Greater Christchurch Northern Rail – Rapid Assessment

For Environment Canterbury

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Executive Summary

The Greater Christchurch Urban Development Strategy partners are assessing a range of options to mitigate congestion on the northern corridor. A rapid assessment of the feasibility and indicative costs of providing a short term passenger rail service on the existing rail corridor is one of the options being considered.

The northern road corridor in Christchurch generally runs from Bealey Avenue, through Papanui, then further north to Belfast, Kaiapoi and Rangiora. Traffic volumes on the Main North Road, near Belfast, are among the highest observed on any road in the Canterbury Region and there are a number of associated issues such as congestion, noise, community severance and delays.

Public transport to the area is by bus with limited sections of bus priority lanes. An existing rail corridor runs from the Christchurch Central rail station at Tower Junction retail park north to Belfast and Kaiapoi then travels through the Waimakariri District via Rangiora continuing north to Picton. Passenger rail is limited to the Coastal Pacific which operates daily during from October to April.

There has been a wealth of research undertaken on public transport in Greater Christchurch. A key finding to date is the need to undertake step changes that enable a more seamless transition towards long term public transport goals.

This report identified passenger rail options based on likely boarding and destination points. A service providing stops in Rangiora, Kaiapoi, Papanui and Addington, with commuter buses to South CBD, Riccarton and Hornby was identified as providing the most effective service for service from Rangiora to Christchurch. The capital cost to implement this option for 6 months is estimated at 8.2 million to purchase and 900,000 to lease, with operating costs for 6months of 1.54 million. Based on a 50% cost recovery of operating costs, this would result in a funding requirement in the region of 770k for 6months of operation.

The implementation of a short-term passenger rail service is not common practice and no examples were identified during this study. There is political risk from implementing a short term passenger rail system. Should the system not meet expectations this could jeopardise any possible future passenger rail development. Conversely, long term public expectations may be built up if a short term service was successful. Decisions around a short term rail service would need to align with an agreed future direction for public transport in Greater Christchurch.

Assessments on the viability of a passenger rail serving the north and south-west of Christchurch were the subject of numerous reports during the last decade. Use of the existing rail on the Main North Line was assessed in some of the studies. Passenger rail on the existing Main North Line is considered feasible insofar as the rail track is compatible with available passenger rolling stock. However, a passenger rail service on the Main North Rail line between Rangiora and Christchurch would be significantly constrained by issues such as lack of track availability, limited rolling stock availability, and station conditions. The Main North Line rail infrastructure is further limited

by a single track, limited passing loops from Belfast, and a basic signalling system. Feeder buses would be required to provide connections to more destinations for passengers who cannot walk to their ultimate destination. This is likely to reduce the efficacy of a passenger rail service. The need to provide feeder services is considered the biggest risk for a passenger rail service and could significantly undermine the potential benefits. In addition, total investment for a passenger rail service is reasonably significant and needs to be weighed against the benefits of developing short term public transport infrastructure. An economic cost-benefit analysis is clearly beyond the scope of a rapid assessment, nonetheless, the level of investment is considered significant for a short-term scenario – particularly for the upgrading of stations station which would become surplus to requirement once the service ceases.

It is important to reiterate that this rapid assessment considers a **short term** passenger rail service, with the very specific function of helping to alleviate peak congestion on the main north corridor. Based on the risks identified with delivering a successful service, a short-term passenger rail system is not considered a feasible option. Furthermore, Papanui Road will continue to be a high demand public transport corridor even with the implementation of the short term rail option and will still require public transport services and priority measures to service those bus stops which are not serviced by the rail line.

1 Introduction

1.1 Purpose

This report provides a rapid assessment of the feasibility and indicative costs of providing a passenger rail service between Christchurch and Rangiora as a short term option to help ease the immediate peak congestion issues on the northern corridor. This is part of a wider package of work by UDS partners looking at a range of options to mitigate northern congestion, as requested by the Chief Executives Advisory Group (CEAG) in April 2014. The results of this study will feed back into that wider package to shape decisions around which options will provide the best response to reduce congestion in a cost effective and timely manner.

