greater WELLINGTON
REGIONAL COUNCIL
Te Pane Matua Taiao

# Wellington Regional Rail Plan 2010 - 2035

## 'A Fresh Look at a Better Rail Experience'

2013 Revised Edition
DRAFT

A six- car Matangi train crosses the Ngauranga Gorge. The first two-car unit has enough capacity to carry all the drivers and passengers from all cars in the photo including the bus passengers

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# Contents

## Foreword

This Wellington Regional Rail Plan (RRP) refreshes the first RRP released by Greater Wellington Regional Council (GWRC) in 2009.

The 2009 RRP outlined a preferred pathway to a better rail experience for users of Wellington's regional rail network. GWRC believes this updated RRP provides for an even better experience within the constraints that the current economic climate demands, while optimising existing resources.

Its scope includes the four rail corridors within the region, including Wairarapa train services. It excludes light rail and the Capital Connection service which are covered by a separate study and business case respectively.

Since the RRP was released in 2009 we have successfully completed a comprehensive work programme to provide a reliable and regular rail service to meet demand. Commuters to Wellington CBD can now catch an electric service from Waikanae and ride in comfort from Masterton. Infrastructure upgrades and new rolling stock have significantly reduced disruptions to service and mean we can quickly get back on track if they do occur.

Our aim now is to maintain a stable network and make incremental improvements that deliver value for money.

The focus of this revised plan is service optimisation to meet peak demand – making the best possible use of the network we have in place.

This updated RRP contains more technical and tactical details than the 2009 RRP, reflecting the modelling and measured practice we have been able to undertake since that time. The result is that "how" we implement our preferred pathway – Rail Scenario 1 (RS1) – is based on more information.

RS1 has been refreshed to work within today's operating environment, taking account of the levelling of patronage growth and the tough economic climate. We've found that by cleverly reorganising services we can provide faster and more frequent train services during the busiest morning travel period with existing resources. A phased approach to implementation will give us the flexibility to adjust future development of Wellington's rail network to changing circumstances and customer expectations.

Good decisions are supported by sound information and effective public engagement. This RRP is underpinned by both. It is directed by wider strategic objectives for passenger and freight transportation. We are confident it will serve our people and region well.

**Fran Wilde**
Chair
Greater Wellington Regional Council

# Executive Summary

This revised Wellington Regional Rail Plan (RRP) takes a fresh look at how to provide a better rail experience. It updates the plan first produced by GWRC in 2009, taking into account the significant network improvements made since then and the benefits they have delivered, patterns of use, customer and community expectations and the constraints imposed by the current economic climate.

> The key challenge is to optimise use of existing resources to meet peak demand.

The RRP underpins the Regional Public Transport Plan, which sets the direction for the public transport network as a whole. The RRP is a plan for the long-term development of Wellington's regional rail network.

The RRP Vision is:

> *To deliver a modern, reliable and accessible rail system that competitively moves people and freight in an economic, environmental, integrated and socially sustainable way.*

The focus is on the metropolitan rail network which moves close to 9,000 passengers each weekday AM peak period. It is central to the vibrancy and economic development of our region.

The RRP has been reviewed by GWRC's Economic Wellbeing Committee, NZTA and KiwiRail with public input from Metlink customer satisfaction surveys, public transport information sessions and consultation on GWRC's Regional Land Transport Strategy, Long-Term Plan and Annual Plan. The upcoming review of the Regional Public Transport Plan will provide a more formal mechanism for engaging with the public on the main elements of the RRP as one part of the design and operation of the Wellington public transport network.

The review is to ensure that implementation of the RRP remains firmly tied to the broader objectives of national and regional transport strategies and reflects today's operating environment.

## Achievements since 2009 RRP

Over the last five years Wellington's rail network has been transformed to better deliver the RRP's targeted outcomes:

- Reliability
- Frequency
- Capacity
- Journey time
- Reach.

In that time, most of the issues that beleaguered the network when the 2009 RRP was released have been addressed. A comprehensive work programme described as "The Base Case" in the original RRP has been carried out. Much has been achieved:

- Successful completion of a range of projects – both infrastructure and rolling stock including:
  - Double tracking and electrification to Waikanae
  - All Matangi trains (96 new cars) in service
  - New Waikanae Station and upgrade of other Kapiti stations
  - Expansion of "Park and Ride" facilities
  - Johnsonville Line route clearance
  - Upgrade of Johnsonville tunnels, increase in capacity of the approaches to Wellington Station, station platforms, traction and signalling upgrades, and the new EMU depot, EMU wash and wheel lathe.
- Successful integration and commissioning of all projects
- Transfer of ownership of metro assets - rolling stock, stations (except Wellington Station) and EMU depot - from KiwiRail to GWRL in 2011
- Improved service for the Wairarapa Line – 18 new SW carriages, a longer 4.25pm train to meet demand and reintroduction of modified SE cars
- Better integration of train and bus services to make Wellington's Metlink public transport network easier to use.

## Current situation

The Base Case projects have delivered considerably more than expected, especially in terms of increased capacity, and this needs to be factored into forward planning.

The biggest outcome of these improvements is improved reliability, which is rated by our customers as the most important priority. On time performance has never been better – generally, more than 95% of services are now on time within five minutes.

However, disruption caused by the improvements has impeded growth in passenger numbers, exacerbated by the economic climate.

GWRC's acquisition of rolling stock and stations has enabled better asset management and expenditure control.

In 2012 GWRC decided to replace the current Ganz Mavag fleet, rather than refurbish it. Funding for more Matangi trains has been approved and we will have an all-new fleet by 2016. In addition, the Government has committed to fund a network catch-up renewals programme.

Our metro operations and rolling stock maintenance contract with KiwiRail expires in mid-2016 and we're very likely to test the market for these critical services for the first time in Wellington's metro rail history.

The inaugural Wellington Metropolitan Rail Annual Report 2011/12 was released in October 2012 and provided a comprehensive and transparent account of:

- how the service performed
- what it cost to provide the service
- how it was funded
- the actions that have and are being taken to maintain and improve the service
- rolling stock and station asset management.

The Wellington regional rail network is in a good place. It's timely to consider what we do next.

## Forward focus

The 2009 RRP presented a series of scenarios for the network's future development (see Appendix A). As part of the three-yearly review, GWRC completed a comprehensive environmental check and has confirmed Rail Scenario 1 (RS1) as the preferred pathway. RS1 is an essential first stage to a better rail experience, providing for projected growth in patronage up to and beyond 2016 of 2% per annum (2009 RRP projected growth was 3% p.a.). RS1 also increases freight capacity and speed. It effectively and efficiently meets the strategic requirements of the region in the short to medium term.

## Refreshed RS1

While RS1 is still the next stage in developing Wellington's rail system, how it will be delivered has changed.

Wellington's current system isn't designed to maximise the use of resources. Patronage peaks in a 15 minute window in morning peak period when 30% of passengers arrive at Wellington Railway Station. This is inefficient because so much resource is dedicated to managing this "peak hour factor".

The solution is reorganising services to spread the load (load factor optimisation) and matching capacity/frequency to peak demand.

RS1 has been refreshed to provide a nominal 15 minute service on all metro lines during the AM Peak time. Central to this is a new service pattern to redistribute capacity.

Key features of the refreshed RS1 are:

- A new regularised (clock face) timetable with an enhanced AM Peak Hour service
- A new service pattern based on an inner (metro) and outer (suburban) network
- Network hubs at the busiest stations – Waterloo and Porirua – and more metro services starting from these hubs (up to five trains per hour) during AM Peak Hour.

More trains with fewer carriages across the peak period giving people more flexible travel options

- More express trains from stations on the outer network.

Modelling shows this new AM Peak Hour service pattern will benefit existing rail users with faster trips and reduced waiting time, and also benefit road users by encouraging more people to travel by rail.

### Infrastructure improvements

A few additional infrastructure changes are required to support implementation of RS1 and ensure a reliable rail service.

Key projects include:

- Double tracking Trentham to Upper Hutt
- Turnback/passing loop at Porirua Station
- Turnback facility at Plimmerton
- Signalling and track upgrades through the Tawa Basin
- Safety improvements at level crossings
- Upgrade of Upper Hutt Station
- "Park and Ride" facility upgrades on Kapiti and Hutt Valley Lines.

Maintenance and renewal of infrastructure and trains will continue.

### Implementation approach

Our preferred pathway involves a phased approach to implementing RS1. This gives GWRC the flexibility to respond to changing demand, community needs and available resources. Stops – or decision points – along the pathway provide opportunities to regularly reassess options. This phased approach also helps manage risk, allowing for the significant lead times required to order new rolling stock and undertake large infrastructure projects.

RS1 is expected to be fully completed in 2020, which coincides with the completion of the KiwiRail's catch-up renewals programme.

To maintain momentum and provide the greatest value for money, wherever possible, network improvements will be dovetailed with other planned work. This synergy of projects will deliver benefits earlier, as well as optimise use of resources and reduce overall costs.

### Funding

The extensive evaluation undertaken to update the RRP has demonstrated that targeted investment in rail in Wellington is considerably worthwhile.

There are no immediate budget implications for implementing RS1 as activities requiring expenditure don’t commence until the 2017/18 financial year and are then spread over a five year period.

Given that significant benefits have already been realised through the network improvements completed to date, this refreshed RRP has a Benefit Cost Ratio of 1.8 (including new revenue).

Investment in our rail network is a capital intensive process that delivers substantial long-term benefits in excess of 25 years. The investments we make now – to move people and freight more efficiently and effectively – will not only benefit today’s rail and road users but also ensure the next generation enjoys a better rail experience.

# 1. Introduction

In February 2009 the Greater Wellington Regional Transport Committee endorsed the “Wellington Regional Rail Plan – A Better Rail Experience” (RRP), providing a pathway for the long-term development of the region’s rail network.

The production of the RRP was a requirement associated with the $500 million five year ‘Medium-Term Rail Improvement Programme’ investment package for the Wellington suburban rail network. The package (acknowledged as the Base Case), designed to deliver greater service reliability, reach and network capacity, was be completed in November 2012 when the final Matangi EMU enters revenue service.

The 2009 RRP recognised and encouraged the increasing popularity of rail as a sustainable transport choice for passengers and freight - a trend that continues to be evident across the globe. It also recognised that rail is an essential service underpinning the effective functioning and economic development of the Greater Wellington region. By providing an attractive and competitive rail service, users are attracted from cars and road congestion is reduced – a “win-win” outcome.

The RRP presented a preferred pathway whereby, on completion of the Base Case, Rail Scenario 1 (RS1) (see section 6) would be pursued on the basis that it was considered essential if both regional and national targets and the current growth up to and beyond 2016 were to be catered for.

The preferred pathway supported the RRP Vision:

> *“To deliver a modern, reliable and accessible rail system that competitively moves people and freight in an economic, environmental, integrated and socially sustainable way.”*


Like other Wellington regional strategies, the 2009 RRP provided choices and the flexibility to respond to changing external pressures and community needs, to be achieved through a detailed review and update of the plan every three years. This 'update' represents the first detailed review.

The primary *'focus'* for this updated RRP is:

- review of the Base Case - implementation and outcomes
- refresh of Rail Scenario 1 – change of requirements and direction, capacity requirements and service / timetable optimisation
- RRP economic performance – review the anticipated performance of Rail Scenario 1
- public consultation – acknowledge the outcomes and expectations
- review specific longer-term network issues – Kapiti railway stations and service extensions
- review the implementation pathway.

The 2009 RRP *Executive Summary* is presented in Appendix A.

# 2. Progress and achievements

## 2.1 The Base Case

The Base Case, as presented in the RRP 2009, assumed that no further development or investment in the rail network would occur, beyond the capital projects that were committed to as part of the Medium Term Rail Improvement Plan (MTRIP) funding announcement and critical asset renewals (to maintain current levels of safety and accessibility standards).

The Base Case capital projects comprise:

- New rolling stock (and associated works)
- Track upgrades
- Station upgrades
- Infrastructure renewals
- Short-term capacity enhancement.

In addition, it should be realised that beyond these committed projects, the *'Do Minimum'* Base Case is certainly not a no-cost option, as future expenditure is required for the on-going maintenance and renewal of the existing rail network infrastructure and rolling stock assets (including the replacement of the Ganz Mavag EMUs). On-going investment is considered necessary for the continued and safe operation of rail passenger services on the Wellington suburban rail network.

Available peak service operations typically provide a notional 20 minute service on all lines with an inbound peak loading capacity (based on all Wellington arrivals between 07:00 to 09:00 hrs) of this service level option in the order of up to 14,000 passengers (theoretical capacity based on AW1[1] loading).

Whilst the increase in peak capacity is noticeable in the short-term, the corresponding demand for this option, based on forecasting, could be reached as early as 2016.

## 2.2 Corridor infrastructure works

A variety of network-wide infrastructure upgrades and rail system strengthening works have been necessary to maximise performance and operational benefits and efficiency of the new EMUs. The following infrastructure works have been completed since the release of RRP 2009.

[1] AW1 vehicle capacity when all passengers are seated

| Infrastructure projects | Outcome |
|---|---|
| Double tracking and electrification to Waikanae | Completed – provides extra capacity, network reach and reliability. |
| Johnsonville Line route clearance | Completed – provides operational flexibility (Matangi trains can now operate on the line). |
| Signalling and overhead power upgrades – Matangi operability | Completed – provide greater reliability. |
| Stabling | Completed – provides extra stabling capacity for increased train fleet. |
| Platform upgrades | Completed – allows Matangi operation on all lines. |
| Wellington Station approach (Kaiwharawhara) | Completed – provides extra capacity, greater reliability and journey time improvements. |
| Kapiti railway stations | Completed – new and improved stations in the Kapiti area, providing enhanced station access / facilities and network reach. |
| Network-wide station deferred maintenance and major repairs | On-going – a network wide programme of station works has commenced, providing enhanced journey experience. |

### 2.3 Rolling stock

The purchase of a new fleet of EMUs is a significant component of the Base Case. A total of 96 'Matangi' cars, configured as 48 x two car units, have been manufactured and delivered by Hyundai Rotem (an international rolling stock supplier based in Korea) and all have entered revenue service.

The six car SE 'locomotive hauled' carriage train has undergone a cosmetic overhaul in order to provide an acceptable standard of passenger comfort and additional capacity.

A total of 18 new 'Wairarapa' cars (SW cars) were purchased to operate the long distance services between Wellington and Masterton. These trains entered revenue service in 2007.

| Rolling stock projects | Outcome |
|---|---|
| Matangi EMUs | Completed – provide extra capacity, reliability and vehicle quality. All trains were in service as at November 2012. |
| Thorndon EMU depot upgrade | Completed – provides modern maintenance facilities for the new Matangi, extra capacity and greater productivity. |

| | |
|---|---|
| SE carriages | Completed – provides additional capacity. |
| Wairarapa cars (SW) | Completed – provides greater capacity, vehicle quality and operational flexibility. |

## 2.4 Other committed work

In addition to the original scope of the Base Case a number of 'opportunity' projects were planned. These projects have provided considerable 'value for money' by maximising existing project mobilisation.

| Other Projects | Outcome |
|---|---|
| North South Junction – stage 1 | Completed – provides extra reliability and journey time improvements. |
| Infrastructure renewals – 'catch up' | Commenced – provides greater reliability and network accessibility (traction power, signalling, track, structures, platforms). |
| Ganz Mavag replacement (M2) | A decision has been reached in relation to 'mechanical and cosmetic' refurbishment versus full replacement of the Ganz Mavag fleet. It has been established that full replacement provides greater 'value for money' on a 'whole of life' basis. Fleet replacement provides greater reliability, vehicle quality, operational capacity and operational efficiencies. |
| SE cars (2 stages) | Stage 1 (complete)<br>Stage 2 - The SE cars have been converted for use on the Wairarapa Line (increasing the SW train fleet to 24 carriages). |

## 2.5 Base Case costings

The Base Case requires a total '30 year life cycle' investment in the order of \$2.168 billion. Proportionally, \$883 million relates to CAPEX and \$1,285 million is associated with OPEX. Figure 1 below details the breakdown (note OPEX figures do not take account of fare revenue).

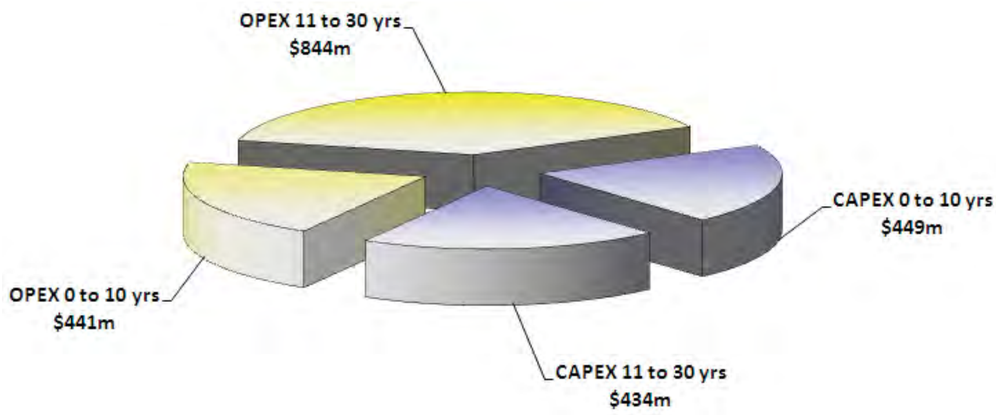


Figure 1: Total Costs for Base Case

Of the 30 year CAPEX requirement a total of $449 million is already committed through LTCCP funding ($142 million specifically relates to the replacement of the existing Ganz Mavag fleet over the next three years). The residual $434 million can be distinctively split into medium and long-term requirements for periodic rolling stock major refurbishments and overhauls.

The costs given in Figure 1 are presented in Appendix E.

# 3. Patronage observations and trends

## 3.1 Trends since 2000

The graph below shows annual rail patronage each financial year from 1999/2000 to 2012/13.

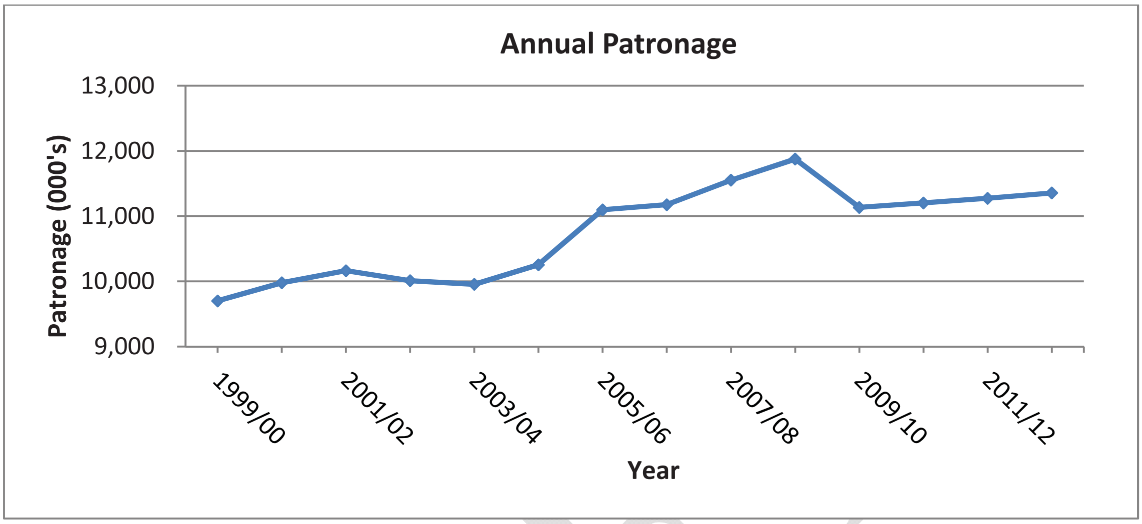


Figure 2: Patronage Observation and Trends 1999 to 2013

When the RRP was developed in 2008/09 the five-year average growth in patronage (to June 30 2008) was 3.1% and in the light of this a future growth rate of 3% per annum was forecast.

## 3.2 Changes since the 2009 RRP

Figure 2 shows that patronage growth has levelled off in recent years. This is probably due to a number of factors including:

- Global economic downturn
- Local economic downturn such as downsizing of public sector
- General service disruption during upgrade works, specifically:
  - Block of lines to enable upgrade works
  - Rail replacement ‘bussing’
  - Prolonged periods of disruption
- Driver shortages leading to service cancellations
- System reliability
- Service crowding.

It is considered that these issues have likely been the ‘root cause’ of rail patronage levelling off, which is most marked between 2009 and 2010.

## 3.3 Expected future patronage

The five year average patronage growth for the last three years has been +1.5%, -0.2% and +0.2% per annum respectively, although the negative figure is largely a reflection of very high passenger numbers in 2005/06. Even so, in the light of this it seems overly optimistic to continue to use the previous assumption of 3% per annum growth for future years.

On the basis of recent patronage trends, a future growth rate of 2% per annum has been adopted. As well as broadly reflecting recent trends, this figure is consistent with forecasts from the regional transport models WPTM and WTSM, both of which indicate annual growth in peak rail patronage of 2.2% between 2011 and 2021.

# 4. Customer and community expectations

## 4.1 Purpose and approach

During the development of the 2009 Wellington Regional Rail Plan scenario design and service level specifications were established through detailed consideration of a number of separate but inter-related issues, including:

- Strategic attributes – maintaining alignment with the Regional Passenger Transport Plan (2007 to 2016)
- Passenger transport attributes – at an overarching system level
- Rapid transit attributes – these being mode specific, characterising 'high quality' commuter rail services
- Customer importance – identification of 'what is important' in relation to customer satisfaction
- Community importance – identification of 'what is important' in relation to the communities that interface with Wellington's metropolitan rail network (through consultation and public submissions).

When the above issues were considered in their entirety the following 'targeted outcomes' for the RRP were sought:

- Reliability
- Frequency
- Capacity
- Journey time
- Reach.

To update the RRP it was considered necessary to undertake a process of public engagement identifying *'what is important to existing and potential customers and the wider community'* in relation to the RRP's 'targeted outcomes'. This has assisted in the refinement of the approach to the implementation of RS1 and has emphasised the need for agility.

The following mechanisms were used to gain public input:

- The Metlink Public Transport Customer Satisfaction Survey 2012 (conducted in May 2012)
- Public submissions during consultation on GWRC's Regional Land Transport Strategy (RLTS) and Annual Plan
- The GWRC Public Transport Information Sessions (held throughout the region during June and July 2012).

The primary findings that have influenced the development of this refreshed RRP are outlined below.

Formal public consultation on the outcomes of the RRP will occur through the next review of the Regional Public Transport Plan.

## 4.2 Annual Public Transport Satisfaction Monitor 2012 and 2013

Metlink conducts an annual customer satisfaction survey, with the 2012 and 2013 surveys being undertaken in May of each year.

### 2012

For the 2012 survey it was identified that the annual survey would be the ideal vehicle to pose the question *'What is important to the Wellington rail commuter?'* (The survey is conducted randomly by telephone and consequently provides for balanced feedback from both existing and potential service users.)

The 2012 survey identified that:

- 48% of recent users were either satisfied or very satisfied with the 'overall' train service offered (unchanged from 2011)
- The 'highest' levels of dissatisfaction were:
  - Cycle storage at stations (despite satisfaction trending upwards)
  - Reliability (during April 2012 this was measured at 90.4%)
  - Fare cost
  - Keeping users informed of disruption.

These responses informed this updated RRP, the most significant being 'reliability' as this is one of the plan's 'targeted outcomes'.

Respondents were also asked the 'main reasons for using the train' which are dependent on a number of factors, including:

- Journey time (total travel time versus rail journey segment)
- Journey purpose (work, education, pleasure)
- Journey frequency (daily, weekly, monthly)
- Location of system access (stations, service reach)
- Multi modal journeys (walk, bus, train, car, bicycle) combinations
- Rail passenger transport product (service quality/reliability, fare structure, etc).

The survey identified the following main reasons for using the train:

- Convenience
- As an outing/for pleasure
- No alternative
- Value for money
- Faster
- Parking is difficult.

Again, the responses have influenced the update of the RRP, and will be considered during its implementation, specifically:

- Convenience of use - needs to increase so that it is the main reason for using the train
- No alternative – the perception of 'no alternative' needs to be transformed to a more positive reason such as convenience or value for money
- Value for money – this also needs to increase so that customers consider the overall experience rather than just the price of the fare which always needs to be reasonable and directly related to the service being delivered.

### 2013

A summary of the 2013 results shows a significant increase in overall satisfaction for train users with improvements in the following areas:

- Ease of getting on/off train
- Quality of trains
- Speed of journey
- Car park safety
- Reliability of trains
- Keeping users informed of disruptions.

Other positive trends include:

- **59%** of recent users were either satisfied or very satisfied with the train service overall. This is a significant increase from 48% in 2012.
- **53%** of residents had used a train in the last three months, consolidating on an upward trend from 2008 (36% in 2008, 38% in 2009, 46% in 2010, 47% in 2011 and 53% in 2012).

 

## 4.3 Community expectations

As stated in section 4.1, the design and development of various scenarios in the RRP encapsulated community input through public submissions during GWRC's RLTS and Annual Plan consultation.

Appendix C provides details of the projects considered, their status and their corresponding attributes (mapped to the relevant RRP scenarios).

The majority of the projects detailed in Appendix C are still relevant to the medium and long-term future development of the Wellington rail network.

With the immediate focus being on the establishment of a robust implementation pathway to RS1, the community engagement undertaken in 2012 was designed to capture the importance and significance of the longer-term scenarios, i.e. RSA (journey time) and RSB (network reach). As a result, the RRP's project list has been reviewed to assess the importance and related benefits of projects at a community level.

During the region-wide GWRC Public Transport Information Sessions all attendees were given the opportunity to identify "what was most important to them from a community perspective" in terms of targeted outcomes. A simple ranking system of 1 to 5 (1 being of the highest priority / importance, and 5 the lowest priority / importance), delivered the following results.

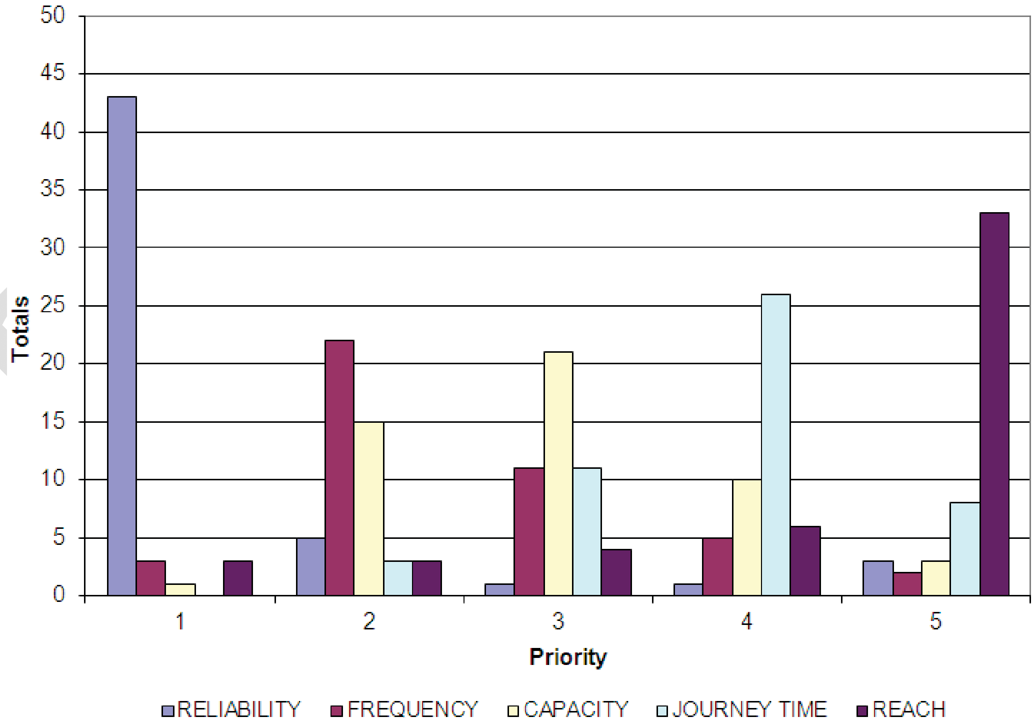


Figure 3: Community feedback – Prioritisation of targeted outcomes

Figure 3 identifies that reliability and reach were considered to be the most and least important targeted outcomes respectively. Whilst the overall 'sample size' was small, the results remained consistent across all of the region-wide information sessions.


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# 5. The Wellington Metropolitan Rail Network - today

## 5.1 Wellington Metropolitan Rail Network characteristics

The Wellington Metropolitan Rail Network comprises two main line and two branch line routes emanating from Wellington railway station. The current "base case" operational service level (AM peak inbound) is detailed below.

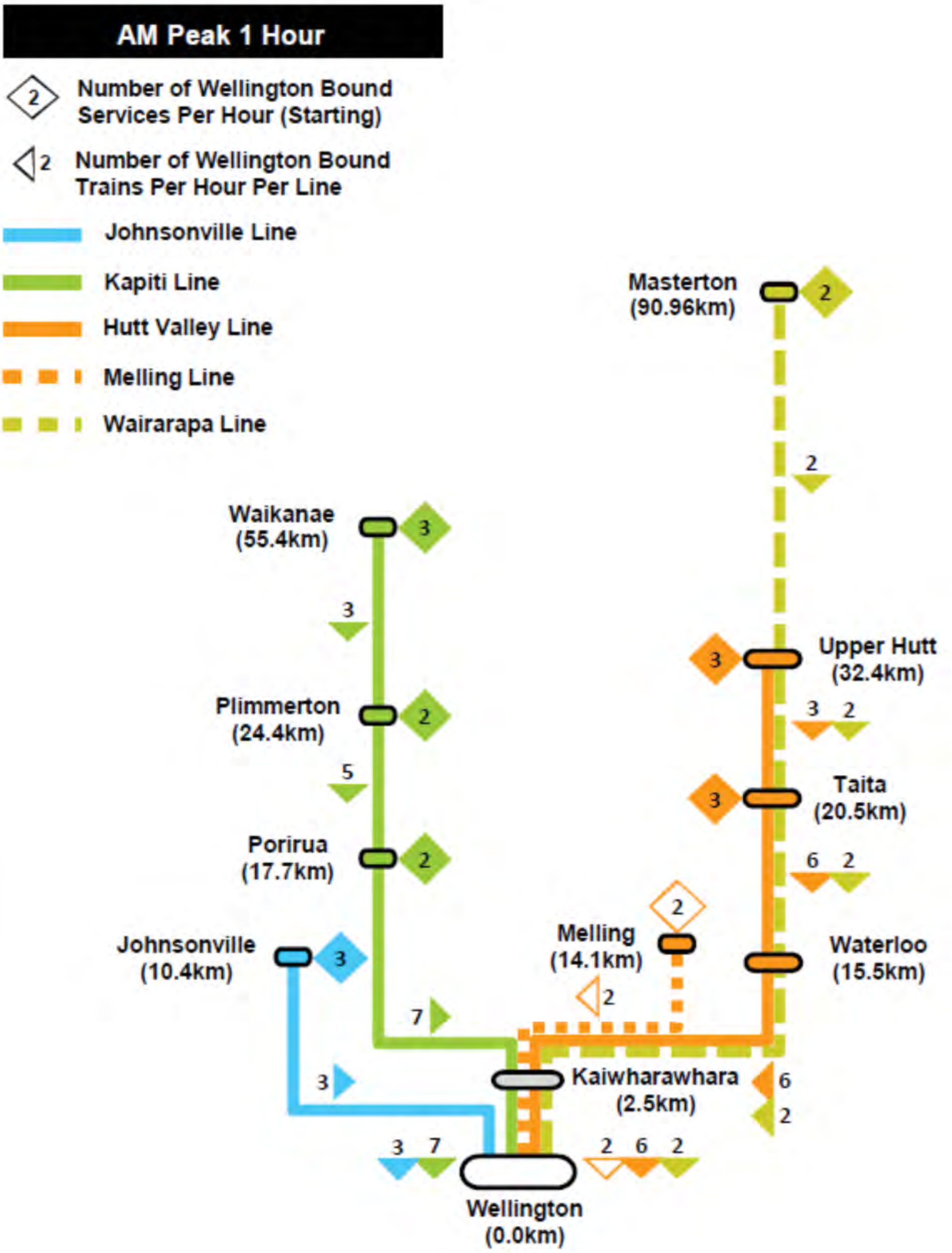


Figure 4: Base Case / current operational service levels (AM Peak – 1 Hour)

From a pure rail network perspective Wellington can be characterised as a "suburban railway" (refer to Appendix D).

Suburban rail services usually operate on their own right of way which is often grade separated, and may include level crossings. Station spacing is typically no less than 3km, which consequently enables operating speeds to be higher than "metro" style networks. However, on some lines suburban services sometimes share tracks with long distance/inter-urban passenger and freight rail services for part of their routes or have at-grade crossings with other tracks, and these features can adversely affect frequency and speed.

In general terms, the Wellington Metropolitan Rail Network can be characterised by the description presented above. However, there are discrete aspects of the network, specifically a significant "peak of the peak", that aligns more closely to a metro system (see Figure 5 below). This has prompted a detailed review of the system from an operational requirements perspective in order to determine whether or not RS1 is or can be optimised.

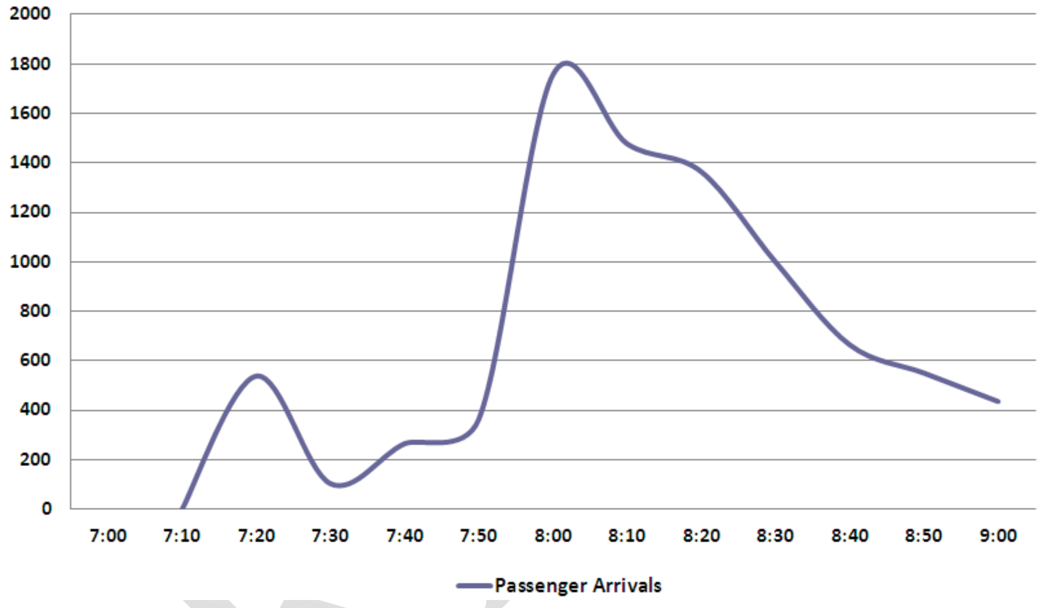


Figure 5: AM Peak passenger arrivals at Wellington station (0700hrs to 0900hrs)

From a location perspective the Wellington Railway Station provides a primary passenger transport gateway to the Central Business District (CBD), which encompasses significant areas of employment, education and leisure.

This ultimately provides for a situation whereby the rail network is characterised by the journey to and from work, school, college or university, i.e., morning peak period inbound travel and evening peak period outbound travel on a Monday to Friday basis.

## 5.2 Wider Land Transport Network

A direct economic growth and productivity outcome of investment in the Wellington Metro Rail fleet is the managing of demand on the State Highway network.

Preliminary analysis[2] by NZTA has predicted that the impact of rail patronage being transferred to the state highway network would generate 1 hour and 42

2 This preliminary analysis was somewhat validated by the congestion impact on SH2 caused by storm damage to the seawall undermining the railway line forcing closure between Petone and Wellington for 7 days in June 2013. Reports indicated travel times of up to 1 hour 20 minutes between Melling and Wellington. http://www.stuff.co.nz/dominion-post/news/hutt-valley/8833240/Hutt-traffic-grinds-to-a-standstill

minutes additional journey time. This is based on peak period congestion relief at Ngauranga through the reduction of 4,972 vehicles at the AM peak of 0700hrs to 0900hrs (equivalent to 6,811 rail passengers). The impact of these additional vehicles would result in the state highway network breaching full capacity prior to the peak with significant queuing occurring which spills over to breach capacity constraints through subsequent time periods. This prediction was validated when the rail network was unavailable following storm damage in June 2013.

The maximum queue generated is 6,953 vehicles generating the maximum average delay of 102 minutes (1 hour and 42 minutes), a total delay of 19,500 vehicle hours equating to 26,800 people hours (vehicle hours converting to people hours by 1.37). It would take until 1100hrs for the queue to completely dissipate. Figure 6 below provides a graph of the journey time impact, and this is also supported by the tables presented in Appendix F.

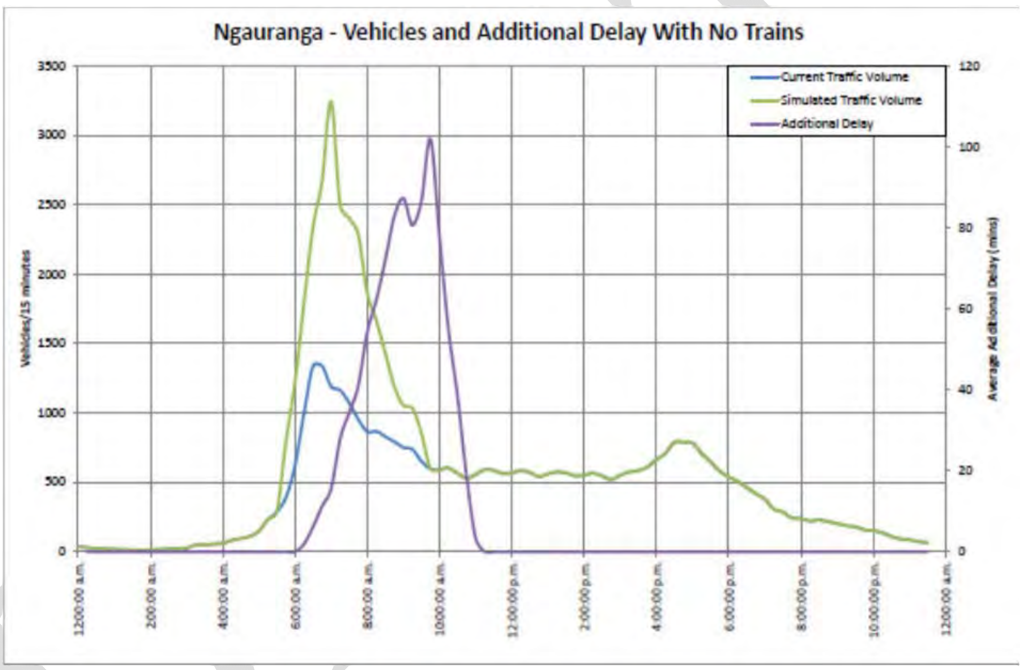


Figure 6: Impact of 4,972 vehicles for the AM peak (0700hrs to 0900hrs)

## 5.3 Route and service overview – today (The Base Case)

### 5.3.1 Wellington Station

All services operating on the Wellington Metropolitan Rail Network terminate at Wellington Station. This station primarily serves commuters and so passenger use is characterised by high volumes of arrivals in the morning peak and departures in the evening.

The station currently handles in excess of 8,700 passenger arrivals in the morning peak (arrivals at Wellington between 0700hrs and 0900hrs).

Figure 5 above shows the passenger arrivals at Wellington Station and confirms that the greatest volume of passenger use occurs during a 15 minute period between 0755hrs and 0810hrs. During this time there are more than

2,800 journeys into Wellington on a typical weekday (this broadly represents a third of the total AM Peak boardings).

Table 1 shows the average number of passengers arriving at Wellington during the morning peak period, identified for critical operational timeframes.

| Wellington Station – passenger arrivals | | | |
|---|---|---|---|
| Time Period | Volumes | % of AM Peak | Train arrivals |
| AM Peak – $P_{15}$ (0755hrs to 0810hrs) | 2,813 | 33% | 7 |
| AM Peak – $P_{30}$ (0756hrs to 0826hrs) | 4,812 | 57% | 14 |
| AM Peak – busiest hour (0750hrs to 0850hrs) | 6,811 | 80% | 22 |
| AM Peak – 2 hours (0700hrs to 0900hrs) | 8,716 | 100% | 32 |

Table 1: Wellington Station arrivals - AM Peak (Source: GWRC (WPTM) passenger counts data 2011)

Inspection of the data reveals:

- The AM peak can be considered to be 'inefficient' due to its unevenness and significant $P_{15}$ and $P_{30}$ passenger volumes
- There is significant unevenness of passenger demand during the AM peak period, both within the two hour and one hour time frames
- Passenger demand is driven by destination 'arrival' times as well as the other service characteristics that underpin the RRP, such as reliability, frequency and capacity.

The most important type of loading diversity is the unevenness of passenger demand over the peak hour. Consequently, it is essential that loading diversity, as observed in Wellington, is considered when planning future passenger rail operations.

