Newcastle Light Rail

A City Revitalization Project

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Newcastle Australia

The region is renowned for it's many beaches, scenic coastline and nearby wine country

Project Background

In 2015 the NSW State Government established:

- The Newcastle Urban Transformation and Transport Program (NUTTP) to deliver the revitalization of Newcastle City.
- The Newcastle Light Rail (NLR) was one of the projects to support the NUTTP objectives of:

- Bringing people and businesses back to the city center
- Reconnecting the city to its waterfront
- Promoting new development linked to new transport
- Creating new public domain and community assets
- Generating new jobs in the city center.

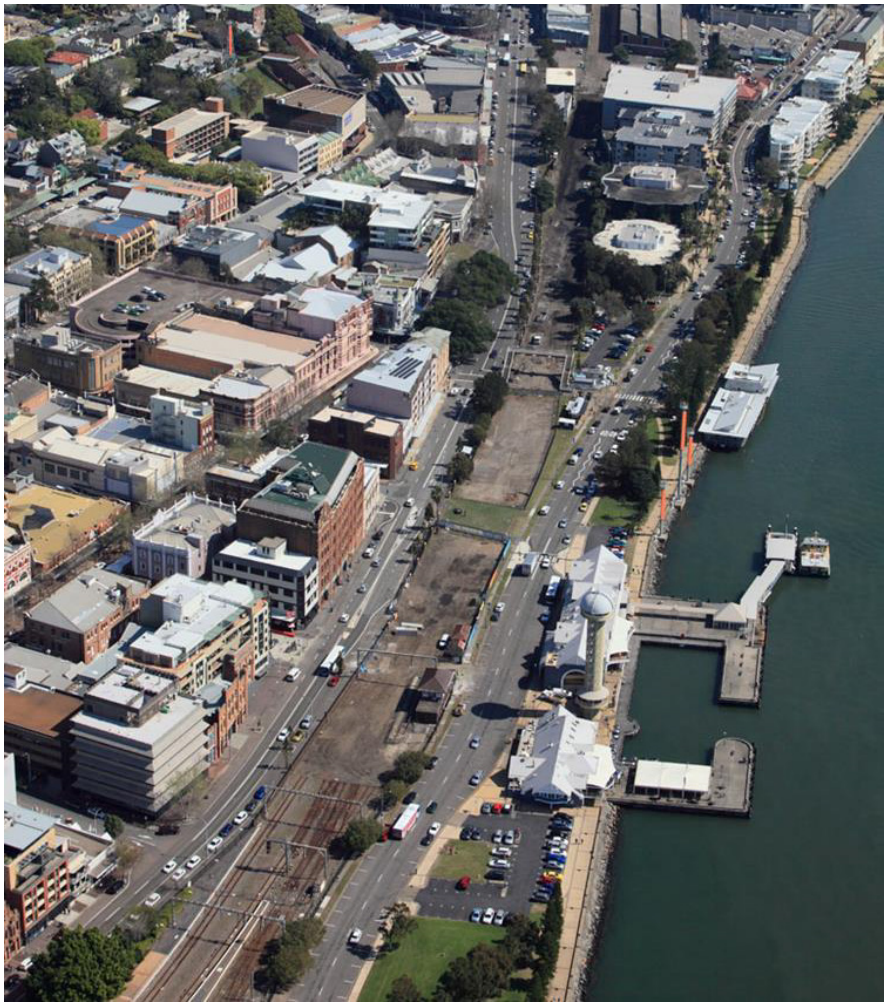
Existing Heavy Rail Corridor

- An existing passenger heavy rail line terminated at Newcastle Station
- Was originally built in 1853 as freight line to service the port.
- The fenced, 1500V DC heavy rail corridor cut the city's center from the harbour foreshore, limiting pedestrian access to the waterfront with it's restaurants, bars and esplanade.