This study focuses on the practicality of providing a commuter rail service in the short term to offer clear direction to management and governance about whether this is achievable, how long it would take to implement, how much it would cost, potential demand and how the effectiveness of such a service could be monitored and evaluated.

1.2 Limitations

This report provides a rapid assessment of the feasibility, practicality and indicative cost of a short term passenger rail service along the Main North Rail corridor. The duration of a 'short-term' service has not specifically been assessed as part of this study. The current major infrastructure programme includes a number of significant roading projects that will be completed over the next 5-6 years so it is considered that a short term rail service would operate during the interim period while they are implemented. There may need to be a shorter trial period to test the service first.

This report addresses a specific element of the land transport network as a short term option for relieving congestion along one of Christchurch's key transport corridors. The findings are specific to this route and would need to be applied with caution in other areas. The scope of the report does not look at wider transport impacts or how rail would fit into the long term strategic transport programme.

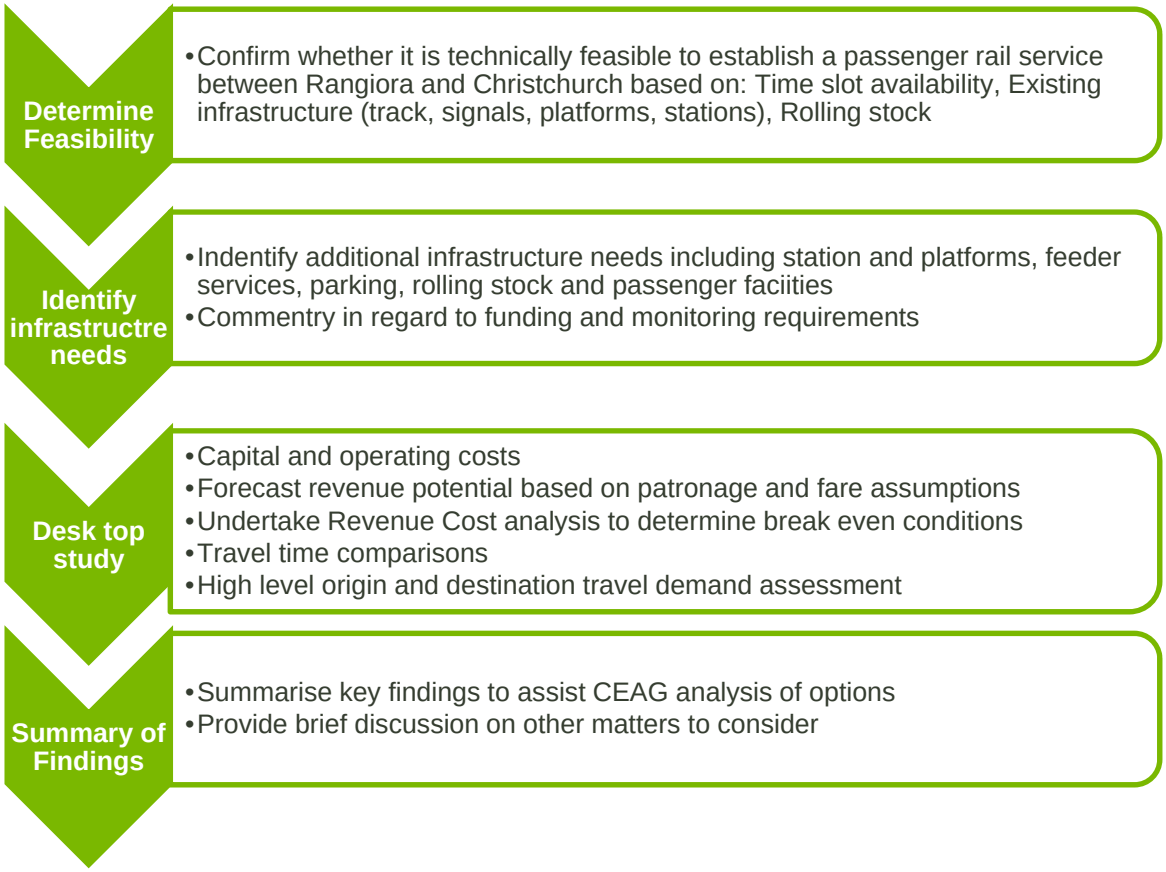
A peak train service would activate level crossings on various city roads but the impact that this could have on the traffic flow has not been modelled as part of this high level, rapid assessment. Trains at some stations would cause level crossings to be activated and remain activated, while passengers board, which would have additional impacts on traffic at those locations.