### 5.3.2 Kapiti Line

The Kapiti Line carries around 3,232 passengers a day into Wellington in the morning peak (arrivals at Wellington between 0700hrs and 0900hrs). Wellington bound trains operate from three service origin points – Waikanae, Plimmerton and Porirua – thus providing an outer and inner suburban service feature. Table 2 below shows the number of passengers counted on the service on a typical weekday morning peak in June 2011.

| Kapiti Line | | | |
|---|---|---|---|
| Service Origin | Waikanae | Plimmerton | Porirua |
| Passengers | 1,664 | 541 | 1027 |

Table 2: Kapiti Line AM Peak Boardings by Service Segment

Since the publication of the 2009 RRP patronage on the Kapiti Line has increased by 4.7%. This has primarily been as a direct result of completion of the Double Tracking and Electrification to Waikanae (DTEW) project and subsequent commencement of services from Waikanae. For the year ending 30 June 2012, patronage increased by 3.1%, compared with the previous year.

Table 3 shows the average number of passengers on each of the three service segments along the Kapiti Line, travelling to Wellington, and the average load factor (passengers divided by seats expressed as a percentage) during the morning peak; and for services arriving at Wellington between 0800hrs and 0900hrs, which is considered to the busiest hour each day (the Peak Hour). These loads are recorded at the busiest point for each train which - on this route - is Wellington.

| Kapiti Line | | | | |
|---|---|---|---|---|
| Service origin | 0800hrs – 0900hrs | | 0700hrs – 0900hrs | |
| | Passengers | Load factor | Passengers | Load factor |
| **Waikanae** | 1,376 | 93% | 1,664 | 86% |
| **Plimmerton** | 402 | 91% | 541 | 61% |
| **Porirua** | 827 | 93% | 1,027 | 87% |

Table 3: Kapiti Line passenger loadings (Source: GWRC (WPTM) Passenger counts data 2011)

The load factors indicate that travelling conditions for passengers are similar on all the Kapiti Line services in the busiest hour and that any crowding is a result of the effects of loading diversity on or limited stop services running via services running limited stops via Porirua.

Examination of the loading along the routes has been possible using detailed patronage counts. The analysis of this data is presented in Figure 7, which details the passenger loading profile for each service segment and demonstrates how demand builds up along the route.

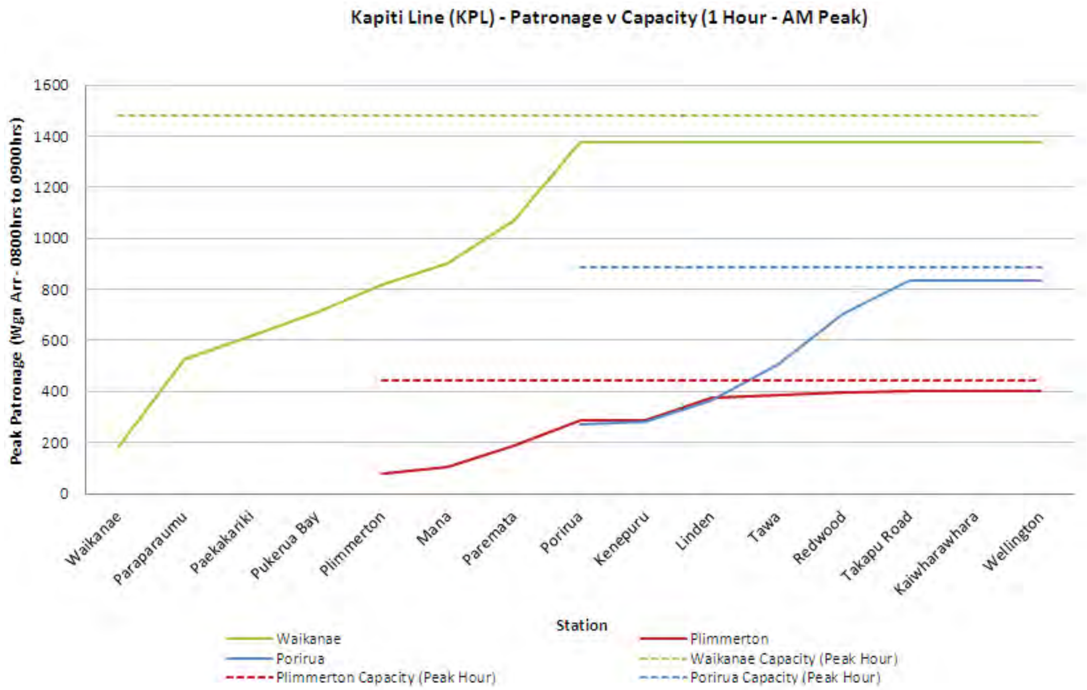


Figure 7: Kapiti Line loading profile – AM Peak busiest hour

Inspection of the data reveals:

- 86% (2,605 / 3,032) of the route's total AM Peak boardings occur in the busiest hour
- The boardings on the inner suburban services account for 32% (827 / 2,605) of the route's total AM Peak boardings in the busiest hour
- 29% (747 / 2,605) of the route's total AM Peak boardings in the busiest hour occur at Porirua Station which is served by four through and three starting services during the same period
- During the AM Peak's busiest hour demand is closely matched to seated capacity (AW1)
- During the two hour morning peak there is a reasonable amount of spare capacity on the two outer suburban service segments (Waikanae and Plimmerton) prior to Porirua boardings
- During the two hour morning peak there is a limited amount of spare capacity on the inner suburban service segment (Porirua)
- On express / limited stop services crowding is evident from Porirua, the last station stop prior to arrival in Wellington (it is likely that this is car specific due to the effects of loading diversity)
- During times of disruption, crowding on the inner suburban service segment (Porirua) will be apparent

- The busiest stations along the Kapiti Line are Porirua and Paraparaumu with observed boardings in the busiest hour of 747 and 342 respectively.

### 5.3.3 Hutt Valley Line

The Hutt Valley Line carries around 2,992 passengers a day into Wellington in the morning peak (arrivals at Wellington between 0700hrs and 0900hrs). Wellington bound trains operate from two service origin points Upper Hutt and Taita thus providing an outer and inner suburban service feature. Table 4 below shows the number of passengers counted on the service on a typical weekday morning peak in June 2011.

| Hutt Valley Line | | |
|---|---|---|
| Service origin | Upper Hutt | Taita |
| Passengers | 1,683 | 1,309 |

Table 4: Hutt Valley Line AM Peak boardings by service segment

Since the publication of the 2009 RRP, patronage on the line has decreased by 1% (this also includes Melling Line services). For the year ending 30 June 2012, patronage reduced by 1.12%, compared with the previous year. It is recognised that this reduction is attributable largely to fluctuating levels of reliability and crowding on popular services.

Table 5 shows the average number of passengers on each of the two service segments along the Hutt Valley Line, travelling to Wellington, and the average load factor (passengers divided by seats expressed as a percentage) during the morning peak; and for services arriving at Wellington between 0740hrs and 0840hrs, which is considered to the busiest hour each day (the Peak Hour). These loads are recorded at the busiest point for each train which - on this route - is Wellington.

| Hutt Valley Line | | | | |
|---|---|---|---|---|
| Service origin | 0740hrs – 0840hrs | | 0700hrs – 0900hrs | |
| | Passengers | Load factor | Passengers | Load factor |
| Upper Hutt | 1,497 | 84% | 1,683 | 76% |
| Taita | 1,013 | 76% | 1,309 | 74% |

Table 5: Hutt Valley Line passenger loadings (Source: GWRC (WPTM) passenger counts data 2011)

The load factors indicate that travelling conditions for passengers are relatively similar on all the Hutt Valley Line services in the busiest hour and that any crowding is a result of the effects of loading diversity on specific services running limited stops via Waterloo.

Examination of the loadings along the routes has been possible using detailed patronage counts. The analysis of this data is presented in Figure 8, which details the passenger loading profile for each service segment and demonstrates how demand builds up along the route.

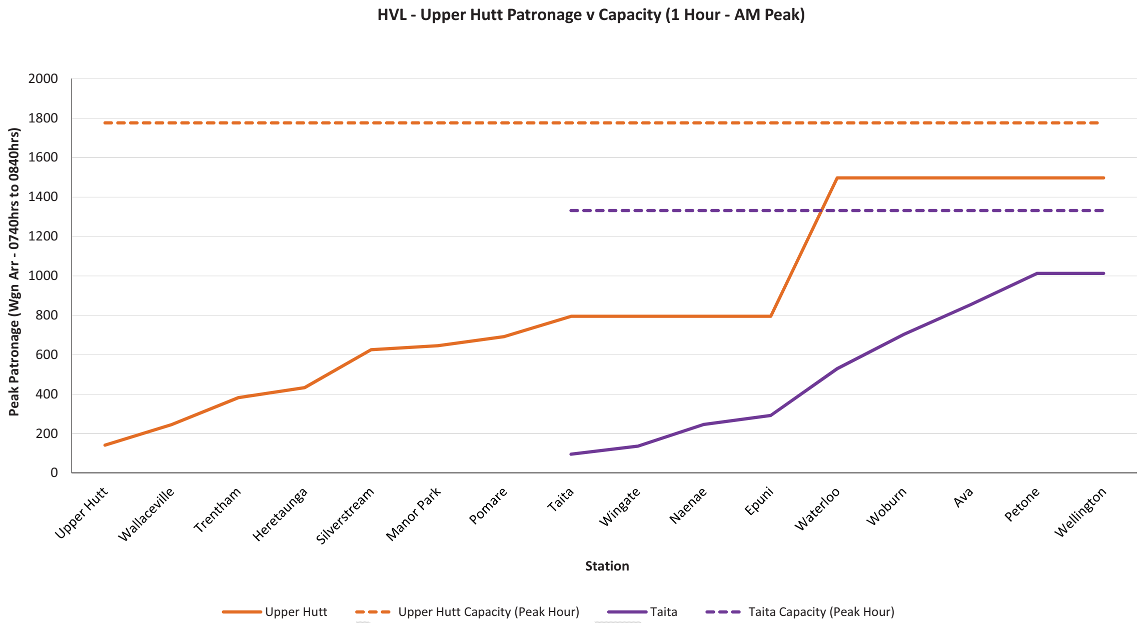


Figure 8: Hutt Valley Line loading profile – AM Peak busiest hour

Inspection of the data reveals:

- 84% (2,510 / 2,992) of the route's total AM Peak boardings occur in the busiest hour
- The boardings on the inner suburban services account for 40% (1,013 / 2,510) of the route's total AM Peak boardings in the busiest hour
- 46% (1,164 / 2,510) of the route's total AM Peak boardings in the busiest hour (arrivals at Wellington Station between 0740hrs and 0840hrs) occur at Waterloo Station which is served by seven through services (excluding Wairarapa Line services) during the same period
- During the AM Peak's busiest hour demand is closely matched to seated capacity (AW1)
- During the two hour morning peak there is a reasonable amount of spare capacity on both the outer and inner suburban service segments
- On the most popular services, identified as those arriving at Wellington Station between 0755hrs and 0820hrs, perceived crowding is evident from Woburn, the station stop immediately after Waterloo (it is likely that this is car specific due to the effects of loading diversity)
- During times of disruption, crowding on both the outer and inner suburban service segments will be apparent from Waterloo station

- The busiest station along the Hutt Valley Line is Waterloo with observed boardings in the busiest hour of 1,164 (Petone is the second busiest with 328 boardings in the busiest hour).

### 5.3.4 Melling Line

The Melling Line carries around 425 passengers a day into Wellington in the morning peak (arrivals at Wellington between 0700hrs and 0900hrs). Wellington bound trains operate from Melling, the terminal station on a branch line which diverges from the main Hutt Valley Line at 11.19km (Melling Branch Junction). Table 6 below shows the number of passengers counted on the service on a typical weekday morning peak in June 2011.

| Melling Line | |
|---|---|
| Service origin | Melling |
| Passengers | 425 |

Table 6: Melling Line AM Peak Boardings

Table 7 shows the average number of passengers on the Melling Line, travelling to Wellington and the average load factor (passengers divided by seats expressed as a percentage) during the morning peak; and for services arriving at Wellington between 0745hrs and 0845hrs, which is considered to the busiest hour each day (the Peak Hour). These loads are recorded at the busiest point for each train which - on this route - is Wellington.

| Melling Line | | | | |
|---|---|---|---|---|
| Service origin | 0745hrs – 0845hrs | | 0700hrs – 0900hrs | |
| | Passengers | Load factor | Passengers | Load factor |
| Melling | 311 | 35% | 425 | 29% |

Table 7: Melling Line passenger loadings (Source: GWRC (WPTM) Passenger Counts Data 2011)

The load factors indicate that travelling conditions for passengers are relatively similar on all the Melling Line services in both the busiest hour and two hour AM Peak, and spare capacity is considered significant (even on the most popular service).

Examination of the loadings along the route has been possible using detailed patronage counts. The analysis of this data is presented in Figure 9, which details the passenger loading profile for the service segment and demonstrates how demand builds up along the route.

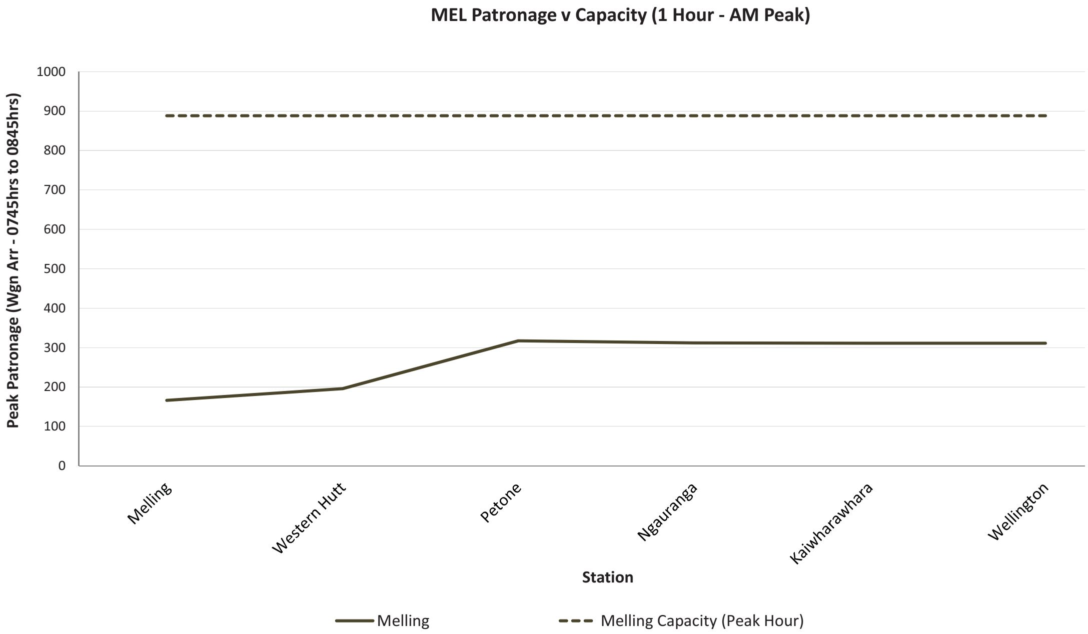


Figure 9: Melling Line loading profile – AM Peak busiest hour

Inspection of the data reveals:

- 73% (311 / 425) of the routes total AM Peak boardings occur in the busiest hour
- 53% (166 / 311) of the total AM Peak boardings in the busiest hour occur at Melling Station which is served by three starting services during the same period
- During the AM Peak's busiest hour demand is less than half of the provided seated capacity (AW1)
- Petone Station, which is also served by the Hutt Valley Line's inner suburban service segment, equates for 40% (125 / 311) of the total AM Peak boardings in the busiest hour.

### 5.3.5 Johnsonville Line

The Johnsonville Line carries around 1,187 passengers a day into Wellington in the morning peak (arrivals at Wellington between 0700hrs and 0900hrs). Wellington bound trains operate from Johnsonville, the terminal station on the branch line which diverges from the North Island Main Trunk line north of Thorndon. Table 8 below shows the number of passengers counted on the service on a typical weekday morning peak in June 2011.

| Johnsonville Line | |
|---|---|
| Service origin | Johnsonville |
| Passengers | 1,187 |

Table 8: Johnsonville Line AM Peak boardings

Since the publication of the 2009 RRP, patronage on the line has decreased by 5%. For the year ending 30 June 2012, patronage reduced by 3.26%, compared with the previous year. It is recognised that this reduction is largely attributable to fluctuating levels of reliability during the last 6 to 9 months of the English Electrics 70 years of service.

Table 9 shows the average number of passengers on the Johnsonville Line, travelling to Wellington, and the average load factor (passengers divided by seats expressed as a percentage) during the morning peak; and for services arriving at Wellington between 0735hrs and 0835hrs, which is considered to the busiest hour each day (the Peak Hour). These loads are recorded at the busiest point for each train which - on this route - is Wellington.

| Johnsonville Line | | | | |
|---|---|---|---|---|
| Service origin | 0735hrs – 0835hrs | | 0700hrs – 0900hrs | |
| | Passengers | Load factor | Passengers | Load factor |
| Johnsonville | 854 | 72% | 1,187 | 57% |

Table 9: Johnsonville Line Passenger loadings (Source: GWRC (WPTM) passenger counts data 2011)

The load factors indicate that travelling conditions for passengers are relatively similar to those experienced by commuters on the Hutt Valley Line inner suburban service segment in the busiest hour and that any crowding is a result of the effects of loading diversity on specific services. It has further been identified that the 0746hrs service from Johnsonville, which arrives at Wellington at 0807hrs, is the most popular and is likely to experience low levels of crowding.

Examination of the loading along the route has been possible using detailed patronage counts. The analysis of this data is presented in Figure 10, which details the passenger loading profile for the service segment and demonstrates how demand builds up along the route.

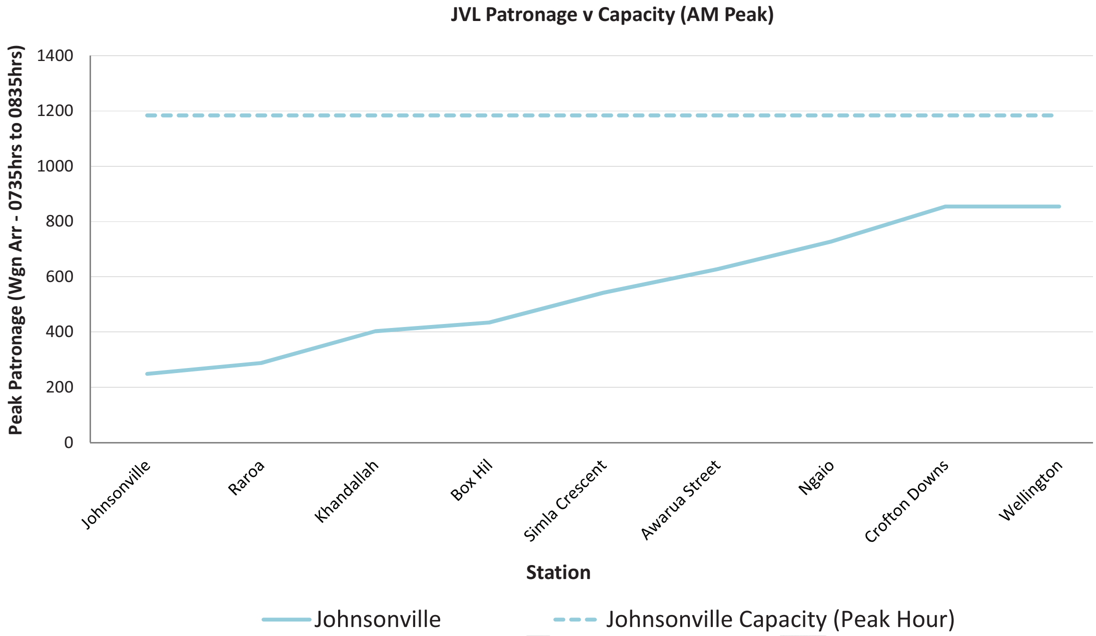


Figure 10: Johnsonville Line loading profile – AM Peak busiest hour

Inspection of the data reveals:

- 72% (854 / 1,187) of the route's total AM Peak boardings occur in the busiest hour
- 29% (248 / 854) of the total AM Peak boardings in the busiest hour occur at Johnsonville Station which is served by four starting services during the same period
- During the AM Peak's busiest hour demand is closely matched to the provided seated capacity (AW1)
- On the most popular service, identified as the 0746hrs service from Johnsonville, which arrives at Wellington at 0807hrs, it is likely that perceived crowding will be evident from Ngaio to Wellington – a relatively short distance and 10 minute journey time (it is likely that this is car-specific due to the effects of loading diversity)
- During times of disruption, crowding will be evident from Awarua Street Station to Wellington – again, a relatively short distance and 12 minute journey time
- The busiest station along the Johnsonville Line is Johnsonville with observed boardings in the busiest hour of 248
- Crofton Downs Station, which also happens to be the final station prior to arrival at Wellington, is the second busiest with 130 boardings in the busiest hour.

### 5.3.6 Wairarapa Line

The Wairarapa Line (Masterton) carries around 1,019 passengers a day into Wellington in the morning peak (arrivals at Wellington between 0700hrs and 0900hrs). Wellington bound trains operate a limited stops service from Masterton to Upper Hutt then express to Wellington with additional stops at Waterloo and Petone. The Wairarapa Line services share the route with the Hutt Valley Line outer and inner suburban service segments. Table 10 below shows the number of passengers counted on the service on a typical weekday morning peak in June 2011.

| Wairarapa Line | |
|---|---|
| Service origin | Masterton |
| Passengers | 1,019 |

Table 10: Wairarapa Line AM Peak boardings

Since the publication of the 2009 RRP, patronage on the line has significantly increased by 8.8%. For the year ending 30 June 2012, patronage increased by 4.69%, compared with the previous year.

Table 11 shows the average number of passengers on the Wairarapa Line, travelling to Wellington, and the average load factor (passengers divided by seats expressed as a percentage) during the morning peak; and for services arriving at Wellington between 0700hrs and 0800hrs, which is considered to the busiest hour each day (the Peak Hour). These loads are recorded at the busiest point for each train which - on this route - is Wellington.

| Wairarapa Line | | | | |
|---|---|---|---|---|
| Service origin | 0700hrs – 0800hrs | | 0700hrs – 0900hrs | |
| | Passengers | Load factor | Passengers | Load factor |
| Masterton | 709 | 107% | 1,019 | 103% |

Table 11: Wairarapa Line passenger loadings (Source: GWRC (WPTM) passenger counts data 2011)

The load factors indicate that travelling conditions for passengers are relatively similar to those experienced by commuters on the Hutt Valley Line outer and inner suburban service segments in the busiest hour and that crowding is likely to be a result of the effects of loading diversity and perturbed operation on the route rather than specific services. During the passenger counts an example was observed where 160 waiting passengers at Waterloo boarded the service as a result of a preceding Hutt Valley Line service not arriving. This resulted in significant crowding in all carriages (Waterloo boardings during normal service running is between 30 and 40 passengers).

Examination of the loading along the route has been possible using detailed patronage counts (Upper Hutt to Wellington). The analysis of this data is presented in Figure 11, which details the passenger loading profile for the service segment and demonstrates how demand builds up along the route.

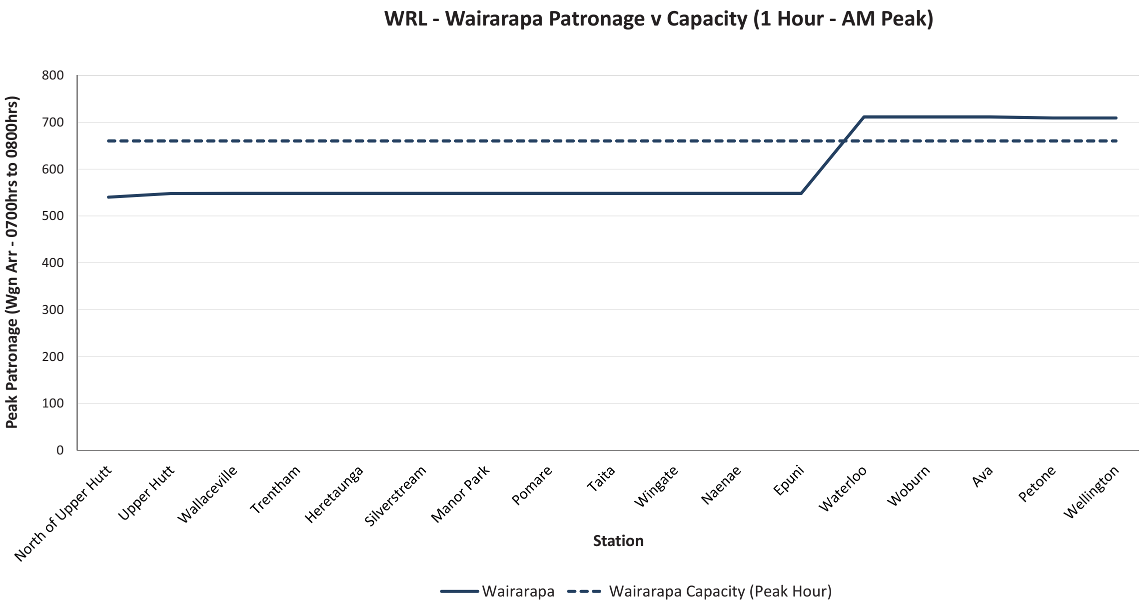


Figure 11: Wairarapa Line Loading Profile – AM Peak Busiest Hour

Inspection of the data reveals:

- 70% (709 / 1,019) of the route's total AM Peak boardings occur in the busiest hour
- 76% (540 / 709) of the total AM Peak boardings in the busiest hour occur prior to the services reaching Upper Hutt Station
- During the AM Peak's busiest hour demand is closely matched to the provided seated capacity (AW1)
- During times of perturbation on Hutt Valley Line services, crowding will be evident from Waterloo to Wellington – a distance of 15.5km with a corresponding sub 20 minute journey time.

## 5.4 Person capacity

The capacity of a suburban rail network is what defines its design and equipment, how it is constructed and maintained, and how it will perform when passengers use it. The 'person capacity' of the system is the maximum number of people that can be carried in one direction over a section of track in a given period of time, under specified operating conditions without unreasonable delay, hazard, or restriction, and with reasonable certainty. By definition, and as observed in Wellington, this will be the morning peak hour, since the evening peak tends to be more spread out and therefore lower in intensity.

The definition of person capacity is less absolute than the definition of line capacity, as it depends on the number of trains operated, the length of those trains, passenger loading standards, and variations in passenger demand between trains and between individual cars of a given train.

This last factor, known as loading diversity, provides an important distinction between a line's theoretical capacity and a more realistic person capacity that can actually be achieved on a sustained basis. The theoretical capacity assumes that all of the offered capacity can be used by passengers. In practice, this only occurs when a constant queue of passengers exists to fill all available seats and standing room — a situation that realistically is undesirable in the operation of a suburban rail system, as it leads to crowded platforms and passenger delay.

It should be acknowledged that passengers generally do not arrive at an even rate over the course of an hour and do not distribute themselves evenly among the cars of a train. Accounting for loading diversity allows one to determine the number of people that can be accommodated on the system during an hour without pass-ups occurring.

Constraints on staff and equipment resources, i.e., rolling stock, must also be considered. Line capacity considers how many trains ***could*** be operated, assuming no constraints on the supply of cars to form trains, nor any constraints on the number of operators available to drive those trains. During the refresh of RS1, knowing and designing for the ultimate person capacity of a line, and by extension the system is of critical importance due to long-term planning implications. However, it is also important to know in the short-term how many trains ***can*** be operated and the person capacity of those trains, given existing resources resulting from the implementation of the Base Case.

The person capacity of a rail route (defined as Passengers Per Hour Per Direction - PPHPD) at its maximum load section is determined by multiplying the number of trains per hour by the number of cars per train, the scheduled design load for each car, and a peak hour factor, as shown in the equation below.

$$\mathbf{P} = T\,Nc\,Pc\,(PHF)$$

where:

P = person capacity (p/h)

$T$ = line capacity (train/h)

$Nc$ = number of cars per train (car/train)

$Pc$ = maximum schedule load per car (p/car – set by GWRC and is less than crush loading)

$PHF$ = peak hour factor (this being the measure of loading diversity within the peak hour).

Table 12 shows the person capacity of each route / service segment resulting from the implementation of the Base Case under current operations, giving consideration to both *theoretical* (PHF = 1) and *realistic* (PHF = Actual Observed) loading situations.

| Base Case - person capacity (PPHPD) | | | | |
|---|---|---|---|---|
| Routes and service segments | Theoretical | | Realistic | |
| | AW1 (seating only) | AW2 (seating + standing at 2.55/m2) | AW1 (seating only) | AW2 (seating + standing at 2.55/m2) |
| NETWORK | 8,451 | 13,878 | 5,936 | 9,710 |
| Kapiti Line | 2,646 | 4,428 | 1,707 | 2,856 |
| Waikanae | 1,323 | 2,214 | 728 | 1,218 |
| Plimmerton | 441 | 738 | 397 | 664 |
| Porirua | 882 | 1,476 | 582 | 974 |
| Hutt Valley Line | 3,087 | 5,166 | 2,316 | 3,875 |
| Upper Hutt | 1,764 | 2,952 | 1,588 | 2,657 |
| Taita | 1,323 | 2,214 | 728 | 1,218 |
| Melling Line | 882 | 1,476 | 512 | 856 |
| Melling | 882 | 1,476 | 512 | 856 |
| Johnsonville Line | 1,176 | 1,968 | 847 | 1,417 |
| Johnsonville | 1,176 | 1,968 | 847 | 1,417 |
| Wairarapa Line | 660 | 840 | 554 | 706 |
| Masterton | 660 | 840 | 554 | 706 |

Table 12: Wellington Suburban Rail Network – person capacity AM Peak hour (Source: GWRC (WPTM) passenger counts data 2011)

The above data clearly illustrates the effect of loading diversity in relation to the theoretical and realistic person capacity of the current AM Peak Hour operational scenario.

From the point of ‘theoretical’ capacity, current demand can be accommodated. However, when the ‘realistic’ capacities are compared with current demand (as detailed in section 5.3), it is clear that the effects of ‘crowding’ are a direct result of loading diversity which, in turn, is driven by the existing irregular operational timetable.

## 5.5 Future service planning

As stated in the introduction, a specific issue considered during this update is the determination of opportunities that exist within RS1 to realise ‘value for money’ through smart and optimised planning.

RS1, as presented in section 6, has given due consideration to the detailed analysis undertaken as part of this update and to other observations to ensure delivery can be optimised, whilst still providing for continued option agility.

Matters that have been considered are:

- Network characterisation – inner and outer suburban services (capacity and frequency)
- Operational optimisation – service v capacity v demand v availability
- Loading diversity – acknowledgement that Wellington has a 15 minute peak, driven by destination arrival timings which result in an inefficient peak. To address this there is a need for the peak hour factor (PHF) to be closer to 0.85
- Levels of service – acceptable levels of crowding – acknowledging that on longer commuter and outer suburban services standing for 20 minutes for any journey and more than 10% above seating capacity can be regarded as 'overcrowded' on a passenger network such as Wellington
- Growth factors – service enhancements and growth nodes throughout the network
- RS1 implementation – timing and identification of 'synergy' projects to optimise delivery and minimise disruption.

# 6. Rail Scenario 1

## 6.1 Overview

Rail Scenario 1 (RS1) was designed to underpin the region's strategic requirements for rail based passenger and freight transportation. The primary focus of RS1 is the continued improvement of the following key operational characteristics, specifically during peak periods:

- Capacity
- Reliability
- Frequency.

RS1, as developed in the 2009 RRP, provides for a significant increase in the number of new electric trains forming the GWRC rolling stock fleet. Consequently RS1 had increasing peak seat capacity and delivery of a regular and reliable service with at least four trains per hour to Wellington on all electrified lines during the two hour AM Peak time. By design, RS1 also had the effect of increasing freight capacity and speed.

It was established that, without RS1, there would be a significant shortfall of seat capacity across the AM Peak by 2016, should modelled demand eventuate (a better quality service, supporting growth in rail patronage in line with the NZTS and RPTP targets for 2016).

## 6.2 Pathway to Rail Scenario 1

A detailed review of the Base Case outputs has established that, in some cases, discrete projects have delivered considerably more than originally anticipated. This has had a number of significant effects on the proposed pathway, namely:

- The programme approach to implementation has proved beneficial, in so much as the physical outcomes are considered to be greater than planned. A notional 15 minute service level is being delivered for limited periods within peak periods, however, for this level of service across the full peak period reliability would be questionable
- The level of infrastructure enhancement required to deliver RS1 has reduced due to the early implementation of projects such as 'Stage 1 North South Junction'.

These factors when combined with specific strategic investment decisions such as the Government's commitment to fund a 'catch up' renewals programme, and GWRC's decision to completely replace the current Ganz Mavag fleet (rather than extend the operational life of the fleet through a substantial overhaul and refurbishment programme), has resulted in the need to 'restate' RS1. This will be achieved through the pursuit of a network, asset and operational optimisation strategy that will realise the preferred implementation pathway in a timely manner whilst delivering value for money.

## 6.3 Key assumptions

RS1 has been refreshed to provide a nominal 15-minute peak train service on all metro lines whilst maintaining the capability of delivering the strategic objectives and growth targets for rail, in line with the RRP Vision.

The key assumptions for RS1 are described below.

### 6.3.1 Proposed RS1 AM Peak Service Strategy

RS1 will see the implementation of a nominal 15 minute AM Peak period service with a modified service pattern incorporating a regularised timetable (i.e., clock face). The aim of the modified service pattern is to optimise operational assets through the redistribution of capacity to where it is most needed in the short to medium-term. Figure 12 below details the proposed 'AM Peak Hour' service strategy map.

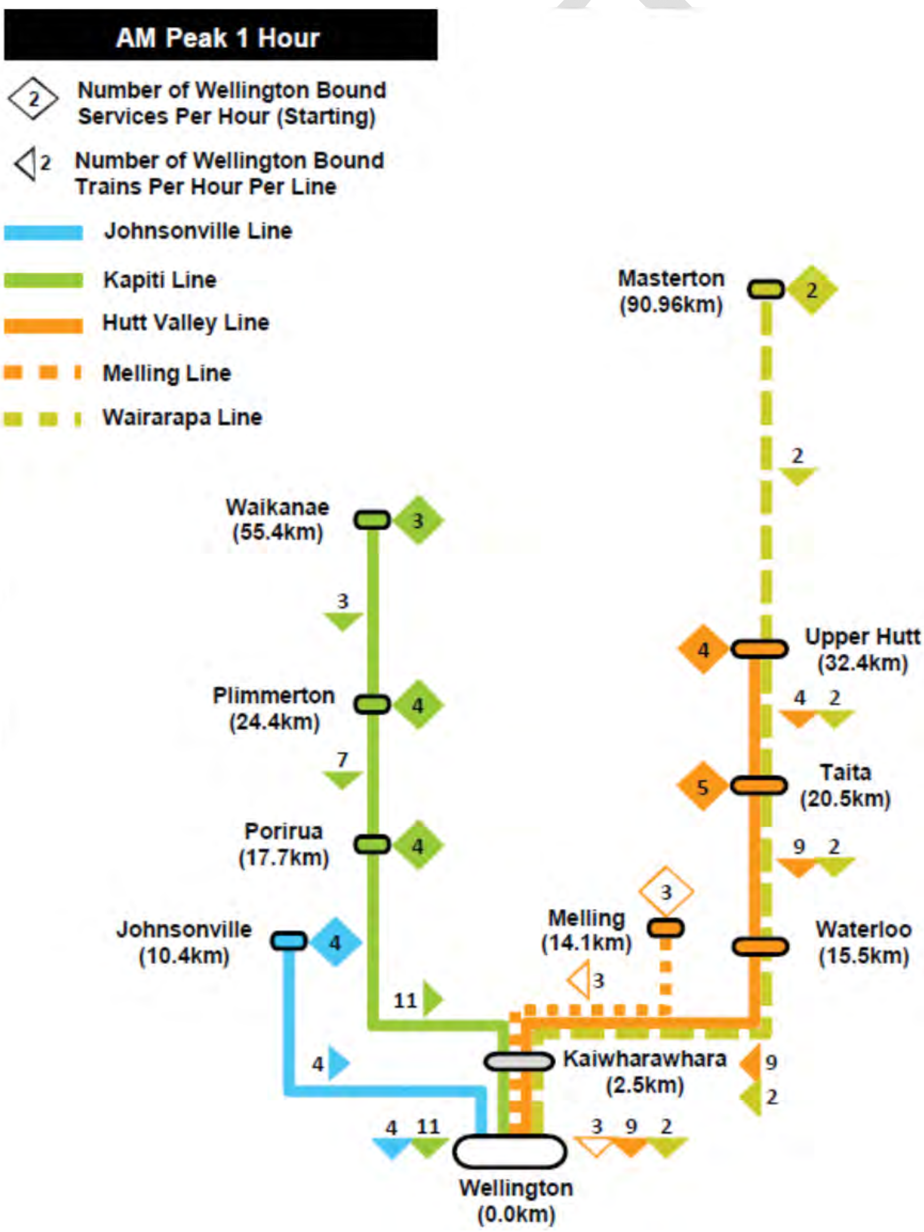


Figure 12: RS1 Service Strategy diagram

Predicted patronage growth means that the earliest date for implementation of the above service strategy is December 2016, the latest is July 2019 (this later date coincides with the completion of the KiwiRail ‘catch up’ renewals programme).

The proposed ‘AM Peak Hour’ service pattern is presented in Table 13 below.

| RS1 service pattern | | | |
|---|---|---|---|
| Routes and service segments | Origin | Stopping pattern | Destination |
| **Kapiti Line** | | | |
| Outer | Waikanae | All stops to Plimmerton then Express to Wellington | Wellington |
| Outer | Plimmerton | All stops to Porirua then non-stop to Wellington | |
| Inner | Porirua | All stops to Wellington | |
| **Hutt Valley Line** | | | |
| Outer | Upper Hutt | All stop to Taita then non-stop to Wellington | Wellington |
| Inner | Taita | All stops to Wellington | |
| **Melling Line** | | | |
| Inner | Melling | All stops to Wellington | Wellington |
| **Johnsonville Line** | | | |
| Inner | Johnsonville | All stops to Wellington | Wellington |
| **Wairarapa Line** | | | |
| Inter urban | Masterton | All stops to Upper Hutt then limited stops to Wellington | Wellington |

Table 13: RS1 service pattern

The above Service Pattern is also presented graphically in Appendix D.

### 6.3.2 Infrastructure requirements

Whilst on certain areas of the Wellington network the peak service frequency is 15 minutes or less for short periods, as delivered by the Base Case, it is acknowledged that additional infrastructure renewals, system strengthening and enhancements are necessary to provide a reliable service (and recoverability during times of disruption) for the entirety of the peak periods.

The infrastructure works required are:

| Project | Implementation timeline |
|---|---|
| KiwiRail eight year infrastructure 'catch up' renewals programme encompassing signalling, traction power supply, overhead line electrification rehabilitation, track, structures and platforms (this activity is being funded through Crown contributions) | 2011 (FY12) to 2019 |
| Double track Trentham to Upper Hutt (including necessary electrification and station works) | 2017 (FY18) to 2020 |
| Construct a turnback and passing loop (3rd Platform) at Porirua Station, thus providing greater operational flexibility.<br>Carry out signalling and track upgrades at certain locations where the net effect of the four trains per hour exceeds current capacity (Tawa Basin) | 2017 (FY18) to 2017 |
| Construct a turnback facility including signalling and track upgrades at Plimmerton thus providing greater operational flexibility | 2017 (FY18) to 2017 |
| Redevelopment and upgrade of Upper Hutt Station | 2019 (FY20) to 2020 |
| Network wide station deferred maintenance and major repairs | Commence 2012 (FY13) |
| Upgrades and safety improvements at level crossings | 2015 (FY16) to 2018 |

Allowing for the minimisation of network disruption and maximisation of network availability, it has been established that the most realistic practicable date for completion of the above infrastructure works is 2019 / 2020 (FY20). This date is governed by the KiwiRail infrastructure "catch up" renewals programme.

In addition to the above improvements, consideration should be given to prioritisation of 'Park and Ride' upgrades linking directly to the following stations (on the basis of enhanced services):

- Kapiti Line – Waikanae / Paraparaumu / Paekakariki / Plimmerton / Porirua
- Hutt Valley Line – Upper Hutt / Taita / Waterloo / Petone.

The GWRC Park and Ride Capacity Strategy (PARCS) (see Appendix G) is designed to provide a strategic emphasis for pursuing land opportunities which improve commuter rail park and ride capacity at locations that facilitate the service strategies set out in this updated RRP.

### 6.3.3 Patronage

On the basis of recent patronage trends a future growth rate of 2% per annum has been adopted in this updated RRP. As well as broadly reflecting recent trends this figure is consistent with forecasts from the regional transport model

WTSM, which indicates annual growth in peak rail patronage of 2.2% between 2011 and 2021.

Figure 13 below presents the above growth rates and those previously assumed in 2009, providing a comparison between the original RS1 and the refreshed RS1 and today (base case).