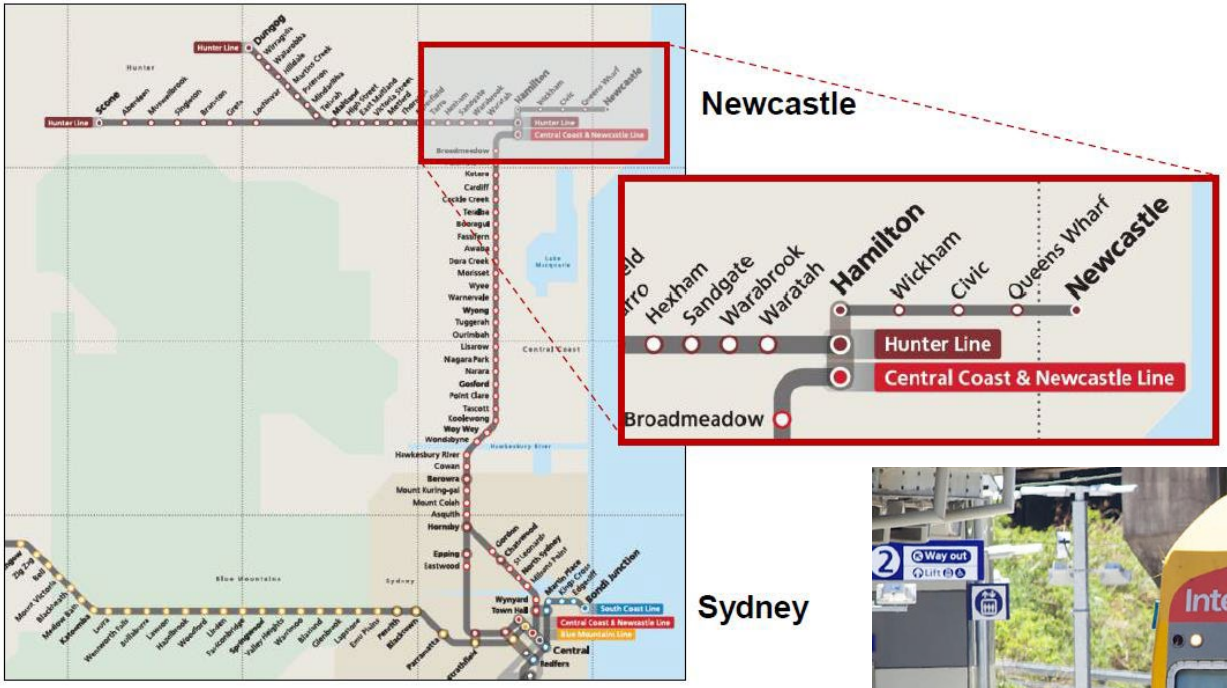
Existing Heavy Rail Corridor

Pedestrians could only cross the fenced rail line via limited overpasses or boom gated road crossings.

Cross city road traffic congestion was also a significant issue.



Existing Heavy Rail Corridor



Service was operated by 8 Car, Double Deck EMU Sets with capacity of 830 seated.

Ridership between Hamilton and Newcastle was typically very low.

New Light Rail System

- 2.7km (1.6 mile) line.
- 6 Light Rail Stops (replacing 3 Heavy Rail Stations).
- 600 to 800m between stations.
- 18 road crossings and intersections.
- Queens Wharf to Newcastle Beach shared with road traffic lanes.
- 10 to 12 minute journey time.
- 7.5 min headways & 4 LRVs on network during peak (7am-7pm).
- 15 min headway & 2 LRVs on network Off Peak 5am-7am & 7pm-1am.

Light Rail Corridor

The light rail route (red line):

- Starts new Heavy Rail terminus known as Newcastle Interchange.
- Runs along the old heavy rail corridor for 600m,
- S bends onto the main east-west roadway to Newcastle Beach.
- Lack of undermining of the old rail allows development of high rise buildings with no risk of land subsidence.

New maintenance depot and stabling yard sized for 6 LRVs

Light Rail Vehicles

A fleet of 6 CAF Urbos LRVs ordered as an extension of a previous TfNSW order of 12 for Sydney Inner West Light Rail Project.

Vehicle Details:

- 5 Module, 33m length
- 100% Low Floor
- Tare Mass 47t
- 750V DC Supply
- 60 Seats including 16 Priority
- Total Capacity 276 persons
- 2 x Wheelchair Spaces
- Luggage and Surfboard Racks

Vehicle Passenger Compartment

Surf Board Rack

NLR Interior

Vehicle Passenger Compartment

Vehicle Passenger Compartment

Vehicle Production

The vehicle bodies and bogies were manufactured in the traditional CAF facilities of Zaragoza and Beasain in Spain. Assembly and static testing of the LRVs was undertaken in a small satellite facility at Bagneres in the south of France due to capacity issues.