The costs and revenue provided in this report are best estimates based on the information provided at the time of this rapid assessment. If the project proceeds further, then more detailed cost negotiation and analysis would be required.

1.3 Approach

This report focuses on the existing northern rail corridor, from Rangiora to Christchurch using the existing Main North rail line. This route was previously assessed as part of the *North and Southwest Public Transport Corridors Study* prepared for the Greater Christchurch Urban Development Strategy partners (MWH, 2009, 2010).

This study comprises four key steps as follows:



Information on rolling stock and existing infrastructure has been informed by high level discussions with KiwiRail and Auckland Transport. Indicative data on travel demand, feeder service costs and travel times have been provided by Christchurch City Council, Environment Canterbury and NZTA, respectively.

2 Defining the Problem

The northern road corridor in Christchurch generally runs from the intersection of Bealey Avenue in the south on to Belfast, Kaiapoi and Rangiora. It includes Papanui Road and Main North Road. Cranford Street is also used as an alternative to Papanui Road for access to the city centre. QEII Drive is the major east/west connection in this sector. Together Main North Road and QEII Drive are SH74 serving strategic traffic between north of Christchurch and Lyttelton Port.

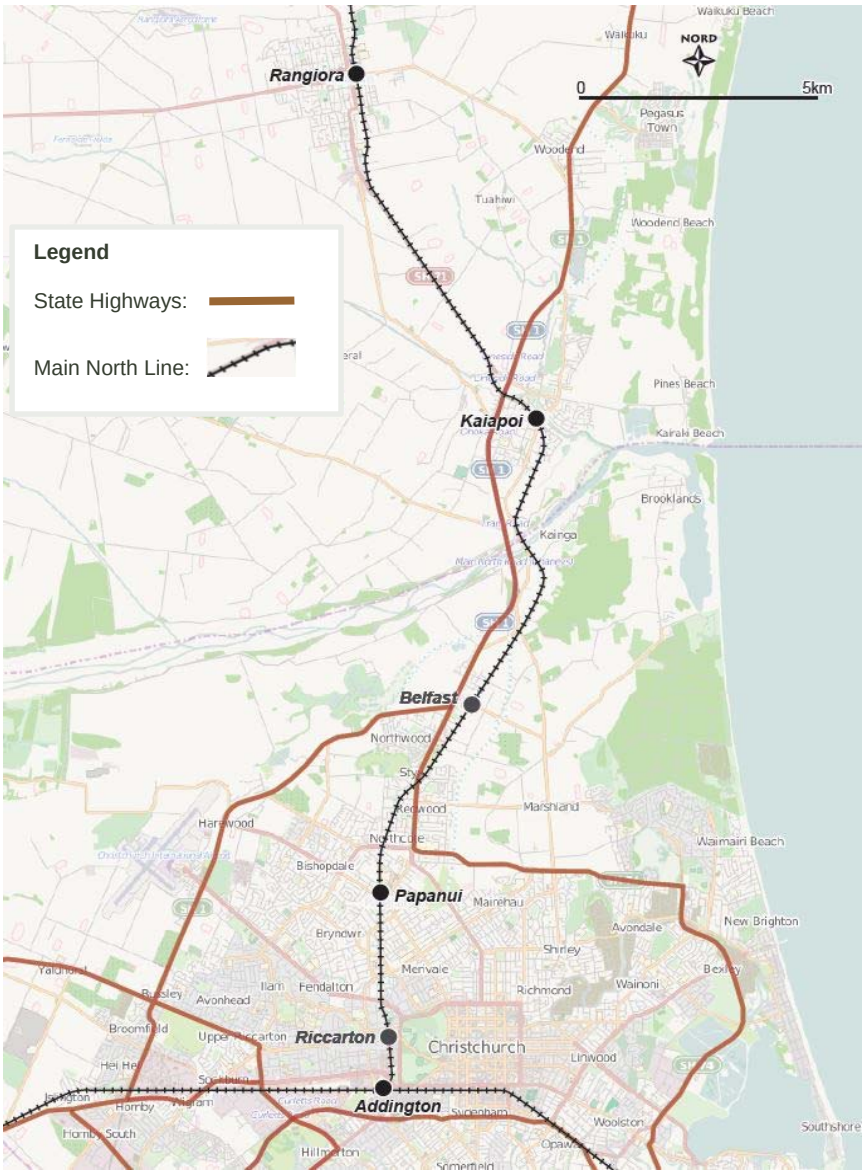


Figure 1: The Northern Corridor

Public transport to the northern road corridor area, as defined above, is by bus (the Blue Line) and with limited sections of bus priority lanes. Existing public transport bus services link the area to the CBD, Papanui and Waimakariri District. Three orbital routes (the Orbiter, Comet and MetroStar) also pass through the sector and provide transfer links to other areas such as the airport, Riccarton and Hornby. The Main North Line (MNL) rail corridor runs from the rail station at Tower Junction retail park north through Belfast, Kaiapoi and Rangiora and further north to Picton. The MNL predominantly consists of single track and the railway corridor is typically around 13 m wide.

The northern corridor has been subject to a number of public transport investigations. A number of existing relevant reports have been reviewed as part of the desktop study component of this project, as outlined in the reference section of this report. Most of the investigations conclude the need to implement "carrot and stick" measures in tandem to achieve a staged modal shift toward more sustainable modes of transport. The reports state that there are a number of elements that contribute to an effective public transport system. Adequate levels of investment and political will are also necessary to achieve an effective, efficient, sustainable land transport system. Car restraint and greater integration of land use and transport are also critical elements.