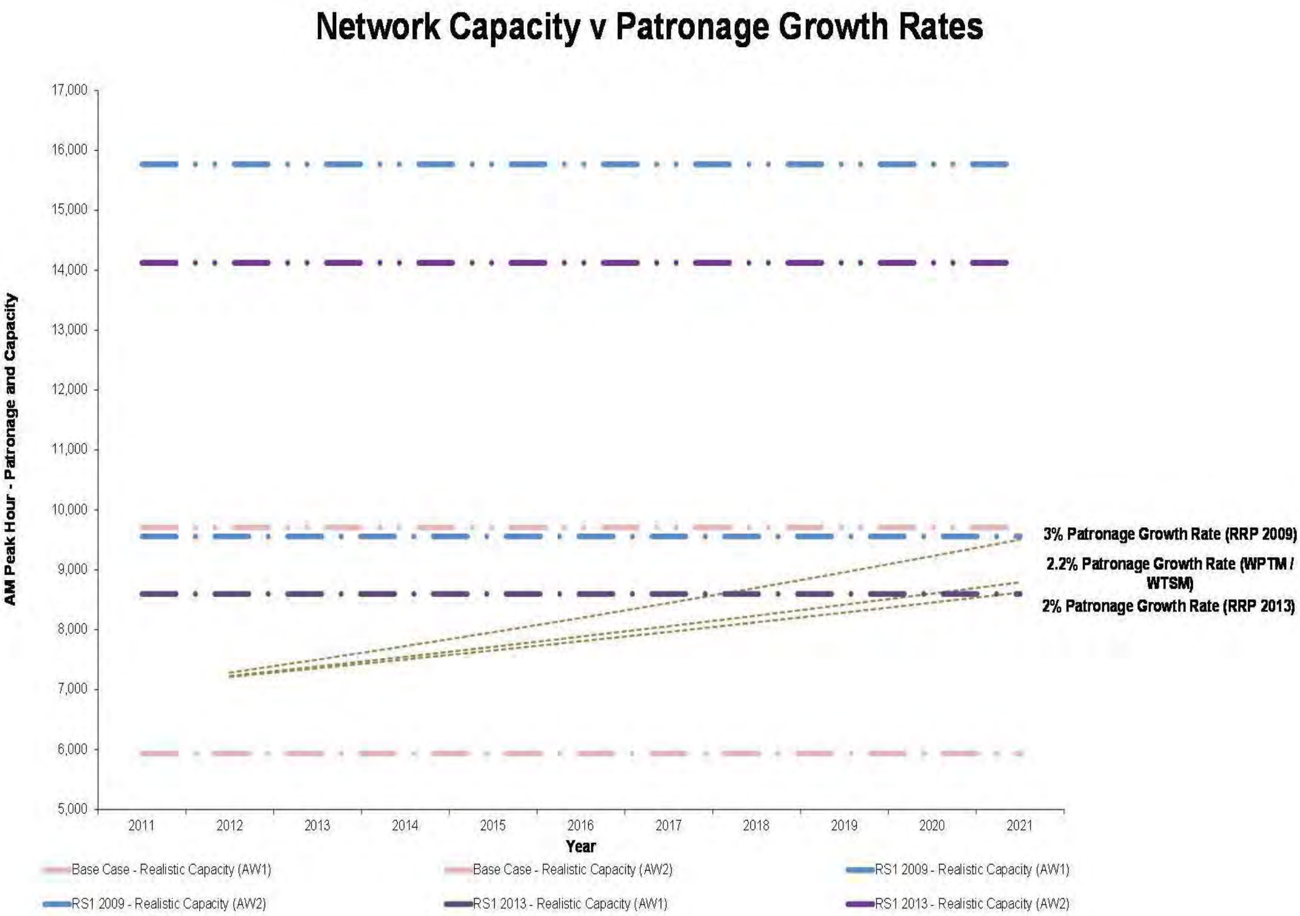


Figure 13: Patronage growth v realistic capacity RS1 – 2009 / 2013 (PPHPD)

### 6.3.4 Capacity

The 'AM – Peak Hour' capacity, based on the proposed service pattern detailed in section 6.3.1, and stated as Passengers Per Hour Per Direction (PPHPD), is presented in Table 14. The table also provides for a comparison with the Base Case – RS1 delivers a 31% increase in peak hour capacity.

| RS1 - person capacity (PPHPD) | | | | |
|---|---|---|---|---|
| Routes and service segments | Realistic capacity (RS1) | | Realistic capacity (Base Case) | |
| | AW1 (seating only) | AW2 (seating + standing at 2.55/m2) | AW1 (seating only) | AW2 (seating + standing at 2.55/m2) |
| NETWORK | 8,598 | 14,124 | 5,936 | 9,710 |
| Kapiti Line | 3,675 | 6,150 | 1,707 | 2,856 |
| Waikanae | 1,323 | 2,214 | 728 | 1,218 |
| Plimmerton | 1,176 | 1,968 | 397 | 664 |
| Porirua | 1,176 | 1,968 | 582 | 974 |
| Hutt Valley Line | 2,646 | 4,428 | 2,316 | 3,875 |
| Upper Hutt | 1,176 | 1,968 | 1,588 | 2,657 |
| Taita | 1,470 | 2,460 | 728 | 1,218 |
| Melling Line | 441 | 738 | 512 | 856 |
| Melling | 441 | 738 | 512 | 856 |
| Johnsonville Line | 1,176 | 1,968 | 847 | 1,417 |
| Johnsonville | 1,176 | 1,968 | 847 | 1,417 |
| Wairarapa Line | 660 | 840 | 554 | 706 |
| Masterton | 660 | 840 | 554 | 706 |

Table 14: RS1 realistic capacity (PPHPD)

When considering available capacity and forecast patronage it has been calculated that by 2021, AW1 capacity will be exceeded on certain services, most notable services originating from Taita (from Petone – 12 mins) and Porirua (from Redwood – 10 mins). It should be acknowledged that on longer commuter and outer suburban routes passengers standing for 20 minutes for any journey and more than 10% above seating capacity is regarded as overcrowded (when compared with similar systems / networks). However, RS1 capacity is envisaged to be exceeded only on inner suburban routes and for a period of no longer than 12 minutes which is considered acceptable.

### 6.3.5 Rolling stock

It has been calculated that the total number of 'service units' required to deliver the proposed RS1 'AM Peak Hour' service pattern as presented in Table 14 above, is 76 x two car EMUs (152 cars). A minimum requirement for spares is considered to be seven x two car EMUs (14 cars). A total fleet requirement of 83 x two car EMUs (166 cars) broadly correlates with the planned available fleet (M1 – 96 cars + M2 – 70 cars). The Wairarapa Line 'locomotive hauled' carriage train fleet will increase to 24 carriages.

It is envisaged that the detailed development of the proposed RS1 'working timetable' may render some optimisation of the fleet allocation. However, any fleet reduction requirements established through optimisation should not be effected literally but considered as available growth.

## 6.4 Benefits

The benefits, over and above the Base Case, attributable to the implementation of Rail Scenario 1, were described in the 2009 RRP and can be summarised as follows:

- Increased seat capacity on all lines, as a result of additional rolling stock
- Increased network capacity, as a result of the elimination of network and operational constraints
- Increased reliability (due to improved infrastructure)
- Increased service frequency on all lines, throughout the peak periods
- Ability to stimulate patronage growth
- Delivering a safer environment for users both on-board and at stations
- Maintaining a level of residual network capacity for rail freight
- Infrastructure improvements allowing faster freight transport
- Simplified journey experience, through the implementation of a 'clock face' timetable
- Increasing the opportunity for intensified urban development that aligns with the Wellington Regional Growth Strategy (WRGS)
- Decongestion of the Wellington roading network, as a result of new passenger transport users, resulting in wider regional economic benefits and additional environmental and accident benefits
- Providing two primary rapid transit corridors that are integrated within the passenger transport network
- Environmental improvements, such as better local air quality, from reduction in emissions generated from car usage.

As in the previous evaluation, most of these benefits have been quantified using a range of approaches. Dollar values were assigned using the NZ

Transport Agency (NZTA) Economic Evaluation Manual (EEM). The EEM benefit calculation has been updated to reflect:

- Recent changes in unit benefit values such as decongestion
- An evaluation period of 30 years and discount rate of 8%
- A new base year ("year zero") of 2012 / 13.

The key tools in modelling the impacts of RS1 relative to the base were the multi-modal regional transport models Wellington Transport Strategy Model (WTSM) and the Wellington Public Transport Model (WPTM) developed during 2012. WPTM is designed to work in conjunction with WTSM but provides the facility to model public transport (bus, rail and ferry) at a more detailed level than WTSM, for example, by using a more detailed zoning system.

For this refreshed RRP, WPTM has been used to model the impact on ridership of faster, more frequent services, while WTSM has been used to assess road traffic impacts (decongestion) due to mode shift to rail. A model run was undertaken for 2011, with benefits assumed to grow at 2% thereafter, consistent with expected passenger growth.

Runs of both models were also done for 2021 and 2031 for comparison with the growth approach described above. A sensitivity test was carried out with benefit streams derived from a combination of the three modelled years and interpolation and extrapolation for other years.

The WPTM was used to forecast how many additional passengers would be attracted to rail with RS1 compared to the "Do Minimum" scenario (DM). As before, the value of benefits to new passengers was taken from SP10 in volume 2 of EEM. At the same time, the loss of benefits due to fewer bus passengers was also taken into account.

In parallel, WTSM was used to calculate decongestion benefits from the mode switch, again using suitable values of time and vehicle operating costs from EEM.

With the proposed new service pattern in RS1 it was found that existing rail users would also benefit from both faster trips and reduced waiting time. Using passenger-hour results from WPTM, the average in-vehicle time (IVT) was calculated for both the DM and RS1, for all three modelled years. It was found that with RS1 the average IVT was just over one minute less than in the DM so a time saving of one minute was used.

Similarly, the average wait time per passenger was calculated and again it was found that RS1 gave a reduction of about one minute. This was weighted by a factor of two to reflect passengers' dislike of waiting, as described in EEM and various other sources. Overall, each peak passenger will receive a benefit of three minutes of IVT.

Previously, WTSM benefits were increased by 15% to reflect the impact of fuel price increases which have taken place since the model was calibrated but as the model has now been recalibrated to 2012 this is no longer necessary.

For the 2009 RRP, three further sources of benefit were modelled separately from WTSM. These were:

- Vehicle quality
- Crowding
- Reliability.

These are discussed in turn below.

The 2009 evaluation included benefits from a higher quality fleet in RS1 than the Base Case. However, this situation has now changed with the agreement by NZTA to part-fund a second tranche of Matangi trains, meaning that the fleets in both the Base Case and RS1 will be the same. As a result, vehicle quality benefits have been excluded.

Crowding has been modelled by comparing the loading profile on each line from WPTM with the available capacity based on headways and train consists for the busiest hour of the AM Peak. Crowding for both the Base Case and RS1 has been calculated as the excess of load over capacity, totalled over all services, on arrival at Wellington station, since that is where virtually all crowding occurs. For example, in the 2021 AM peak, the total number of passengers over capacity was found to be 1,711 in the Base Case but only 1,192 in the RS1 option.

It was assumed that crowding only took place on the last 20 minutes of a journey and the extra value of time (VoT) when standing was taken from EEM as the difference between the VoT of seated and standing passengers. The crowding model also assumed that the "peak within the peak" that is a noticeable feature of current Wellington demand (see Figure 5) would be less with the improved pattern of services in RS1.

For this refreshed RRP the previous calculation of reliability has been updated. The relatively new section in EEM on this topic has also now been taken into account. As the fleet is identical in both the Base Case and the RSI options no reliability benefits have been assumed from that source; previously the Base Case included refurbished Ganz Mavag units which were expected to reduce reliability.

Reliability benefits in RS1 are now expected to result from double tracking north of Trentham on the Hutt Valley Line. It has been assumed that all peak passengers on that section of line will receive a reliability benefit of half a minute reduction in average minutes late since the double tracking will provide greater resilience in the event of unexpected delays.

Both crowding and reliability improvements will lead to two sources of benefits:

- Benefits to rail passengers themselves
- A small increase in rail patronage which gives decongestion benefits to road users due to mode shift.

These benefits have been evaluated, using suitable values from EEM, for the three modelled years of 2011, 2021 and 2031.

# 7. Rail Scenario 1 – costs and benefits

## 7.1 Cost analysis - approach

In order to understand the total costs associated with the Base Case and updated Rail Scenario 1, it is necessary to use a mechanism that will identify the potential financial impacts of any particular scenario over the duration of the 30 year economic evaluation period (the current NZTA requirement).

To ensure that each scenario is accurately represented, a detailed cost model has been developed using a 'full value' approach covering the 'lifecycle' of the asset (cost data represents the full value of cash outflows for each line item). The full value approach was use on the basis that:

- The outputs would be used to support long term business planning
- There is a need for relevant stakeholders to use the data to plan budgets on cost projections, i.e., an understanding of the full value figures
- The Base Case scenario, as a long-term option, is still considered untenable as it fails to meet the strategic requirements of the region.

The cost analysis is relative to a base year commencing on 1 July 2012 (financial year 2013).

## 7.2 Cost analysis – updated Rail Scenario 1

To fully implement the updated RS1 (as described in section 6), a further $240 million (present value (PV) - $77.63 million) is required over and above the current committed Base Case. Proportionally, $127.75 million (PV - $44.94 million) relates to CAPEX and $112.50 million (PV - $32.69 million) is associated with additional OPEX. The distribution of the incremental costs is presented in Figure 14.

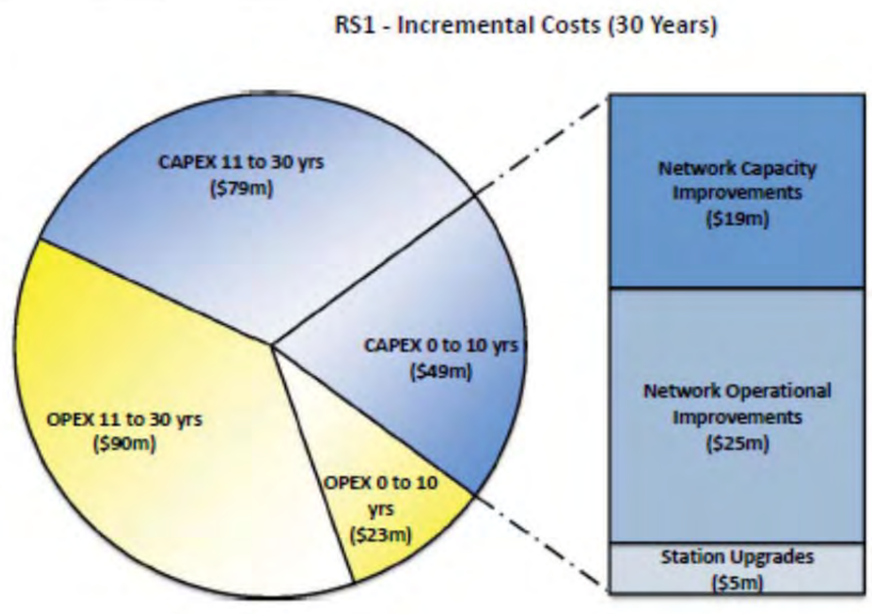


Figure 14: RS1 incremental cost capex + opex (30 years)

Whilst the additional financial commitment is significant, it must be recognised that the capital and operational costs are spread over a long period of time.

The 10 year RS1 implementation costs of an additional $72 million is still significant, however **there are no immediate budget implications of adopting RS1 as cost causing activities do not commence until FY18 (2017 / 2018), and are spread over a three year period**. Furthermore the initial capital cost impacts are accounted for within GWRC's draft Long-Term Plan budgets.

The capital and operational expenditure cost models are presented in Appendix E.

## 7.3 Benefit analysis

The economic benefits of RS1 are discussed above. The outcome of wider benefits evaluation is shown in Table 15 and Figure 15. It can be seen that the PV of all benefits is just over $116 million. This is lower than the figure from the 2009 RRP evaluation, reflecting both the removal of two sources of benefit and the fact that benefits have been "pushed back" in time so are more heavily discounted.

In summary, about half the benefits are from the modelled sources (new users and decongestion) and about a third are for existing users. Reliability and reduction in crowding account for the rest.

| Source | $m (PV) | Breakdown |
|---|---|---|
| WTSM / WPTM | $59.85 | 51% |
| Existing users | $38.41 | 33% |
| Reliability | $6.47 | 6% |
| Reduction in crowding | $12.13 | 10% |
| Total | $116.86 | |

Table 15: RS1 benefit analysis – sources of benefit

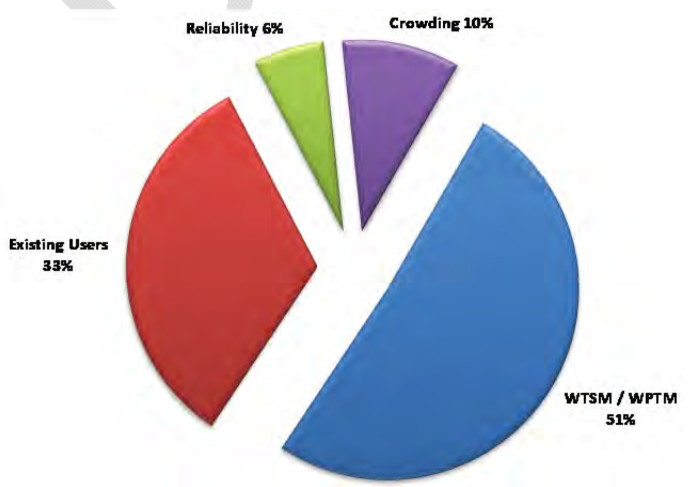


Figure 15: RS1 Sources of Benefits

### 7.4 Benefit cost ratio

The full costs and benefits of the proposed updated RS1 are detailed in Table 16 below.

| Costs: | $m (PV) |
|---|---|
| CAPEX & OPEX | $77.63 |
| Extra revenue | ($13.24) |
| Benefits: | |
| WTSM / WPTM | $59.85 |
| Existing users | $38.41 |
| Reliability | $6.47 |
| Reduction in crowding | $12.13 |
| Total | $116.86 |
| BCR(N) | 1.5 |
| BCR(G) | 1.8 |

Table 16: RS1 benefit cost ratio

It can be seen that the BCR is 1.5 if no account is taken of the extra revenue (the BCR(N)) and 1.8 if it is (BCR(G)). The BCR's are lower than in the 2009 RRP evaluation and both costs and benefits are lower as a result of the different timing. The cost of new rolling stock has been taken out of the equation, resulting in lower costs but also fewer benefits.

If the benefit stream is based on the three modelled years (rather than linear growth), the BCR's fall slightly to 1.4 and 1.6 respectively. This is largely due to the forecast impact of the Wellington Roads of National Significance (RoNS) on public transport usage in the later years of the evaluation.

Overall, the economic efficiency is low in terms of the NZTA profile, since it lies in the range 1 – 2.

# 8. Sensitivity testing

To test the robustness of the economic outcome a series of sensitivity tests have been carried out varying the assumptions in the economic model. The tests looked at a number of aspects of the costs and benefits and the impact on the BCR of changing them. The results are given in Table 17.

| Test | BCR(N) | BCR(G) |
|---|---|---|
| RS1 | 1.5 | 1.8 |
| Annual patronage growth 1.5% p.a. (base = 2%) | 1.5 | 1.7 |
| Annual patronage growth 2.5% p.a. | 1.6 | 1.9 |
| No patronage growth after 2030 | 1.5 | 1.8 |
| No reliability benefits | 1.4 | 1.7 |
| No crowding benefits | 1.3 | 1.6 |
| Benefits to existing users 10% lower | 1.5 | 1.8 |
| Benefits to existing users 10% higher | 1.6 | 1.9 |
| WTSM benefits 10% lower | 1.4 | 1.7 |
| WTSM benefits 10% higher | 1.6 | 1.9 |
| Capital costs 10% lower | 1.6 | 2.0 |
| Capital costs 10% higher | 1.4 | 1.7 |
| Operating costs 10% lower | 1.6 | 1.9 |
| Operating costs 10% higher | 1.4 | 1.7 |
| Discount rate 6% (base = 8%) | 1.5 | 1.8 |
| Discount rate 4% | 1.5 | 1.8 |
| Include wider economic benefits at 20% of conventional transport (i.e. WTSM) benefits | 1.7 | 2.0 |

Table 17: RS1 sensitivity tests

The nature of the tests is largely self-explanatory. For example, the base passenger growth assumption of 2% per annum has been varied by + / - 0.5%. Benefits from different sources have been either varied or excluded and total capital and operating costs have been varied by + / - 10%.

However, the last three tests in Table 17 require further explanation. The tests of discount rate are a requirement of NZTA. The fact that there is little impact on the BCR reflects that the benefits and costs occur throughout the evaluation period so that the present value (PV) of benefits and costs changes roughly in equal measure when the discount rate changes. The final test includes an estimate of 'wider economic benefits', such as agglomeration, with a 20% uplift which has been based on public transport schemes elsewhere.

It can be seen from the results that none of the tests has a major impact on the BCR's. No test changes the BCR by more than + / - 0.2%. This is considered significant in so much as it indicates that the overall economic case is robust and does not depend on any single source of benefits or costs.

# 9. Pathway to implementation

## 9.1 A better rail experience

The preferred solution recommended for the long term development of the Wellington region's rail network needs to deliver an outcome that achieves the RRP Vision Statement:

- Achieving strategic goals for Public Transport in the region
- Providing value for money
- Providing the Outcomes desired by the customer
- Meeting GPS requirements
- Having a positive effect on rail based freight movements through the region
- Providing capacity that closely matches demand
- Enhancing region-wide network accessibility
- Achieving positive buy in from all stakeholders
- Certainty of funding
- Certainty on timescales
- Appropriate assignment of responsibility for risk.

Investment in rail is a capital-intensive process that delivers substantial long-term 'generational' benefits typically in excess of 25 years. The quantitative evaluation undertaken as part of the RRP 2009 has been updated and once again demonstrated that targeted investment in rail in Wellington is considerably worthwhile. Rail Scenario 1 (RS1) remains an 'effective and efficient' development option.

The implementation of RS1 is considered the **essential first stage** to ***'A Better Rail Experience'***, [this was previously acknowledged through regional endorsement in February 2009].

The current underlying growth in patronage of around 2% is marginally less than original 2009 annual growth rate assumption of 3% (which aligned with GPS targets). However, setting aside targets, RS1 is still essential if the projected growth up to and beyond 2016 is to be catered for.

## 9.2 Implementation

The Base Case outputs have delivered considerably more than originally anticipated (specifically around operational network capacity), and consequently it has been logical to focus on the scope of RS1 during this update.

In this refreshed RRP, RS1 has been optimised to ensure that there is not an over-supply of capacity in the medium term, whilst retaining a scalable pathway. This approach has led to the development of an outer (Suburban) and inner (Metro) Network design, that when implemented readily incorporates elements of the *'Preferred Pathway'*.

Ideally, the implementation of RS1 should take place as soon as possible, thus maintaining development momentum, in order to achieve overarching strategic and government targets. This momentum can be maintained not via consideration but by action through the early implementation of projects where 'scope synergy' provides 'value for money' and the 'early realisation of benefits'. As an example, RS1 identifies the need for a turnback and platform loop at Porirua Station to facilitate the proposed operational service requirements. The majority of the required infrastructure already exists and is currently identified for upgrading / renewal as part of the KiwiRail catch-up renewals programme. The planned work incorporates the enhancement of both track and signalling assets ahead of when the infrastructure is actually needed. This will result in less disruption and the improvements can be utilised sooner, providing for earlier realisation of benefits and savings in the overall implementation cost.

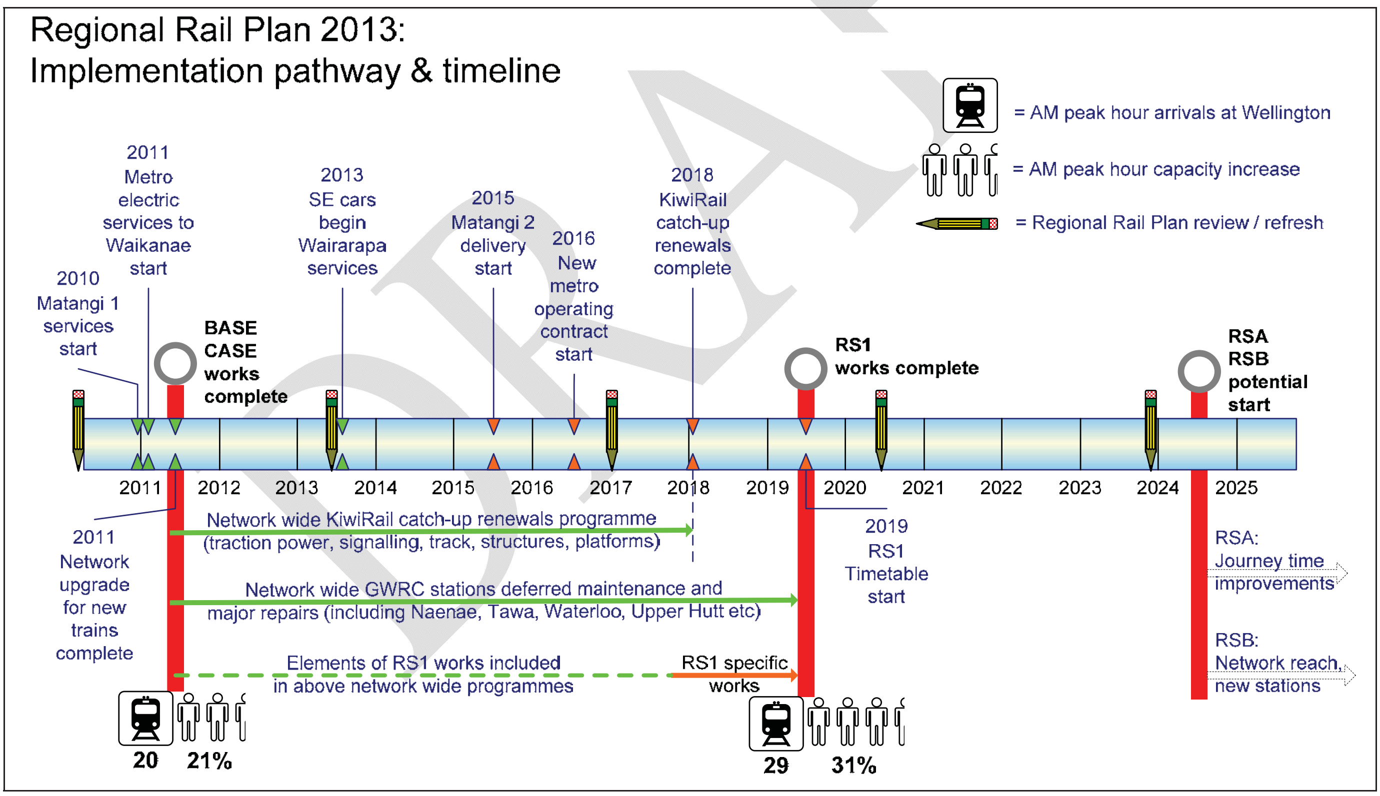


Figure 16: RRP 2013 implementation pathway

The 2009 RRP identified RS2 (*Increased Frequency and Capacity*) as the best long-term development option for the Wellington rail network. In order to deliver RS2, and by the incremental nature of the scenario designs, all of the infrastructure enhancement associated with RS1 is required to be implemented.

This type of project staging is extremely beneficial in a financially constrained and capital competitive environment. It should be acknowledged that this type of incremental implementation strategy is widely adopted in many capital rich Australasian regions, most notably Queensland and Western Australia.

# 10. Beyond Rail Scenario 1

GWRC proposes a phased approach to implementation, as presented in section 9 (and most notably in Figure 16). There are stops along the pathway; junctions or decision points between each scenario provide opportunities to defer, bring forward or scale projects up or down depending on network demand and available resources.

As the RRP implementation pathway diagram shows, the preferred option is to complete RS1 then proceed to Rail Scenario 2 (RS2) then to Rail Scenario A (RSA) (journey time reductions) and then Rail Scenario B (RSB) (network extension) (see Appendix A for details of these scenarios). However, if patronage forecasts show a levelling off in demand, specifically on the outer (Suburban) segments of the network, an alternative option exists to proceed directly to RSA after RS1 and implement RS2 and RSB later.

The phased implementation approach assists risk management. It accommodates the significant lead times required for ordering additional new rolling stock and undertaking large infrastructure projects.

Like other Wellington regional strategies, the RRP plan provides choices and the flexibility to respond to changing external pressures and community needs. Both RSA and RSB could be implemented as a direct result of trigger factors which required a more competitive passenger transport offering. RSA would provide noticeable reductions in journey time, whilst RSB would provide for service and network expansion beyond the current TMW operational boundaries.

Figure 16 clearly identifies both RSA and RSB as long-term development scenarios, i.e., implementation beyond 2020. During this update both the project list and associated scenario mapping have been reviewed (see Appendix C). This exercise has identified a number of specific projects that would benefit from an early review to confirm the appropriateness of previous assumptions.

The projects / programmes that have been reviewed are:

- Station enhancements (Raumati and Lindale)
- Service enhancements (service extension north of Waikanae)
- Corridor enhancement (electrification extension to Otaki).

The review outcomes are discussed in the following sections.

## 10.1 Station enhancements - Raumati and Lindale

### 10.1.1 Kapiti railway stations

In February 2008, GWRC endorsed the findings of the scoping phase of the Kapiti Railway Stations Concept Design Project (KRSCD).

The overarching objective of the KRSCD was to inform and assist GWRC to determine the most appropriate implementation programme for the development of railway stations on the Kapiti Coast.

The scoping phase study concluded that the following implementation programme would provide the best outcome.

| Timetable | Development | Comments |
|---|---|---|
| 0-5 years | Paraparaumu Station<br>- New eastern platform<br>- New station facilities<br>- Improved mobility impaired access<br>- Car park enhancements | Enabling works for double tracking and electrification to Waikanae |
| | Waikanae Station<br>- Station re-development<br>- Additional / new car parking | Provision of additional car parks and services from Waikanae will relieve some pressure on car parking at Paraparaumu |
| 5-15 years | Lindale Station | Would act as a sister station to Paraparaumu providing park and ride facilities, freeing space at Paraparaumu.<br>Timing dependant on Western Link Rd implementation and overall demand (passengers and parking) |
| 15+ years | Raumati Station | Affected by final location of Western Link Rd (Poplar Avenue). Optimal timing dependant on population growth |

Table 18: KRSCD Implementation Programme (2008)



The KRSCD implementation programme detailed in Table 18 above, specifically relating to Lindale and Raumati, was supported by the following rationale:

- Both Lindale and Raumati have development opportunities within walking distance from the proposed stations. Developments should be planned to support the stations with increased residential density. Most of the Kapiti Coast area will attract park and ride users, given the distance from residences / townships to the railway stations.

- The implementation programme provides increased car parking capacity, with additional car parks at Waikanae. Lindale Station can be considered a sister station to Paraparaumu as it is only located 1.5km from Paraparaumu Station. Land owned by GWRC is available for car parking in the direct vicinity of the proposed Lindale Station (Lot 12 DP 314986). With the Western Link Road in place, this station would have the largest park and ride catchment. A new Lindale station will relieve pressure for car parks at Paraparaumu and is the only station that does not require motorists to cross or use the congested State Highway 1 and Kapiti Road routes to access the station, thereby reducing traffic congestion.

- Raumati Station has a smaller catchment than Lindale and is to the south of the populated area. Car park availability and access to the station is also more limited than Lindale and has the added disadvantage of severance (caused by the adjacency of SH1). Land owned by GWRC is available for car parking adjacent to SH1 (PT Lot 42 DP 17564 and PT Sec 18 Wainui District) and would be linked to the proposed railway station by means of a pedestrian access footbridge. Rail passengers / existing users north of Raumati would be delayed by the time taken to slow, stop and accelerate trains for a station at Raumati.

- Modelling established that the benefits to the local Raumati residents for a new station are in fact outweighed by the disadvantage to the other rail passengers. As the population increases in the vicinity of the Raumati Station the disadvantage may be balanced with increased station patronage. The modelling also identified that the majority of 'passenger boardings' at Raumati Station would be a direct result of patronage redistribution, primarily from Paraparaumu, rather than new users. The optimal timing for the new station is expected to be at the end of the implementation programme when there is potential for increased patronage and doubt over the location of the Western Link Road connection to State Highway 1 has been clarified.

### 10.1.2 RRP 2012 - Review

The early review of RSB 'scenario mapping' assumptions relating to both Lindale and Raumati stations has focussed on the overall need (through detailed modelling) and economic viability (through the update of associated costs and benefits) of implementing the works. The overall approach has been to undertake a 'qualitative' assessment of the stated options, supported by 'quantitative' analysis.

The early review has identified a number of significant issues that potentially remove the options for new railway stations that have been previously identified at Lindale and Raumati. The issues identified are:

#### (a) Lindale Station

- The Western Link Road (WLR) project has now been superseded by the MacKays to Peka Peka Expressway – M2PP (a project being delivered by NZTA as part of the 'Roads of National Significance' – RoNs Programme).

- The confirmed M2PP alignment does not incorporate the extension of Mazengarb Road, which in the original WLR project, provided station access and the realisation of a significant 'park & ride' catchment for the proposed Lindale station.

- The attractiveness of Lindale as a 'park and ride' railway station has been significantly affected through the combination of reduced catchment, and indirect access.

- Adjacent land development opportunities have been deferred and in some cases completely eliminated i.e. Whitireia Community Polytechnic has now relocated to a new campus at the intersection of Kapiti Road and Milne Drive.

On the basis of the above it is considered that the implementation of a new railway station at Lindale should be removed from the projects list as it no longer contributes to the realisation of the Wellington RRP *'Vision Statement'* and as such does not support the identified *'Targeted Outcomes'*.

(b) Raumati Station

- The confirmed M2PP alignment at the proposed Poplar Avenue Interchange necessitates 'land requirements' that significantly affect the site of, and access to, the proposed Raumati Station car park [land requirements identified include PT Sec 18 Wainui Dist – 1.6683ha (Balance – 0ha); and PT Lot 42 DP 17564 – 1.4404ha (Balance – 1.0376ha)].

- The balance of land available to GWRC at Raumati, within PT Lot 42 DP 17564, still retains the potential to be utilised for a future railway station 'park and ride' development, albeit at a significantly reduced capacity.

- The primary functional characteristic of the station is 'Park and Ride', and as such access to and the capacity of car parking is fundamental to the attraction of users.

- The car park to station access at Raumati is still a significant requirement in relation to the overall station layout and platform accessibility. It has been established that the proposed access footbridge would need to be in the order of 115m in length, with a clear main span over the M2PP expressway of 35m to 45m in length (by way of comparison the recently constructed Beachcroft Avenue footbridge over SH16 in Auckland has a 46m clear span, see Figure 17 below), and up to 3 side spans each in the order of 20m to 25m in length. In order to optimise available land and space within the station platform confines, vertical access to the footbridge will require pedestrian lifts and stairs in lieu of ramps.


Figure 17: Beachcroft Avenue Footbridge SH20 - Auckland (NZTA)

- The combination of additional requirements for the car park to station platform access, and capacity constrained car parking at Raumati, will almost certainly render an un-acceptable investment outcome from an economic viability perspective.

An update of modelling work undertaken as part of the KRSCD project, concluded that most of the patronage at Raumati is actually abstracted from existing stations within the Kapiti cluster, and that 'net' new patronage will be minimal (an actual decline in later years of around 3% has been forecast). Given the fact that a number of key assumptions are now considered to be invalid i.e. introduction of M2PP and implementation costs it has been necessary to fully update both the patronage modelling and the capital cost of the project.

Detailed patronage modelling using both the Wellington Transport Strategy Model (WTSM) and the recently developed Wellington Passenger Transport Model (WPTM) has confirmed that passenger boardings at Raumati Station would largely comprise existing passengers from Paraparaumu Station. The modelling results are presented in Table 19.

| Modelling Outputs | Boardings |
|---|---|
| Total Peak Hour (WPTM) | 254 |
| Existing Users (Station Switchers) | 237 |
| New Users | 17 |

Table 19: Raumati Station WTSM / WPTM modelling results

A review of the costs associated with the implementation of Raumati Station has calculated that the 'Base Cost' is in the order of $9.3 million an increase of 20% from the figures stated in the KRSCD Scoping Study (2008). A comparison of high level cost estimates is detailed in Table 20 (the costs presented do not include any rail disruption costs).

| Option | Base $ | Minimum $ (Most likely) | Maximum $ (Most likely) |
|---|---|---|---|
| Raumati Station (KRSCD - 2008) | $ 7,698,600 | $ 6,928,750 | $ 10,008,200 |
| Raumati Station (RRP - 2012) | $ 9,269,665 | $ 10,196,630 | $ 12,050,560 |

Table 20: Raumati Station – high level cost estimation and comparison

The modelled patronage forecasts and updated costs provide for a Benefit Cost Ratio of 0.7. This analysis confirms that the implementation of Raumati Station is not viable from an 'Economic Efficiency' perspective. A detailed overview of the economic evaluation undertaken is presented in Appendix H.

On the basis of this information, it is considered that the implementation of a new railway station at Raumati no longer contributes to the realisation of the Wellington RRP 'Vision Statement' nor does it support any of the identified 'targeted outcomes'.

The analysis undertaken for Raumati also serves as a 'viability benchmark' for the future consideration of new stations, in so much as modelled peak hour patronage needs to be in the order of 300 new passengers.

In lieu of new railway stations at Lindale and Raumati, consideration should be given to the incorporation within RSB, of future development of Waikanae, Paraparaumu and Paekakariki Stations.

## 10.2 Service enhancements – north of Waikanae

Rail Scenario B (RSB) is an event driven service enhancement option that can be founded on either RS1 or RS2, but is considered to be independent.

It is anticipated that the implementation of RSB would be as a direct result of a 'trigger factor', most probably the inherent need for a more competitive public transport offering that will penetrate further into the region through service expansion beyond existing Wellington Metropolitan Rail Network operational boundaries, namely Waikanae (KPL) and Upper Hutt (HVL).

It is considered that this scenario will be reactionary, with the necessity and ability for quick implementation. As such the scenario, as previously developed, comprises the provision of 'shuttle' services that would feed into the main network in an almost seamless manner through integrated transfers.

GWRC currently provides the Wairarapa Line service from Masterton to Wellington, using locomotive hauled SW carriages. This service operates primarily during peak periods (Monday to Friday) with a reduced service at weekends.

On the KPL an 'inter-urban' regional rail service, the Capital Connection (CC), operates between Palmerston North and Wellington. The service, operated by KiwiRail – Tranz Scenic, runs Monday to Friday as a single morning peak in-bound and evening peak outbound. Despite the 125 minute journey time, the CC is popular with long distance commuters on the basis of its express schedule and higher levels of comfort.

## 10.3 Corridor enhancements – electrification extension to Otaki

The service enhancement element of RSB, as described above does not incorporate the extension of the current Wellington Electrified Area (WEA) beyond its exiting limits. However, within RSB there is the potential for the consideration of sub options (refer to Appendix C – The Projects List) that would be corridor specific and wholly reliant on growth in demand. One such consideration is the extension of the WEA limits beyond Waikanae to Otaki, a distance in the order of 15km.

In order to deliver the option the following infrastructure works would require to be implemented:

- Construction of 17.5 single track kilometres of 1500 volt DC overhead electrification equipment (this allows for 3 passing loops)
- Construction of up to two new traction power feeder substations
- Track upgrades and renewals
- Signalling upgrades and renewals (including associated immunisation works)
- End of line stabling facility (including associated driver and cleaning facilities)
- Upgrade / renewal of Otaki railway station.

It is envisaged that the cost of the infrastructure works detailed above would be in the order of $50m to $60m[3].

From an operational perspective the length of single line track and position of existing passing loops will dictate the level of service and hence the number of trains that can be reliably operated. As a start-up service it is considered practical to operate peak services only, with up to two trains per hour in both the AM and PM peak periods.

3 Breakdown of Estimate: 17.5km of OCS $17.5m; 2 x Feeder Stations $12m; Track Upgrades / Renewals $5m; Signalling Upgrades $10m; End of Line Stabling $5m; Otaki Station Upgrade / Renewal $5m

In order to deliver the service described above, it is anticipated that four 'inter urban' train sets would be required. These trains would be an addition to the existing EMU fleet and it is envisaged that they would typically be based on the existing Matangi, with modifications to cater for an appropriate level of passenger comfort expected when embarking on a long distant commuter rail journey with a 70 minute travel time (Otaki to Wellington). Modification's would typically include 4 car consists, with one of the car's providing for disabled passengers with at least 75% low floor height and toilet facilities (designed accordingly).

It is estimated that the additional rolling stock required for this option would cost between \$60m and \$80m[4], this being on the basis of 4 x 4 car consist EMUs plus the attraction of a 'small / special order' premium.

Work undertaken during the production of the 2009 RRP suggested that an extended rail service to Otaki could generate daily demand of approximately 200 to 250 passengers (based on growth projections underpinned by outputs from the 2006 census).

Taking into consideration the results of the economic evaluation undertaken for Raumati Station (as presented in section 10.1 above), it is 'highly unlikely' that a project with similar levels of passenger boarding (254 versus 250) and capital expenditure requirement ten times greater (\$110m versus \$10m) will provide an acceptable level of investment return.