The completed LRVs were road transported by prime mover on a custom trailer then shipped out one at a time. Unloaded via a ramp onto the rail in Newcastle.

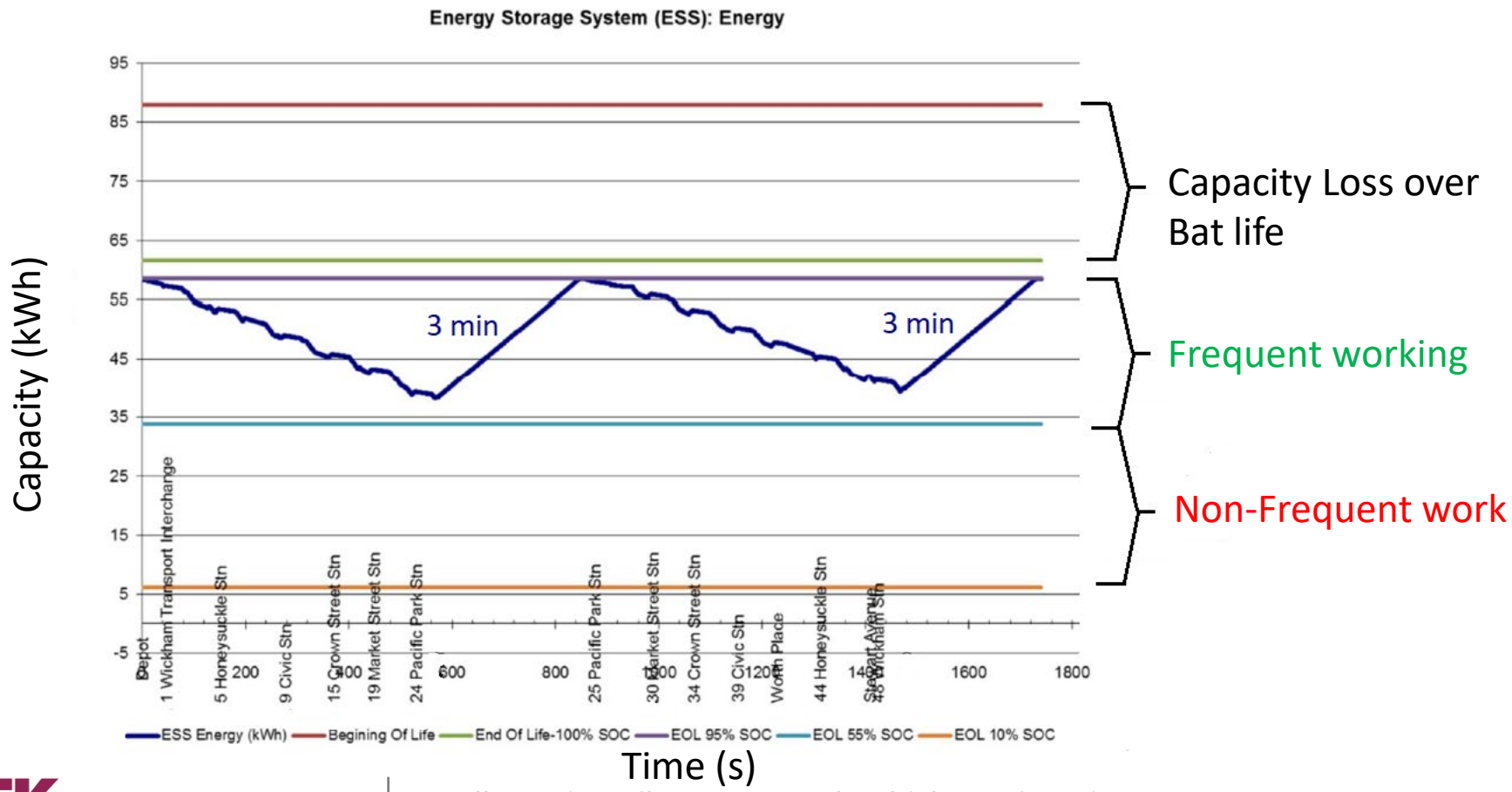
Catenary Free Variation

- In April 2017 (~1 year in), the project elected to eliminate the overhead wire over the whole route and use an On-Board Energy Storage System (OESS).
- Decision driven primarily by aesthetics but also perceived safety benefit.
- Newcastle became the 9th LRV CAF have delivered with OESS.
- 12 month lead time for OESS so LRVs completed, static tested and then retro-fitted.
- Added 2,400kg to each C module.