However, the peak hour traffic on the northern corridors into Christchurch continues to increase in tandem with the growth in residential development to the north of Christchurch City. The increase in road traffic was exacerbated following the Canterbury Earthquakes due to the relocation of residents and displacement of business from the CBD. Residents are driving further and to different destinations across the city, compared to the pre-earthquake network situation.

The Waimakariri District has experienced significant growth following the Canterbury Earthquakes as Christchurch residents have moved into that District at a faster rate than originally planned in the Greater Christchurch Urban Development Strategy (UDS) and further growth is anticipated. The Land Use Recovery Plan confirms priority residential Greenfield land in Rangiora, Kaiapoi and Belfast. Residential populations north of the city will continue to impact on existing road corridors for some time, until alternative travel options are provided and/or the residential dispersal reverses.

Prior to the earthquakes, the northern motorway, western corridor and Johns Road were identified as Roads of National Significance and will be subject to major upgrades. Resource consent applications for the Western Bypass, connecting Johns Road with the northern motorway, have been lodged by NZTA and are likely to be notified this month. The Bypass is currently scheduled for completion by 2017/18 and the northern arterial extension by 2020. Various district roading projects totalling around $25 million are underway to enhance capacity and efficiency of key routes to the motorway. It is anticipated that the Northern Arterial in particular (Figure 1) will divert a considerable portion of the traffic, including most freight, away from Main North Road providing an opportunity to change the function of Main North Road. These roading projects will provide extra capacity on the southern side of the Waimakariri River, but will not provide extra capacity on the Waimakariri Bridge, which is a key constraint for traffic travelling from the north.

Figure 2: Current Proposals for the Northern Corridor Roading Projects[1]

The existing traffic volumes on Main North Road, north of Johns Road are approximately 37,000 vehicles per day. The traffic volumes on the Main North Road, near Belfast, are among the highest observed on any road in the Canterbury Region. Traffic volumes are approaching capacity at Main North Road and there are a number of associated issues such as congestion, noise, community severance and delays.