Given the findings above it is anticipated that any service extension as presented in RSB will be based on shuttle or interlined services delivered by non-electrified rolling stock, namely SW locomotive hauled carriage trains or new Diesel Multiple Units (DMU's). This scenario being as assumed and presented in the 2009 RRP.

## 10.4 Kapiti Railway Stations - Further Options

In addition to the projects reviewed above, additional investigation was done to expand the conclusions. This supplementary analysis/evaluation (Appendix I) reviewed an alternate site for a Raumati Station and a proposed station for Queen Elizabeth II Park.

### (a) Raumati Station (Northern Option)

This proposed car park location would utilise land that may become available on completion of the M2PP project. The land is located to the north of Leinster Ave, and provides a linear car park adjacent to the railway corridor.

| Option | Base \$ | Minimum \$ (Most Likely) | Maximum \$ (Most Likely) |
|---|---|---|---|
| Raumati Station – Northern Option | \$ 7,500,975 | \$ 8,251,070 | \$ 9,751,270 |

4 16 cars x \$3.75m to \$5m per Car

An estimate to the costs associated with the implementation of the northern Raumati Station option has calculated that the 'Base Cost' is in the order of $7.5 million. This gives the project a BCR of around 0.9, however as the costs still exceed the benefits the northern option is not considered to be justified from an 'Economic Efficiency' perspective.

### (b) Queen Elizabeth II Park (Proposed Station)

The location of the proposed station is at MacKays Crossing, with the nearest areas of residential population being Paekakariki township, which is already served by Paekakariki Station. The stations primary function will be Park and Ride, facilitated by the utilisation of a parcel of land situated between SH1 and the railway corridor, that may be available as a result of the MacKays Crossing grade separation which was completed c2006.

| Option | Base $ | Minimum $ (Most Likely) | Maximum $ (Most Likely) |
|---|---|---|---|
| Queen Elizabeth II Park Station | $ 8,212,450 | $ 9,444,315 | $ 10,676,180 |

An estimate of the costs associated with the implementation of a Queen Elizabeth II Park station has calculated that the 'Base Cost' is in the order of $8.2 million. A quantitative analysis of the 'Economic Efficiency' relating to the provision of a new station has not been undertaken. However given the reasonable comparison with the detailed analysis undertaken for Raumati Station it is conceivable that a BCR in the range of 0.6 to 0.8 would be achieved if a quantitative analysis were undertaken.

It is considered unlikely that the total benefits attributable to the construction of a new station at Queen Elizabeth II Park would exceed the total costs, the consequence being that the proposal is not viable from an 'Economic Efficiency' perspective. This is also supported by the further observations made within the RRP around a 'viability benchmark'. Furthermore, if it was determined that the proposed station was in fact a destination point then it is conceivable that the level of benefits would in fact be considerably less than if it were a point of origin.

Given the location of Paekakariki Station and Queen Elizabeth II Park (a distance of less than 3km) it is recommended that further development of the car park at Paekakariki station be considered in order to add capacity to the Kapiti Coast station cluster through the most efficient and effective means available.

### (c) Paekakariki Car Park

An estimate of costs for the development of the car park at Paekakariki has been undertaken by Aurecon. To increase the current capacity of the car park by 54 spaces (based on a sketch plan only and no design or investigation works) a cost of $680,000 has been estimated. There is the potential for significant costs in approval and construction of the works particularly related to the following items:

- Subgrade improvement works for the pavement due to poor underlying soil conditions
- Costs related to the handling and disposal of contaminated materials
- Repair and/or replacement works associated with KCDC stormwater mains
- Protection and/or diversion of other underground services
- Negotiations with neighbouring properties and assessment of effects (particularly light spill).

# 11. Conclusions

The Base Case projects have delivered considerably more than expected, especially in terms of increased capacity, and this needs to be factored into forward planning.

GWRC has decided to replace the current Ganz Mavag fleet, rather than undertake mechanical and cosmetic refurbishment which would prolong the economic life of the fleet by up to 10 years. Funding for more Matangi trains has been approved and an all-new fleet will be operational by late 2016.

Government has committed to fund an 8 year network catch-up renewals programme. The programme covers overhead traction, signalling, track and structures assets.

Patronage growth in recent years has fallen, meaning that a reduced future growth of 2% per annum has been assumed rather than the previous 3%. The current figure is in line with the latest forecasts from GWRC's transport modelling for the period 2011-21.

A detailed review of boarding and alighting data has identified that the current system is not operating in a way that maximises resources. The analysis has established that patronage peaks in a 15 minute window in the AM peak period when 30% of all passengers arrive at Wellington Railway Station. This is inefficient because so much resource is dedicated to managing this "peak hour factor".

The solution presented in the refreshed RS1 is to reorganise services so that capacity is redistributed to closely match demand. This approach will promote the increase of the 'peak hour factor' thus optimising loading diversity.

Almost 50% of all AM peak boardings observed are with in the inner segment of the Wellington network. The inner segment is within 21 kilometres and 30 minutes of Wellington Station.

It has been established that during the busiest hour, 46% of all AM peak boardings on the Hutt Valley Line occur at Waterloo station, and that 29% of all AM peak boardings on the Kapiti Line occur at Porirua station.

The proposed refreshed RS1 service pattern acknowledges the boarding / loading observations on the inner and outer segments of the network and has adopted corresponding metro and suburban service characteristics.

A number of additional infrastructure enhancements that are essential for the implementation of RS1 have been confirmed, thus allowing for the refinement of the preferred pathway.

A process of selective public engagement, with both customer and community stakeholders, has reconfirmed that "reliability" is considered to be the most important of the RRP targeted outcomes.

When determining person capacity requirements it is essential to make due allowance for loading diversity. This enables the distinction to be made between how many passengers ‘can’ be, rather than ‘could’ be accommodated during the defining operational planning period (the inbound AM peak hour).

Following the review of a number of longer term projects contained within RSB, it has been confirmed that:

- The implementation of additional railway stations on the Kapiti Line at Raumati and Lindale no longer contribute to the realisation of the RRP “Vision Statement” or support the identified “Targeted Outcomes”

- The detailed analysis undertaken for Raumati also serves as a ‘viability benchmark’ for the future consideration of new stations generally; in so much as modelled peak hour patronage needs to be in the order of 300 new passengers

- Network extensions beyond the current Metlink operational limits will take the form of shuttle or non-electrified interlined services

- Electrification beyond the current WEA limits is not considered to be a viable component of RSB.

While this refreshed RRP largely follows the 2009 RRP, there are a number of significant differences that have been considered during the economic evaluation, namely:

- A more detailed model of Passenger transport in the region WPTM has been used in the latest economic evaluation

- During 2012, NZTA agreed to assist with the funding of a second tranche of new Matangi trains. This means the Ganz Mavag units will be decommissioned within the next few years rather than being refurbished. This was part of the options in the previous RRP and can now be considered to have moved from being in the options to being part of the Do Minimum (DM)

- As a result of the Matangi fleet decision, vehicle quality benefits no longer appear in the evaluation since improved rolling stock is also part of the DM. Reliability and crowding benefits have also reduced compared with the 2009 RRP. The remaining reliability benefits arise from double tracking north of Trentham and the remaining crowding benefits are the result of timetable and capacity improvements

- The Matangi purchase has also led to a reduction in capital and operating (e.g., maintenance) costs in the evaluation

- Benefits to existing users, from reduced in-vehicle and waiting times, are included in the RRP for the first time

- The other significant difference in the evaluation is that the NZTA discount rate has fallen from 10% to 8% and the evaluation period has increased from 25 to 30 years. This affects both costs and benefits.

The net effect of all the above factors is a BCR of 1.5 if new revenue is excluded and 1.8 if it is included. A series of sensitivity tests has shown this finding to be robust.

# Glossary

## Primary stakeholders involved in the Wellington Regional Rail Plan

| | |
|---|---|
| GWRC | Greater Wellington Regional Council – Greater Wellington Regional Council is the body responsible for setting overall land transport and public transport policy in the Wellington region. |
| GWRL | Greater Wellington Rail Limited – is a subsidiary company of Greater Wellington Regional Council, and owns rolling stock and other rail infrastructure assets (stations and depot). |
| NZRC | New Zealand Railways Corporation – is the organisation that holds 'Crown land' for rail purposes (this land is made available for use by KHL under a lease agreement). |
| KHL | KiwiRail Holdings Limited – is the new State Owned Enterprise (as announced by the Government in June 2012) that owns and operates NZRC's entire rail and ferry operating assets, including track infrastructure. KHL operates under the KiwiRail brand. |
| KiwiRail (I&E) | KiwiRail Infrastructure and Engineering – is the business unit within KiwiRail Limited (a wholly owned subsidiary of KiwiRail Holdings Limited – KHL) that maintains and improves the rail network and controls the operation of trains on the network. |
| NZTA | NZ Transport Agency – is the government agency responsible for allocating resources to transport services and infrastructure, consistent with government transport policy, and the approver of safety operating systems such as those required by rail operators to obtain a Rail Safety Licence. |
| TA | Territorial Authority – TAs affected by the rail within the region are Kapiti Coast District Council, Porirua City Council, Wellington City Council, Hutt City Council, Upper Hutt City Council, South Wairarapa District Council, Carterton District Council, Masterton District Council. |
| TMW | Tranz Metro Wellington – the operator of rail passenger services in Wellington (TMW is a brand within the KiwiRail Passenger business unit). |

## General terms and abbreviations

| | |
|---|---|
| AB | Agglomeration Benefits |
| ATR | Alternatives to Roading |

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|---|---|
| AW | Added Weight – (AW1, AW2) – the factor that describes the rail vehicle loading scenario / capacity:<br>AW1 – vehicle capacity when all passengers are seated (equal to number of seats in the vehicle)<br>AW2 – vehicle capacity when all seats are taken plus 2.55 people are standing per one square metre (this being calculated as the *'regular commuter maximum capacity with ability to collect revenue'* – as per Wellington EMU Passenger Capacity Report November 2011). |
| BCR | Benefit Cost Ratio |
| BCR(G) | BCR Government – this is effectively a benefit cost ratio which also takes into account any changes in revenue (not normally present in a roading scheme) by deducting revenue increases from the costs. |
| BCR(N) | BCR National – this is effectively a benefit cost ratio which excludes the effects of revenue increases. |
| CAPEX | Capital Expenditure – costs associated with the implementation of a Capital Works Project / Programme. |
| CBD | Central Business District |
| CLOCK FACE | Clock Face Timetable – a timetable where departure times are easy to use and remember for a regular passenger, for example, train departs at the same time each hour 09:00 / 09:30 / 10:00 (30 minute clock face). |
| CPP | Competitive Pricing Procedures |
| DMU | Diesel Multiple Unit |
| DTEW | Double Track and Electrification to Waikanae – the project, completed in early 2011, which facilitated track duplication from MacKays Crossing to Waikanae, encompassing additional and extended overhead electrification infrastructure. |
| EEM | Economic Evaluation Manual – the manual that has been developed to assist approved organisations evaluate the economic efficiency of activities for which they seek funding from NZTA, within the framework of NZTA's overall funding allocation process. |
| EMU | Electrical Multiple Unit |
| FAR | Financial Assistance Rate |
| GM | Electric Multiple Units, comprising motor coaches and trailer coaches, manufactured by the Ganz Mavag Company |

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| GPS | Government Policy Statements (GPSs) – the framework that is utilised to establish the government's funding policy and priorities for land transport development on a three-yearly cycle (in accordance with the objectives presented in the NZTS 2008). |
| HVL | Hutt Valley Line (the section of the Wairarapa Line between Wellington and Upper Hutt Station) |
| IVT | In-Vehicle Time |
| JVL | Johnsonville Branch Line |
| Layered | Layered Timetable / Service Pattern – the optimisation of route capacity through the operation of a combination of stopping patterns, i.e., Express + Limited Stops + All Stops. |
| Loading Diversity | Loading Diversity – loading diversity provides the important distinction between a line / route's theoretical capacity and a more realistic person capacity that can actually be achieved (this is based on the fact that passengers do not load evenly into cars and trains over the peak hour). |
| LoS | Level of Service |
| LTCCP | Long Term Council Community Plan |
| LTMA | Land Transport Management Act 2003 |
| LTMAB | Land Transport Management Amendment Bill 2012 |
| Matangi | Electrical Multiple Units, comprising power car and trailer car, designed and manufactured by Hyundai – Rotem between 2010 and 2012 |
| MCA / PBS | Multi Criteria Analysis / Planning Balance Sheet – methods adopted for the analysis and evaluation of options that consider both economic and non-economic factors (a requirement of the LTMAA). |
| MEL | Melling Branch Line |
| MTRIP | Medium-Term Rail Improvement Plan |
| NIMT | North Island Main Trunk Line |
| NLTP | National Land Transport Programme |
| NPV | Net Present Value |

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|---|---|
| NRS | National Rail Strategy to 2015 – the document that details how the vision and objectives of the New Zealand Transport Strategy will be applied to New Zealand's railway network. |
| NZTS | New Zealand Transport Strategy (2008) |
| OPEX | Operating Expenditure – costs associated with the operation (including maintenance) of an asset. |
| Peak Hour | Peak Hour – this is the busiest 60 minute period in relation to passenger demand, typically occurring in the morning (AM) Monday to Friday. |
| Person Capacity | Person Capacity – is the maximum number of people that can be carried in one direction over a section of track in a given period of time, typically 1 hour, under specified operating conditions without unreasonable delay, hazard, or restriction, and with reasonable certainty. |
| PHF | Peak Hour Factor – this is the measure of *Loading Diversity* that gives due consideration to the unevenness of passenger demand over the peak hour. For suburban passenger rail networks / systems the PHF ranges from 0.25 (all passenger volume occurs during the peak 15 minutes) to 1.00 (passenger volumes are even throughout the hour). |
| PPFM | Planning, Programming and Funding Manual |
| PPHPD | Passengers Per Hour Per Direction – refer to *Person Capacity* above. |
| KPL | Kapiti Line (the section of the NIMT between Wellington and Waikanae Station) |
| PPP | Private Public Partnerships |
| PT | Public Transport (sometimes referred to as Passenger Transport) |
| PTP | Passenger Transport Plan – refer to RPTP below. |
| PV | Present Value –the future 'value of money' restated in today's money terms. |
| RGS | Regional Growth Strategy |
| RPTP | Regional Public Transport Plan 2011 - 2021 |
| RRP | Regional Rail Plan – this is the Wellington regions long term planning document for rail based passenger transport. |
| RLTS | Regional Land Transport Strategy – this is the document that details the way forward for the Wellington Region's transport system from 2010 to 2040. |

| | |
|---|---|
| RMA | Resource Management Act |
| RTC | Regional Transport Committee |
| SE | SE Carriage - are commuter carriages operated on the Wellington suburban rail network during peak periods (the carriages are formed to operate as an electric locomotive hauled six – car train set). |
| SOV | Single Occupancy Vehicle – a motor vehicle occupied by a driver only. |
| SW | SW Carriage – are 'long distance' commuter carriages used on the Wairarapa Line for services between Masterton and Wellington (the carriages are formed to operate as diesel locomotive hauled six – car train sets). |
| SLS | Service Level Specification – various options relating to proposed passenger rail services. |
| STCC | Surface Transport Costs and Charges Study – a study commissioned by the Ministry of Transport, designed to provide baseline data on the costs and charges associated with the road and rail network. |
| EWC | Economic Wellbeing Committee (previously the Transport and Access Committee) |
| TWG | Technical Working Group – refer to section A.1.2 for a detailed overview of the scope and purpose of the TWG. |
| VoT | Value of Time – VoT's are resource costs, which reflect the actual costs of travel excluding taxation and other non-resource costs. |
| WPTM | Wellington Public Transport Model – developed during 2012, the WPTM is designed to work in conjunction with WTSM but provides the facility to model public transport (bus, rail and ferry) at a more detailed level than in WTSM, for example by using a more detailed zoning system. |
| WRL | Wairarapa Line |
| WTSM | Wellington Transport Strategy Model – a transport planning model developed by Greater Wellington Regional Council, updated in 2007 to reflect 2006 census data. The WTSM model outputs passenger transport information using 2016 land use projections, and data for the peak and inter-peak periods. |

## Appendix A: The Wellington Regional Rail Plan 2009 - Executive Summary

The Regional Rail Plan (RRP) is a pathway to a better rail experience for users of Wellington's rail network.

### Purpose

The RRP provides for the long term development of the region's rail network.

Its purpose it to maintain and grow rail's position as the key transport mode for long to medium distance and high volume transport services over the next 25 years.

Its scope covers the four rail corridors within the region, including the train services that operate from Masterton.


While plans are already under way for a number of improvements, such as the order for new rolling stock, the RRP provides for the longer term improvement of the rail network once current developments are complete.

The plan recognises and encourages the increasing popularity of rail as a sustainable transport choice for passengers and freight, a trend that is evident across the globe. It also recognises that rail is an essential service underpinning the effective functioning and economic development of the Greater Wellington region. By providing an attractive and competitive rail service, users are attracted from cars and road congestion is reduced – a "win-win" outcome.

### Vision

The WRRP Vision is:

> *"To deliver a modern, reliable and accessible rail system that competitively moves people and freight in an economic, environmental, integrated and socially sustainable way."*

### Strategic Context

Rejuvenation of our rail system contributes to the realisation of the New Zealand Transport Strategy 2008 (NZTS) which aims to deliver *"an affordable, integrated, safe, responsive and sustainable transport system"*.

This plan supports the broader objectives of national and regional transport strategies including the NZTS, the Government Policy Statement 2008, the National Rail Strategy to 2105 and the Regional Land Transport Strategy (RLTS) 2007. In particular, the plan focuses on achieving RLTS key outcomes and the transport targets in the Regional Passenger Transport Plan (RPTP) within the RLTS.

RLTS key outcomes are:

- Increased peak period passenger transport mode share
- Increased mode share for pedestrians and cyclists
- Reduced greenhouse gas emissions
- Reduced severe road congestion
- Improved regional road safety
- Improved land use and transport integration
- Improved regional freight efficiency.

Improvement of the region's rail network is identified as a significant feature of the RLTS and contributes to achieving many of the above outcomes.

The WRRP is designed to be reviewed every three years, in line with RLTS reviews and the Regional Transport Committee prioritisation process.

### Collaborative Approach

Greater Wellington Regional Council (Greater Wellington) has developed this plan in collaboration with primary rail stakeholders: KiwiRail, ONTRACK, NZ Transport Agency (NZTA) and the Ministry of Transport. This collaborative approach draws on the value of shared decision-making, experience and recognises shared responsibility for the delivery of outcomes.

The RRP also reflects community needs and views, as expressed in RLTS and annual plan submissions, Metlink customer satisfaction surveys and public meetings held throughout the region in 2007 to discuss transport challenges.

### Technical Input

The specialist railway and economic evaluation design and analysis, embodied in this plan, was provided respectively by Alan Burford (Maunsell AECOM) and John Bolland (John Bolland Consulting Ltd).

### Issues and Opportunities

The WRRP addresses specific problems facing the Wellington rail network and leverages opportunities to move more people and freight from road to rail transport. While some issues result from external pressures, many are a direct result of inadequate past investment in the network.

Key issues are:

- Poor reliability – historical lack of investment in infrastructure and rolling stock leads to frequent breakdowns and delays to services. Surveys show that this is the number one issue for Wellington rail users

- Lack of capacity across the network – trains are crowded due to increasing demand. This discourages people from using rail and exacerbates congestion on arterial roads, especially SH1 and SH2. Currently, there is a shortfall of more than 1200 seats across the network at AM peak time with a projected shortfall of over 5,000 seats by 2016

- Frequency of services – there is not enough network capacity or trains to meet demand for higher frequency services in peak times

- Ageing train fleet – many trains need replacement or refurbishment soon. Creeping obsolescence contributes to poor service reliability, longer journey times and an uncomfortable travel experience which deters potential rail passengers

- Ageing infrastructure – existing tracks, tunnel size, signalling systems, platforms and station access limit service levels and have not been designed to support a modern rail service.

Key opportunities are:

- Increased passenger transport demand resulting from government policy initiatives, population growth, and economic and environmental pressures including volatile fuel prices

- Committed passenger transport component in government funding for land transport

- New legislation enabling Greater Wellington to purchase rolling stock

- New legislation enabling local government to collect a regional fuel levy for use on regional land transport projects

- Marketing initiatives including Metlink branding of Wellington's regional public transport network to make it easier to use and use of lower cost information technology to build customer relationships eg; Real time information and integrated ticketing.

## RRP Outcomes

The plan has been designed to deliver levels of service defined by both the RPTP and Wellington passenger transport users through annual customer satisfaction surveys.

Targeted outcomes for the RRP are:

- Reliability
- Frequency
- Capacity
- Journey time
- Reach

By delivering these outcomes the plan seeks not just to meet existing customer needs, but to encourage greater rail use in line with NZTS and RPTP targets.

## The Core Plan

The RRP is a pathway comprised of a series of rail scenarios or modules, each with a programme of projects.

Following is a description of each rail scenario (RS).

## The Base Case

The RRP builds on the comprehensive five year rail improvement programme for the Metlink rail network initiated by Greater Wellington in July 2007 – the Medium Term Rail Improvement Programme (MTRIP). The Base Case incorporates MTRIP and the cost of funding these improvements and running existing rail services for the next 25 years.

Key improvements:

- 96 “Matangi” cars (configured as 48x2-car consist, electric multiple units (EMUs)) for the suburban network
- 24 carriages for the Wairarapa service (including 6 SE carriages)
- Refurbishment of 88 Ganz Mavag cars (configured as 44x2 car consist EMUs); and phased replacement from 2018
- Double tracking and electrification to Waikanae
- Kaiwharawhara throat upgrade to improve approach to Wellington Station
- Johnsonville tunnel upgrades
- Station upgrades for new trains
- Track and signal upgrades

| | |
|---|---|
| Priority: | *essential* |
| Timing: | *in progress* |
| Targeted outcomes: | *capacity, reliability, journey time, reach* |

## Rail Scenario 1 (RS1)

RS1 provides a significant increase in the electric rail fleet which will increase peak seat capacity by 53% and enable a regular and reliable service with at least four trains per hour to Wellington on all electrified lines during the two hour AM peak time. This scenario is required to meet passenger volumes (without RS1 there will be a shortfall of over 2700 seats across the AM peak by 2016). More seats and a better quality service will support growth in rail patronage in line with the NZTS and RPTP targets for 2016. RS1 also increases freight capacity and speed. The current underlying growth is around 3% which is closely aligned with the GPS target. Setting aside targets, RS1 is essential if the current growth up to and beyond 2016 is to be catered for.

Key improvements:

- 14 new cars (7 x 2 car EMUs)
- North/South Junction Stage 1[5]
- Double tracking Trentham to Upper Hutt
- Network changes for reliable frequency (signalling and track - turnback / passing loops)
- Freight capacity and speed
- Station and park n ride upgrades

5 Stage 1: Strengthen the walls of the tunnels then lower the floors thereby increasing clearances. This would allow heavier weight rail to be laid and increase the speed at which trains can travel through the tunnels. This would reduce the transit time and the risk of trains stalling.

Priority: *essential if regional/national targets and the current growth up to and beyond 2016 are to be catered for.*

Timing: *starts 2011/12*

Targeted outcomes: *capacity, reliability, frequency*

### Rail Scenario 2 (RS2)

With the benefits of RS1 bedded in and if demand requires it, RS2 will increase capacity on Wellington's busiest commuter service and provide a regular 10 minute service between Upper Hutt and Wellington during peak time.

Key improvements:

- 44 new cars (22 x 2 car EMUs)
- Incremental network changes (signalling and track - turnback / passing loops)
- Level crossing safety upgrades

Priority: *optional*

Timing: *starts 2014/15 or later depending on demand*

Targeted outcomes: *frequency, capacity*

### Rail Scenario A (RSA)

If after RS1, and/or RS2, patronage growth plateaus due to decongested roads, RSA introduces faster rail services between Upper Hutt/ Waikanae/ Johnsonville/ Masterton and Wellington in AM peak time. Journey time is recognised, and highlighted in customer surveys, as a key driver of modal choice. Infrastructure enhancements will enable trains to travel at higher speeds, significantly reducing journey times for commuters.

Key improvements:

- Faster passenger and freight services (reduced journey times)
- North/South Junction Stage 2-3[6]
- Track upgrades and curve easements
- Station rationalisation
- Level crossing grade separation

Priority: *optional*

Timing: *starts 2017/18 depending on demand and capacity*

Targeted outcomes: *journey time*

6 Stage 2: This solution would include the tunnel lowering as above plus elimination of one tunnel altogether and extension of the double track at the northern and southern ends to as near as is practical to the tunnel portals. This would have the dual benefit of reducing the amount of single track and reducing transit time through that single section.
Stage 3: This solution would include the works listed above (tunnel lowering; remove one tunnel; extend double tracking) plus build a bridge around the outside of the tunnels so there is always double track – one on the bridge and one through the tunnels.

### Rail Scenario B (RSB)

Demand driven, RSB makes rail services more accessible to more people by providing greater transport connections between the rail network and urban centres such as Otaki, Levin, Palmerston North and Masterton. RSB "brings the train closer to you" beginning with minivan, or bus shuttle services, leading to rail shuttle services. It extends the network reach.

Key improvements:

- Integrated connection to faster services
- Phased modal connections
- Shuttle services
- Network extensions/new stations

| | |
|---|---|
| Priority: | *optional* |
| Timing: | *starts 2017/18 depending on demand and capacity* |
| Targeted outcomes: | *reach* |

### Implementation Pathway

Greater Wellington proposes a phased approach to implementation. There are stops along the pathway; junctions or decision points between each module (work programme) provide opportunities to defer, bring forward or scale projects up or down depending on network demand and available resources. As the Implementation Pathway diagram (Figure 1) shows, the preferred option is to complete RS1 then proceed to RS2 then to RSA and then RSB. However, if patronage forecasts show a levelling off in demand on the Hutt Line, an alternative option exists to proceed directly to RSA after RS1 and implement RS2 and RSB later.

Like other Wellington regional strategies, the RRP provides choices and the flexibility to respond to changing external pressures and community needs.

The phased implementation approach assists risk management. It accommodates the significant lead times required for ordering new rolling stock and undertaking large infrastructure projects. A key decision point is 2018 when 88 Ganz Mavag cars are due for replacement. The cost of rolling stock is a major consideration and forward planning provides the potential to capture savings from another bulk order of new electric units.

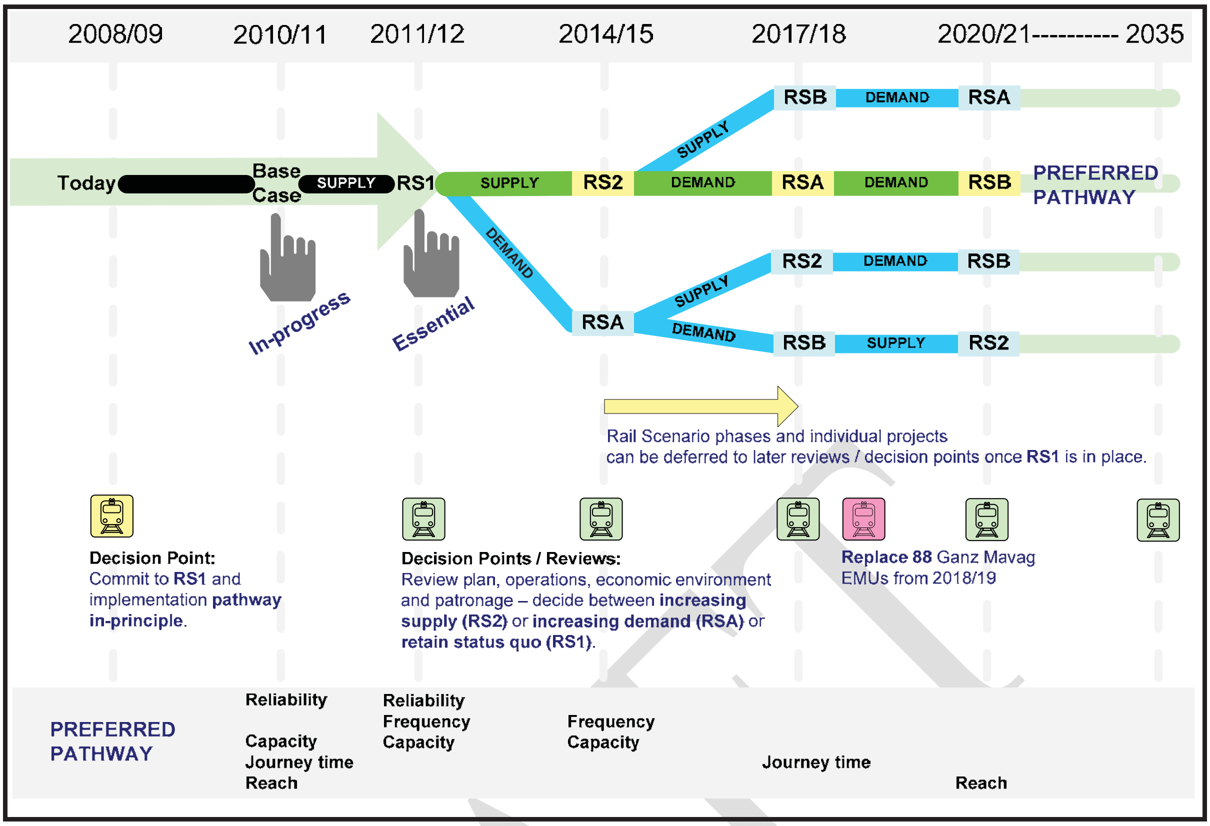



Figure 1:.Implementation Pathway

## Qualitative Benefits

The RRP addresses gaps in rail service levels.

Collectively, the rail scenarios provide a better experience for rail users.

Passenger transport benefits:

1. Capacity – more trains, longer trains and more frequent services
2. Quality – increasingly safe, more reliable and comfortable services
3. Competitiveness – faster services with extended reach.

Rail freight benefits:

1. Capacity – maintained
2. Reliability – greater network and system reliability
3. Competitiveness – reduced journey times from infrastructure improvements.

The plan takes a holistic view of the Region's land transport network and presents an approach to rail development that also benefits other modes and delivers integrated transport solutions.

It gives people more reasons to use rail, so they choose to take the train even when roads become less congested.

### Costs and quantified benefits

The WRRP represents a significant investment.

Rail projects are capital intensive with a long term return. However, with the phased implementation approach, expenditure is incremental so the demands on rail users, ratepayers and funding agencies are manageable.

The incremental cost of the first three years of RS1 is $35.2m (see Table 2) and there are no RS1 cost impacts until 2011/12. Table 3 depicts the 10 and 25 year RS1 costs of an additional $238m and $440m respectively. While these long term costs are significant they also carry quantified long term benefits (Table 3), furthermore the immediate three year budget implications of adopting RS1 are less onerous.

The recommended approach is a prudent one in an uncertain economic climate.

Sections 5-10 of this plan provides detailed information on the costs and revenue (fares and subsidies) over a 25 year timeframe for each Rail Scenario.

Economic analysis has identified that the cost/benefit ratios (BCR) for the rail scenarios in this plan range between 0.9 and 2.3, with the early Scenarios (RS1 and RS2) both above 1.5, well above the norm for similar rail infrastructure and rolling stock projects.

| Rail Scenario 1 (RS1) (first 3 years) | 2009/10 | 2010/11 | 2011/12 |
|---|---|---|---|
| Rolling stock supply (14 additional cars) | 0 | 0 | $4.6m |
| Double track Hutt Line | 0 | 0 | $7.0m |
| Network changes and upgrades for reliable frequency | 0 | 0 | $7.5m |
| Station and car park upgrades/development | 0 | 0 | $6.1m |
| North – South Junction (stage 1.) | 0 | 0 | $5.0m |
| Total CAPEX | 0 | 0 | $30.2m |
| Total OPEX | 0 | 0 | 0 |
| TOTAL | 0 | 0 | $30.2m |

Table 2: RS1 budget provisions for first 3 years (additional to Base Case)

| Preferred Pathway | 10 year budget increase | | Total 25 yr cost incremental | BCR(N)[1] 8% 30 yrs | BCR(G)[2] 8% 30 yrs |
|---|---|---|---|---|---|
| | Capital | Opex | | | |
| Rail Scenario 1 (RS1) | $166m | $72m | $440m | 1.5 | 1.9 |
| Rail Scenario 2 (RS2) | $188m | $47m | $235m | 1.2 | 1.4 |
| Rail Scenario A (RSA) | $333m | $68m | $401m | 0.9 | 1.1 |
| Rail Scenario B (RSB) | $198m | $362m | $560m | 1.1 | 1.3 |

[1] BCR(N): takes no account of additional fare revenue
[2] BCR(G): additional fare revenue is netted off the cost

Table 3: Pathway costs and benefits (10 year budget and 25 year total costs)

## Funding

The above average benefit cost ratios (BCRs) are a very positive attribute of at least the early phases of the preferred pathway, however implementation still relies on affordability and the availability of funding.

The RRP will need to progress through several steps before funding can be confirmed for even the smallest individual element. Following endorsement by the Transport and Access Committee (TAC), the Regional Transport Committee (RTC) and NZ Transport Authority (NZTA) the RRP will become part of the RTC prioritisation process.

If successfully prioritised actual sources of funding will need to be determined by the Greater Wellington Regional Council, the RTC, and NZTA. This is likely to include consideration of the Regional Fuel Tax.

## Summary

All of the scenarios have been evaluated on their ability to deliver an integrated, high quality passenger transport network, with each assessed against the objectives of the RLTS and the RPTP using passenger demand forecast modelling based on different mode share assumptions. The scenarios were found to perform well against all key objectives.

Either RS1 or RS2 can meet the 2016 GPS targets but only RS2 can meet those of the RLTS. RS2 is the only option which maintains long-term growth through to 2026.

The current underlying growth is around 3% which is closely aligned with the GPS target. Setting aside targets, RS1 is essential if the current growth up to and beyond 2016 is to be catered for.

Sensitivity testing using Rail Scenario 1 as a test case reinforced the robustness of the business case for the RRP. When modelled, a range of environmental and economic variables, such as future roading developments, either had little impact or enhanced BCR and benefits over time.

| Preferred Pathway | Improvements | Peak Service Levels | Increase in seat capacity | Reliability | Frequency | Capacity | Journey Time | Reach |
|---|---|---|---|---|---|---|---|---|
| Base Case (BC) | 96 new Matangi cars (48 x 2 car EMUs)<br>Double track/electrify to Waikanae<br>Kaiwharawhara Throat upgrades<br>Johnsonville Tunnels<br>Track and Signal upgrades<br>24 cars for the Wairarapa Service<br>Refurbish & replace 88 Ganz Mavag cars<br>Station upgrades for new EMUs | Irregular 20minutes maximum wait (all lines) | 21% above today | ✓ | ✓ | ✓ | | ✓ |
| Rail Scenario 1 (RS1) | 14 new cars (7 x 2 car EMUs)<br>Double track Trentham to Upper Hutt<br>Station upgrades, park n ride<br>Network changes for reliable frequency<br>Freight capacity and speed<br>North-South Junction Stage 1 upgrade | Regular 15minutes maximum wait (all lines) | 53% above BC | ✓ | ✓ | ✓ | | |
| Rail Scenario 2 (RS2) | 44 new cars (22 x 2 car EMUs)<br>Level crossing safety upgrades<br>Network changes | Regular 15minutes maximum wait (all lines)<br>10minutes (Hutt Line) | 4% above RS1 | | ✓ | ✓ | | |
| Rail Scenario A (RSA) | North-South Junction Stage 2 -> 3<br>Track upgrades and curve easements<br>Level crossing grade separation<br>Station rationalisation<br>Increased freight speed | Estimated Journey time reductions<br>UH>WLG 6mins<br>Waik>WLG 7mins<br>J'ville>WLG 1min<br>Mast.>WLG 16mins | - | | | | ✓ | |
| Rail Scenario B (RSB) | Integrated connection to faster services<br>Phased modal connections<br>Shuttle services<br>Network extensions/new stations | | - | | | | | ✓ |

Figure 4: Overview of RRP Service Levels, Improvements and Outcomes



In summary, evaluation of the RRP shows that is a realistic, adaptable plan that will deliver substantial, long-term benefits. Investment in rail in Wellington is considerably worthwhile and will deliver value for money.

### Next Steps

A communication programme has been developed to support the release of the RRP.

Following endorsement of the RRP business case by the RTC prioritisation process:

- Greater Wellington will work with NZTA to develop a Funding Plan.
- Greater Wellington will work with KiwiRail and ONTRACK to develop an Implementation Plan. This plan will consider operational parameters (including staging and disruption), asset responsibilities and ownership, rail industry policy and procurement programmes.

# Appendix B: Business Case

## B1 – Purpose

A primary component of the RRP is the development of a supporting Business Case.

The overall purpose of the Business Case is to:

- Justify the financial commitment associated with any proposed upgrade programme or development scenario
- Help choose between proposed capital projects
- Establish a sustainable 'service strategy'
- Help decide the timing of the planned projects
- Support budgetary planning
- Help choose potential Funding / Financing methods and Implementation Strategy / Pathway.

## B2 – Business Case Framework

The general process methodology adopted for the Business Case is presented in Figure B1 below:

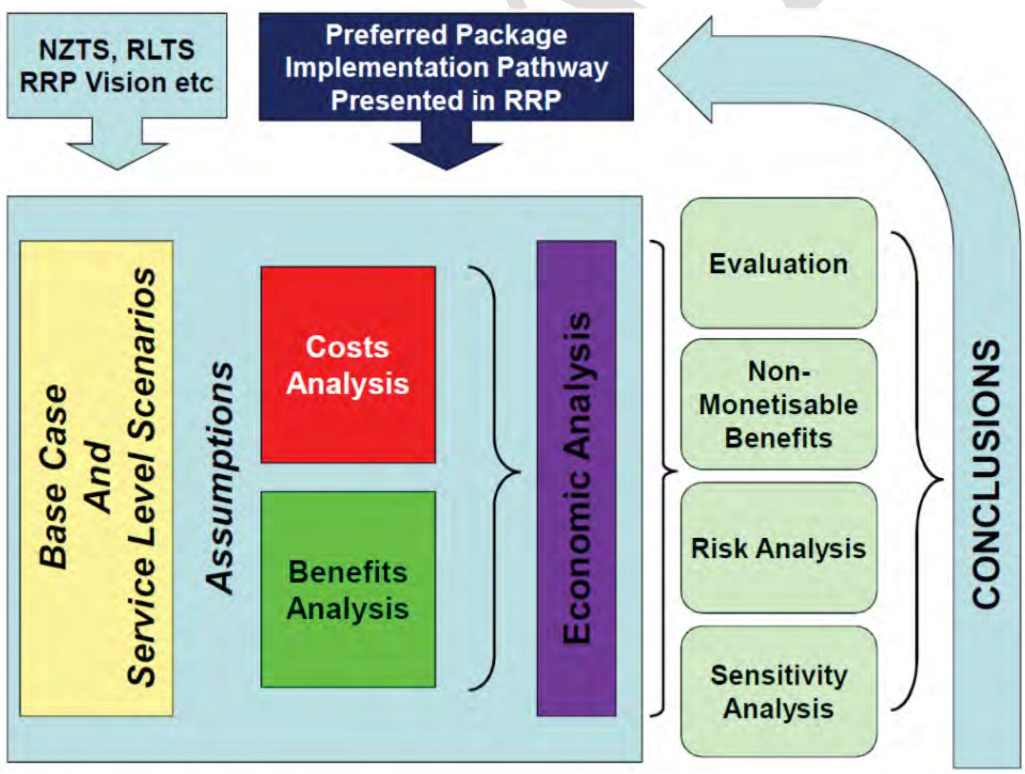



Figure B1: RRP Business Case Framework

A number of service strategy scenarios have previously been identified, that reflect the region's Vision and the Strategic Options presented in the RLTS.

The scenarios have been designed and developed to deliver the principal components of an 'Ideal' passenger transport system, fully optimising existing corridor infrastructure; whilst being consistent with needs of the customer; analysed and evaluated in accordance with NZTA evaluation methodology and appropriate existing frameworks presented in the following documentation:

- EEM (Volume 1 and 2)
- PPFM.

The PPFM was developed to consider the requirements of the NZTS and also the requirements placed upon the NZTA under the LTMAA. Consequently the evaluation of the various options considered and tested the impacts, and assumptions in relation to other transport modes affected (private and public). In particular the extent, to which the options support the objectives of the RLTS and the associated RPTP, for an integrated passenger transport network, were considered within patronage demand forecast modelling for different mode share assumptions.

The options and scenario that has been considered for the Business Case are:

- Base Case (today)
- A nominal 15 minute peak hour frequency on all routes (RS1 refreshed).

The development and evaluation of the above is detailed in sections 8, 9 and 10 of this document.

## Appendix C: The projects list

Inputs from a number of sources (including RLTS submissions, Annual Plan submissions, and Primary Stakeholders) have been considered in the development of the SLS scenarios.

The RRP Technical Working Group (TWG) undertook a ‘scenario mapping’ exercise, in order to ascertain the necessary requirements for each scenario to deliver each SLS. The primary SLS scenarios RS1 and RS2 are incremental and by their nature inter-dependant i.e. to achieve RS2 the component projects of RS1 need to be completed. The long term SLS scenarios (RSA and RSB) are independent and are considered as ‘event driven’ choices for future enhancement.

