greater WELLINGTON
REGIONAL COUNCIL

Report **06.495**
Date 29 September 2006
File T/18/15/01

Committee **Passenger Transport Committee**
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Solutions for increasing peak rail capacity prior to the delivery of new trains

1. Purpose

To provide the Committee with information on a range of solutions for increasing peak period passenger carrying capacity on the Wellington region's rail network, prior to the delivery of new Electric Multiple Units (EMUs) in 2010, and to recommend a preferred solution for detailed investigation.

2. Significance of the decision

The matters for decision in this report **do not** trigger the significance policy of the Council or otherwise trigger section 76(3)(b) of the Local Government Act 2002.

3. Background

For the year ending June 2006 the passenger rail network in Wellington experienced patronage growth of 11%. Prior to this growth per annum had been averaging just under 2%. While it is encouraging that greater numbers of commuters are choosing rail, the patronage growth is placing an increasing strain on Wellington's aging train fleet and reducing passenger comfort and satisfaction through overcrowding and declining service reliability.

The new 58 Electric Multiple Units (EMUs), to which funding has been committed, will replace the 33 operational English Electrics cars, and provide for further patronage growth. The additional capacity will allow the refurbishment of the Ganz-Mavag units to begin. However, the requirement to follow a fair and competitive international procurement process, in conjunction with manufacturing timescales, dictates that modern new EMUs will not be introduced to revenue service until 2010.

The current and pro-longed increased workload imposed on the aging incumbent fleet has a two pronged detrimental effect:

- all of the available trains are utilised in service under heavier loads for longer periods, this has an amplified impact on reliability which is made worse by;
- the ensuing decreased opportunity to undertake more intensive levels of reliability based maintenance that an aging fleet requires.

Clearly if suitable interim trains could be sourced in the short term it would take the pressure of the current fleet, providing more passenger carrying capacity and allowing more intensive maintenance cycles. This dilemma has plagued the Auckland rail network since at least 2002. Although starting from a much lower base, just over 5 million trips were made on the Auckland rail system during the year ended 30 June 2006, Auckland is currently experiencing patronage growth of 32% per annum.

Auckland has a much smaller diesel fleet and currently does not have funding committed to new multiple units. After exploring many options for a suitable interim solution both within New Zealand and internationally, two significant interim solutions have been pursued in Auckland.

- Seven "SX" carriages were purchased from ZigZag Railway in 2002, and refurbished by Toll at the Hillside Workshops in Dunedin. They currently provide peak services and run as a 5-car train hauled by two of Toll's DBR locomotives (one at each end).

- The "SA" Train project uses British Rail MKII carriages – imported from the UK and remanufactured at Toll's Hillside Workshops. They generally run in a 4-car formation hauled by a Toll DC Locomotive. There are currently 14 SA Trains on order with 13 in service and funding committed to another three. While these trains have been successful and enabled much of the rapid growth in patronage, they are not ideally suited to a metro service by virtue of there slower rates of acceleration and braking.

While the current focus is on short term to medium term capacity, consideration should also be given to the long term capacity requirements in the context of future new train purchases. Developing a long term strategic procurement plan will mitigate recurring capacity shortfalls and any consequential short term "stop gap" interim solutions.

This report will consider a range of proposed solutions against the realities of Wellington passenger rail operations, lessons from the Auckland experience, and recommend a preferred solution for further investigation and implementation.

4. Increasing passenger capacity

Three broad strategies for increasing passenger carrying capacity on the Wellington rail network are considered in this report.

4.1 Additional rolling stock (trains)

Introducing additional rolling stock to cater for more passengers, eg. more frequent trains, longer trains, or a combination thereof.

To introduce additional trains ahead of the arrival of purpose built new EMUs, requires the sourcing of second-hand trains that can be relatively quickly modified to run on the Wellington network. Unfortunately the key constraints that faces both Auckland and Wellington in the search for suitable second-hand trains, is the fact that New Zealand has a 'narrow gauge' (1067mm) track configuration, and of greater significance, the relatively small size of the railway structure gauge.