UDS partners are investigating a wide range of options to address congestion on the northern corridor, including bus service changes, infrastructure improvements and driver behaviour initiatives. A passenger rail service on the existing Main North Line is just one of the options being considered.

2.1 Previous Work

The *Greater Christchurch Public Transport Review and Gap* Analysis (Aurecon, 2014) summarises a number of public transport investigations undertaken in Christchurch during the last decade. The Northern corridor has been the focus of a number of studies discussed in the report with some information on potential use of the existing northern rail corridor.

The North and Southwest Public Transport Corridors Study 2010 prepared for the Greater Christchurch UDS Partners investigates the staged development of a potential tram-train system on those two key demand corridors building on existing or planned bus priority measures along the routes.

A supplementary report (MWH, 2010) provides a brief examination of a potential rail service using the existing rail network between Lyttelton, Rolleston and Rangiora. The total infrastructure cost for options (including anticipated land costs) at 2010 was $243 million for an at grade rail option into the

[1] Source: NZTA http://www.nzta.govt.nz/projects/northern-arterial/index.html.

CBD[2]. Costs were for a fully functioning, permanent service and included additional infrastructure to connect the Main North Line with the Main South Line and CBD.

Following the Canterbury Earthquakes, investigations into the northern corridor have continued, including the Northern Corridor Transport Needs Review Study which is looking at the impacts of the earthquakes and land use change on the strategic transport programme with a medium to long term focus for the whole northern area. This forms part of a package of work underway on the northern corridor.

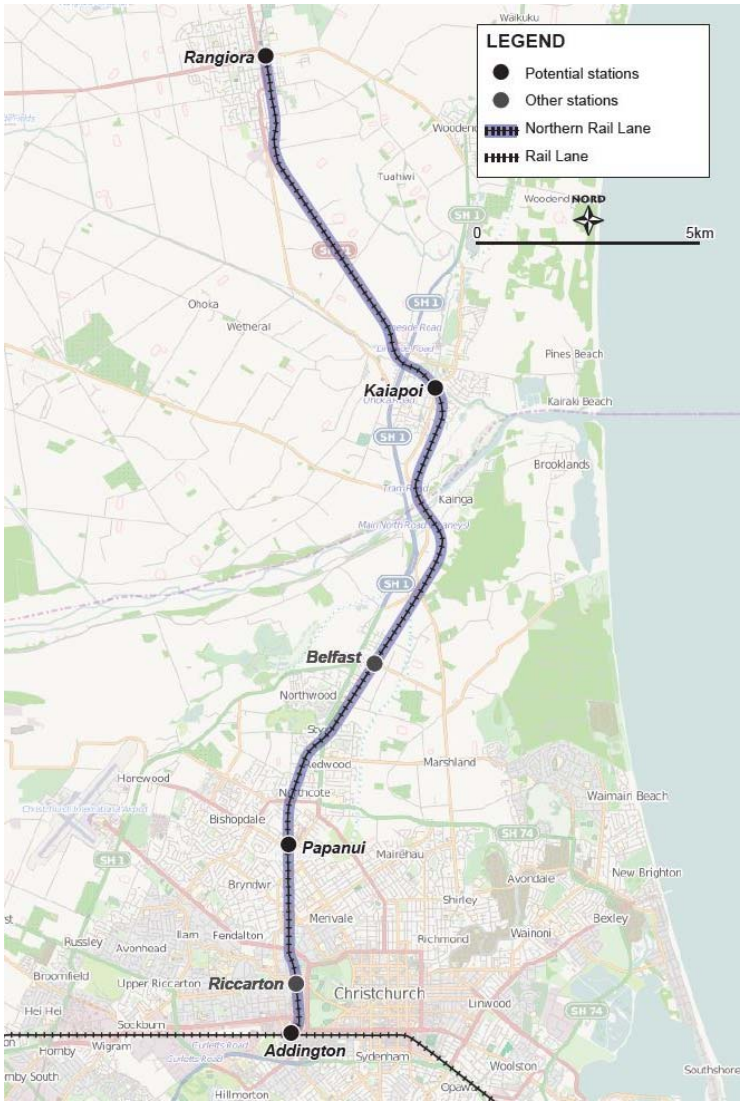
[2] All infrastructure costs are rough order costs, based on the use of refurbished NZ second hand two car train units. Operational and maintenance costs do not include any renewal of infrastructure and are based on 2010 fuel costs.