NLR LRV C Module Roof with OESS

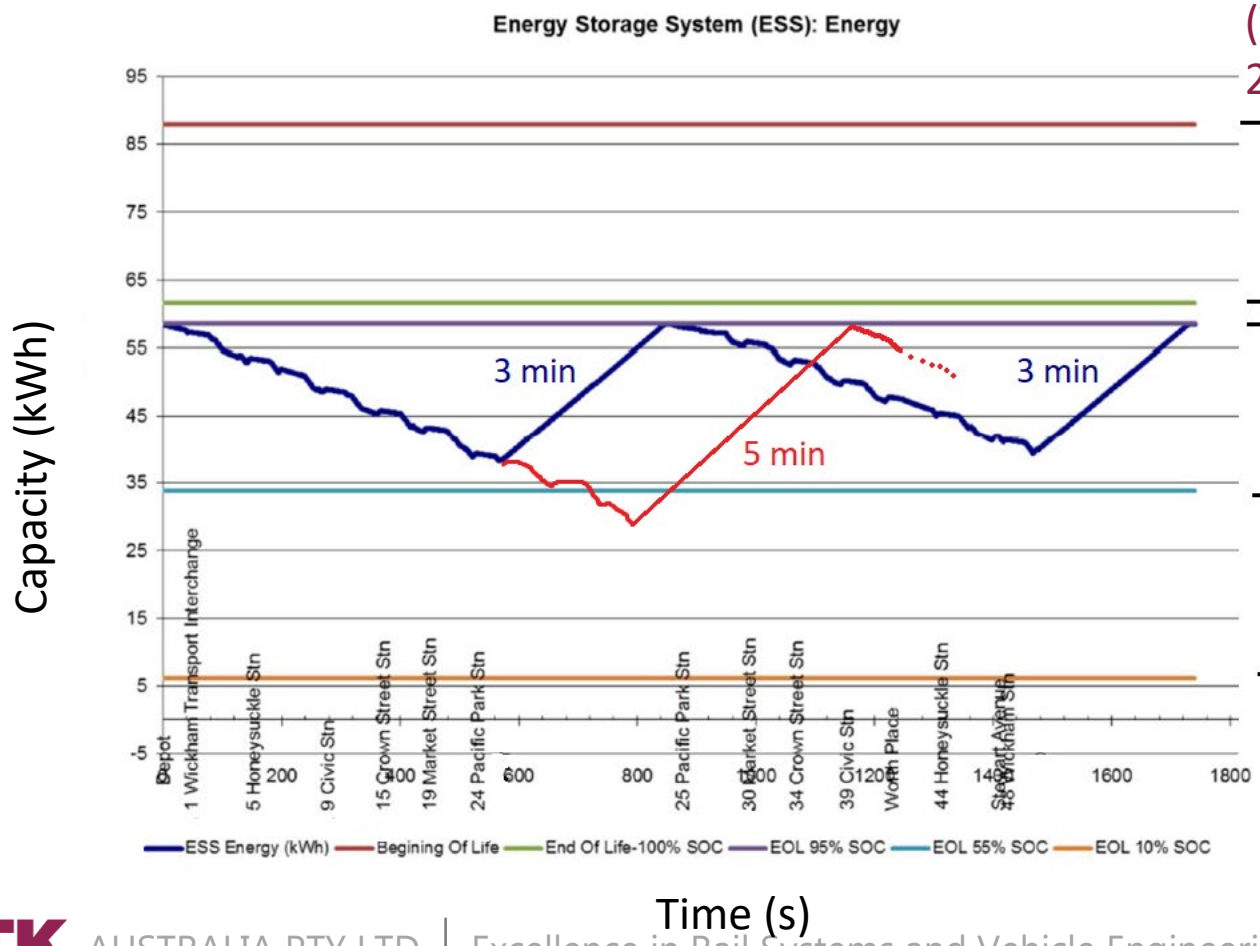
Catenary Free Variation

OESS Battery Solution – 90% of Journeys <10 min



Catenary Free Variation

OESS Battery Solution – 90% of Journeys <12.5 min



(VISSIM Traffic Model using 2028 predicted volumes)