- The structure gauge is the space available within which the trains can safely operate without coming into contact with trackside structures – typically bridges, platforms, tunnels and station buildings. Added to this the structure gauge in Wellington is tighter than in Auckland.

- There are numerous countries with examples of 'narrow gauge' railways in operation around the world, some of the more relevant examples exist in Japan, South Africa, South America and closer to home in Perth and Brisbane.

Essentially there are 3 types of second hand rolling stock that can be considered:

- 1500V DC Electrical Multiple Units

- Diesel Multiple Units (which can run under the wires)

- Unmotorised carriages which will need to be pulled by either 1500V DC electric or diesel locomotives.

Replacement bogies will be required for any carriage stock that is not narrow gauge – the supply of narrow gauge second hand bogies from Toll has been exhausted by Auckland's SA Train and Wellington's SW Train programmes. Any further carriages supplied without narrow gauge bogies will most likely require a new bogie. Indicative costs range from $250k - $350k per carriage, with a minimum 18 month lead time.

A similar situation exists with sourcing locomotives to haul any unpowered carriages. Again the supply of second hand diesel locomotives from Toll has been exhausted by Auckland's SA Train programme and the second hand market for narrow gauge locomotives is very limited. Therefore any further carriage trains will most likely require new locomotives from an international manufacturer. Indicative costs range from $3m - $5m per locomotive, with procurement and manufacturing lead times similar to new EMUs (3-4 years).

Other key considerations include:

- Residual value risk - the market for reselling any second hand stock would be very limited.

- Timeliness of introduction – to justify the extra capital and operational costs any solution needs to deliver the additional capacity well in advance of the new EMUs arriving.

- Any second hand rolling stock imported into the country must comply with the approved safety system which must cover inspection, maintenance and design of the vehicle. The operator takes the risk in New Zealand not the government/regulatory authority. Land Transport NZ would need assurance that issues and risks are identified and managed to their satisfaction. They will not want to see New Zealand "importing problems from other countries". Conversely there are no sunset clauses on any rolling stock in New Zealand (such as the English Electrics). The key Land Transport NZ requirement is that it must be maintained to a standard that is safe.

- The operational and maintenance complexities that arise from introducing another rolling stock variant. Operational issues are inevitable from the holding of non-standard spare parts, any limitation on services that the additional stock can operate, further training requirements, potential greater use of more qualified drivers, different maintenance regimes, and or storage requirements. This is further exacerbated by the likelihood that the second hand rolling stock is not likely to be supported by an original equipment manufacturer (OEM).

  The 'SX' carriages in Auckland, which were imported from Australia in [2002] and operate as one 5-car locomotive hauled train, is a maintenance peculiarity due to its individualised part requirements, extremely limited fleet size and age.

4.2 Modifying incumbent rolling stock

Modify the current rolling stock to provide more capacity, eg. allocate a higher percentage of carriage space to standing room or reducing seat pitch allowing more seats to be installed.

Modifying the incumbent fleet to carry a greater number of passengers requires taking trains out of service for extended periods of time in order to carry out the modifications works. As stated earlier, the current utilisation of the fleet doesn't allow time for intensive reliability maintenance therefore having trains out of service for an extended period of time is currently untenable. This strategy would be best utilised in conjunction with adding infrastructure, where additional trains would provide adequate cover for trains out of service being modified.

A potential modification to the Ganz Mavag's would enable a greater number of standing passengers which would increase the overall capacity of each carriage. Proposed modifications may include the realignment of more seating from the transverse (parallel) layout to a greater use of longitudinal seating, thus allowing more standing area. This action would also require the fitting of appropriate handrails to provide safe and comfortable support for the higher proportion of standing passengers that the revised seating layout would allow.