The relationship between each project and corresponding scenario is presented in the complete and updated project list below.

| greater WELLINGTON REGIONAL COUNCIL | Project Status | Scenarios | | | | | Attributes | | | | | Project Outcomes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BASE CASE | RS1 | RS2 | RSA | RSB | Reliability | Frequency | Capacity | Journey Time | Reach | |
| **Committed and Approved Projects** | | | | | | | | | | | | |
| **Rolling Stock** | | | | | | | | | | | | |
| New Matangi EMUs | Completed | ✓ | ✓ | ✓ | | | ✓ | | ✓ | ✓ | | Ongoing - Provides extra Capacity, Reliability, and Vehicle Quality. All trains are to be in service by August 2012. |
| SE Carriages | Completed | ✓ | | | | | | | ✓ | | | Completed - Provides Additional Capacity. |
| New Wairarapa SW-Cars | Completed | ✓ | | | | | ✓ | | ✓ | | | Completed - Provides greater Capacity, Vehicle Quality and Operational Flexibility. |
| **EMU Infrastructure Compliance** | | | | | | | | | | | | |
| Johnsonville Tunnel and Track / Loop Improvements (including stations) | Completed | ✓ | ✓ | ✓ | | | ✓ | | ✓ | | | Completed - Provides Operational Flexibility (Matangi can now operate on the line). |
| Signalling Equipment Compliance | Completed | ✓ | ✓ | ✓ | | | ✓ | | | | | Completed - Provides greater Reliability. |
| Traction Power Supply & Overhead Wiring Rehabilitation | Completed | ✓ | ✓ | ✓ | | | ✓ | | | | | Completed - Provides greater Reliability. |
| Platform / Accessibility Upgrades | Completed | ✓ | ✓ | ✓ | | | ✓ | | ✓ | | | Completed - Allows Matangi Operation on all Lines. |
| **Interim Rolling Stock and Maintenance Facilities** | | | | | | | | | | | | |
| Ganz Mavag refurbishment | Superseded | ✓ | ✓ | | | | ✓ | | ✓ | | | Planning - A decision has been reached in relation to the replacement of the Ganz Mavag Fleet. Provides greater Reliability, Vehicle Quality and Operational Capacity. |
| Thorndon EMU Maintenance Depot Upgrade and Additional Stabling Facilities | Completed | ✓ | ✓ | ✓ | | | ✓ | | ✓ | | | |
| **Corridor Enhancement** | | | | | | | | | | | | |
| Double Track MacKays Crossing to Waikanae (including extension of electrification infrastructure) | Completed | ✓ | ✓ | ✓ | | | ✓ | | ✓ | | ✓ | Completed - Provides extra Capacity, Network Reach and Reliability. |
| Waikanae and Paraparaumu Station Upgrades and Associated Train Stabling | Completed | ✓ | ✓ | ✓ | | | | | ✓ | | ✓ | Completed - New and improved stations in the Kapiti area, providing enhanced station access / facilities and network reach. |
| Wellington Station Approach Kaiwharawhara Throat | Completed | | ✓ | ✓ | | | ✓ | ✓ | ✓ | ✓ | | Completed - Provides extra Capacity, greater Reliability and Journey Time improvements. |
| North - South Jcn alignment improvements (Investigation) | Completed | ✓ | ✓ | ✓ | | | ✓ | ✓ | ✓ | ✓ | | Study / Investigation Completed. |
| **Station Upgrades (Not Part of Corridor Works)** | | | | | | | | | | | | |
| Johnsonville Station | Feasibility | ✓ | ✓ | ✓ | | | ✓ | | | | | |
| Park and Ride Improvements to Existing Facilities (CCTV / Security / Lighting) | Design | ✓ | ✓ | ✓ | | | ✓ | | | | | Ongoing - A network wide programme of station works has commenced, providing enhanced journey experience. |
| Electronic Ticketing | Design | ✓ | ✓ | ✓ | | | ✓ | | | | | |
| Real Time - Passenger Information Displays (PIDs) | Design | ✓ | ✓ | ✓ | | | ✓ | | | | | |
| **Infrastructure Renewals (Deferred Maintenance)** | | | | | | | | | | | | |
| Track / Structures / Signalling / Overhead Line Electrifcation | Ongoing | | ✓ | ✓ | | | ✓ | ✓ | ✓ | ✓ | ✓ | Commenced - Provides greater Reliability and Network Accessibility (Traction Power, Signalling, Track, Structures, Platforms). |
| **Other CAPEX Projects (In Progress / Completed 2007-2008)** | | | | | | | | | | | | |
| SW Stabling Facilities (Masterton) | Completed | ✓ | ✓ | ✓ | | | ✓ | | ✓ | | | Completed - Provides extra stabling capacity for increased Train Fleet. |
| Wairarapa Station Platform and Shelter Improvements | Completed | ✓ | ✓ | ✓ | | | ✓ | | | | | |
| 4 English Electric Units | Completed | ✓ | | | | | | | ✓ | | | |

greater WELLINGTON
REGIONAL COUNCIL

| | Project Status | Scenarios | | | | | Attributes | | | | | Project Outcomes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | BASE CASE | RS1 | RS2 | RSA | RSB | Reliability | Frequency | Capacity | Journey Time | Reach | |
| **MEDIUM TERM NETWORK ENHANCEMENT PROJECTS** | | | | | | | | | | | | |
| **Rolling Stock** | | | | | | | | | | | | |
| Order Additional Matangi EMUs | Planning | | ✓ | ✓ | | | ✓ | | ✓ | ✓ | | Decision has now been made to replace the Ganz Mavag fleet. |
| Replacement of Ganz Mavags | Planning | | ✓ | ✓ | | | ✓ | | ✓ | ✓ | | |
| Refurbishment of Wairarapa SW Cars (encompassing new bogies and draw gear) | Feasibility | | | | | ✓ | ✓ | | | | ✓ | |
| **Track Capacity Enhancements** | | | | | | | | | | | | |
| North / South Junction - Partial Track Duplication | Completed | | ✓ | ✓ | | | ✓ | ✓ | ✓ | ✓ | | Completed - Provides extra Reliability and Journey Time improvements. |
| North / South Junction - Full Track Duplication | Pre - Feasibility | | | | ✓ | | ✓ | ✓ | ✓ | ✓ | | |
| Double Track Trentham to Upper Hutt (including associated station works at Wallaceville and Trentham) | Pre - Feasibility | | ✓ | ✓ | | | ✓ | ✓ | ✓ | | | |
| **Network Operational Improvements** | | | | | | | | | | | | |
| Improvements at Mana / Plimmerton | Pre - Feasibility | | ✓ | ✓ | | | ✓ | ✓ | ✓ | | | RS1 Component Project |
| Tawa Basin (Capacity) | Pre - Feasibility | | ✓ | ✓ | | | ✓ | ✓ | ✓ | | | RS1 Component Project |
| Safety Improvements at Level Crossings | Pre - Feasibility | | ✓ | ✓ | ✓ | | ✓ | | | ✓ | | RS1 Component Project |
| **Station Enhancement** | | | | | | | | | | | | |
| Network Wide Station Upgrades and Improvements | Ongoing | ✓ | ✓ | ✓ | | | ✓ | | | | | Ongoing - A network wide programme of station works (Deferred Maintenance and Major Repairs) has commenced, providing enhanced journey experience. |
| Major Station Upgrade - Upper Hutt | Pre - Feasibility | | ✓ | ✓ | | | ✓ | | | | | RS1 Component Project |
| Major Station Upgrade - Waterloo | Pre - Feasibility | | ✓ | ✓ | | | ✓ | | | | | |
| Major Station Upgrade - Porirua (Interchange) | Pre - Feasibility | | ✓ | ✓ | | | ✓ | | | | | RS1 Component Project |
| Raumati Station | Feasibility | | | | | ✓ | | | | | ✓ | Not Considered Viable (refer to section 12.1) |
| Lindale Station | Feasibility | | | | | ✓ | | | | | ✓ | Not Considered Viable (refer to section 12.1) |
| Station Configuration | Pre - Feasibility | | | | ✓ | | ✓ | | | ✓ | | |
| Greater Multi-Modal Integration (Interchange) | Pre - Feasibility | | | | | ✓ | ✓ | | | | ✓ | |
| **Service Enhancements** | | | | | | | | | | | | |
| Increased Wairarapa Services | Pre - Feasibility | | | | | ✓ | | ✓ | ✓ | | ✓ | |
| Service Extension North of Waikanae (Otaki) | Pre - Feasibility | | | | | ✓ | | | | | ✓ | |
| **LONG TERM NETWORK ENHANCEMENT PROJECTS** | | | | | | | | | | | | |
| **Corridor Enhancement Projects** | | | | | | | | | | | | |
| Double Track and Electrification to Timberlea (including associated works at Timberlea Station) | Pre - Feasibility | | | | | ✓ | | | | | ✓ | |
| Electrification Extension to Cruickshank Road (including new Cruickshank Road Station) | Pre - Feasibility | | | | | ✓ | | | | | ✓ | |
| Electrification Extension to Maymorn (including associated works at Maymorn Station) | Pre - Feasibility | | | | | ✓ | | | | | ✓ | |
| Electrification to Masterton | Pre - Feasibility | | | | | ✓ | | | | | ✓ | |
| Electrification Extension to Otaki | Pre - Feasibility | | | | | ✓ | | | | | ✓ | Not Considered Viable (refer to section 12.3) |
| Electrification Extension to Palmerston North | Pre - Feasibility | | | | | ✓ | | | | | ✓ | |
| Gracefield / Seaview Corridor | Pre - Feasibility | | | | ✓ | | | | ✓ | ✓ | | |
| Corridor Security | Pre - Feasibility | | | | ✓ | | ✓ | | | ✓ | | |
| **Rolling Stock** | | | | | | | | | | | | |
| DEMU / Rail Cars | Pre - Feasibility | | | | | ✓ | ✓ | | | ✓ | ✓ | |
| New Locomotives (Wairarapa Services) | Pre - Feasibility | | | | | ✓ | ✓ | | | ✓ | ✓ | |
| **Track Capacity Enhancements** | | | | | | | | | | | | |
| Porirua to Hutt Loop Line | Pre - Feasibility | | | | | ✓ | | | | | ✓ | |
| Journey Time Improvements | Pre - Feasibility | | | | ✓ | | | | | ✓ | | |
| General Infrastructure Renewals (Slab Track / Higher Speed Turnouts) | Pre - Feasibility | | | | ✓ | | ✓ | | | ✓ | | |
| **Network Operational Improvements** | | | | | | | | | | | | |
| Automatic Train Protection (ATP) | Pre - Feasibility | | | | ✓ | | ✓ | | | ✓ | | |
| OHW Upgraded to Auto - Tensioning | Feasibility | | | | ✓ | | ✓ | | | ✓ | | |
| **Station Enhancement** | | | | | | | | | | | | |
| Queen Elizabeth Park Station (MacKays) | Pre - Feasibility | | | | | ✓ | | | | | ✓ | |
| Whenua Tapu Cemetery Station | Pre - Feasibility | | | | | ✓ | | | | | ✓ | |
| Te Horo Station (re-opening) | Pre - Feasibility | | | | | ✓ | | | | | ✓ | |
| Aotea Block Station | Pre - Feasibility | | | | | ✓ | | | | | ✓ | |
| Ferry Terminal / Stadium Station | Pre - Feasibility | | | | | ✓ | | | | | ✓ | |
| Transit Orientated Developments (TODs) | Pre - Feasibility | | | | | ✓ | ✓ | | | | ✓ | |
| **Service Enhancements** | | | | | | | | | | | | |
| Service Extension North of Waikanae (Levin) | Pre - Feasibility | | | | | ✓ | | | | | ✓ | Event driven option (refer to section 12.2) |
| Peak Train Size 6-8-10 | Feasibility | | | | | ✓ | | | ✓ | | ✓ | |
| Tidal Flow (Peak Timetable) | Feasibility | | | | | ✓ | | | ✓ | | ✓ | |
| Melling to Waterloo (rail extension and service increase) | Pre - Feasibility | | | | | ✓ | | ✓ | | | ✓ | |
| **Inter - Regional Service Enhancements** | | | | | | | | | | | | |
| Wellington to Palmerston North Services | Pre - Feasibility | | | | | ✓ | | | | | ✓ | |
| Auckland to Wellington High Speed Rail (160kph) | Pre - Feasibility | | | | ($50 - 80b) | | | | | ✓ | ✓ | Not Considered Viable |

Figure C1: RRP projects list

# Appendix D: Suburban rail characteristics, service planning and network capacity

## D1 – Suburban rail characteristics

During the refresh of RS1 a number of specific issues have been considered with the objective of identifying opportunities that exist within RS1 to realise 'value for money' through smart and optimised planning.

Urban rail systems are defined by their operational characteristics and available technologies. Presented in Figure D1 below are the primary characteristics of a 'Suburban Rail' network. These are the functional characteristics that have been applied in the future planning for RS1.

| Feature | Attribute / Requirement |
|---|---|
| Operations | |
| Maximum speeds | 80 to 130kph |
| Operating speed | 40 to 70kph |
| Maximum trains per hour | 10 to 30tph |
| Practical capacity | up to 30,000 passengers per hour |
| Reliability | Very high |
| Train and cars | |
| Cars per train | 1 to 10 |
| Car length | 20 to 26m |
| Passengers per car | 150 to 180 (crush loaded) |
| Fixed facilities | |
| Segregated right of way % of total route | 90 to 100% |
| Station platform height | Low or high |
| Fare collection | On or off train |
| System aspects | |
| CBD coverage | Limited / typically destination |
| Station spacing | typically greater than 2km |
| Average trip length | Long |

Figure D1: Characteristics of a suburban rail network (aligned with Wellington)

## D2 – Service Planning

The capacity of a suburban rail network is what defines its design and equipment, how it is constructed and maintained, and how it will perform when passengers use it. Section 5.3 provides commentary that acknowledges the importance of the establishment of accurate boarding and alighting data and / or patronage forecasting that is used to determine capacity requirements and undertake basic ‘service planning’.

The review and refresh of RS1 has been based broadly on the following process:

1. Undertake a reasonable estimate of the number of passengers likely to use the system at both a station and route level (this was done through the consideration of actual observed and modelled forecast data)

2. Determine PPHPD and plot boardings against location

3. Establish the maximum number of passengers (the peak hour) that the network will be required to transport

4. From the information determined in 3 above, calculate the corresponding train requirements per hour using AW1 and AW2 capacities (this will be governed by the maximum capacity of trains operating i.e. 6 or 4 car consists)

5. Determine nominal headways required giving due consideration to both boardings and individual train capacities

6. Calculate the number of trains required to operate the proposed service (the final number will need to consider train performance, run times and the requirements for maintenance and operational spares).

It is acknowledged that further detailed planning will be required to develop the RS1 timetable. The ‘immediate’ next stages of the planning process will be to:

1. Develop the draft Working Time Table (WTT)

2. Confirm stabling requirements / strategy

3. Agree levels of ‘recovery time’

4. Prepare rolling stock and crew diagrams

5. Develop Published Timetable (the timetable).

The RS1 summary service plan is presented in Figure D2 below.

**Hutt Valley Line (Option 1)**

1 Hour - AM Peak (Wellington Arrivals - 0745hrs to 0845hrs)

| Service | Headway (Minutes) | Train Consist (Cars) | Upper Hutt | Wallaceville | Trentham | Heretaunga | Silverstream | Manor Park | Pomare | Taita | Wingate | Naenae | Epuni | Waterloo | Woburn | Ava | Melling | Western Hutt | Petone | Ngauranga | Kaiwharawhara | Wellington |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 32.400 | 31.300 | 29.400 | 28.240 | 26.830 | 23.700 | 21.980 | 20.550 | 19.490 | 18.250 | 16.540 | 15.500 | 14.370 | 12.520 | 13.470 | 11.870 | 10.500 | 4.800 | 2.550 | 0.000 |
| Upper Hutt (UH - Ta - Wgn X) | 15 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | | | | | | | | | | | | 4 |
| Taita (Ta - Wgn AS) | 12 | 4 | | | | | | | | 5 | 5 | 5 | 5 | 5 | 5 | 5 | | | 5 | | | 5 |
| Melling (Mel - Wgn AS) | 20 | 2 | | | | | | | | | | | | | | | 3 | 3 | 3 | 3 | 3 | 3 |

**Kapiti Line (Option 5)**

1 Hour - AM Peak (Wellington Arrivals - 0800hrs to 0900hrs)

| Service | Headway (Minutes) | Train Consist (Cars) | Waikanae | Paraparaumu | Paekakariki | Pukerua Bay | Plimmerton | Mana | Paremata | Porirua | Kenepuru | Linden | Tawa | Redwood | Takapu Road | Kaiwharawhara | Wellington |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 55.430 | 48.260 | 38.800 | 30.350 | 24.480 | 23.160 | 21.870 | 17.740 | 16.160 | 14.910 | 13.750 | 13.170 | 11.890 | 2.550 | 0.000 |
| Waikanae (Wai - Plim - Wgn X) | 20 | 6 | 3 | 3 | 3 | 3 | 3 | | | | | | | | | | 3 |
| Plimmerton (Plim - Por - Wgn X) | 15 | 4 | | | | | 4 | 4 | 4 | 4 | | | | | | | 4 |
| Porirua (Por - Wgn AS) | 15 | 4 | | | | | | | | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |

**Johnsonville Line (Option 1)**

1 Hour - AM Peak (Wellington Arrivals - 0730hrs to 0830hrs)

| Service | Headway (Minutes) | Train Consist (Cars) | Johnsonville | Raroa | Khandallah | Box Hil | Simla Crescent | Awarua Street | Ngaio | Crofton Downs | Wellington |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 10.490 | 9.330 | 7.890 | 7.340 | 6.890 | 6.010 | 5.420 | 4.770 | 0.000 |
| Johnsonville (JVL - Wgn AS) | 15 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |

| KEY |
|---|
| Service Origin / Destination |
| Stop Service |
| No Stop Service |
| No Service |

Figure D2: Summary Service Pattern (RS1)

## D3 – Network Capacity

Future levels of crowding depend on both available capacity and passenger demand. At this stage, it is expected that the refreshed RS1 option will not lead to the significant increase in capacity previously calculated (RS1 calculated a 53% increase in peak period seat capacity over and above the Base Case in the 2009 RRP). On the other hand, lower expected growth will mean less demand so the point at which capacity is forecast to be exceeded will be reached later.

An analysis of capacity and various levels of patronage growth has been undertaken. The purpose of this work was to identify timelines when capacity may run out and also the ability to cater for short term patronage peaks.

Figures D3 to D7 below illustrate 'capacity run-out' on all service segments for both the Base Case and RS1.

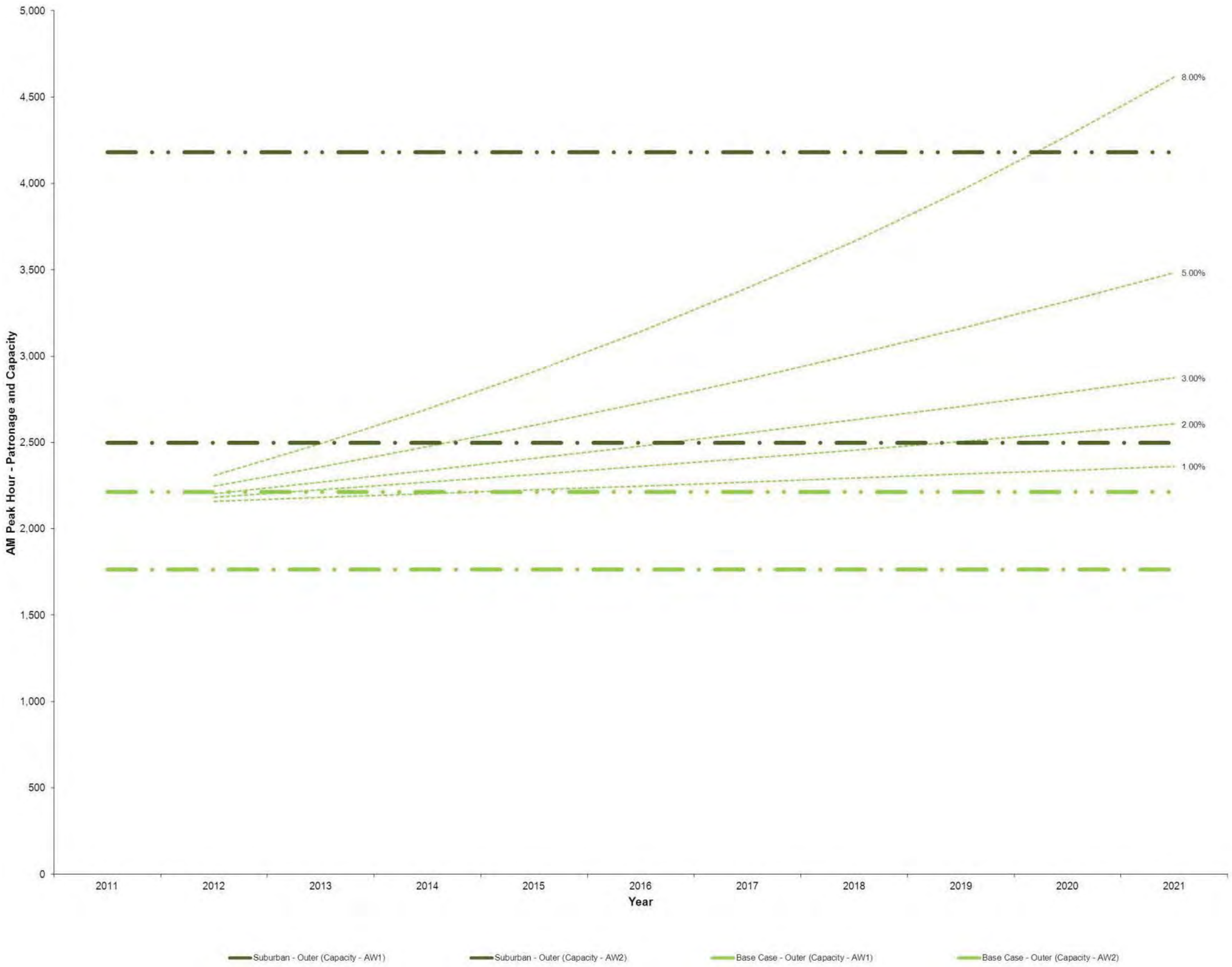



Figure D3: Theoretical Capacity v Patronage Growth Rates (KPL – Suburban / Outer)

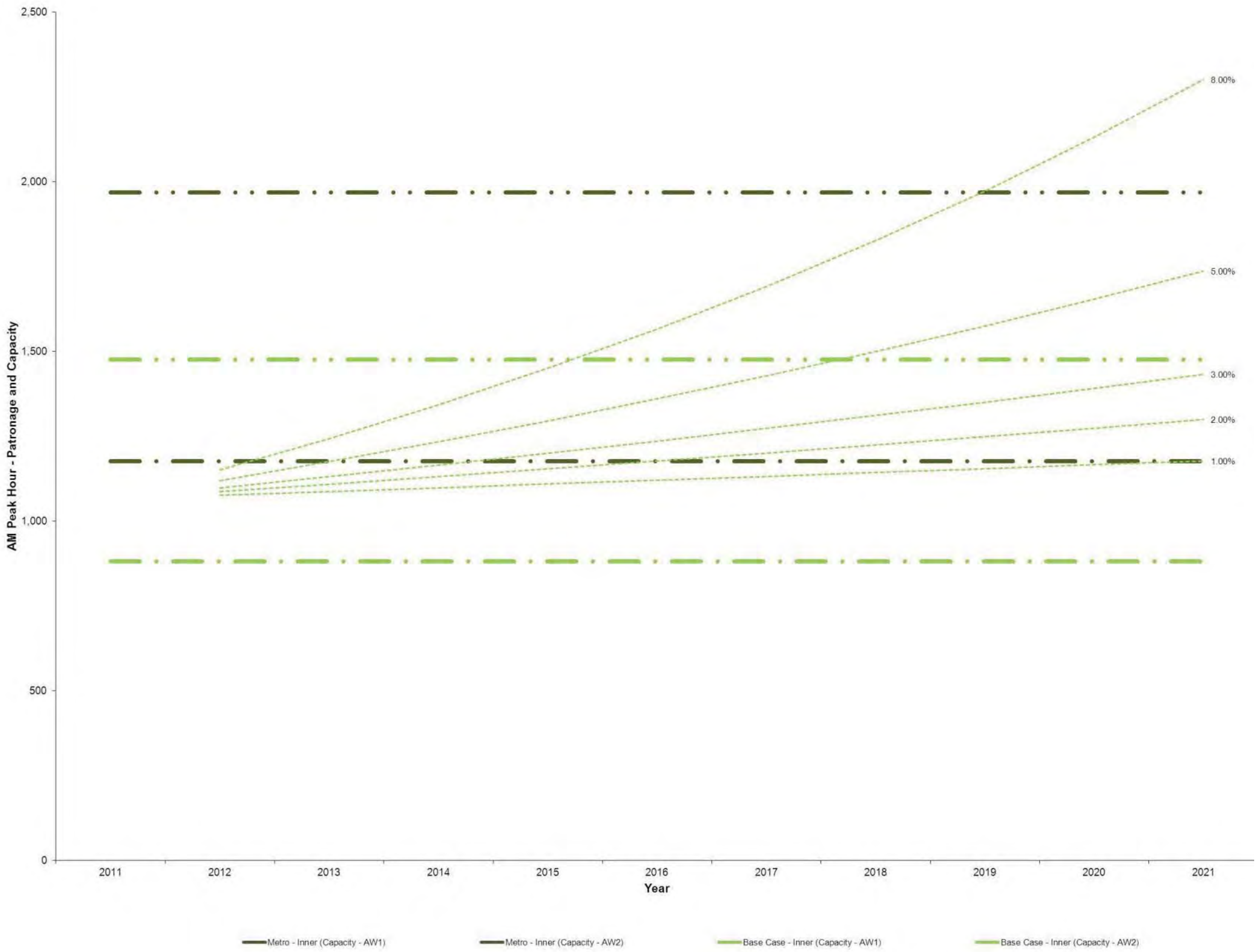



Figure D4: Theoretical Capacity v Patronage Growth Rates (KPL – Metro / Inner)

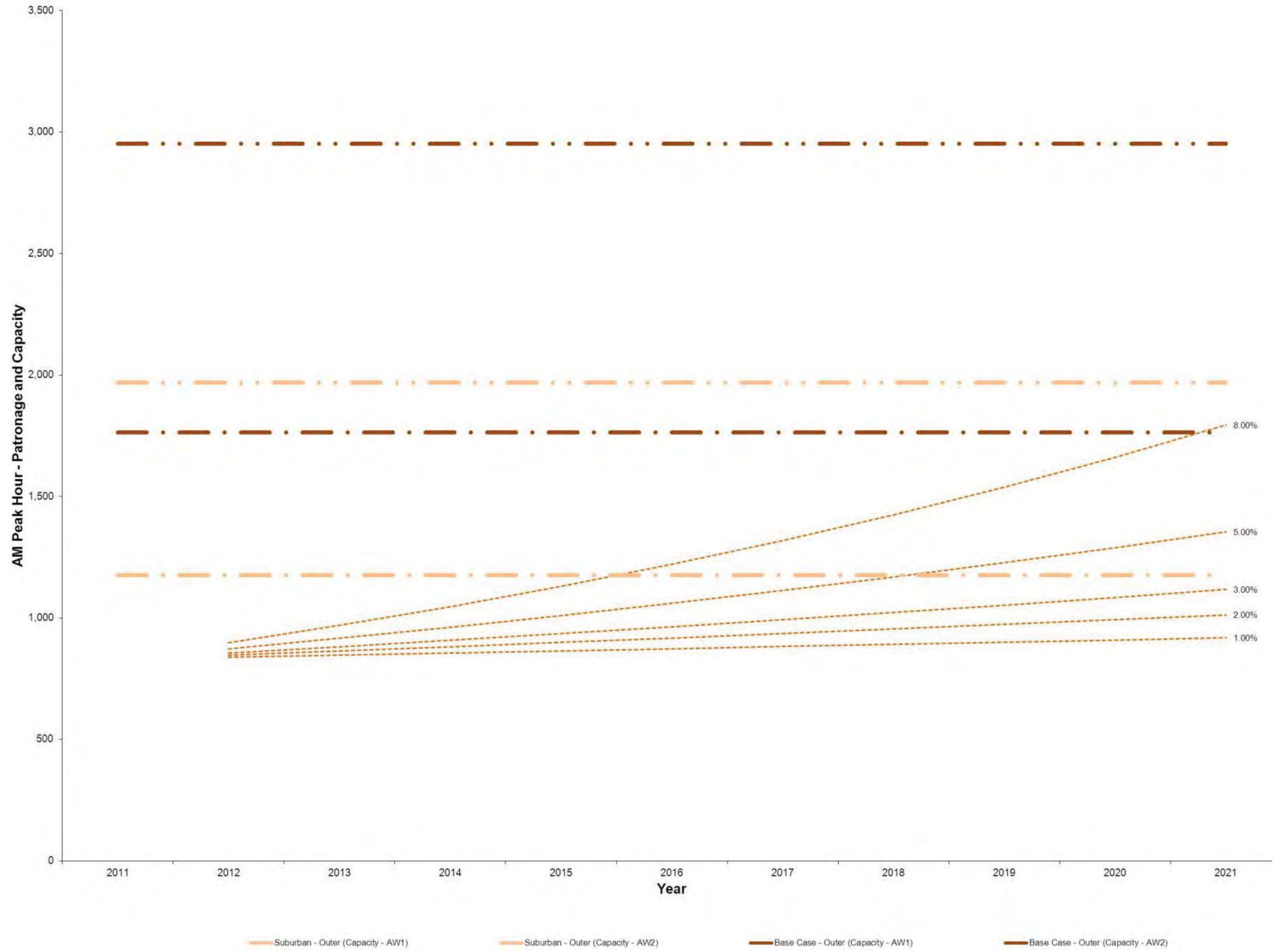



Figure D5: Theoretical Capacity v Patronage Growth Rates (HVL – Suburban / Outer)

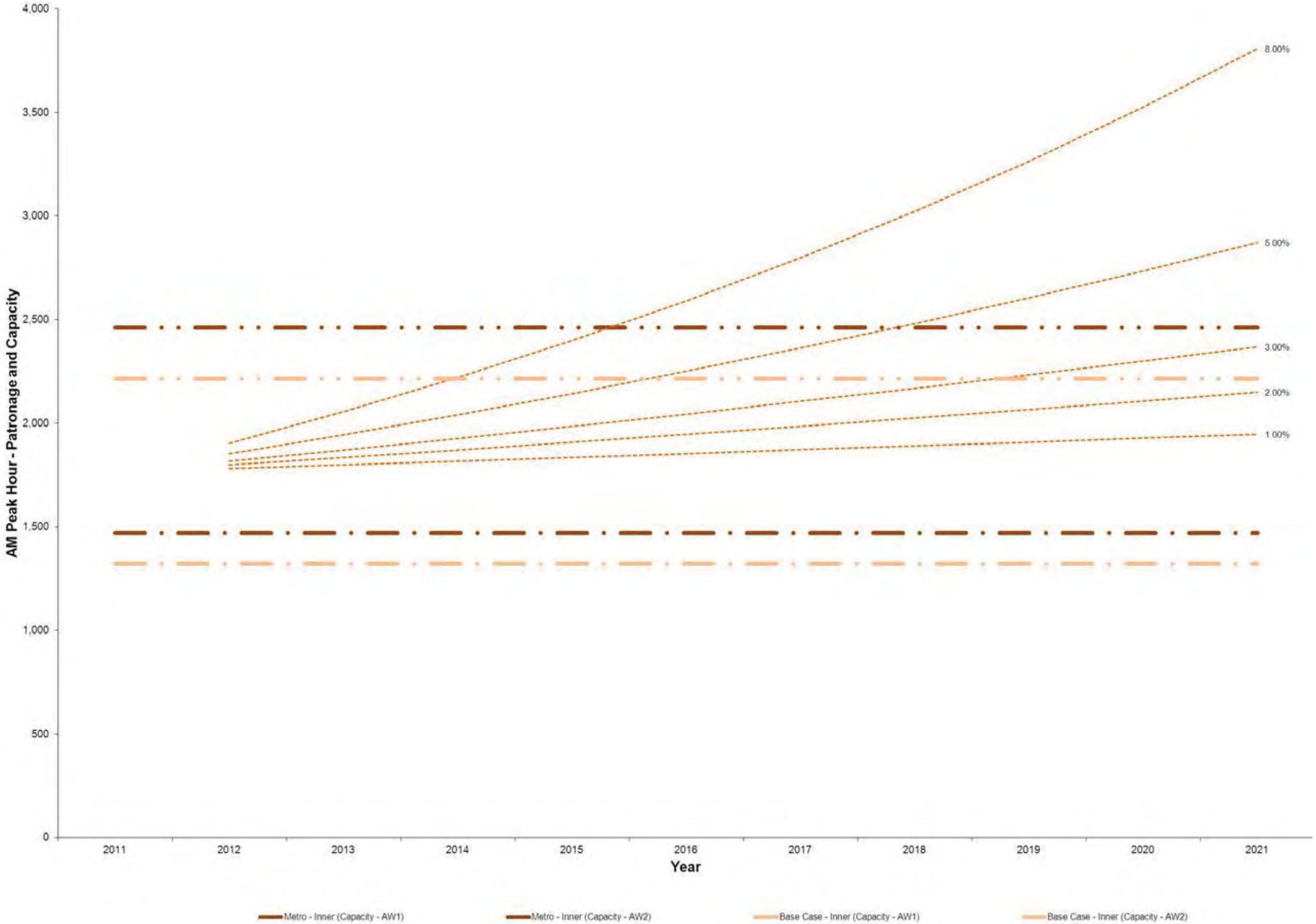



Figure D6: Theoretical Capacity v Patronage Growth Rates (HVL – Metro / Inner)

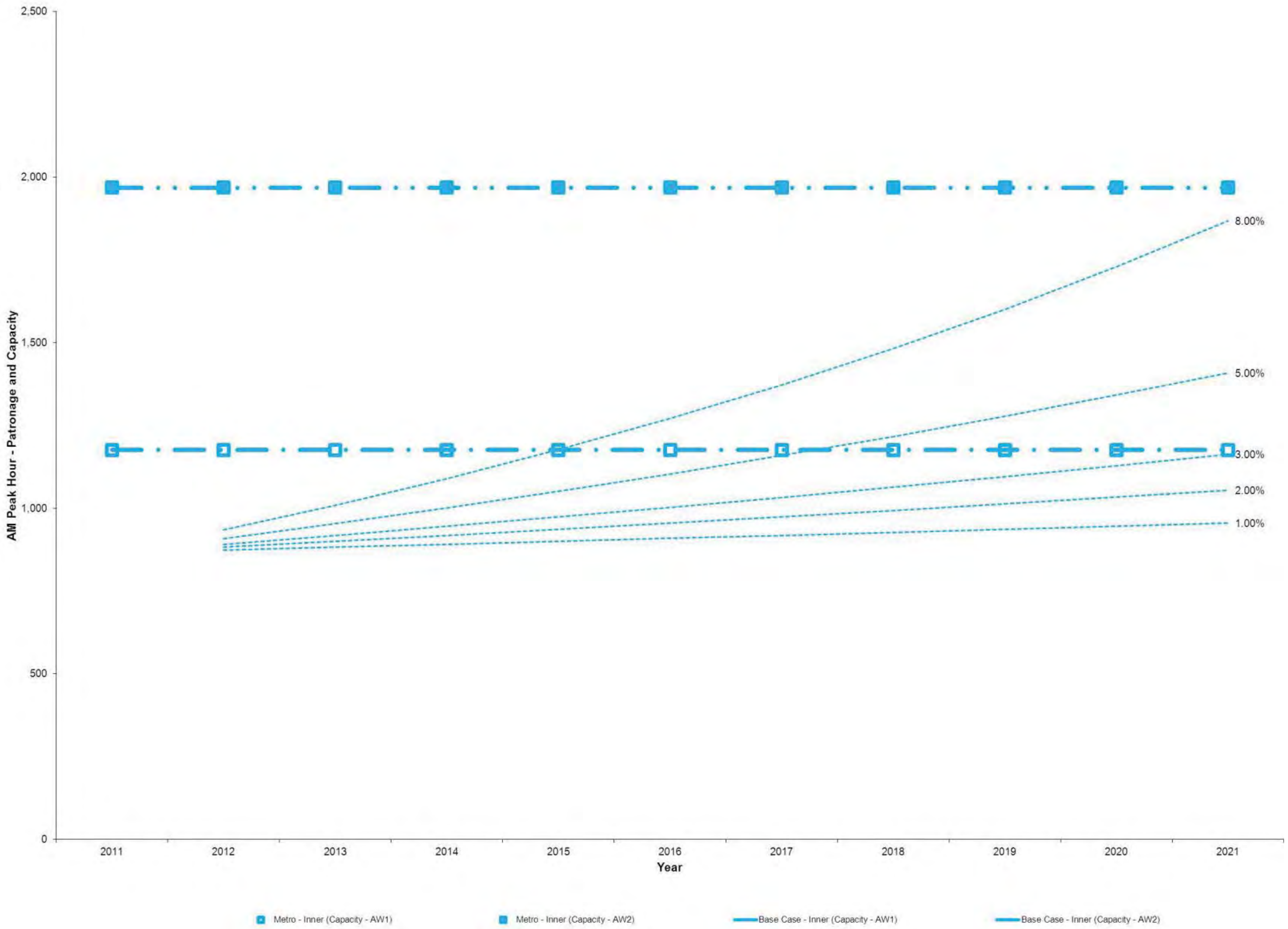



Figure D7: Theoretical Capacity v Patronage Growth Rates (JVL – Metro / Inner)