Capacity Loss over Bat life

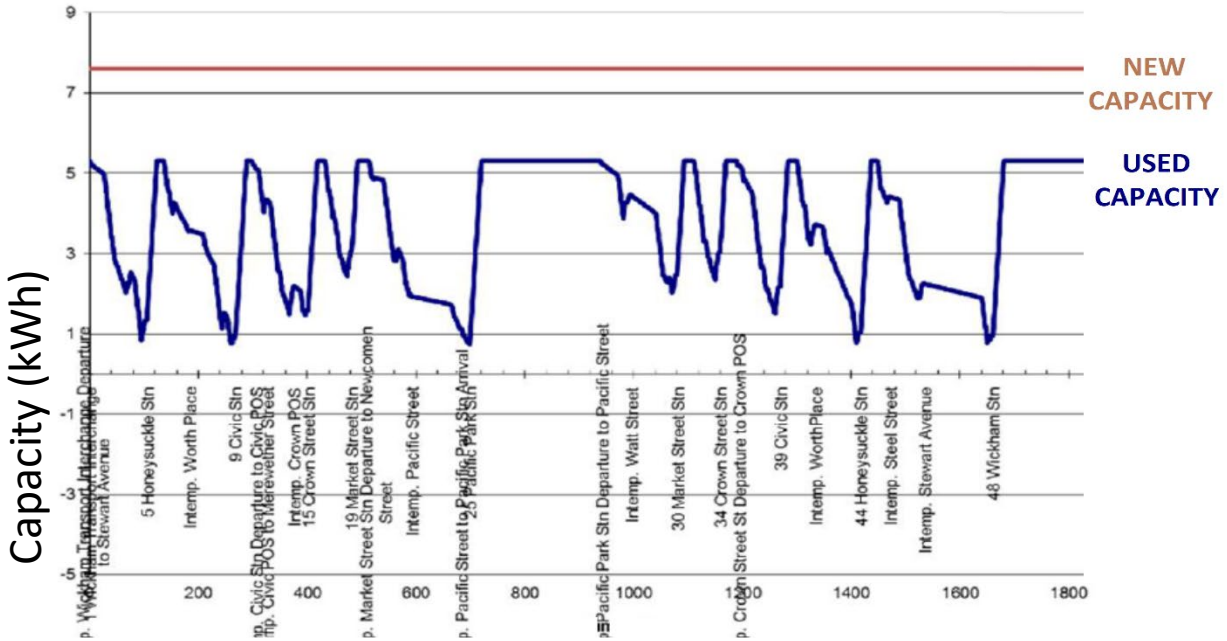
Frequent working

Non-Frequent work

Catenary Free Variation

OESS Super Capacitor + Back-up Battery – 90% of Journeys <12.5min

Super Capacitors 7.6 kWh



Battery 17.6 kWh

Frequent working range

Time (s)

Stop Charging

- Automatic Pantograph raise / lower
- 45s stop time = 30s charge (min)
- Peak charge current of 1350 Amps requiring a special pantograph head.
- Line split into 2 segments each with a with single traction power substation (TPS).
- Maximum of 2 LRVs able to change simultaneously on each segment.
- The 3rd LRV in the segment must wait before the charge bar energizes.
- Managed automatically by TPS system software.

Stop Charging

Newcastle Interchange

Maintenance Depot & Yard

The depot and yard is the only part of the Network with OHW.

Upon entering depot, OESS defaults to slow charge mode drawing <270 Amps under OHW.

There is no OHW within the workshop to minimize roof height.

- Lower panto to drive in under OESS.
- Tow out if OESS discharged.

Maintenance Depot

Lesson Learned:

Better to automatically lower the pantograph before entering the depot workshop.