3 Feasibility

The following section provides a brief overview of existing infrastructure and availability of the Main North Line to determine whether a passenger rail service is practically feasible. Cost implications are explored in section 5.

3.1 The Existing Main North Rail Corridor

The existing northern rail corridor runs from the Christchurch Central rail station at Tower Junction retail park north through Belfast, Kaiapoi then travels through the Waimakariri District via Rangiora (illustrated in Figure 3) continuing north to Picton.



As noted, the Main North Line (MNL) is predominantly single track and provides for bi-directional running.

The track crosses a number of major and minor arterial roads and collector roads in the city including Riccarton Road, Fendalton Road, Wairakei Road, Harewood Road and Main North Road. There is an existing off-road shared pedestrian/cycle way that runs alongside the rail track from Riccarton Road north to Northlands Mall.

The connection at Tower Junction that could link the northern track (MNL) to the Main South Line heading towards the CBD was built out with the construction of the Blenheim Road deviation. To connect these sections of rail would require a length of cut and cover tunnel and land purchase at considerable cost. This has been discussed in previous reports and identified as a key consideration for long term rail options on the existing

track, but is not considered for this short term service. There could also be options to extend the service onto the Main South Line towards Hornby, but that has not been explored as part of this study which is focussing on northern congestion relief.

3.2 Time Paths

KiwiRail have undertaken a preliminary assessment, based on time graph analysis, of time path availability for a new passenger service on the Main North Line. The assessment indicates that two AM services and two PM services could be provided for (Table 1). The times take into consideration:

- The peak rail season i.e. includes all alternate freight paths and 'summer only' services. [There would be greater flexibility during winter as the Coastal Pacific passenger service which travels to Picton ceases to operate from May to September].
- Train crossing allowance and time for Track Warranting at Belfast Station. [Passing loops are currently only available at Rangiora and Belfast stations so other sections of the track rely on manual Track Warrants3].
- Coordination with other services, in particular the Trans Scenic travelling to Greymouth, departing and arriving at Addington Station platform.

These are significant constraints for additional passenger services on the Main North Line. Any delays in existing rail services provided by KiwiRail would further constrain a new passenger service. A potential timetable is shown in Table 1 below. This allows for boarding time at Kaiapoi, Belfast, Papanui and a 15 minute turnaround at Addington Station terminus and Rangiora Station terminus. The timetable is not optimal for all passengers, as explained further in the following paragraphs, but there could be potential to make minor improvements.

Table 1 Indicative Passenger Timetable (including stopping time)

Period	Origin		Destination	
	Location	Time	Location	Time
Morning Peak	Rangiora	6:55 am	Addington	7:25 am
	Addington	7:40 am	Rangiora	8:10 am
	Rangiora	8:25 am	Addington	8:55 am
Evening Peak	Addington	5:25 pm	Rangiora	5:55 pm
	Rangiora	6:20 pm	Addington	6:50 pm
	Addington	7:10 pm	Rangiora	7:40 pm

The morning destination time is a key component to success of the passenger service. Passenger's total travel time also needs to take into account transfer time from the rail terminal to their ultimate destination, which may include walking, cycling or bus transfer. Current bus data indicates transfers

[3] Track warrants are systematised permissions used on some railroad lines to authorise a train's use of the main line. Dispatchers issue these permissions to train crews instead of using signals. The crews receive track warrants by radio, phone, or electronic transmission from a dispatcher.

onto other bus services to reach destinations beyond the rail station could add another 20 minutes onto the overall journey time for some passengers, depending on their destination.

