & not require a tunnel, or have to pass through the heavily congested top portion of Rongotai Road. It would NOT require traffic lights with consequent delays for taxis and other road vehicles at the two Cobham Drive roundabouts, nor the major delays that are inevitable during LRT construction there.



Other Information – Observations on LGWM tender for "Mass Rapid Transit and State Highway IBCs

1. RFT" says the WCC has already decided the route and MRT mode? See excerpts below (pg 94) .
 - *"WCC proposes to adopt the baseline route and Light Rail Transit (LRT) as the recommended route and mode as the basis of engagement given the conclusions of the PBC"*
 - *The LGWM MRT project does not have a preferred position on the modal technology to be used, aside from being a street-running mass transit mode (e.g. LRT, trackless tram or bus-based systems).*
2. It is a major concern that the list of factors that need to be taken into consideration for the IBC (pg 102) omits to explicitly include
 - a. A safety assessment for impact on pedestrians and cyclists along the route. There is a significant risk of deaths and injuries as evidenced with overseas LRT given the route passes through the National War memorial Park and Newtown shops.
 - b. The impact of blockages resulting from vehicle crashes or building incidents such as the Kilbirnie Crescent Dairy fire
3. The tender says (pg 96) MRT in Wellington should have the following characteristic:
"fast and reliable and a genuinely attractive alternative to the car" but omits to say
 - *"fast and reliable and a genuinely attractive alternative to the current bus network" or*
 - *"doesn't impact on the current bus system/timetables encouraging people to use cars".*

This is important because MRT should result in a better service for passengers than the current bus service for people travelling on the MRT route and should not impact other bus users e.g. if the bus service is reduced.
4. The Tender acknowledges issues with LRT, e.g.
 - a. As a result of MRT competing for road space,
 - "traffic diversion is expected to less suitable routes such as around the bays or through Newtown. This issue is expected to become more critical as other modes compete for road space on these routes (i.e. mass transit through Newtown)" (pg 145)
 - "consultant also needs to understand the impacts of displaced traffic from the MRT route" (pg 104)
 - b. It says "technical reviews have highlighted challenges for implementing MRT in Wellington."*Beyond the CBD/central city, engineering solutions are likely to be more expensive and potentially lower patronage potential (due to more dispersed development patterns south and east of Newtown)" (pg 96)*