LRV software modification under discussion.

Maintenance Depot

Service Commencement

The Newcastle Light Rail network was opened to the public in February 2019 on time and just before the NSW State election.

Wire Free Operation

An number of open grassed areas are a feature of the light rail which now provides easy access for pedestrians from one side of the line to the other.

Wire Free Operation

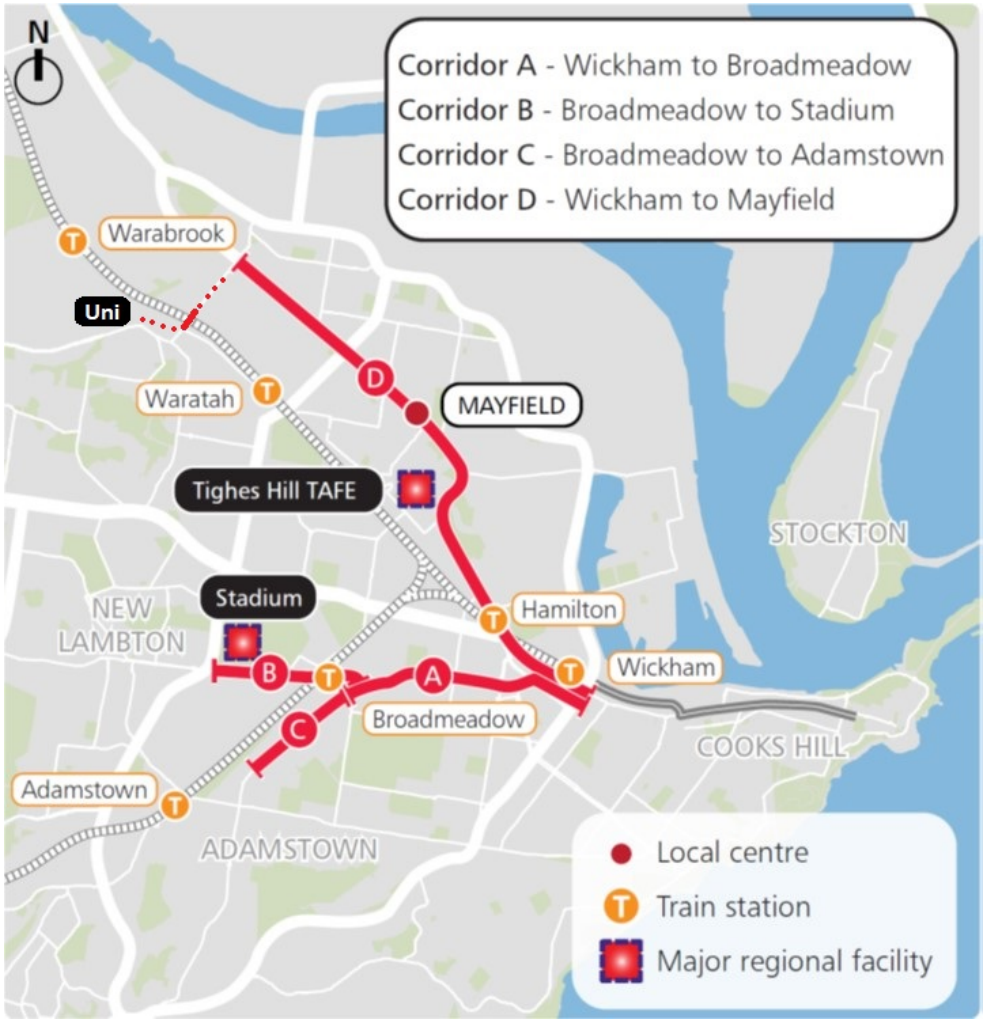
The city is now experiencing new development, with numerous cranes in the skyline demonstrating the amount of building construction underway.

Future Network Expansion ?

4 potential corridor extensions have been proposed in planning studies:

- **Option A** – to Broadmeadow Station enabling further heavy rail truncation.
- **Option A+B** – to the Sports Stadium, Showground and Entertainment Centre.
- **Option A+C** – Accessing Race Track and high schools.
- **Option D** – To Mayfield and Newcastle University.

No State funding as yet allocated for next stages.



Thank you and Questions?