Toll have provided an indicative cost of $77k per 2 cars to modify 100% of seating and install handrails. More detailed analysis is required to determine the resulting increase in passenger capacity.

This type of modification may be perceived by the public as a degradation of service amenity and may be met with some resistance, particularly after the recent price increases.

4.3 Operational measures

Options include targeted passenger management, pricing levers or timetable optimisation, to either 'pack' more passengers onto crowded trains, spread the peak load over a greater number of services, or allocate the fleet to better match peak load points on peak services.

An extreme example of passenger management is station platform attendants physically 'packing', or encouraging more passengers into crowded carriages.

Pricing levers might include the introduction of higher prices on peak load services (or conversely lower prices outside peak services). The Johnsonville Line shoulder peak "Peace Train" provides for a lower cost monthly ticket if you avoid the 7.46am and 7.59am peak services which carry a majority of school children.

Optimising the timetable with fleet allocation to better suit peak load points and peak services, requires a careful study of all peak trains to ensure the maximum capacity is applied to existing peak loads. For example, spare capacity on a services where patronage growth is flat should be reallocated to services experiencing growth and overcrowding.

The introduction of operational measures, though potentially simple and cost effective to implement, may meet with considerable public resistance, again following soon after the recent price increases.

5. Potential sources of second hand rolling stock

Table 1. categorises a summary of elements for each viable source of second hand rolling stock. A full list of previously and currently proposed sources of second hand rolling stock, along with more information regarding their availability and suitability is included in Attachment 1. Any identified costs are indicative and offered on the basis of comparison only.

The four potential options that warrant more detailed investigation are:

1. Type 1: British Rail (BR) MKII Carriages (fully modified for All Stops services)
2. Type 2: British Rail MKII Carriages (minimal modification Express services only)
3. Type 5: Out of Service English Electrics
4. Type 6: EO Electric Locomotives

The above four options would allow the introduction of the following additional capacity:

- Two 6-car carriage trains (either express only or all stop, or one of each using MKII carriages) hauled by electric locomotives.
  - Indicative total cost: $23.3m (all stops) - $19.7m (express only)
  - Indicative timeframe: dictated by new bogies - 18months (assumes sole supplier)

- Two 3-car EMU trains (resulting in an operational fleet of 36 English Electric cars)
  - Indicative total cost: $1.8m (assumes 1 x 3 car already being returned to service as part of current minor upgrade and maintenance programme)
  - Indicative timeframe: 12 months

Key advantages of both BR MKII carriage options, if combined with the EO Electric Locomotive, include:

- they represent a well understood modification programme in terms of time and cost
- fleet familiarity, interoperability and residual market value in both Wellington and Auckland
- options exist to adjust the level of modification to match a proposed budget
- sufficient carriages exist to provide operationally significant capacity improvements

The main disadvantage is the timeframe for new bogies.

Key advantages of reinstating the out of service English Electrics cars include:

- strengthens the numbers of rolling stock type that currently makes up 30% of incumbent fleet – therefore totalling interoperable and seamless integration
- relative speed of implementation and low cost

The key disadvantages of this option are: the low residual value of the cars and limited additional capacity provided by only 6 additional cars.