# Appendix E: Cost Models

## E1 – Capital Expenditure (CAPEX) - Summary

| | | Year | Yr0 FY13 (Start 01 July 2012) | Yr1 FY14 | Yr2 FY15 | Yr3 FY16 | Yr4 FY17 | Yr5 FY18 | Yr6 FY19 | Yr7 FY20 | Yr8 FY21 | Yr9 FY22 | Yr10 FY23 | Yr11 FY24 | Yr12 FY25 | Yr13 FY26 | Yr14 FY27 | Yr15 FY28 | Yr16 FY29 | Yr17 FY30 | Yr18 FY31 | Yr19 FY32 | Yr20 FY33 | Yr21 FY34 | Yr22 FY35 | Yr23 FY36 | Yr24 FY37 | Yr25 FY38 | Yr26 FY39 | Yr27 FY40 | Yr28 FY41 | Yr29 FY42 | Yr30 FY43 | 30 Yr Evaluation Total | 0 to 10 Yr Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BASE CASE | 1.1 | Rolling Stock (Including Associated Infrastructure Works) | 31.62 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 31.62 | 31.62 |
| | 1.2 | Interim Rolling Stock (Medium Term Solution) | 0.50 | 0.94 | 0.94 | 0.98 | 0.96 | 0.00 | 0.09 | 0.94 | 0.94 | 0.98 | 0.00 | 0.00 | 0.00 | 1.03 | 0.94 | 0.94 | 0.98 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 11.17 | 7.27 |
| | 1.3 | Corridor Enhancement | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 1.4 | Station Upgrades and Renewals (Minor Works) | 4.95 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 109.95 | 39.95 |
| | 1.5 | Infrastructure Renewals (8 year Programme) | 13.15 | 10.75 | 10.75 | 10.75 | 10.75 | 10.75 | 10.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 77.65 | 77.65 |
| | 1.6 | Other CAPEX Projects | 1.50 | 1.50 | 1.50 | 1.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6.00 | 6.00 |
| | 1.7 | Infrastructure Renewals (Rolling Programme) | 6.87 | 9.32 | 10.32 | 7.32 | 7.32 | 7.32 | 7.32 | 7.32 | 7.32 | 7.32 | 6.65 | 6.65 | 6.65 | 6.65 | 6.65 | 6.65 | 6.65 | 6.65 | 6.65 | 6.65 | 6.65 | 6.65 | 6.65 | 6.65 | 6.65 | 6.65 | 6.65 | 6.65 | 6.65 | 6.65 | 6.65 | 217.41 | 84.41 |
| | 2.1 | Rolling Stock - Matangi (Maintenance Renewals & Overhauls) | 0.00 | 0.00 | 0.00 | 7.17 | 7.17 | 7.17 | 0.00 | 0.00 | 0.00 | 7.17 | 7.17 | 7.17 | 18.00 | 18.00 | 18.00 | 7.17 | 7.17 | 7.17 | 0.00 | 0.00 | 0.00 | 7.17 | 7.17 | 7.17 | 0.00 | 0.00 | 0.00 | 25.17 | 25.17 | 25.17 | 0.00 | 215.50 | 35.83 |
| | 2.2 | Rolling Stock - Ganz Mavag (Refurbishment) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 2.3 | Rolling Stock - M2 (Ganz Mavag - Replacement) | 0.00 | 41.25 | 100.30 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 7.84 | 7.84 | 0.00 | 0.00 | 0.00 | 0.00 | 7.84 | 7.84 | 0.00 | 0.00 | 0.00 | 0.00 | 7.84 | 7.84 | 0.00 | 0.00 | 0.00 | 0.00 | 7.84 | 7.84 | 0.00 | 0.00 | 0.00 | 204.27 | 157.24 |
| | 2.4 | Rolling Stock - Carriage Trains (Renewals) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 4.55 | 4.20 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 8.75 | 8.75 |
| | | Total | 58.59 | 67.27 | 127.32 | 31.22 | 29.70 | 28.74 | 26.21 | 15.96 | 19.60 | 26.81 | 17.32 | 17.32 | 28.15 | 29.18 | 36.93 | 26.10 | 18.30 | 17.32 | 10.15 | 10.15 | 17.99 | 25.16 | 17.32 | 17.32 | 10.15 | 10.15 | 17.99 | 43.16 | 35.32 | 35.32 | 10.15 | 882.32 | 448.73 |

| | | Year | Yr0 FY13 (Start 01 July 2012) | Yr1 FY14 | Yr2 FY15 | Yr3 FY16 | Yr4 FY17 | Yr5 FY18 | Yr6 FY19 | Yr7 FY20 | Yr8 FY21 | Yr9 FY22 | Yr10 FY23 | Yr11 FY24 | Yr12 FY25 | Yr13 FY26 | Yr14 FY27 | Yr15 FY28 | Yr16 FY29 | Yr17 FY30 | Yr18 FY31 | Yr19 FY32 | Yr20 FY33 | Yr21 FY34 | Yr22 FY35 | Yr23 FY36 | Yr24 FY37 | Yr25 FY38 | Yr26 FY39 | Yr27 FY40 | Yr28 FY41 | Yr29 FY42 | Yr30 FY43 | 30 Yr Evaluation Total | 0 to 10 Yr Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RS1 (2018 - Refresh) | 1.1 | Rolling Stock (Including Associated Infrastructure Works) | 31.62 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 31.62 | 31.62 |
| | 1.2 | Interim Rolling Stock (Medium Term Solution) | 0.50 | 0.94 | 0.94 | 0.98 | 0.96 | 0.00 | 0.09 | 0.94 | 0.94 | 0.98 | 0.00 | 0.00 | 0.00 | 1.03 | 0.94 | 0.94 | 0.98 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 11.17 | 7.27 |
| | 1.3 | Corridor Enhancement | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 1.4 | Station Upgrades and Renewals (Minor Works) | 4.95 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 109.95 | 39.95 |
| | 1.5 | Infrastructure Renewals (8 year Programme) | 13.15 | 10.75 | 10.75 | 10.75 | 10.75 | 10.75 | 10.75 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 77.65 | 77.65 |
| | 1.6 | Other CAPEX Projects | 1.50 | 1.50 | 1.50 | 1.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6.00 | 6.00 |
| | 1.7 | Infrastructure Renewals (Rolling Programme) | 6.87 | 9.32 | 10.32 | 7.32 | 7.32 | 7.32 | 7.32 | 7.32 | 7.32 | 7.32 | 6.65 | 6.65 | 6.65 | 6.65 | 6.65 | 6.65 | 6.65 | 6.65 | 6.65 | 6.65 | 6.65 | 6.65 | 6.65 | 6.65 | 6.65 | 6.65 | 6.65 | 6.65 | 6.65 | 6.65 | 6.65 | 217.41 | 84.41 |
| | 2.1 | Rolling Stock - Matangi (Maintenance Renewals & Overhauls) | 0.00 | 0.00 | 0.00 | 7.17 | 7.17 | 7.17 | 0.00 | 0.00 | 0.00 | 7.17 | 7.17 | 7.17 | 18.00 | 18.00 | 18.00 | 7.17 | 7.17 | 7.17 | 0.00 | 0.00 | 0.00 | 7.17 | 7.17 | 7.17 | 0.00 | 0.00 | 0.00 | 25.17 | 25.17 | 25.17 | 0.00 | 215.50 | 35.83 |
| | 2.2 | Rolling Stock - Ganz Mavag (Refurbishment) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 2.3 | Rolling Stock - M2 (Ganz Mavag - Replacement) | 0.00 | 41.25 | 100.30 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 7.84 | 7.84 | 0.00 | 0.00 | 0.00 | 0.00 | 7.84 | 7.84 | 0.00 | 19.69 | 19.69 | 0.00 | 7.84 | 7.84 | 0.00 | 0.00 | 0.00 | 0.00 | 7.84 | 7.84 | 0.00 | 19.69 | 19.69 | 283.02 | 157.24 |
| | 2.4 | Rolling Stock - Carriage Trains (Renewals) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 4.55 | 4.20 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 8.75 | 8.75 |
| | 3.1 | Track Capacity Enhancements | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 3.00 | 7.00 | 9.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 19.00 | 19.00 |
| | 3.2 | Network Operational Improvements | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 9.50 | 10.50 | 5.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 25.00 | 25.00 |
| | 4.1 | Station Enhancements and Upgrades | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5.00 | 5.00 |
| | | Total | 58.59 | 67.27 | 127.32 | 31.22 | 29.70 | 41.24 | 43.71 | 34.96 | 19.60 | 26.81 | 17.32 | 17.32 | 28.15 | 29.18 | 36.93 | 26.10 | 18.30 | 37.00 | 29.84 | 10.15 | 17.99 | 25.16 | 17.32 | 17.32 | 10.15 | 10.15 | 17.99 | 43.16 | 35.32 | 55.00 | 29.84 | 1010.07 | 497.73 |

Figure E1: 30 Year Capital Expenditure – Summary Model

## E2 – Operational Expenditure (OPEX) - Summary

| | Year | Yr0 2012/13 | Yr1 2013/14 | Yr2 2014/15 | Yr3 2015/16 | Yr4 2016/17 | Yr5 2017/18 | Yr6 2018/19 | Yr7 2019/20 | Yr8 2020/21 | Yr9 2021/22 | Yr10 2022/23 | Yr11 2023/24 | Yr12 2024/25 | Yr13 2025/26 | Yr14 2026/27 | Yr15 2027/28 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Base Case | Per Train Km | 11.40 | 11.98 | 12.36 | 12.81 | 13.26 | 13.62 | 14.35 | 14.88 | 15.53 | 16.11 | 15.78 | 15.78 | 15.78 | 15.78 | 15.78 | 15.78 |
| | Per Train Hour | 3.30 | 3.26 | 3.25 | 3.25 | 3.24 | 3.24 | 3.24 | 3.23 | 3.23 | 3.22 | 3.22 | 3.22 | 3.22 | 3.22 | 3.22 | 3.22 |
| | Per Train Operating | 4.87 | 4.60 | 4.74 | 4.90 | 5.07 | 5.31 | 5.52 | 5.71 | 6.00 | 6.21 | 6.21 | 6.21 | 6.21 | 6.21 | 6.21 | 6.21 |
| | Per Track Km | 7.52 | 7.41 | 7.41 | 7.41 | 7.41 | 7.41 | 7.41 | 7.41 | 7.41 | 7.41 | 7.41 | 7.41 | 7.41 | 7.41 | 7.41 | 7.41 |
| | Per Station | 2.51 | 5.51 | 3.51 | 2.51 | 2.51 | 2.51 | 2.51 | 2.51 | 2.51 | 2.51 | 2.51 | 2.51 | 2.51 | 2.51 | 2.51 | 2.51 |
| | Overheads | 9.71 | 7.84 | 6.92 | 6.94 | 6.88 | 6.99 | 7.00 | 7.05 | 7.18 | 6.98 | 7.01 | 7.06 | 7.03 | 7.14 | 7.06 | 7.03 |
| | Total | 39.32 | 40.62 | 38.19 | 37.83 | 38.38 | 39.29 | 40.03 | 40.80 | 41.86 | 42.45 | 42.14 | 42.19 | 42.17 | 42.27 | 42.19 | 42.17 |
| RS1 (2013 Refresh) | Per Train Km | 11.40 | 11.98 | 12.36 | 12.81 | 13.26 | 13.62 | 18.85 | 19.38 | 20.03 | 20.61 | 20.28 | 20.28 | 20.28 | 20.28 | 20.28 | 20.28 |
| | Per Train Hour | 3.30 | 3.26 | 3.25 | 3.25 | 3.24 | 3.24 | 3.24 | 3.23 | 3.23 | 3.22 | 3.22 | 3.22 | 3.22 | 3.22 | 3.22 | 3.22 |
| | Per Train Operating | 4.87 | 4.60 | 4.74 | 4.90 | 5.07 | 5.31 | 5.52 | 5.71 | 6.00 | 6.21 | 6.21 | 6.21 | 6.21 | 6.21 | 6.21 | 6.21 |
| | Per Track Km | 7.52 | 7.41 | 7.41 | 7.41 | 7.41 | 7.41 | 7.41 | 7.41 | 7.41 | 7.41 | 7.41 | 7.41 | 7.41 | 7.41 | 7.41 | 7.41 |
| | Per Station | 2.51 | 5.51 | 3.51 | 2.51 | 2.51 | 2.51 | 2.51 | 2.51 | 2.51 | 2.51 | 2.51 | 2.51 | 2.51 | 2.51 | 2.51 | 2.51 |
| | Overheads | 9.71 | 7.84 | 6.92 | 6.94 | 6.88 | 6.99 | 7.00 | 7.05 | 7.18 | 6.98 | 7.01 | 7.06 | 7.03 | 7.14 | 7.06 | 7.03 |
| | Total | 39.32 | 40.62 | 38.19 | 37.83 | 38.38 | 39.29 | 44.53 | 45.30 | 46.36 | 46.95 | 46.64 | 46.69 | 46.67 | 46.77 | 46.69 | 46.67 |

| | Year | Yr16 2028/29 | Yr17 2029/30 | Yr18 2030/31 | Yr19 2031/32 | Yr20 2032/33 | Yr21 2033/34 | Yr22 2034/35 | Yr23 2035/36 | Yr24 2036/37 | Yr25 2037/38 | Yr26 2038/39 | Yr27 2039/40 | Yr28 2040/41 | Yr29 2041/42 | Yr30 2042/43 | 30 Yr Evaluation Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Base Case | Per Train Km | 15.78 | 15.78 | 15.78 | 15.78 | 15.78 | 15.78 | 15.78 | 15.78 | 15.78 | 15.78 | 15.78 | 15.78 | 15.78 | 15.78 | 15.78 | 467.80 |
| | Per Train Hour | 3.22 | 3.22 | 3.22 | 3.22 | 3.22 | 3.22 | 3.22 | 3.22 | 3.22 | 3.22 | 3.22 | 3.22 | 3.22 | 3.22 | 3.22 | 100.12 |
| | Per Train Operating | 6.21 | 6.21 | 6.21 | 6.21 | 6.21 | 6.21 | 6.21 | 6.21 | 6.21 | 6.21 | 6.21 | 6.21 | 6.21 | 6.21 | 6.21 | 183.37 |
| | Per Track Km | 7.41 | 7.41 | 7.41 | 7.41 | 7.41 | 7.41 | 7.41 | 7.41 | 7.41 | 7.41 | 7.41 | 7.41 | 7.41 | 7.41 | 7.41 | 229.96 |
| | Per Station | 2.51 | 2.51 | 2.51 | 2.51 | 2.51 | 2.51 | 2.51 | 2.51 | 2.51 | 2.51 | 2.51 | 2.51 | 2.51 | 2.51 | 2.51 | 81.91 |
| | Overheads | 7.06 | 7.06 | 7.11 | 7.06 | 7.06 | 7.03 | 7.06 | 7.14 | 7.03 | 7.06 | 7.06 | 7.03 | 7.13 | 7.05 | 7.03 | 221.74 |
| | Total | 42.19 | 42.19 | 42.25 | 42.19 | 42.19 | 42.17 | 42.19 | 42.27 | 42.17 | 42.19 | 42.19 | 42.17 | 42.27 | 42.19 | 42.17 | 1284.90 |
| RS1 (2013 Refresh) | Per Train Km | 20.28 | 20.28 | 20.28 | 20.28 | 20.28 | 20.28 | 20.28 | 20.28 | 20.28 | 20.28 | 20.28 | 20.28 | 20.28 | 20.28 | 20.28 | 580.30 |
| | Per Train Hour | 3.22 | 3.22 | 3.22 | 3.22 | 3.22 | 3.22 | 3.22 | 3.22 | 3.22 | 3.22 | 3.22 | 3.22 | 3.22 | 3.22 | 3.22 | 100.12 |
| | Per Train Operating | 6.21 | 6.21 | 6.21 | 6.21 | 6.21 | 6.21 | 6.21 | 6.21 | 6.21 | 6.21 | 6.21 | 6.21 | 6.21 | 6.21 | 6.21 | 183.37 |
| | Per Track Km | 7.41 | 7.41 | 7.41 | 7.41 | 7.41 | 7.41 | 7.41 | 7.41 | 7.41 | 7.41 | 7.41 | 7.41 | 7.41 | 7.41 | 7.41 | 229.96 |
| | Per Station | 2.51 | 2.51 | 2.51 | 2.51 | 2.51 | 2.51 | 2.51 | 2.51 | 2.51 | 2.51 | 2.51 | 2.51 | 2.51 | 2.51 | 2.51 | 81.91 |
| | Overheads | 7.06 | 7.06 | 7.11 | 7.06 | 7.06 | 7.03 | 7.06 | 7.14 | 7.03 | 7.06 | 7.06 | 7.03 | 7.13 | 7.05 | 7.03 | 221.74 |
| | Total | 46.69 | 46.69 | 46.75 | 46.69 | 46.69 | 46.67 | 46.69 | 46.77 | 46.67 | 46.69 | 46.69 | 46.67 | 46.77 | 46.69 | 46.67 | 1,397.40 |

Figure E2: 30 Year Operational Expenditure – Summary Model

## Appendix F: Journey Time Impact analysis

| Time | Ngauranga Average Flow | Capacity | Additional Vehicles | Simulated Vehicles | Queued | Total Delay (minutes) | Total Delay (Hours) | Average Delay |
|---|---|---|---|---|---|---|---|---|
| **5:00:00 a.m.** | 147.7 | 1338.5 | 0 | 147.7 | 0 | 0 | 0 | 0 |
| **5:15:00 a.m.** | 230.6 | 1338.5 | 0 | 230.6 | 0 | 0 | 0 | 0 |
| **5:30:00 a.m.** | 288.9 | 1338.5 | 0 | 288.9 | 0 | 0 | 0 | 0 |
| **5:45:00 a.m.** | 391.1 | 1338.5 | 400 | 791.1 | 0 | 0 | 0 | 0 |
| **6:00:00 a.m.** | 619.6 | 1338.5 | 600 | 1219.6 | 0 | 0 | 0 | 0 |
| **6:15:00 a.m.** | 997.5 | 1338.5 | 800 | 1797.5 | 459.0 | 3442.7 | 57.4 | 1.9 |
| **6:30:00 a.m.** | 1338.0 | 1338.5 | 1000 | 2338.0 | 1458.5 | 14381.6 | 239.7 | 6.2 |
| **6:45:00 a.m.** | 1338.4 | 1591.25 | 1332 | 2670.4 | 2537.7 | 29971.8 | 499.5 | 11.2 |
| **7:00:00 a.m.** | 1191.5 | 1591.25 | 2053 | 3244.5 | 4191.0 | 50465.4 | 841.1 | 15.6 |
| **7:15:00 a.m.** | 1163.8 | 1591.25 | 1332 | 2495.8 | 5095.6 | 69649.4 | 1160.8 | 27.9 |
| **7:30:00 a.m.** | 1071.9 | 1591.25 | 1332 | 2403.9 | 5908.2 | 82528.5 | 1375.5 | 34.3 |
| **7:45:00 a.m.** | 954.9 | 1591.25 | 1332 | 2286.9 | 6603.9 | 93840.5 | 1564.0 | 41.0 |
| **8:00:00 a.m.** | 864.9 | 1591.25 | 1000 | 1864.9 | 6877.5 | 101109.8 | 1685.2 | 54.2 |
| **8:15:00 a.m.** | 867.0 | 1591.25 | 800 | 1667.0 | 6953.2 | 103729.7 | 1728.8 | 62.2 |
| **8:30:00 a.m.** | 829.9 | 1591.25 | 600 | 1429.9 | 6791.8 | 103087.0 | 1718.1 | 72.1 |
| **8:45:00 a.m.** | 792.0 | 1591.25 | 400 | 1192.0 | 6392.5 | 98882.2 | 1648.0 | 83.0 |
| **9:00:00 a.m.** | 751.6 | 1591.25 | 300 | 1051.6 | 5852.8 | 91840.3 | 1530.7 | 87.3 |
| **9:15:00 a.m.** | 736.3 | 1591.25 | 300 | 1036.3 | 5297.9 | 83630.4 | 1393.8 | 80.7 |
| **9:30:00 a.m.** | 651.7 | 1591.25 | 200 | 851.7 | 4558.3 | 73921.5 | 1232.0 | 86.8 |
| **9:45:00 a.m.** | 597.6 | 1591.25 | 0 | 597.6 | 3564.6 | 60922.2 | 1015.4 | 102.0 |
| **10:00:00 a.m.** | 591.8 | 1591.25 | 0 | 591.8 | 2565.2 | 45973.7 | 766.2 | 77.7 |
| **10:15:00 a.m.** | 602.4 | 1338.5 | 0 | 602.4 | 1829.1 | 32957.4 | 549.3 | 54.7 |
| **10:30:00 a.m.** | 564.7 | 1338.5 | 0 | 564.7 | 1055.3 | 21633.5 | 360.6 | 38.3 |
| **10:45:00 a.m.** | 529.3 | 1338.5 | 0 | 529.3 | 246.2 | 9761.6 | 162.7 | 18.4 |
| **11:00:00 a.m.** | 556.4 | 1338.5 | 0 | 556.4 | 0.0 | 1846.5 | 30.8 | 3.3 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **11:15:00 a.m.** | 592.4 | 1338.5 | 0 | 592.4 | 0.0 | 0.0 | 0.0 | 0.0 |

| Time | Ngauranga Average Flow | Capacity | Additional Vehicles | Simulated Vehicles | Queued | Total Delay (minutes) | Total Delay (Hours) | Average Delay |
|---|---|---|---|---|---|---|---|---|
| **7:00:00 a.m.** | 1191.5 | 1338.5 | 2053 | 3244.5 | 1906.0 | 14295.3 | 238.3 | 4.4 |
| **7:15:00 a.m.** | 1163.8 | 1591.25 | 1332 | 2495.8 | 2810.6 | 35374.9 | 589.6 | 14.2 |
| **7:30:00 a.m.** | 1071.9 | 1591.25 | 1332 | 2403.9 | 3623.3 | 48254.0 | 804.2 | 20.1 |
| **7:45:00 a.m.** | 954.9 | 1591.25 | 1332 | 2286.9 | 4318.9 | 59566.1 | 992.8 | 26.0 |
| **8:00:00 a.m.** | 864.9 | 1591.25 | 0 | 864.9 | 3592.5 | 59335.4 | 988.9 | 68.6 |
| **8:15:00 a.m.** | 867.0 | 1591.25 | 0 | 867.0 | 2868.2 | 48455.3 | 807.6 | 55.9 |
| **8:30:00 a.m.** | 829.9 | 1591.25 | 0 | 829.9 | 2106.8 | 37312.6 | 621.9 | 45.0 |
| **8:45:00 a.m.** | 792.0 | 1338.5 | 0 | 792.0 | 1560.3 | 27503.4 | 458.4 | 34.7 |
| **9:00:00 a.m.** | 751.6 | 1338.5 | 0 | 751.6 | 973.4 | 19002.7 | 316.7 | 25.3 |
| **9:15:00 a.m.** | 736.3 | 1338.5 | 0 | 736.3 | 371.2 | 10084.0 | 168.1 | 13.7 |
| **9:30:00 a.m.** | 651.7 | 1338.5 | 0 | 651.7 | 0.0 | 2783.7 | 46.4 | 4.3 |

# Appendix G: GWRC Park and Ride Capacity Strategy

## 1. Introduction

### 1.1 Purpose

This Greater Wellington Regional Council (GWRC) Park and Ride Capacity Strategy (PARCS) has been developed to generate greater access to effective and efficient commuter rail services within the region. The PARCS is designed to provide a strategic framework for pursuing commuter rail park and ride land opportunities which facilitate Regional Rail Plan (RRP) service strategies, and improves the efficiency and robustness of the wider land transportation network.

### 1.2 Background

Park and ride refers to commuter parking facilities, which are linked to the central city and other commercial centres by the passenger transport network. These parking facilities are provided primarily for commuters travelling to and working in the central city and other commercial centres.

There are 31 park and ride facilities located on land or roads near railway stations and passenger transport interchanges across the region. Currently GWRC owns only a few of the sites that are used to provide rail customers with park and ride facilities. The land is managed by Council contracted property consultant Jigsaw Property. These blocks of land are at:

- Paraparaumu (part of which is Council owned)
- Lindale (undeveloped land)
- Porirua (will be largely in Council ownership by June 2013)
- Tawa
- Woodside
- Featherston

The remainder of the sites are leased from various owners, including KiwiRail, NZTA, local Councils and private owners.

Currently, 30% of Greater Wellington rail commuters use park and ride facilities.

All park and ride facilities are marked and signposted as Metlink park and ride facilities. These parking facilities are operated free of charge. With future patronage growth it will not be possible to sustain this level of access because nearby land is in short supply. In addition, the cost of providing and maintaining park and ride facilities is increasing.

As GWRC continues to grow its rail services based on the RRP, the development of park and ride facilities provides a very strong correlation with, and catalyst for patronage growth. However, such development is expensive and must therefore be targeted and strategic. This section of the RRP develops a strategy to identify park and ride priorities which contribute to generating higher patronage at specific locations which current and future service levels can support.

## 2. Service strategy and park and ride capacity strategy

The goal of the RRP is to maintain and grow rail's position as the key transport mode for long to medium distance and high volume transport services over the next 25 years.

The PARCS contributes to this goal by:

1. Developing park and ride capacity development and expansion around a smaller number of larger stations and/or key interchanges – ie. concentrating economic activity and passenger flows at larger stations which can provide a higher level of service.

2. Providing a basis for engaging closely with other network owners and stakeholders such as NZTA (Property, Highways & Network Operations, and Planning & Investment), KiwiRail Group, and other utilities and private owners to investigate land transactions and developments for park and ride that contribute to wider transportation network benefits (eg. decongestion of highways, development of passenger and freight hubs).

3. Provide a documented basis for early and regular signalling of locations of interest and opportunity.

The 2013 RRP refresh shows 2009 RRP delivered greater than expected results with Base Case improvements. While RS1 is still the next stage in developing Wellington's rail system, how it will be delivered has changed.

Key features of the refreshed RS1 are:

- A new regularised (clock face) timetable with an enhanced AM Peak Hour service

- A new service pattern based on an inner (metro) and outer (suburban) network

- Network hubs at the busiest stations – Waterloo and Porirua – and more metro services starting from these hubs (up to five trains per hour) during AM Peak Hour. More trains with fewer carriages across the peak period giving people more flexible travel options

- More express trains from stations on the outer network

### 2.1 Current Network

The Wellington Metropolitan Rail Network comprises two main line and two branch line routes emanating from Wellington railway station. All services operating on the Wellington Metropolitan Rail Network terminate at Wellington Station.

The Kapiti Line carries around 3,032 passengers a day into Wellington in the morning peak.

- The busiest stations along the Kapiti Line are Porirua and Paraparaumu

The Hutt Valley Line carries around 2,992 passengers a day into Wellington in the morning peak.

- The busiest station along the Hutt Valley Line is Waterloo with Petone the second

The Melling Line carries around 425 passengers a day into Wellington in the morning peak.

The Johnsonville Line carries around 1,187 passengers a day into Wellington in the morning peak.

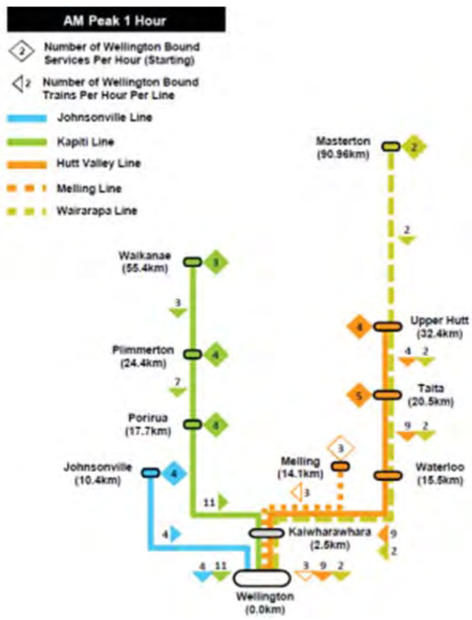
The Wairarapa Line (Masterton) carries around 1,019 passengers a day into Wellington in the morning peak.

## 2.2 Future Service Strategy

RS1 has been refreshed to provide a nominal 15-minute peak train service on all metro lines whilst maintaining the capability of delivering the strategic objectives and growth targets for rail, in line with the RRP Vision. The aim of the modified service pattern is to optimise operational assets through the redistribution of capacity to where it is most needed in the short to medium-term.

Comparison of the operational service strategy's using the two diagrams below show where the impacts of the RS1 implementation will occur on each line.


Current




Future

It is acknowledged that additional infrastructure renewals, system strengthening and enhancements are necessary to provide a reliable service (and recoverability during times of disruption) for the entirety of the peak periods. In addition to the above improvements, consideration should be given to prioritisation of park and ride upgrades linking directly to the following stations (on the basis of enhanced services):

- Kapiti Line – Waikanae / Paraparaumu / Paekakariki / Plimmerton / Porirua
- Hutt Valley Line – Upper Hutt / Taita / Waterloo / Petone

These stations (or hubs) are where the focus of GWRC's review of current park and ride facilities, and land availability for future expansion to meet the demand that will be created by the improved operational service strategy, should begin.

# 3. Park and Ride

## 3.1 Role of park and ride

The main role of park and ride is to transfer parking demand from the central city and other major commercial areas to suburban/urban fringe locations.

Benefits include:

1. Better utilisation of passenger transport capacity

   Park and ride facilities help concentrate passenger trips along key high capacity corridors allowing higher levels of service (e.g. frequency and capacity).

2. Reduced road congestion

   Park and ride facilities help reduce road congestion by allowing people to avoid driving through the most congested parts of the road network.

3. Increased parking capacity

   Park and ride facilities provide additional parking capacity to that in the central city and other major commercial areas. Park and ride facilities therefore complement the local parking policies in these areas.

4. Improved environmental outcomes

   Park and ride facilities also provide improved environmental outcomes by reducing emissions, energy use and potential need for increased road capacity.

Park and ride facilities also have an important role in the Wellington region to enable access to the transport network where direct access is not feasible. Direct access by walking may be difficult in hilly or poorly connected areas while direct access by public transport may not be feasible in low density and poorly connected areas.

## 3.2 Key success factors

A strong park and ride market will generally only develop in regions with relatively high parking charges in their central city and/or other major commercial areas and limited road capacity into these areas. The strong park and ride market in Wellington is a factor of these and also of the high quality passenger transport network.

Provided the above conditions are met key success factors for individual park and ride facilities include:

1. High quality public transport links

   Public transport links must ensure a high level of service (e.g. fast, frequent, and reliable) that is competitive with the private car to provide an incentive for people not to drive all the way.

2. Well designed and located facilities

   Facilities should also be easy to access and be well maintained.

3. High degree of safety and security

   Personal safety and car security are important considerations with perceptions just as important as actual crime statistics.

4. Quality information and marketing

   Facilities must also provide sufficient capacity to meet demand such that people using the facility on a regular basis have a reasonable chance of finding a parking space at that facility.

## 3.3 Current facilities

Park and ride facilities are available at, or near, railway stations. When you catch the train you can park your car for free. There are currently 4,565 spaces, as compared to just over 2,000 spaces in 2001/02 and just over 4,000 spaces in 2006, excluding dedicated on-street parking. The sites are as listed below.

| Hutt Line | | Kapiti Line | |
|---|---|---|---|
| Petone | 266 | Takapu Rd | 73 |
| Melling | 200 | Redwood | 149 |
| Woburn | 160 | Tawa | 75 |
| Waterloo | 657 | Porirua | 452 |
| Taita | 65 | Paremata | 300 |

| | | | |
|---|---|---|---|
| Pomare | 42 | Mana | 43 |
| Silverstream | 64 | Plimmerton | 50 |
| Trentham | 113 | Pukerua Bay | 27 |
| Wallaceville | 147 | Paekakariki | 79 |
| Upper Hutt | 188 | Paraparaumu | 581 |
| | | Waikanae | 176 |
| Johnsonville Line | | Wairarapa Line | |
| Crofton Downs | 53 | Featherston | 149 |
| Ngaio | 58 | Woodside | 92 |
| Simla Cres | 6 | Carterton | 95 |
| Khandallah | 14 | Solway | 54 |
| Raroa | 12 | Masterton | 76 |
| Johnsonville | 49 | | |

### 3.4 Current usage

The GWRL Rail Asset team is reviewing and updating the records on car parking spaces. Usage used to be monitored via hiring students to complete counts annually but this practice was stopped about 3 years ago.

A survey in 2007 counted 4,137 vehicles at park and ride facilities across the region which equated to a 93% utilisation rate of facilities at that time.

Also passenger count information at each station to show usage is something that is currently only collected very rarely. The last survey was completed in 2011 with the survey prior to that done in 2004. However as part of the design of the new Matangi units that are now in service (and those currently being negotiated for purchase) an Automatic Passenger Count system was installed. This system is currently being set up for daily operation.

## 4. Land

### 4.1 All sites

KiwiRail owns the land that encompasses the rail corridor, including the platform, and in some instances car park area. Some car park areas have been developed and there are some that are available for future development. Appendix 1 has full A3 station plans showing the land owned by KiwiRail and the car park areas leased by GWRC.

The last review of the park and ride facilities, capacity, usage and future opportunities was completed in 2008.

## 4.2 Current land purchases

### 4.2.1 Petone

NZTA owns land at Petone that they have expressed an interest to sell. GWRC currently leases a parcel of the land, and NZTA will sell with our current lease in place. GWRC should look to purchase this land to ensure its future security as if we do not purchase any land from NZTA in the area now it is less likely to be available to GWRC at value again. Valuations have been completed by NZTA and GWRC and these will be used a basis for negotiation should GWRC proceed with the purchase.

GWRC has also recently been approached by the owner of blocks of land adjacent to the current car park and the NZTA land that is being purchased.

### 4.2.2 Porirua

There are 3 blocks of land at Porirua that will be dealt with in succession.

#### (a) Phase 1

NZTA has for some time been working through a programme of identifying property in its ownership which is not needed for its core operational activities. Once surplus property has been identified, a process commences to dispose of the property at current market value. As part of the disposal process NZTA first considers if any other government or local government agency has an interest in the property, before offering it for sale on the open market.

NZTA land at Mungavin Porirua has been declared surplus to NZTA's requirements and offered to GWRC as a logical interested party.

Demand for commuter car parking at Porirua Station has exceeded supply for some time now and this is a site targeted by GWRC for car park expansion. Hence GWRC has confirmed its interest in the acquisition of this land and engaged in negotiations with NZTA to agree an appropriate transfer values.

With NZTA having declared the subject property surplus to its requirements, it has a statutory obligation to carry through with the disposal of the property. Therefore if GWRC does not proceed with the purchase of the property it will be marketed for sale on the open market.

If this occurs possible outcomes would be that the new owner develops the land for another purpose or requires GWRC to enter into a commercial car park lease. Purchase of this land by GWRC will secure its investment in the existing developed carparks in perpetuity and provide scope for carpark expansion in the future.

The land at Porirua compromises a large elongated site of circa 17,110 square metres in close proximity to Porirua city centre. The land is bound by the Porirua rail station to the west and SH1 to the east.

The northern and central portions of the land has been used for of commuter car parking for many years now and is actively managed and maintained by GWRC in conjunction with adjoining car park land currently owned by Porirua City Council (PCC).

The southern portion of the site has not been developed for car parking but is ear-marked by GWRC for future car park expansion. Despite not being sealed this area is already used extensively by commuter car parkers as overflow.

#### (b) Phase 2

A significant portion of the existing developed car park at Porirua is located on land held by PCC.

This land was purchased from Housing NZ in 1999 for commuter car park purposes. GWRC agreed to fund the purchase and to meet subsequent development and maintenance costs of the land and PCC agreed to have the land placed in its ownership.

This unusual purchase mechanism was adopted because prior to the passing of the Land Transport Management Act 2003 (LTMA), GWRC was prohibited by the Local Government Act 1974 from owning land and assets for the purpose of transport related activities.

On the passing of the LTMA, GWRC approached PCC requesting the land be transferred back to GWRC (who funded the purchase) at a peppercorn consideration. To date PCC has resisted on the grounds of perceived legal complications and gift duty implications. Gift duty has since been abolished.

GWRC is preparing to make a fresh approach to PCC requesting that the PCC car park land be transferred back to GWRC.

#### (c) Phase 3

Immediately to the south of the subject property is further NZTA land which is being retained as a depot site during the construction of Transmission Gully. Once that project has been completed the land will probably be identified as surplus to NZTA requirements and will offer it to GWRC.

## 4.3 Current Land Sales

Land that was purchased by GWRC at Lindale for future carpark and station development is now intended for sale.

### 4.3.1 Lindale

The 2013 RRP review of the case relating to Lindale station has focussed on the overall need and economic viability of implementing the works.

The review has identified a number of significant issues that potentially remove the options for a new railway station that has been previously identified at Lindale. The issues identified are:

The Western Link Road (WLR) project has now been superseded by the MacKays to Peka Peka Expressway – M2PP (a project being delivered by NZTA as part of the 'Roads of National Significance' – RoNs Programme).

The confirmed M2PP alignment does not incorporate the extension of Mazengarb Road, which in the original WLR project, provided station access and the realisation of a significant 'park and ride' catchment for the proposed Lindale station.

The attractiveness of Lindale as a 'park and ride' railway station has been significantly affected through the combination of reduced catchment, and indirect access.

Adjacent land development opportunities have been deferred and in some cases completely eliminated i.e. Whitireia Community Polytechnic has now relocated to a new campus at the intersection of Kapiti Road and Milne Drive.

## 4.4 Other sites

### 4.4.1 Waikanae

There are two leases currently in place for land to provide park and ride facilities. There is also on-street parking on the eastern side of the track, however this is not as popular due to the level crossing operation at peak times impeding the traffic flow back onto State Highway 1. A lot of commuters currently park on the State Highway 1 on the western side of the track to the north of the station. There is currently no land available for development into park and ride facilities that do not require commuters to cross State Highway 1 which would require significant investment to enable safe crossing. However once the MacKays to Peka Peka Expressway (M2PP) has been completed State Highway 1 will be reclassified as a local road and this may enable easier introduction of crossings.

### 4.4.2 Paraparaumu

GWRC was approached August 2012 by one of the directors of the company that owns the above property. It offered 1.40ha of land adjacent the hillside and KCDC commuter car park. The owners were looking to on-sell as two separate lots:

- Front Lot (Paula's Furniture) land area 9500m$^2$.
- Rear Lot (Big Save) land area 5500m$^2$.

The owners approached GWRC again April 2013 and are now looking at developing a car park building on the land for commuters to occupy. They would like GWRC to take a head lease, or if not then perhaps form a relationship with their car park operators that may be interested in this option.

Another option is the block of land on the corner of Kapiti Road, which is currently a car rental yard. However this land is iwi land and may be handed back as part of a Treaty settlement.

### 4.4.3 Paekakariki

An estimate of costs for the development of the car park at Paekakariki has been undertaken by Aurecon. To increase the current capacity of the car park by 54 spaces (based on a sketch plan only and no design or investigation works) a cost of $680,000 has been estimated. There is the potential for significant costs in approval and construction of the works particularly related to the following items:

- Subgrade improvement works for the pavement due to poor underlying soil conditions
- Costs related to the handling and disposal of contaminated materials
- Repair and/or replacement works associated with KCDC stormwater mains
- Protection and/or diversion of other underground services
- Negotiations with neighbouring properties and assessment of effects (particularly light spill).

### 4.4.4 Plimmerton

There are two site leases, however the majority of commuter parking is using on-street parking on Steyne Avenue.

One site is leased from KiwiRail but has not been used for park and ride facilities for 3-4 years. This is due to the cost involved in resurfacing the site and the access bridge repairs that would be required. However this option is being held open by KiwiRail and can be taken on by GWRC if necessary and funding can be sourced.

The second site is leased from Porirua City Council in the Plimmerton Domain. As part of the lease GWRC maintain and upgrade the site. There is an option to extend by 30 spaces however this park and ride facility is not currently at capacity.

### 4.4.5 Tawa Junction

During 2011 Land Equity held the option to buy the entire site for a proposed business park. However this did leave land available for GWRC to purchase for a car park. There is contamination of the site. It was the cost of the land at the time made this option unviable. The land has since been sold and new development is underway. However there may still be an opportunity for GWRC and this should be investigated with the new owners.

### 4.4.6 Takapu Island

There is a block of land available to the south of the station, east of the tracks. The site is sloping with a river at the track end of the site. This would require significant investment in levelling and access to the station.

### 4.4.7 Upper Hutt

Current park and ride facilities are leased from Upper Hutt City Council. However if they redevelop the station then these facilities would likely be lost. There is however land held by KiwiRail that could be developed on the eastern side of the track with space for 50-60 car parks.

### 4.4.8 Taita

There is currently parking available in two locations. There are on-street parks on High Street on the western side of the tracks. There is also land owned by KiwiRail on the eastern side of the track that is currently developed for 65 spaces, however there is room to develop further facilities.

### 4.4.9 Waterloo

The current park and ride facility is at capacity and there is currently no scope for future development that would be economically viable. There is land alongside Cambridge Terrace on the eastern side of the tracks that could be developed into on-street parking however distance and access to the station need to be considered.

## 5. Future Opportunities

A passenger growth rate of 2% per annum has been used in forecasts in the RRP. As well as broadly reflecting trends this figure is consistent with forecasts from the regional transport model WTSM, which indicates annual growth in peak rail patronage of 2.2% between 2011 and 2021.

The current commuter parking access mode share is 30% during peak periods. Without any increase in commuter parking capacity the commuter parking access mode share would reduce to between 15% and 25%.

## 5.1 Guidelines

The following guidelines are intended to guide park and ride decisions, including prioritising the development of park and ride facilities, while taking into account the role and key success factors set out above.

### 5.1.1 Ensure sustainability of existing facilities

All park and ride facilities should be managed to ensure the sustainability of the park and ride infrastructure investment and to ensure people are not discouraged from using passenger transport services due to low levels of service.

### 5.1.2 Ensure safe and secure commuter parking facilities

Park and ride facilities should at a minimum comply with relevant requirements for maintenance, safety and security, layout and design, paving and markings, disabled access, signage, lighting, landscaping.

Where an extension is proposed the entire facility, not just the extension, should be upgraded to comply with the minimum standards. This is to ensure a safe and secure environment and to maximise value for money by only requiring one contract.

Higher standards may be considered where these will result in a better level of service or more efficient outcome, taking into account the available budget.

### 5.1.3 Ensure appropriate capacity and locations

Facilities should be located to provide sufficient capacity taking into account current and future demand and to maximise benefits and overall passenger transport patronage.

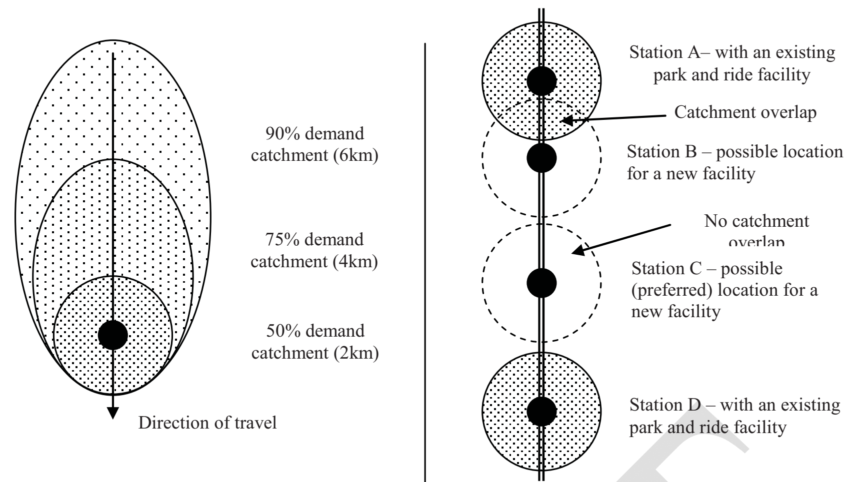
The following guidelines should also be considered when deciding the most appropriate location for developing existing or new park and ride facilities:

- The facility should be located to maximise the overall passenger transport catchment for all access modes.
- The facility should be located so as not to reduce the number of people using active modes or feeder bus services to access the passenger transport network.
- Current and future demand should be considered, including potential repressed demand for the facility, and alternative locations.

The following information is intended to assist in determining the most appropriate location for park and ride facilities:

1. Locate facilities in congested travel corridors
2. Locate facilities upstream of areas experiencing major traffic congestion
3. Locate facilities on key demand corridors
4. Locate facilities in areas with less dense populations including where passenger transport services are less feasible
5. Locate facilities so commuters do not have to backtrack to reach the facilities
6. Locate facilities to minimise any overlap between the primary service areas (50% demand catchments) of facilities (refer diagram below) unless required to provide sufficient capacity.

The following diagram should be used as a guideline when defining park and ride catchments in the Wellington region bearing in mind individual catchments will vary depending on a range of criteria.