Travel time data provided indicates that the peak morning travel time is 7:15 to 8:00 (Lineside Road to St Bedes in Papanui). The optimal arrival and departure times to and from Addington are anticipated to be:

- 7:30-8:40am to cater for 8am and 9am starters; and
- 5:20-5:30pm to cater for 5pm work finishers

Furthermore, school start times along the route vary between 8:15 and 8:40, while the evening school peak would be soon after 3pm. Further analysis is required by KiwiRail to confirm if a service could be provided to cater for the end of school period.

Before confirming the scheduling, the service would be fully computer modelled by KiwiRail. This may provide some allowance to shift the departure and arrival times to better suit work and school hours, but it would prove difficult to provide two services within the optimal peak arrival window of 7:30am to 8:30am using one train. The indicative timetable is based on a quick 15 minute turnaround at each terminus which does not allow a lot of contingency if there are any delays. An alternative option is to provide two separate train services that closely follow each other during the main peak. This would require additional capital costs and operating costs but could reduce risk around maintenance and schedule adherence; at this stage the time paths have not been assessed to allow for this.

3.3 Existing Infrastructure

There are a number of key infrastructure components required for a passenger rail service to be introduced on the existing tracks. These components are briefly discussed below.

Rail Track

The Main North Line is composed of a single bi-directional track with passing loops at Rangiora and Belfast Stations. KiwiRail have provided a general indication that a service can be provided on this single track rail without additional passing loops or double tracking, although the limited passing locations do make the timetabling more restrictive, as discussed in Section 3.2.

Signals

The Main North Line uses Central Train Control as far north as Belfast and then reverts to Track Warrant through the Waimakariri District. Under the Track Warrant system only one train can use this section of the track at any time. The Track Warrant limits the capacity for additional activity on the line, however, a passenger service could be provided without upgrade to crossing signalisation.

At some locations, the proximity of level crossing signals to station platforms will result in road user dis-benefits by delaying traffic at those crossings while the train is stopped at the station. In particular:

- Kaiapoi – northbound trains are likely to activate signals at Peraki Street and Williams Street.

- Papanui Station – southbound trains will activate the level crossing on Harewood Road and northbound trains will trigger Langdons Rd for duration of stop.

At these locations, signals operate continuously while the train is stopped during platform dwell time. The indicative turnaround time for station stops is 2 minutes. Any changes to signalling would require significant investment, as highlighted in previous reports (See MWH, 2009, 2010). The impact of level crossings on general traffic has not been assessed as part of this study.

Platforms/Stations

This study identifies a number of locations for train stations/platforms along the route from Rangiora to Addington that have the potential to be developed to provide an adequate level of service for rail commuters. All locations other than Addington would require some infrastructure improvements. The scale of improvement required to meet platform and safety requirements varies between locations. This is further in Section 4.1 of this report.

3.4 Rolling Stock

A key constraint for a passenger rail service is the availability and suitability of rolling stock (train carriages and locomotives). KiwiRail have undertaken a high level analysis of the various rolling stock options with regard to suitability and availability. They have investigated all known, potentially appropriate, rolling stock options available within New Zealand, including those within Christchurch, Wellington (None Available), Taieri Gorge Railway (Silver fern) and Auckland Transport. The vehicles considered included:

AK Carriages: AK cars are used for KiwiRail's long-distance passenger operation KiwiRail Scenic Journeys. These carriages hold a maximum of 63 seated passengers with limited standing provision. They are bespoke carriages for long haul and considered too elite and hence not appropriate for general commuter work.

AO Carriages: AO carriages have been retired from suburban service, but still operate long-distance trains. These carriages hold a maximum of 47 seated passengers and no allowance for standing. The carriages are not approved by Engineering due to crash proofing (wooden bodies with very little side protection). Due to the inappropriate configuration and engineering concerns, this model is not considered suitable for a passenger commute service on the MNL.

SX: SX are a diesel haul train and can use a locomotive at either end. This model was previously used by Auckland Transport for commuter rail and is being replaced by electric trains.

DMU: DMU requires no separate locomotive, as the engines are incorporated into one or more of the carriages. There is no skill set available in Christchurch to use or maintain these trains.

SA / SD: SA and SD passenger carriages were developed for Auckland Rail and comprise a locomotive at one end. Most are currently in four or five car configurations with a DC class locomotive and were not considered suitable for commuter service on

the Main North Line due to lack of availability.