Table 1. Summary of Elements of Second Hand Rolling Stock

Type	Timeliness of Introduction	Likely Cost	Residual Value	Potential additional carriages	Locomotive Required	Bogie Required	Wellington Network Compatibility	Fleet Inter-operability	Ongoing Operating Approval	Service Compatibility	
										All Stop	Express
1. BR MkII Carriages (metro/all stops mod.)	✓	$$$	$$	100+	$	$	✓	✓	✓✓	✓	✓
2. BR MkII Carriages (minimal modification)	✓✓	$$	$$	100+	$	$	✓	✓	✓✓	-	✓
3. Silver Star Carriages	✗	$$$	$	6	$	$	✓	✗	✓	✓	✓
4. SX Carriages	✗✗	$$	$	0	$	-	✓✓	✗	✓	✓	✓
5. Out of Service English Electrics	✓✓	$$	$	6	-	-	✓✓	✓✓	✓	✓	✓
6. EO Locomotives	✓✓	$$	-	facilitates 12	-	-	✓✓	✓	✓✓	-	-
7. DC Locomotives	✗✗	$$	$	0	-	-	✓✓	✓	✓✓	-	-
8. Old Wairarapa Carriages	✓✓	$	-	15	$	$	✓✓	✓	✗	-	✓
9. Overlander Carriages	✓✓	$	-	11	$	$	✓✓	✓	✗	-	✓
10. RM Silver Fern Railcars	✗✗✗	$$	-	6	-	-	✓✓	✗	✓✓	-	✓
11. Japanese EMU	✗✗✗	$$$	$	0	-	-	✗✗✗	✗✗	?	✓	-

6. Conclusions

Taking account of all available solutions, the likely costs and timeframes, and with due consideration to the inherent constraints, a staged programme of incremental capacity improvements would best minimise financial and public relations risk.

OPEX 1. [$20 – 30k / 4-6 weeks]

Optimise the timetable with fleet allocation to better suit peak load points and peak services. This will necessitate a careful audit of passenger counts and carriage capacity on each peak service on every line. This action will also help determine the reality of severe overcrowding versus anecdotal evidence.

If the reallocation of capacity is necessary and consequently sufficiently effective at reducing overcrowding, then an assessment should be made as to whether capital investment is justified. If the overcrowding is still present then proceed to CAPEX 1.

CAPEX 1. [$3.4m / 2 years total for 88 car fleet (2 months design/set-up then 2 weeks per 2 car set for construction)]

On the proviso that OPEX 1. provides enough spare capacity to allow units to be out of service for sufficient duration to carry out more intensive maintenance and potentially modification of Ganz Mavags to allow more standing capacity. Modification of vehicles that will be in service for the foreseeable future then becomes the most cost effective capital investment.

However if this is modification is untenable from a public perception perspective, or post implementation still does not provide sufficient extra capacity the next level of capital expenditure is CAPEX 2.

CAPEX 2. [$1.8m / 12 months (assumes one 3 car English Electric unit)]

The reinstatement of up to 6 extra English Electric cars. Dependent on the identified level of overcrowding, extra capacity required and confirmed capital project timeframes this process may need to be started in conjunction with the next level which would be CAPEX 3.

CAPEX 3. [$19.7 – 23.3m / 18 – 24 months (assuming sole supplier)]

The refurbishment of five EO Electric locomotives to haul up to 12 BR MKII carriages configured as two 6-car trains. Two locomotives will be required for each train with the fifth being a maintenance spare.
Detailed feasibility studies will be required to ascertain the relative costs and timeframes of each capital project, the outcomes of which may affect the likelihood and order of implementation.

The resource requirement from GW transport staff, and professional services budgets must also be considered – the time and effort to complete investigations, prepare funding applications, formal tenders and contracts can potentially be equivalent to new rolling stock procurement.

7. Communication

Officers will provide concerned members of the community with the details of this report. A communication plan will be developed so ongoing information can be provided to the general public regarding the analysis undertaken and progress on any approved detailed feasibility studies or implementation programmes.

8. Recommendations

That the Committee:

1. ***Receives** the report.*
2. ***Notes** the content of the report.*
3. ***Authorises** the commissioning of Tranz Metro Wellington or suitable independent rail operations professional to undertake an audit of passenger counts and carriage capacity.*
4. ***Authorises** the commissioning of Toll PSG to undertake a detailed feasibility study of:*

   a. Ganz Mavag Standing Capacity Modification;

   b. EO Locomotive Refurbishment; and,

   c. BR MKII Minimal Modification for Express services.

Report prepared by:	Report approved by:	Report approved by:
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Attachment 1:

Potential Sources of Second Hand Rolling Stock