Demand catchments for park and ride derived from observed catchments in Wellington region

This example shows how the 50% demand catchment can help decide the most suitable location for a new park and ride facility. In this example Station C is preferred over Station B because it minimises any overlap with the existing catchments for Stations A & D.

Source: LTNZ (2007), Park and ride: Characteristics and demand forecasting

### 5.1.4 Ensure efficient and cost effective developments

Park and ride developments should seek to maximise efficiency by utilising, where possible, existing capacity across the region and focusing on the cost effective development of catchments where capacity is most constrained.

Developments should also provide efficient and cost effective solutions compared to other access modes such as walking/cycling and connecting bus services.

The availability of funding must also be taken into account, including agreed budgets and any opportunities to charge for commuter parking.

### 5.1.5 Ensure consideration and management of local effects

All local effects arising from the development, including traffic impacts and environmental effects, should be appropriately managed in partnership with relevant stakeholders.

Local parking policies and relevant central city and commercial area parking policies, where applicable, should also be considered when developing facilities.

### 5.1.6 Ensure consideration of alternatives

An assessment should be undertaken of any park and ride proposal to ensure consideration of alternatives, including alternative access modes to the passenger transport network (e.g. walking, connecting bus services) and any demand management opportunities.

The following alternatives should be considered in the assessment:

- Active mode improvements (e.g. walking and cycling)

  Such improvements could include improvements to pedestrian routes within five minutes walk of the passenger transport service or improved cycle facilities/routes.

- Passenger transport service improvements (e.g. feeder bus services)

  Such improvements could include enhancement to connecting passenger transport services or provision of new feeder services. Improved interchange facilities and the provision of integrated ticketing are also possible alternatives that could be considered.

- Transit oriented developments

  Such developments could generate more passenger transport trips than alternative park and ride facilities on the same land (subject to land tenure issues).

- Park and ride alternatives (e.g. different locations or number of spaces provided)

  Consideration should also be given to the proximity of the facility to the station as close proximity could deter access by active modes with people driving short distances.

### 5.1.7 Prioritise development of park and ride facilities

An assessment should be undertaken of any park and ride proposal to enable the prioritisation of developments.

Priorities should be set in accordance with the following guidelines.

- Prioritise developments taking into account the need to provide sufficient capacity and maximise the catchment areas. Developments that maximise catchments and demand should be prioritised ahead of developments that do not.

- Prioritise developments taking into account efficiency and cost effectiveness. The most inexpensive, efficient and cost effective developments should be given priority within the following general framework:

  1. Maintain and upgrade existing facilities
  2. Expand existing on-street facilities
  3. Develop new on-street facilities
  4. Expand existing off-street facilities
  5. Develop new off-street facilities

- Proposals should be prioritised within each category above based on potential to increase passenger transport patronage overall.

### 5.1.8 Secure land and develop partnerships to promote the efficient and effective operation of the passenger transport network

Land tenure should be secured for all park and ride facilities to protect regional investments in park and ride. Opportunities should also be investigated to secure long term land tenure of any land adjacent to current and future railway stations, bus stops and transport interchanges to be used for future park and ride facilities or any other development that would support the efficient and effective operation of the passenger transport network.

Opportunities for partnerships with contributions from local authorities and other infrastructure owners should be promoted to achieve outcomes such as improved land use and transport integration, implementation of growth strategies that benefit all communities.

Existing facilities should not be upgraded or expanded without first having secured ownership or long-term lease, except in the case of safety and security improvements and regular maintenance.

The development of park and ride facilities has an opportunity cost in respect to alternative uses of the land. In some instances, especially in areas of high land value (which is a reflect of the economic value of the land) it may be more effective and efficient to develop the land for business or residential activities (especially high density) which could generate more passenger transport trips than developing it as a park and ride facility. Such alternative developments are often termed transit oriented development and would be considered prior to the use of that land for a park and ride facilities.

## 5.2 Priority order

Key factors to consider when prioritising the development and expansion of park and ride facilities are:

- Current and future demand
- Benefits and costs
- Location and catchment size
- Opportunities to develop alternative access modes (e.g. walking, feeder bus services) within the catchment

To identify future requirements for park and ride space, there are two pieces of data that GWRC needs.

Data of current park and ride usage needs to be collected. This will identify where further space and development is required. Also passenger count information at each station to show usage. The passenger count information will be readily available once the APC system is operating in July 2013.

These two pieces of data could then be used to review the situation over the network and then with the guidance on future plans and growth from the Regional Rail Plan, investigations will be made as to where there will be a future need for greater parking requirements and what options are available.

In applying these key factors, the priority order for the development and expansion of park and ride infrastructure should be as follows:

1. Focus on developing on-street parking within catchments where demand exceeds supply

2. Focus on developing off-street parking within catchments where demand exceeds supply

3. Consider further land development opportunities

These priorities are designed to best reflect the guidelines by ensuring the sustainability and a safe and secure environment for park and ride facilities across the region, while also allowing consideration of opportunities for further development and expansion as required. There also needs to be sufficient flexibility to secure land as it becomes available where such land is consistent with the key factors.

### 5.2.1 On-street

This type of parking is cheaper to develop as there is no land purchase costs involved. However, it can have adverse effects on local residential and retail parking. To develop this type of parking we would need to work in partnership with the local relevant Territorial Authorities to establish appropriate parking controls.

Once these sites are developed it will be difficult to identify further opportunities due to lack of suitable land and therefore could lead to an increase in land and development costs.

### 5.2.2 Off-street

This is a more expensive option as land purchase or leasing is involved and the opportunities to use existing street lighting and incorporating maintenance to existing local roading maintenance contracts cannot be gained. Leasing can be an issue as long term contracts may not be able to be secured in some instances which effects Council's ability to capitalise on the large expense to develop the site. Thus purchasing land is the preferred option as it secures the Council's long term interests.

Off-street parking provides a better controlled safer environment for the passenger transport users, where traffic impacts can be managed and the impacts to the local communities can be minimised.

Once these sites are developed it will be difficult to identify further opportunities due to lack of suitable land, which could lead to an increase in land and development costs.

## 5.3 Funding

Council has no funds set aside to enable strategic land acquisitions to secure land for future park and ride and transit orientated developments. The decision to purchase land at any time can be made by Council and is subject to NZTA funding. If funding is not approved by NZTA any purchase would require 100% rates funding.

Council could choose to put aside a financial reserve to provide for these opportunities and this should be a Long-term Council Community Plan decision.

## 6. Summary

This strategy has been developed to generate greater access to effective and efficient commuter rail services within the region.

This strategy sets out the role and key success factors for park and ride to contribute to achieving the goal of the RRP to maintain and grow rail's position as the key transport mode for long to medium distance and high volume transport services over the next 25 years.

Guidelines have been developed to provide assistance in prioritising the development of park and ride facilities. And as per the RRP the guidelines should be used as part of the consideration that is suggested to be given to prioritisation of park and ride upgrades linking directly to the following stations (on the basis of enhanced services):

- Kapiti Line – Waikanae / Paraparaumu / Paekakariki / Plimmerton / Porirua
- Hutt Valley Line – Upper Hutt / Taita / Waterloo / Petone

# Appendix 1


KiwiRail

## AVA STATION


KiwiRail

# AWARUA STREET STATION



1174678-V4

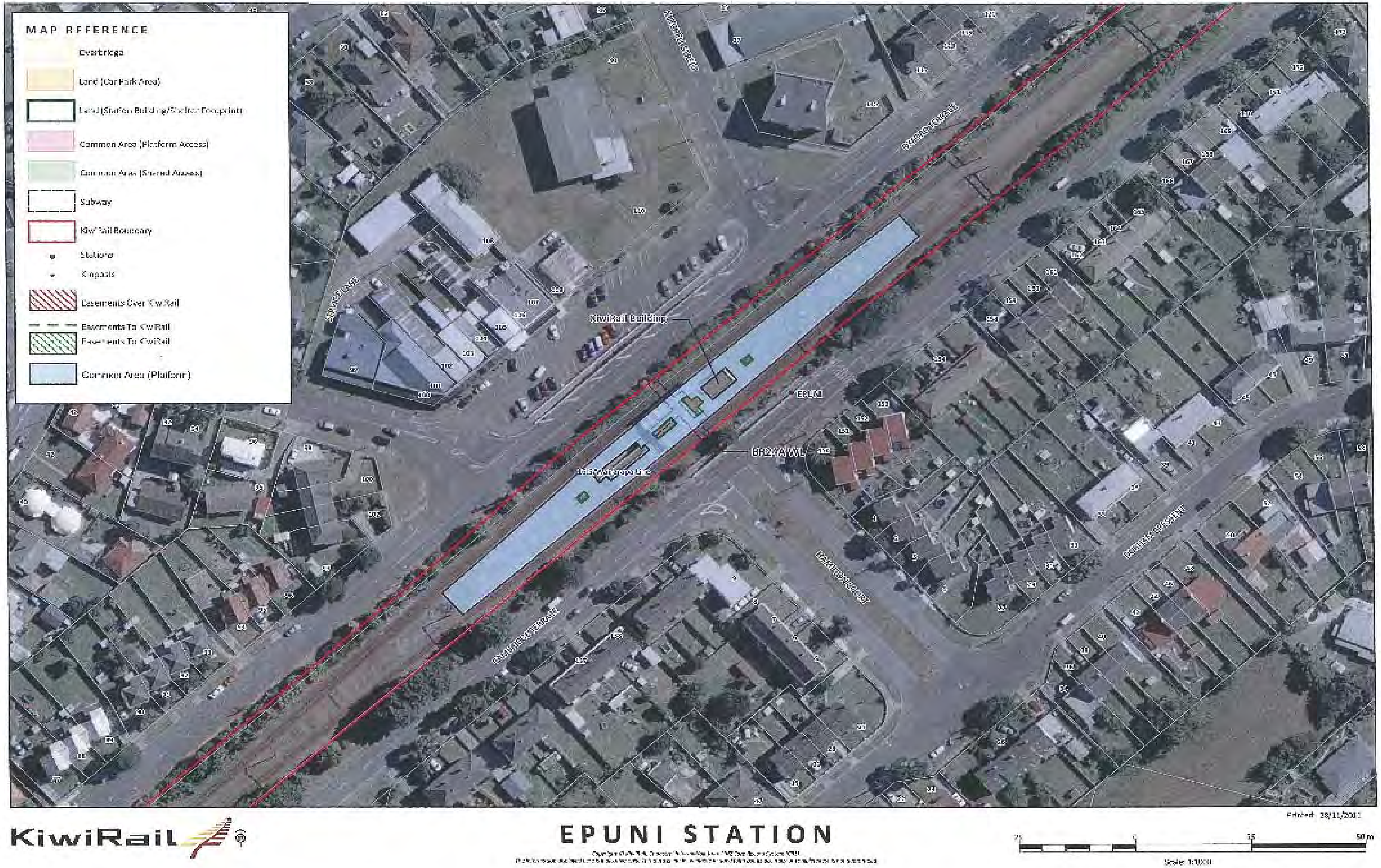

BOX HILL STATION


# CARTERTON STATION


KiwiRail

# CROFTON DOWNS STATION

Scale: 1:1000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Overbridge
Land (Car Park Area)
Land (Station Building/Station Footprint)
Common Area (Platform Access)
Common Area (Shared Access)
Subway
KiwiRail Boundary
Stations
Kilopegs
Easements Over KiwiRail
Easements To KiwiRail
Easements To KiwiRail
Common Area (Platform)
KiwiRail Building
EPUNI
KiwiRail
EPUNI STATION
50 m


KiwiRail

# FEATHERSTON STATION


MAP REFERENCE
Overbridge
Land (Car Park Area)
Common Area (Platform Access)
Common Area (Shared Access)
Stations
Easements Over Kiwi Rail
Easements To Kiwi Rail
Common Area (Platform)
HERETAUNGA
KiwiRail
HERETAUNGA STATION


KiwiRail

# JOHNSONVILLE STATION

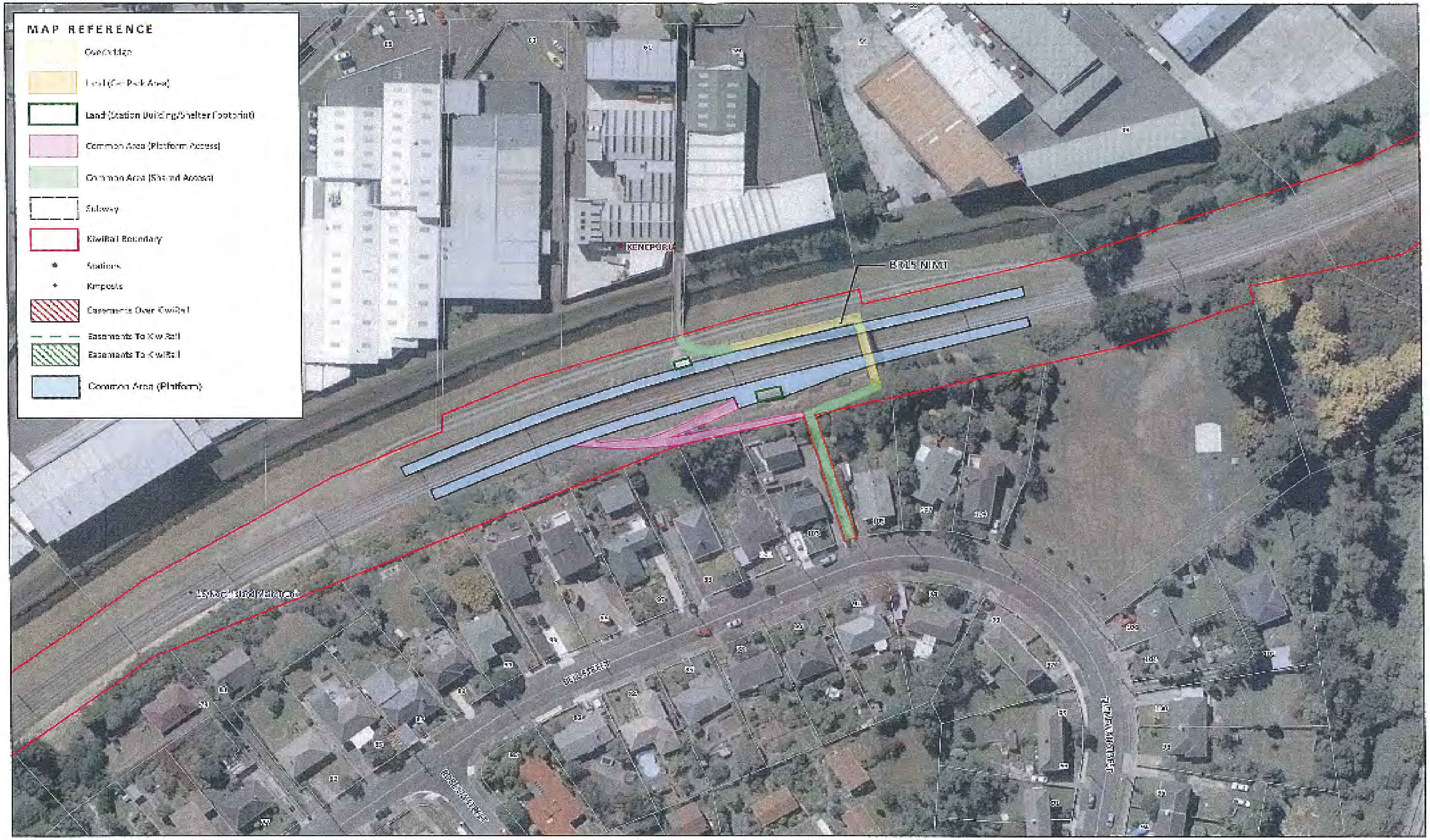
Scale: 1:1000


KiwiRail

# KAIWHARAWHARA STATION



1174678-V4




KiwiRail

# KENEPURU STATION


KiwiRail

# KHANDALLAH STATION



1174678-V4


KiwiRail

# LINDEN STATION


KiwiRail

# LOWER HUTT STATION

Edited: 18/11/2011

Scale: 1:2000


MAP REFERENCE
Overbridge
Land (Car Park Area)
Land (Station Building/Shelter Footprint)
Common Area (Platform Access)
Common Area (Shared Access)
Subway
KiwiRail Boundary
Stations
Emposts
Easements Over KiwiRail
Easements To KiwiRail
Easements To KiwiRail
Common Area (Platform)
MANA
Lease to PCC
KiwiRail
MANA STATION
Scale: 1:1000


KiwiRail

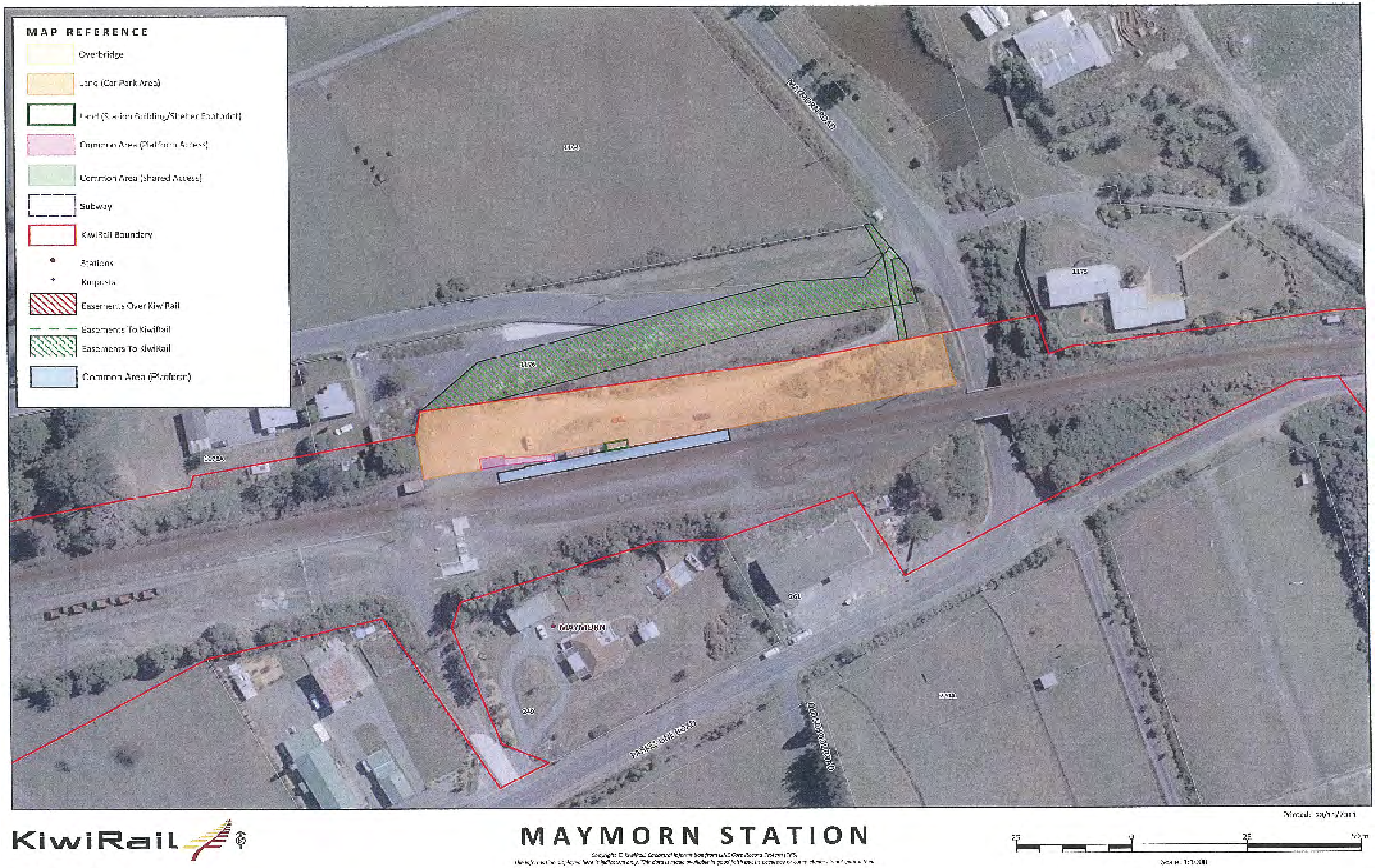
# MANOR PARK STATION

Scale 1:3000


MAP REFERENCE
Overbridge
Land (Car Park Area)
Land (Station Building/Shelter Footprint)
Common Area (Platform Access)
Common Area (Shared Access)
Subway
KiwiRail Boundary
Stations
Kmposts
Easements Over KiwiRail
Easements To KiwiRail
Easements To KiwiRail
Common Area (Platform)
KiwiRail Building
KiwiRail
MASTERTON STATION
Scale 1:1000
50 m


KiwiRail

# MATARAWA STATION


MAP REFERENCE
Overbridge
Land (Car Park Area)
Common Area (Shared Access)
Subway
KiwiRail Boundary
Stations
Easements Over Kiwi Rail
Easements To KiwiRail
Easements To KiwiRail
MAYMORN ROAD
MAYMORN
KiwiRail
MAYMORN STATION


KiwiRail

# MELLING STATION

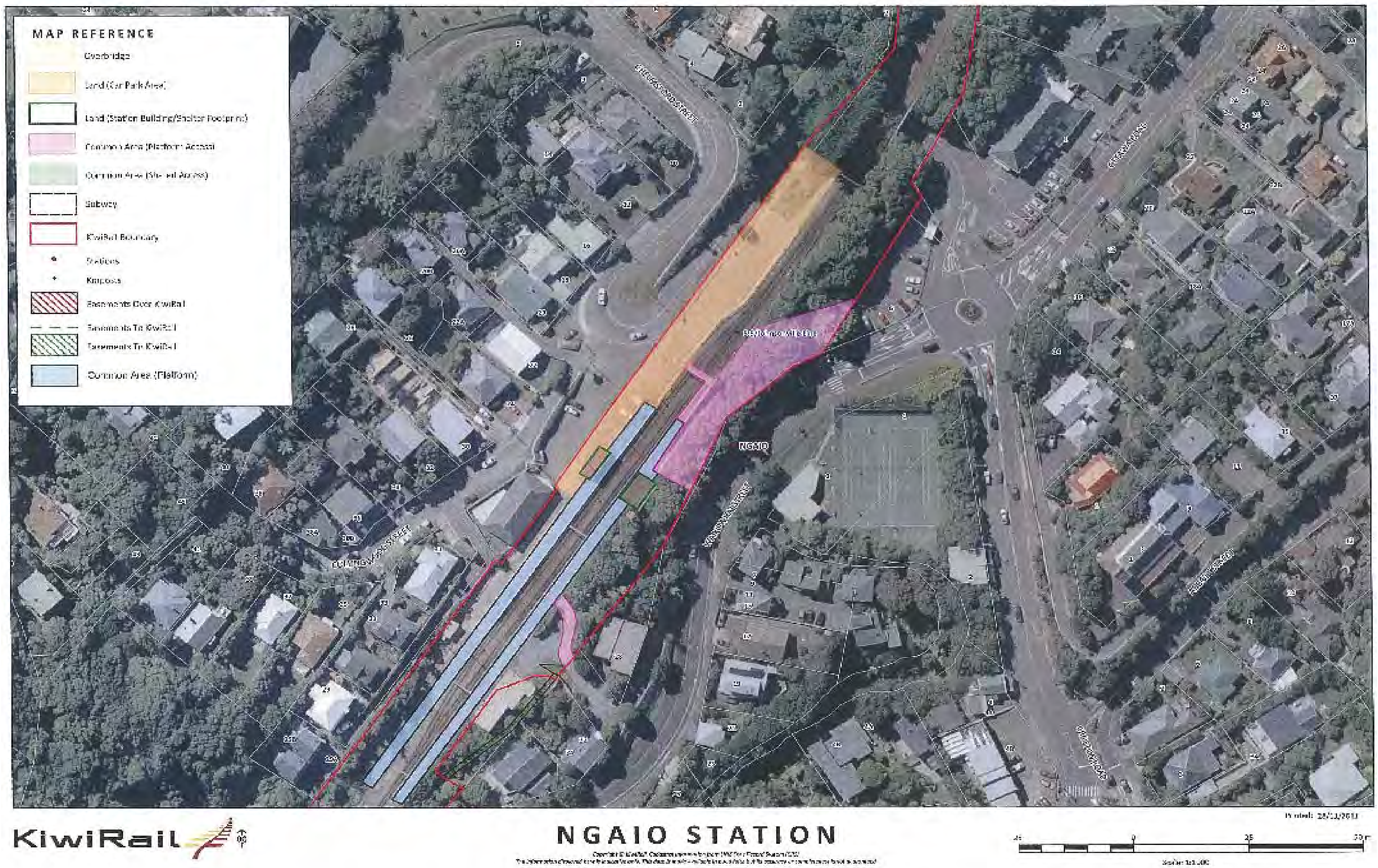
Scale 1:1000



1174678-V4


KiwiRail

# NAENAE STATION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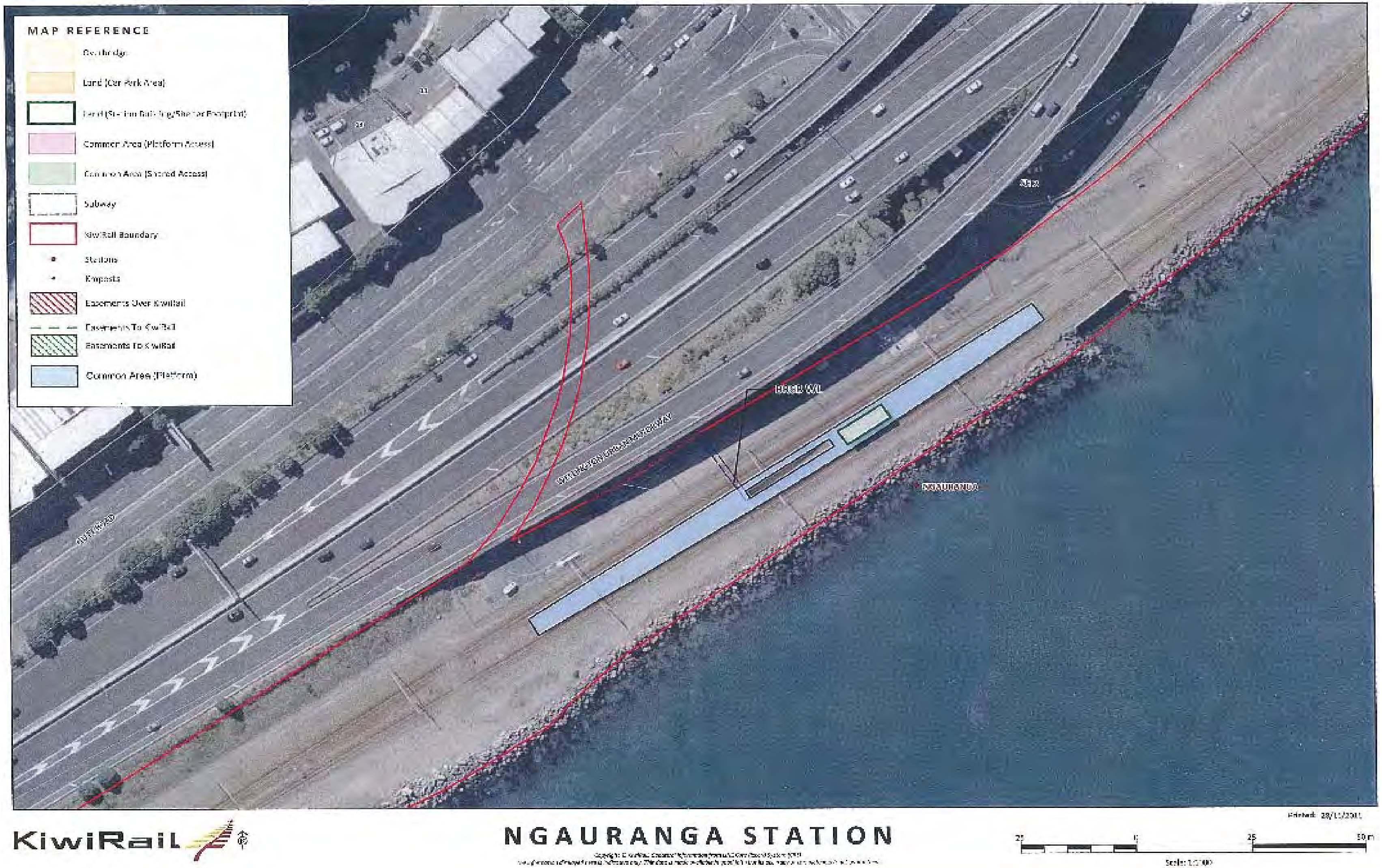
Land (Station Building/Shelter Footprint)
Common Area (Platform Access)
Common Area (Shared Access)
Subway
KiwiRail Boundary
Stations
Kmposts
Easements Over KiwiRail
Easements To KiwiRail
Easements To KiwiRail
Common Area (Platform)
NGAIO
KiwiRail
NGAIO STATION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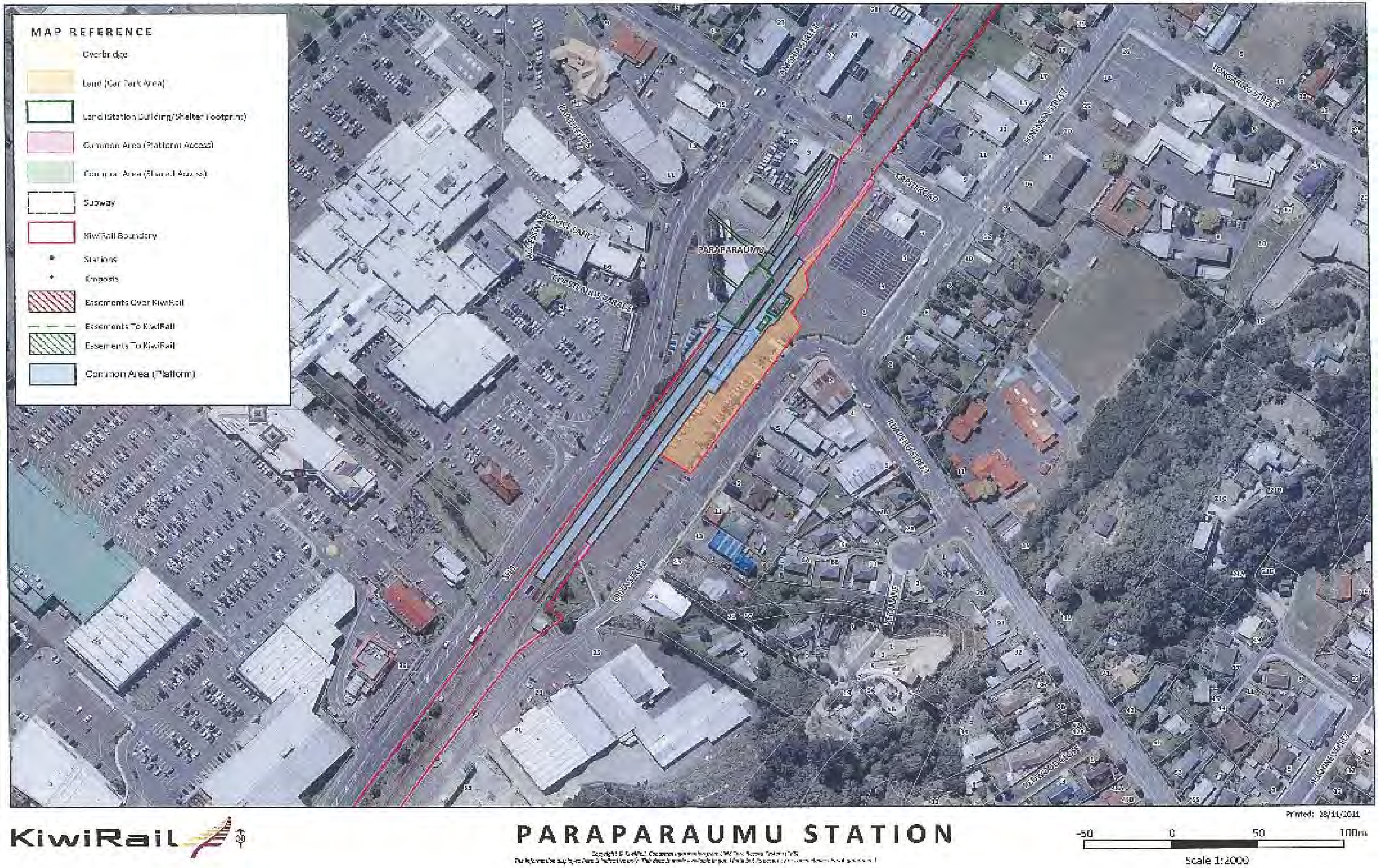
Common Area (Platform Access)
Common Area (Shared Access)
Subway
KiwiRail Boundary
Stations
Easements Over KiwiRail
Easements To KiwiRail
Easements To KiwiRail
Common Area (Platform)
KiwiRail
NGAURANGA STATION
Scale: 1:1000
50 m


MAP REFERENCE
Overbridge
Land (Car Park Area)
Land (Station Building/Shelter Footprint)
Common Area (Platform Access)
Common Area (Shared Access)
Subway
KiwiRail Boundary
Stations
Kmposts
Easements Over KiwiRail
Easements To KiwiRail
Easements To KiwiRail
Common Area (Platform)
PAEKAKARIKI
Signal box owned by others
KiwiRail
PAEKAKARIKI STATION
-50
0
50
100m
Scale 1:2000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Land (Station Building/Shelter Footprint)
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Subway
KiwiRail Boundary
Stations
Easements Over KiwiRail
Easements To KiwiRail
Common Area (Platform)
PARAPARAUMU
KiwiRail
PARAPARAUMU STATION
Printed: 28/11/2011
-50
0
50
100m
Scale 1:2000


KiwiRail

# PAREMATA STATION


KiwiRail

# PETONE STATION

Scale 1:1000

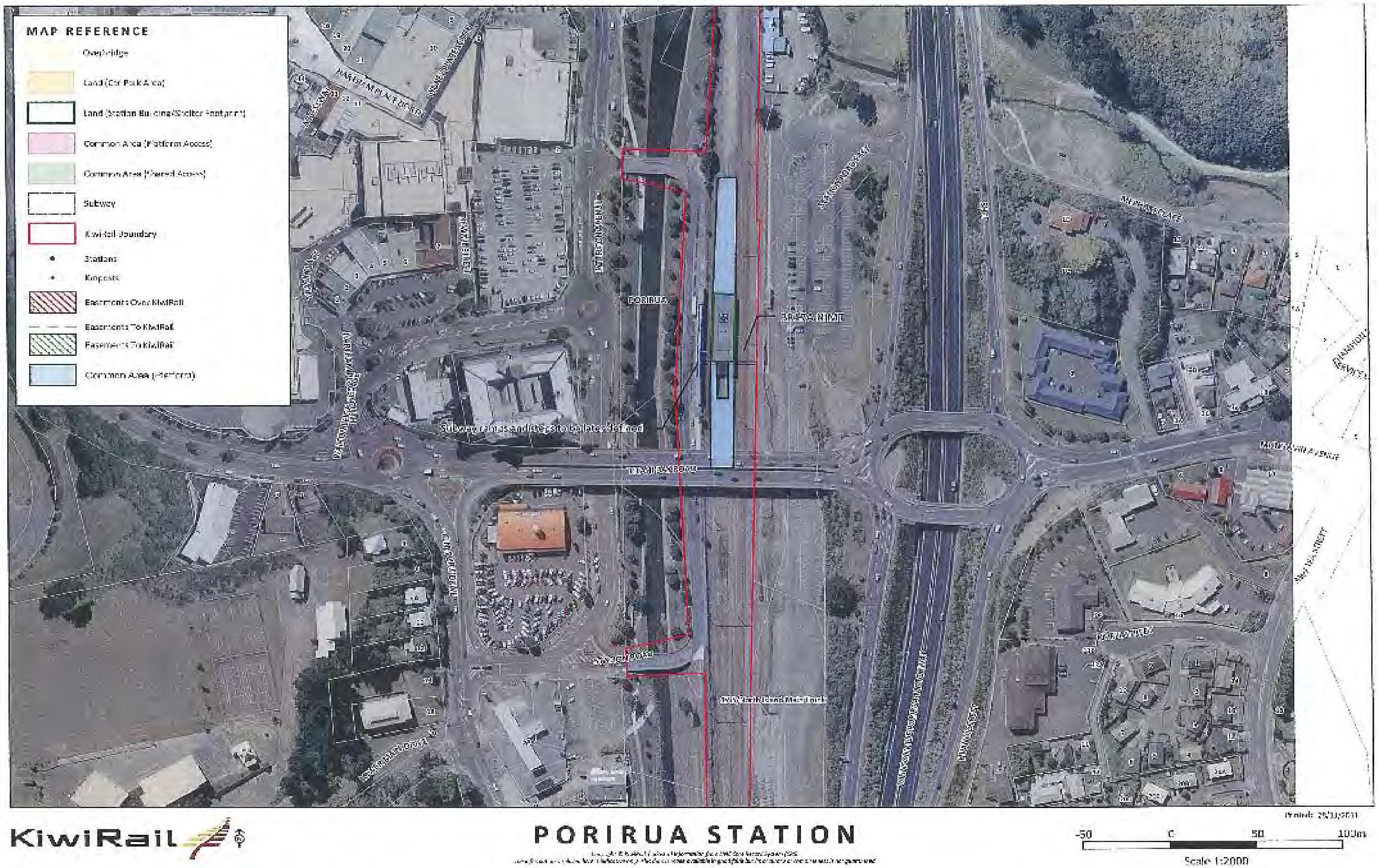

KiwiRail

# PLIMMERTON STATION

50 0 50 100m
Scale 1:2000


KiwiRail

# POMARE STATION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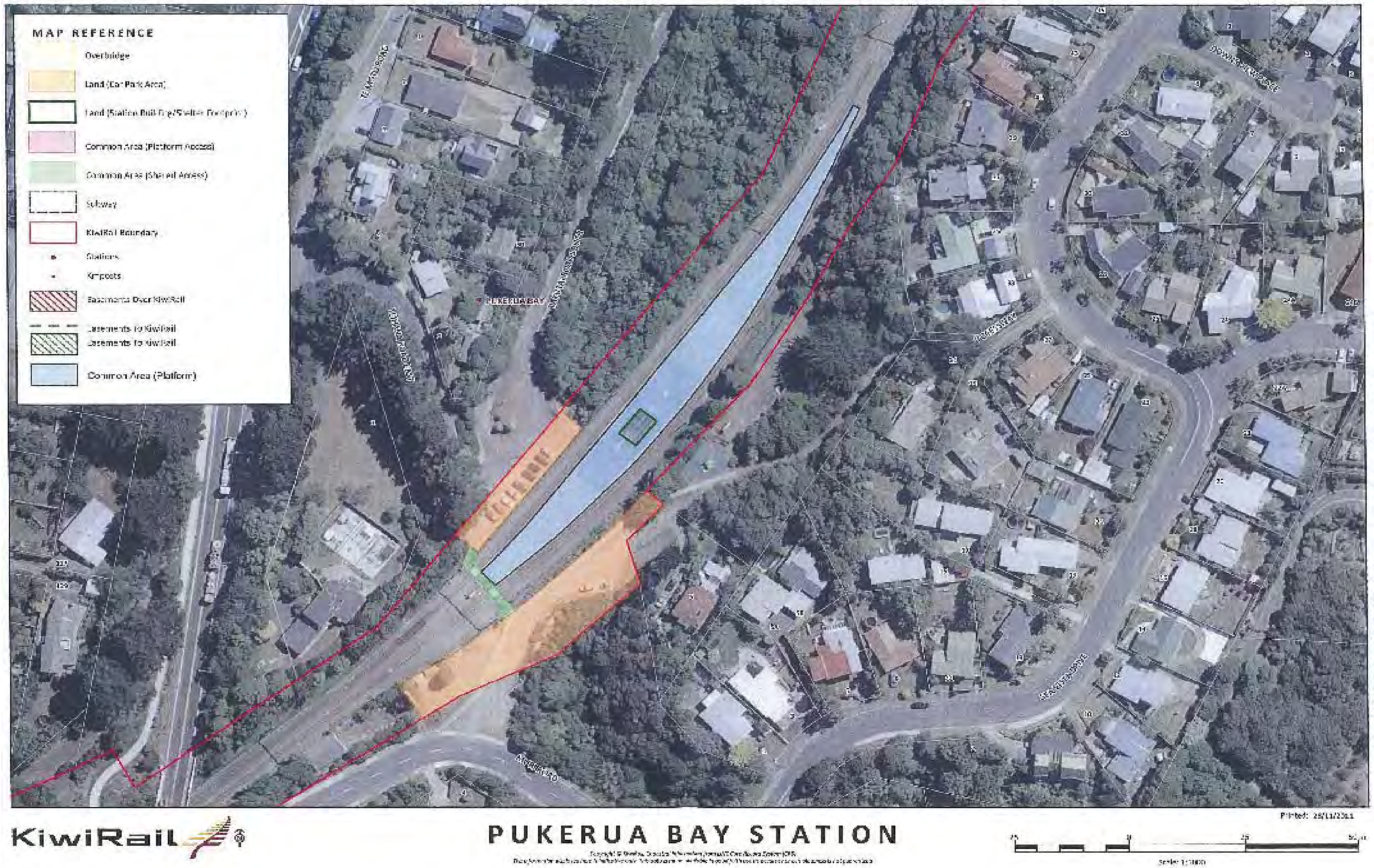
Overbridge
Land (Car Park Area)
Land (Station Building/Shelter Footprint)
Common Area (Platform Access)
Common Area (Shared Access)
Subway
KiwiRail Boundary
Stations
Kmposts
Easements Over KiwiRail
Easements To KiwiRail
Easements To KiwiRail
Common Area (Platform)
PORIRUA
KiwiRail
PORIRUA STATION
-50
0
50
100m
Scale 1:2000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Common Area (Platform Access)
Common Area (Shared Access)
Subway
KiwiRail Boundary
Stations
Kmposts
Easements Over KiwiRail
Easements to KiwiRail
Easements to KiwiRail
Common Area (Platform)
KiwiRail
PUKERUA BAY STATION


KiwiRail

# RAROA STATION


KiwiRail

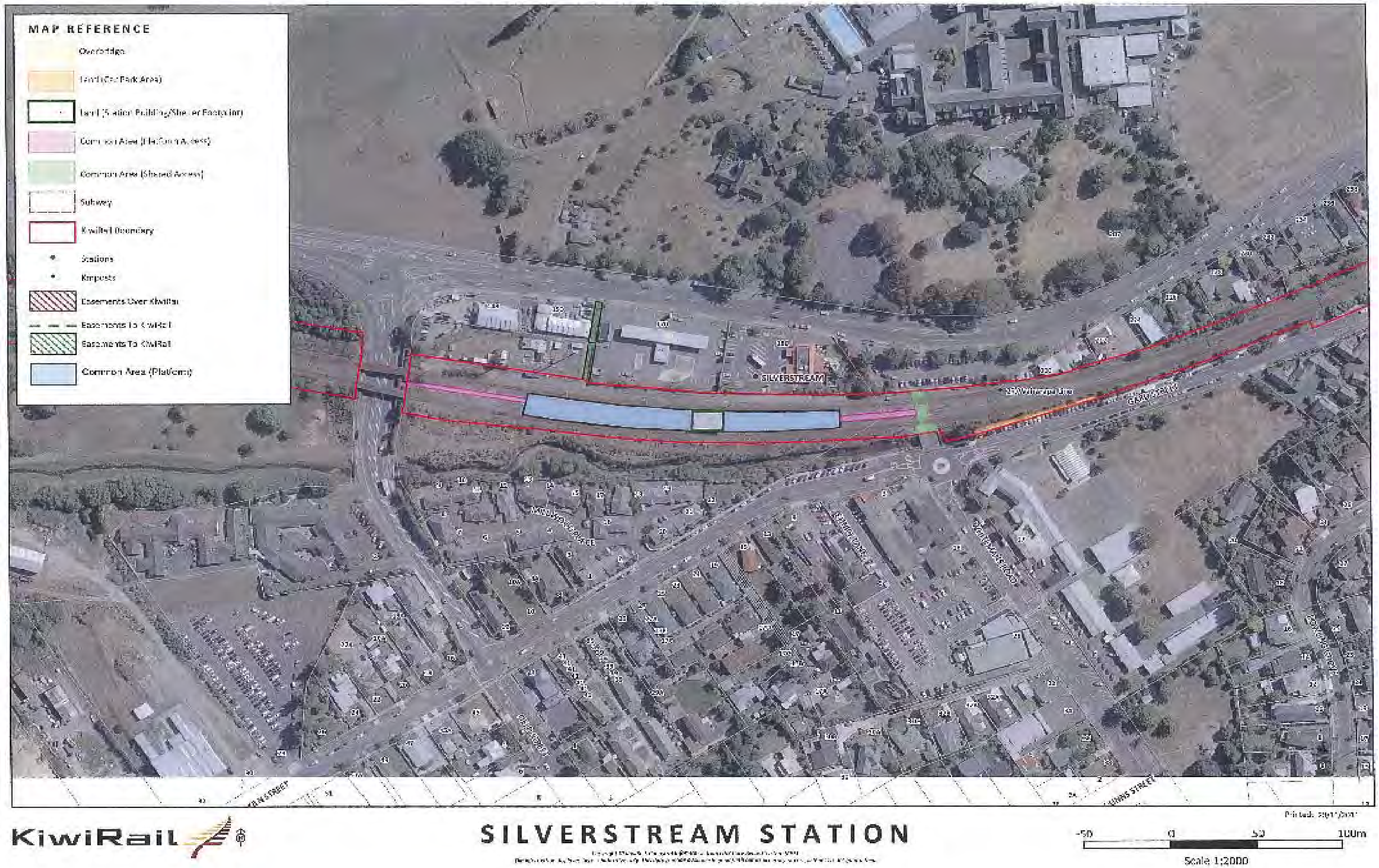
# REDWOOD STATION


KiwiRail

# RENALL STREET STATION

Printed: 23/11/2011

Scale: 1:1000


MAP REFERENCE
Overbridge
Land (Car Park Area)
Land (Station Building/Shelter Footprint)
Common Area (Platform Access)
Common Area (Shared Access)
Subway
KiwiRail Boundary
Stations
Kmposts
Easements Over KiwiRail
Easements To KiwiRail
Easements To KiwiRail
Common Area (Platform)
SILVERSTREAM
KiwiRail
SILVERSTREAM STATION
-50
0
50
100m
Scale 1:2000


KiwiRail

# SIMLA CRESCENT STATION



1174678-V4


KiwiRail

# SOLWAY STATION


# TAITA STATION


KiwiRail

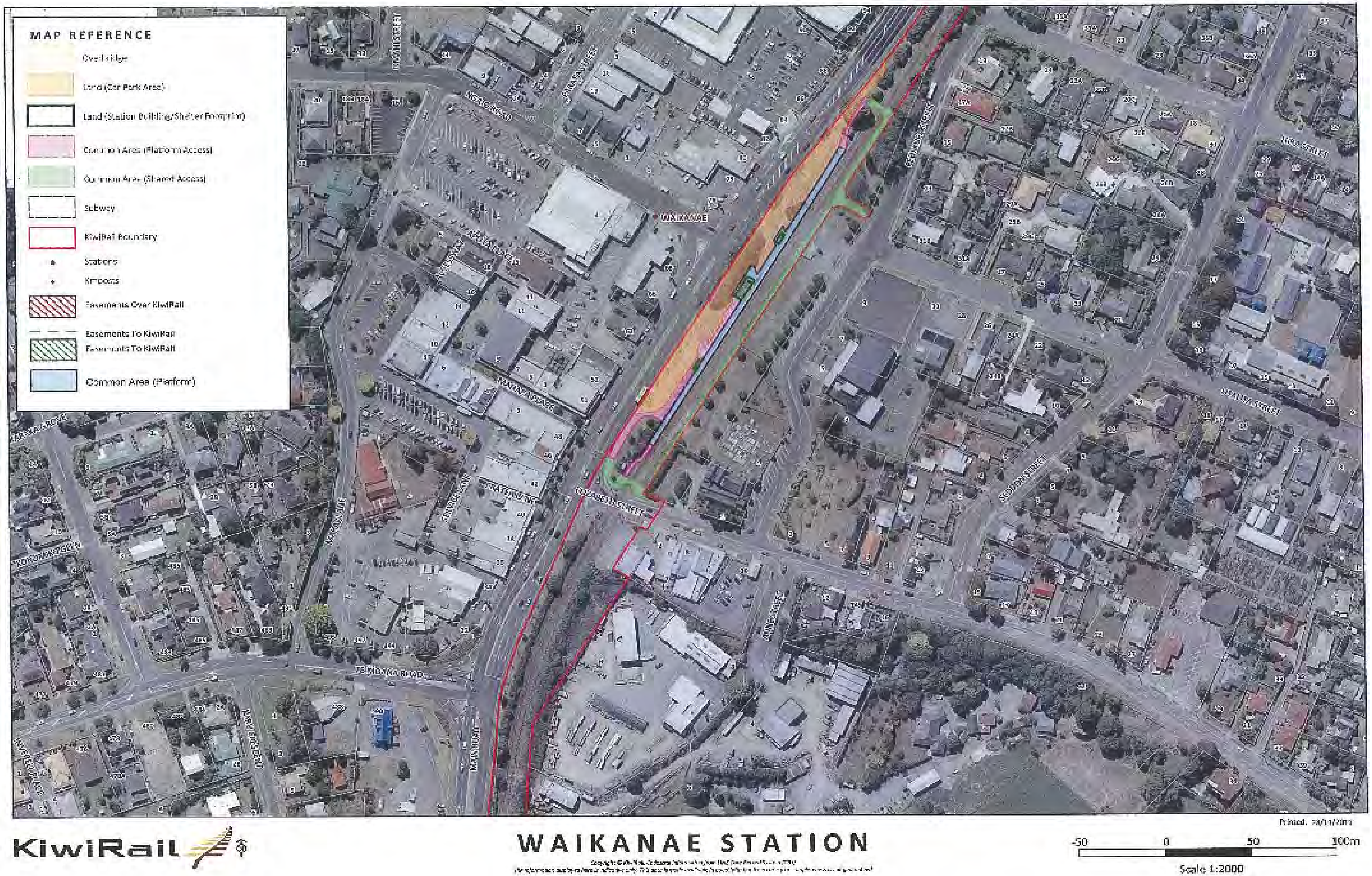
# TAKAPU ROAD STATION


KiwiRail

# TAWA STATION


TRENTHAM STATION


MAP REFERENCE
Overbridge
Land (Car Park Area)
Land (Station Building/Shelter Footprint)
Common Area (Platform Access)
Common Area (Shared Access)
Subway
Kiwi Rail Boundary
Stations
Kioposts
Easements Over KiwiRail
Easements To KiwiRail
Easements To KiwiRail
Common Area (Platform)
UPPER HUTT
Canopy owned by UHCC
Beautification lease
KiwiRail
UPPER HUTT STATION
Scale: 1:1000


MAP REFERENCE
Overbridge
Land (Car Park Area)
Land (Station Building/Shelter Footprint)
Common Area (Platform Access)
Common Area (Shared Access)
Subway
KiwiRail Boundary
Stations
Kmposts
Easements Over KiwiRail
Easements To KiwiRail
Common Area (Platform)
WAIKANAE
KiwiRail
WAIKANAE STATION
Scale 1:2000
-50
0
50
100m


KiwiRail

# WALLACEVILLE STATION

Printed: 28/11/2011

Scale: 1:1000


MAP REFERENCE
Overbridge
Land (Car Park Area)
Land (Station building/Shelter Footprint)
Common Area (Platform Access)
Common Area (Shared Access)
Subway
KiwiRail Boundary
Stations
Mileposts
Easements Over KiwiRail
Easements To KiwiRail
Easements To KiwiRail
Common Area (Platform)
KiwiRail
WATERLOO STATION
-50
0
50
100m
Scale 1:2000


KiwiRail

# WINGATE STATION

Printed: 28/11/2011

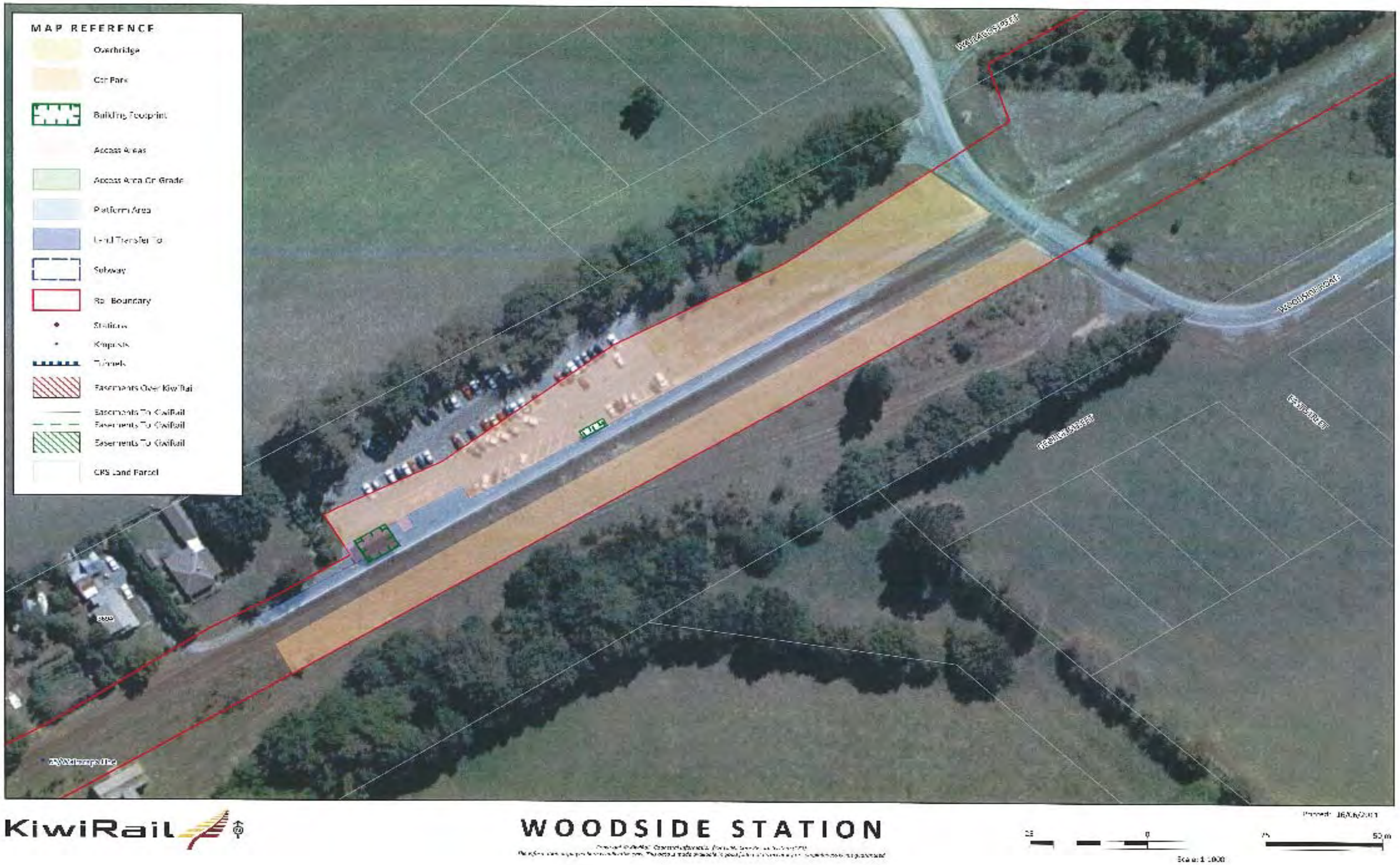
Scale 1:1000


KiwiRail

# WOBURN STATION

Printed: 29/11/2011

Scale: 1:2000


MAP REFERENCE
Overbridge
Car Park
Building Footprint
Access Areas
Access Area On Grade
Platform Area
Land Transfer To
Subway
Rail Boundary
Stations
Kmposts
Tunnels
Easements Over KiwiRail
Easements To KiwiRail
Easements To KiwiRail
Easements To KiwiRail
CRS Land Parcel
KiwiRail
WOODSIDE STATION
Scale 1:1000
50 m

## Appendix H: Kapiti Railway Stations

greater WELLINGTON
REGIONAL COUNCIL
Te Pane Matua Taiao

John Bolland Consulting ltd

# Raumati Station Business Case

### Draft Report, February 2013

# Contents





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## Introduction

This report has been prepared by John Bolland Consulting for Greater Wellington Regional Council (GWRC). It presents the findings of a Business Case for the development of a new rail station at Raumati, south of Paraparaumu on the Kapiti line of the Wellington rail network. The Do Minimum is to have no station there.

## Background

The new station would be located at Raumati on the NIMT, 45.45km north of Wellington. More specifically it would be 2.8km south of Paraparaumu and 6.6km north of Paekakariki. This implies station-to-station running times of 2.5 minutes and 5 minutes respectively.

With the weekday peak operating pattern proposed in the current RRP update, there will be a 20 minute service from Waikanae and all these services would stop at Raumati. From there they would run all stops to Plimmerton then non-stop to Wellington. The Capital Connection would not stop at Raumati.

The proposed station would be built to a basic specification with platform, shelter, lighting and CCTV. Park and Ride would be provided with the proposed location of the car park being relatively remote from the station in that the old SH1 and the proposed M2PP Expressway will separate the two. The car park and station will be linked by a pedestrian access structure – a footbridge, with lifts (in lieu of ramps) to get to the bridge and then down to the platform. The distance from the car park to the station location is approximately 165m in plan. Park and Ride Capacity would be around 150 spaces.

## Costs and Timing

A capital cost of $12m has been estimated by Aecom. The business case has assumed that this would be spent in 2018/19 and 2019/20 and that the station would open on January 1st 2020.

Because of the basic nature of the station the additional operating costs have been assumed to be negligible.

## Economic Methodology

The overall economic methodology is the same as that used for other aspects of the GWRC RRP. The evaluation used the standard EEM discount rate of 8% and a number of unit benefit values taken from EEM. These came largely from SP10, which is designed for use in evaluating improvements to existing PT services.

The 30-year evaluation period required by NZTA has been assumed to start in 2018/19 when construction starts. For discounting purposes year 0 was taken as 2012/13.

The key inputs to the evaluation have been taken from runs of the GWRC modelling suite, comprising:

- WTSM: the four-stage multi-modal model covering the region at a strategic level
- WPTM, the PT model linked to WTSM but with an improved level of modelled detail in terms of factors such as the zoning and PT services.

Both models have been run for 2021 for two scenarios with the RRP in place, one having the current stations and the other adding Raumati. The comparison of the two scenarios shows:

- The number of additional passengers due to Raumati station
- The impact on road traffic
- Whether any passengers switch station, e.g. from Paraparaumu to Raumati.

## Benefit Calculation

### New Passengers

The modelling indicates that a total of 17 new passengers will be generated as a result of the station at Raumati. The benefit per new passenger has been taken from SP10 in EEM, suitably updated.

### Decongestion

Results from WTSM have been used to calculate the difference between the two scenarios (with and without Raumati) in the following:

- Road vehicle-hours at Level of Service (LoS) A, B, or C (relatively uncongested)
- Vehicle-hours at LoS D (moderate congestion)
- Vehicle-hours at LoS E or F (severe congestion).

These were then evaluated using values from EEM, including the CRV factor which gives an uplift in the Value of Time for congested conditions.

### Existing Passengers

The train stopping at Raumati will cause an additional delay to those already on the train. This means that passengers boarding at Waikanae or Paraparaumu (estimated to number almost 1,300 in the 2021 AM peak) will be delayed by an additional two minutes and this disbenefit has been included in the economic case.

### Station Switchers

From the model outputs some 237 passengers will change station, i.e. if Raumati was available they would use it in preference to Waikanae or Paraparaumu. The fact that they choose to change stations implies that they are getting an economic benefit since otherwise they would not make the change.

EEM does not indicate suitable benefit values to use in this situation so a value of $2 per passenger has been assumed. This is equivalent to a saving of around 10 minutes of in-vehicle time or 5 minutes of access or wait time.

### Other Aspects

For years other than the modelled year of 2021, 2% p.a. growth in patronage and benefits has been assumed. This is consistent with recent patronage trends and other parts of the economic analysis in the RRP Update.

The evaluation has only looked at peak periods since off-peak patronage is likely to be small and the associated benefit values are also small. This means that an annualisation factor of 490 (245 working days) has been used to translate from the AM peak model to annual results.

The evaluation has also assumed that the new station will have no impact on bus patronage.

## Outcome: Economic Efficiency

### Base Case

The outcome of the evaluation is given in Table 6.1.

| Item | PV, $m | Contribution |
|---|---|---|
| Benefits to new rail users | $1.15 | 21% |
| Decongestion | $4.46 | 82% |
| Disbenefits to existing users | - $1.98 | - 36% |
| Benefits to station switchers | $1.82 | 33% |
| Total benefits | $5.45 | |
| Total costs | $7.28 | |
| BCR | 0.7 | |

Table 6.1: Base Evaluation

It can be seen that the BCR is 0.7 meaning that the station could not be justified economically since the costs exceed the benefits. The First Year Rate of Return (FYRR) is 5% which clearly indicates that the proposed timing is sub-optimal.

### Sensitivity Tests

A series of sensitivity tests have been carried out and the results are presented in Table 6.2.

| Test | BCR |
|---|---|
| Base | 0.7 |
| Capital costs 10% higher | 0.7 |
| Capital costs 10% lower | 0.8 |
| Operating costs $20k p.a. | 0.7 |
| Passenger growth 1% p.a. (base = 2%) | 0.7 |
| Passenger growth 3% p.a. (base = 2%) | 0.8 |
| No patronage growth after 2040 | 0.7 |
| No benefits to station switchers | 0.5 |
| Discount rate 4% | 1.2 |
| Discount rate 6% | 0.9 |

Table 6.2: Sensitivity Tests

As expected the tests of lower discount rates considerably increase the BCR. That apart, the Table shows that the BCR does not reach 1 under any of the tests, i.e. it does not achieve a ranking of Low in terms of economic efficiency in the NZTA profile.

However it should be noted that even if the BCR was above 1, and therefore Low, the scheme would be unlikely to achieve a priority order above 8 when the other aspects of the profile are taken into account. Currently NZTA is funding nothing below priority 3 so the chances of funding being granted are effectively nil.

## Conclusions

- A business case has been developed for the construction of a new rail station at Raumati which would open in 2020
- The same economic approach has been used as for the GW RRP update
- Using the GWRC modelling suite for the 2021 AM peak indicates that the impact of the station is to create a small number of new rail passengers
- The new passengers receive benefits and also lead to a small amount of decongestion
- The majority of patronage at Raumati is passengers who switch from another station, usually Paraparaumu; such passengers will also receive a benefit
- However passengers from Waikanae and Paraparaumu would be delayed by 2 minutes while the train stops at the new station; this is a disbenefit
- Overall the benefits are about 75% of the costs, i.e. the scheme is not economically viable and this finding is unchanged under sensitivity testing

- Even if the BCR were above 1 the scheme would be so low in NZTA's priority rankings that it is virtually certain not to be funded by them

- The proposed $12m budget for the station could be more effectively spent on other aspects of the RRP.

# Appendix I: Kapiti Railway Stations – Supplementary Analysis / Evaluation

## Introduction

During the development of the RRP 2013 Revised Edition (RRP) due consideration was given to a number of projects (incorporated within Rail Scenario B) that would benefit from an early review but would actually be implemented following the completion of Rail Scenario 1. The projects reviewed were:

- Station enhancements (Raumati and Lindale)
- Service enhancements (service extension north of Waikanae)
- Corridor enhancements (electrification extension to Otaki).

  Whilst the projects above re-considered previous works, and in some cases additional new work was undertaken, it is deemed appropriate to expand the conclusions to accommodate the following:

- Raumati station alternative 'northern' location (this relates to an option identified early in the development of the 2008 Kapiti Railway Stations Concept Design Project)
- A new station located at Queen Elizabeth II Park (in the general vicinity of MacKays Crossing).

The result of this additional analysis is presented in the remainder of this document.

## Raumati Station (Northern Option)

Section 10.1 of the RRP provides for the evaluation of a proposed new station at Raumati. The location of the proposed station is in the general vicinity SH1 and Poplar Avenue Intersection at NIMT 45.46km. This location was established during the 2008 Kapiti Railway Stations Concept Design (KRSCD) project and was driven by the availability of GWRC owned land that could be utilised as station car parking.

The detailed work undertaken during the development of the RRP 2013 concluded that the majority of passenger boardings were as a result of 'station switchers from Paraparaumu' and not through the attraction of 'new' passengers. When this was combined with the infrastructure requirements associated with a new station the result was a Benefit Cost Ratio of 0.7 and as such was not deemed viable from an economic perspective.

During the initial scoping phase of the KRSCD project an alternative station location was identified to the north of Leinster Avenue. The development of this option was dismissed primarily on the basis that the distance between the car park and the station was deemed excessive. However, with the proposed MacKays to Peka Peka Expressway – M2PP, and the future re-categorisation of the adjacent SH1, NZTA (the M2PP delivery agent) have identified existing SH land as being potentially suitable for station car parking directly adjacent to the railway corridor. As a consequence the alternative northern station option has been revisited and the findings are presented below.

## Option Overview

Attachment 1 provides a 'pre-feasibility' option for a new Raumati Station located to the north of Leinster Avenue at approximately NIMT 46km. The stations primary function will be Park and Ride, facilitated by a linear car park adjacent to the railway corridor. The proposed car park will utilise surplus land that may become available on completion of the M2PP project.

The key features of the option are:

- New rail station at approximately NIMT 46km (configured as two edge platforms 195m in length by 4m in width)

- Cross platform access provided by a pedestrian footbridge with stairs and lifts (lifts are provided in lieu of ramps as the site is constrained)

- A linear car park with a capacity for 150 parking spaces, incorporating 3 spaces dedicated for disabled passengers and drop off zone

- The linear car park will be 'partially segregated' from SH1, through the incorporation of an access aisle with all car parking being angled at 45$^\circ$ (this provides for an optimal solution in regards to required width and overall length of the car park)

- The maximum walk distance from the car parking extremities to peak inbound platform is to be less than 300m (this being achieved through centralising the layout around the proposed station access point)

- Lighting, CCTV and PIDS to be incorporated within the station confines and car park area

- Implementation of ancillary rail system works to facilitate proposed station (i.e. alteration to overhead line equipment / structures)

- Implementation of the project can only commence on full completion of M2PP (anticipated 2015 / 2016).

## Option Costings

An estimate of the costs associated with the implementation of the northern Raumati Station option has calculated that the 'Base Cost' is in the order of $7.5 million (this does not include any rail disruption costs). Table 1 below provides a comparison of the high level cost estimates between this northern option and the option presented in the RRP.

| Option | Base $ | Minimum $ (Most Likely) | Maximum $ (Most Likely) |
|---|---|---|---|
| Raumati Station – Northern Option | $ 7,500,975 | $ 8,251,070 | $ 9,751,270 |
| Raumati Station (as presented in RRP) | $ 9,269,665 | $ 10,196,630 | $ 12,050,560 |

Table 1: Raumati Station Northern Option – high level cost estimation and comparison

It is evident from the analysis that the northern option 'base cost' is in the order of $1.77m less than the option presented in the RRP. The majority of this cost differential is attributable to the elimination of the car park to station link structure, for which the need is eliminated with the linear car park.

### Economic Efficiency

The reduction in costs does have an effect on the evaluation of 'Economic Efficiency', in so much as the BCR would increase to around 0.9. However, as the costs still exceed the benefits (which have remained static) the northern option is still not considered to be justified from an 'Economic Efficiency' perspective.

### Conclusion

On the basis of the above analysis it is considered that the general conclusions established in the RRP, relating to the viability of a new station at Raumati, remain valid.

## Queen Elizabeth II Park (Proposed Station)

The RRP provides a comprehensive list of projects that has been mapped to the developed rail scenarios. Appendix C, as presented in the RRP, identifies several longer term network enhancement projects that a directly mapped to Rail Scenario B (RSB – Reach). One particular project is for the development of a potential new station in the general vicinity of Queen Elizabeth II Park.

The location of the proposed station is at MacKays Crossing, which corresponds to NIMT 41.67km. From a railway geographical perspective the proposed station is located between Paekakariki Station (NIMT 38.80km) and Paraparaumu Station (NIMT 48.26km).

The location of the proposed station is rural by nature with the nearest areas of residential population being Paekakariki township (a straight line distance of 1.65km from the station to the nearest residential properties), which is already served by Paekakariki station. Given the station catchment area, and the immediate surrounding amenities, it is anticipated that the overarching station characteristic would be 'park and ride' on the assumption it is utilised as a 'point of origin' (journey / trip commencement) as opposed to the alternative which is a 'point of destination' (journey / trip end). The distinction in relation to the station being a point of origin or destination is one of great importance as it will ultimately define the overall requirements of station amenities to be provided and also the type of benefits attributable to the implementation of the proposal.

For the purpose of this analysis it is assumed that the proposed Queen Elizabeth II Park station is a point of origin and will be characterised by a medium sized 'park and ride' facility with a target catchment predominantly to the north of the station (giving effect to peak inbound modal transfer).

## Option Overview

Attachment 2 provides a 'pre-feasibility' option for a new Queen Elizabeth II Park Station located directly on the southern side of MacKays level crossing at approximately NIMT 41.67km. The stations primary function will be Park and Ride, facilitated by the utilisation of a parcel of land situated between SH1 the railway corridor. The proposed car park will see the utilisation of land that may be available as a result of the MacKays Crossing grade separation which was completed c2006.

The key features of the option are:

- New rail station at approximately NIMT 41.67km (configured as two edge platforms 195m in length by 4m in width)

- Cross platform access provided by a pedestrian level crossing (incorporated within the protection limits of MacKays level crossing)

- A car park with a capacity for 200 parking spaces, incorporating 5 spaces dedicated for disabled passengers and drop off zone

- The maximum walk distance from the car parking extremities to peak inbound platform is to be less than 300m

- Lighting, CCTV and PIDS to be incorporated within the station confines and car park area

- Upgrade of the existing MacKays level crossing (to facilitate the effective operation of barrier arm and warning lights whilst the station platforms are occupied and new surfacing)

- Implementation of ancillary rail system works to facilitate proposed station (i.e. alteration to overhead line equipment / structures)

- Implementation of the project is based upon the assumption that all consents and approvals can be achieved for the station location identified.

## Option Costings

An estimate of the costs associated with the implementation of a Queen Elizabeth II Park Station has calculated that the 'Base Cost' is in the order of $8.2 million (this does not include any rail disruption costs). Table 2 below provides details of the high level cost estimates, presenting minimum and maximum values.

| Option | Base $ | Minimum $ (Most Likely) | Maximum $ (Most Likely) |
|---|---|---|---|
| Queen Elizabeth II Park Station | $ 8,212,450 | $ 9,444,315 | $ 10,676,180 |

Table 2: Queen Elizabeth II Station – high level cost estimation

## Economic Efficiency

A quantitative analysis of the 'Economic Efficiency', relating to the provision of a new station has not been undertaken. However, it is possible to establish a reasonable comparison with the detailed analysis undertaken for Raumati Station (within the RRP) on the basis that:

- The total benefits derived from an aspirational level of boardings in the order of 250 passengers in the peak period are likely to be similar in magnitude and source i.e. decongestion, existing users (potential station switchers Paekakariki and Paraparaumu), new users, and disbenefits to existing users north of the station

- The estimated costs are within a 10 to 15% margin of those determined for Raumati.

Given the above observation it is conceivable that a BCR in the range of 0.6 to 0.8 would be achieved if a quantitative analysis were undertaken.

## Conclusion

It is considered unlikely that the total benefits attributable to the construction of a new station at Queen Elizabeth II Park would exceed the total costs, the consequence being that the proposal is not viable from an 'Economic Efficiency' perspective. This is also supported by the further observations made within the RRP around a 'viability benchmark'. Furthermore, if it was determined that the proposed station was in fact a destination point then it is conceivable that the level of benefits would in fact be considerably less than if it were a point of origin.

Given the location of Paekakariki Station and Queen Elizabeth II Park (a distance of less than 3km) it is recommended that further development of the car park at Paekakariki station be considered in order to add capacity to the Kapiti Coast station cluster through the most efficient and effective means available.

## Attachments

1. Raumati Station – Northern Option

2. Queen Elizabeth II Park – Proposed Station

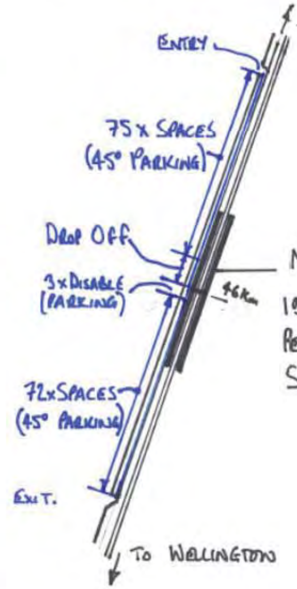
# ATTACHMENT 1

## RAUMATI STATION ≈ 46 KM (NIMT)


ALTERNATIVE LOCATION OF RAUMATI STA ≈ 46.00KM (NORTH OF LEINSTER AVE - AS IDENTIFIED IN KRSCD).

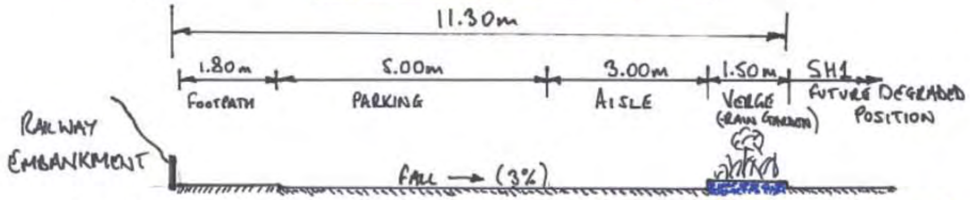
LINEAR CAR PARK ADJACENT TO EXTG SH1 (APPROX 567M IN LENGTH)

### STATION + CAR PARK SCHEMATIC




NEW STATION PLATFORMS 195M. x 4M. LINKED WITH PEDESTRIAN OVERBRIDGE WITH STAIRS + LIFTS

### LINEAR CAR PARK X-SECTION




DWARF RETAINING WALL TO STABILISE TOE OF EMBANKMENT

TYPICAL PAVEMENT ⇒ 40mm MIX 15 ASPHALTIC CONCRETE WITH WEATHER PROOF COAT ON, 100mm AP40, ON 200mm AP65.

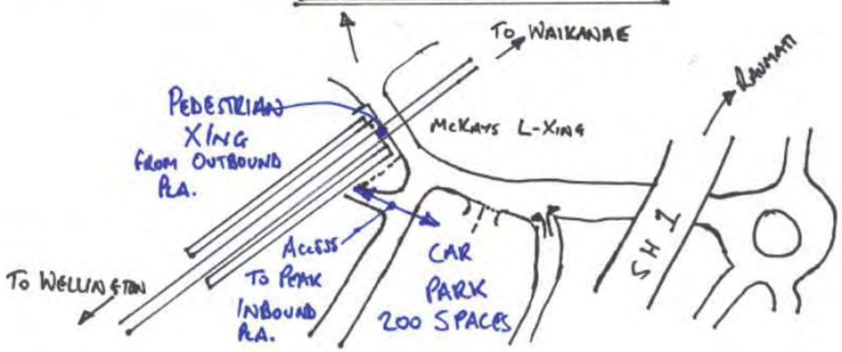
# ATTACHMENT 2


## QE II PARK STATION
At ≃ 41.67 Km (NIMT)

PROPOSED LOCATION OF QE II PARK STA ≃ 41.67 Km
EDGE PLATFORMS (195m x 4.0m)

LAND PARCEL FOR PROPOSED CAR PARK (CAPACITY 200 SPACES)
AREA ≃ 16.72 ha (16,720 m²)
REQ'D ≃ 0.60 ha (6,000 m²)

QE II PARK STATION SCHEMATIC



**Raumati Station New (Basic)**

| Item | Description | Qty | Unit | Rate | Total | |
|---|---|---|---|---|---|---|
| 1 | Construction of new Side Platforms at approximately 45.50km, located between Poplar Avenue and Leinster Rd (2 platforms - 195 x 4m) | 1560 | m2 | $2,315.00 | $ 3,611,400.00 | |
| 2 | Services Reticulation | 1 | Item | $115,000.00 | $ 115,000.00 | |
| 3 | Access Footbridge From West Car Park to Platform (Total Span 115m max, Width 3.5m) | 402.5 | m2 | $5,000.00 | $ 2,012,500.00 | |
| | VT - Lifts (Hydraulic 14 pax capacity) | 3 | Nr | $110,000.00 | $ 330,000.00 | |
| | Lift Enclosure (Inc Pit and Plant Room). | 3 | Nr | $65,000.00 | $ 195,000.00 | |
| | Stairs (3 Sets: Floor to Landing is 5.5m x 2.0m wide) | 16.5 | m | $2,150.00 | $ 35,475.00 | |
| 4 | Car Parking (Area for 150 vehicles at 30m2 / vehicle) | 4500 | m2 | $235.00 | $ 1,057,500.00 | |
| | Construction Total | | | | $ 7,356,875.00 | |
| 5 | Implementation Stage P&G | 20.00% | | $7,356,875.00 | $ 1,471,375.00 | |
| | Sub Total | | | | $ 8,828,250.00 | |
| 6 | Professional Services Detailed Design / PM / CM | 5.00% | | $8,828,250.00 | $ 441,412.50 | |
| | Total (Base) | | | | **$ 9,269,662.50** | **Does Not Include Any Rail Disruption Costs** |
| | Minimum | 110.00% | | $9,269,662.50 | $ 10,196,628.75 | |
| | Maximum | 130.00% | | $9,269,662.50 | $ 12,050,561.25 | |

**Raumati Station - 46km NIMT (North of Leinster Avenue)**

| Item | Description | Qty | Unit | Rate | Total |
|---|---|---|---|---|---|
| 1 | Construction of new Side Platforms at approximately 46km, located north of Leinster Ave (2 platforms - 195 x 4m) | 1560 | m2 | $2,500.00 | $ 3,900,000.00 |
| 2 | Services Reticulation | 1 | Item | $125,000.00 | $ 125,000.00 |
| 3 | Access Footbridge From Linear Car Park / Platform to Platform (Total Span 15m max, Width 3.5m) | 52.5 | m2 | $5,000.00 | $ 262,500.00 |
| | VT - Lifts (Hydraulic 14 pax capacity) | 2 | Nr | $110,000.00 | $ 220,000.00 |
| | Lift Enclosure (Inc Pit and Plant Room). | 2 | Nr | $65,000.00 | $ 130,000.00 |
| | Stairs (2 Sets: Floor to Landing is 5.5m x 2.0m wide) | 11 | m | $2,150.00 | $ 23,650.00 |
| 4 | Linear Car Park - 567m (Area for 150 vehicles - 45 degree Angle Parking) | | | | |
| | Footpath (1.8m x 567m) | 1020.6 | m2 | $105.00 | $ 107,163.00 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Car Park & Aisle (8m x 567m) | 4536 | m2 | $150.00 | $ 680,400.00 | |
| | Rain Garden | 850.5 | m2 | $85.00 | $ 72,292.50 | |
| | Retaining Wall (0.75m to 1.25m - Timber Pole and Plank) | 708.75 | m2 | $257.00 | $ 182,148.75 | |
| | Lighting / CCTV / Comms | 1 | Item | $50,000.00 | $ 50,000.00 | |
| 5 | Rail Systems - Ancillary Works | | | | | |
| | Alterations to OHL Equipment | 1 | Item | $200,000.00 | $ 200,000.00 | |
| | Construction Total | | | | $ 5,953,154.25 | |
| 6 | Implementation Stage P&G | 20.00% | | $5,953,154.25 | $ 1,190,630.85 | |
| | Sub Total | | | | $ 7,143,785.10 | |
| 7 | Professional Services Detailed Design / PM / CM | 5.00% | | $7,143,785.10 | $ 357,189.26 | |
| | Total (Base) | | | | **$ 7,500,974.36** | **Does Not Include Any Rail Disruption Costs** |
| | Minimum | 110.00% | | $7,500,974.36 | $ 8,251,071.79 | |
| | Maximum | 130.00% | | $7,500,974.36 | $ 9,751,266.66 | |

**QE 2 Park Station - 41.67km NIMT (South of MacKays Crossing)**

| **Item** | **Description** | **Qty** | **Unit** | **Rate** | **Total** |
|---|---|---|---|---|---|
| 1 | Construction of new Side Platforms at approximately 46km, located north of Leinster Ave (2 platforms - 195 x 4m) | 1560 | m2 | $2,315.00 | $ 3,611,400.00 |
| 2 | Services Reticulation | 1 | Item | $125,000.00 | $ 125,000.00 |
| 3 | Car Park and Access | | | | $ - |
| | Footpath (2.0m x 100m) | 200 | m2 | $105.00 | $ 21,000.00 |
| | Car Park | 6000 | m2 | $235.00 | $ 1,410,000.00 |
| | Lighting / CCTV / Comms | 1 | Item | $100,000.00 | $ 100,000.00 |
| | Ancillary Items (site clearance etc) | 1 | Item | $50,000.00 | $ 50,000.00 |
| 4 | Rail Systems - Ancillary Works | | | | |
| | Alterations to OHL Equipment | 1 | Item | $200,000.00 | $ 200,000.00 |
| | Upgrade of Level Xing Interlocking (Signalling / Train Starter) | 1 | Item | $150,000.00 | $ 150,000.00 |
| | Upgrade of Level Xing (Barrier Arms / Surfacing) | 1 | Item | $350,000.00 | $ 350,000.00 |
| | Construction Total | | | | $ 6,017,400.00 |
| 5 | Implementation Stage P&G | 20.00% | | $6,017,400.00 | $ 1,203,480.00 |
| | Sub Total | | | | $ 7,220,880.00 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 6 | Professional Services - Consenting / Detailed Design / PM / CM | 7.50% | | $7,220,880.00 | $ 541,566.00 | |
| 7 | Land Purchase Costs | 6000 | m2 | $75.00 | $ 450,000.00 | |
| | Total (Base) | | | | **$ 8,212,446.00** | **Does Not Include Any Rail Disruption Costs** |
| | Minimum | 115.00% | | $8,212,446.00 | $ 9,444,312.90 | |
| | Maximum | 130.00% | | $8,212,446.00 | $ 10,676,179.80 | |

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