Silver Fern DMU Rail Car: There is only one set of Silver Fern DMU Railcar available in the South Island and this is based in Dunedin. It holds 45 seated passengers per unit, 90 in total over the two carriages and is understood to only be available during the Winter Season. These railcars are not considered total viable due to capacity restraints. Furthermore, the compliance and running rights of these on MNL would need to be further checked.

KiwiRail consider the SX carriages the most appropriate for a commuter rail service on the Main North Line (Figure 4). These are to be decommissioned from service in Auckland in October 2014.

Each train consists of six car units and two locomotives. Each of the six cars has a seating capacity of 48 seated and a standing capacity of 87; the maximum running speed is 80 kilometres per hour. With a six car train a maximum capacity of 810 passengers per train would be possible (288 seated and 522 standing). These trains may require retrofitting to provide capacity for cycles, oversize luggage, prams and buggies.

Auckland Transport have indicated that the SX carriages will no longer be required for use by AT from approximately mid-October. This date is subject to delivery of timetable improvements later this year. There should be a degree of flexibility with regards to availability after this date, but not before hand as they are still potentially required for revenue services until timetable changes are delivered.

Auckland Transport have also indicated that the next retirement from the Auckland fleet, which could potentially be of use, are the SA carriages. These are currently programmed to be available from the beginning of March 2015. At this moment in time, there will be multiple (seven) SA trainsets available.

Auckland Transport has indicated that they would be willing to discuss loaning of rolling stock for a trial period. They have indicated that the stock could potentially be made available for a period of six months from October 2014 to April 2015, or longer subject to further discussion and negotiation.

Beyond this period, purchase would need to be discussed.

Figure 4: SX Car Diesel Engine and Rail Cars

Cost

Previous work undertaken by Greater Wellington Regional Council indicated that SX carriages for Auckland (in service when imported) cost around $850K plus locomotives, based on costs at 2003. GHD (2005) indicated that rolling stock would cost approximately $2M for a two car refurbished DMU including the locomotives. GHD costing estimates are based on overseas investment in rail services which provide very high levels of service. As a result the cost estimates provided by GHD are at the upper end of cost estimates.

Further industry investigations during this project have indicated the following potential costs relating to the lease or purchase of SX carriages:

- Lease: $250,000 and $400,000 per annum, for the 6 SX Carriages (excluding any transfer costs to Christchurch)
- Purchase: $1-1.5 million per carriage (excluding any transfer costs to Christchurch).
- Additionally, the lease of locomotives would be required for both options above and has been included by KiwiRail as part of their operating costs.

4 Additional Infrastructure Requirements

The following section provides an overview of additional infrastructure requirements needed to support a short term passenger rail service.

4.1 Station and Platform Assessment

An assessment of potential platforms and stations located along the northern rail corridor from Rangiora to Addington (Tower Junction) is provided in Appendix A. Rangiora, Kaiapoi, Belfast, Papanui, Riccarton and Addington have been considered in this report as potential boarding and drop down areas along the route due to the level of potential travel demand to those locations. Photographs of some of the sites are provided in Appendix B. If a successful service was established, other stations could be added later or the route could continue to stations on the Main South Line but this has not been explored in detail as part of this study.

The station assessment takes the following aspects into consideration:

- Platform length, height and condition
- Access to platform and car parking availability
- Signalling and level crossing alarms

The main issues relating to each site are summarised below:

Rangiora: Rangiora has an existing platform and station close to the centre of the town which is currently owned and occupied by a café. There is some off street parking but KiwiRail does not own the current car park land. There may be opportunities to provide more parking on a vacant site nearby as discussed in section 4.3. Only minor repairs are required to utilise this station.

Kaiapoi: Kaiapoi Station does not exist and suitable land would need to be identified to accommodate a platform and station. Two potential sites have been suggested, south of Williams Street and north of Courtney Drive. Land at Williams Street is comprised of designated railway land. Land adjoining the Courtney Drive side is vested in the Waimakariri District Council. Both sites have issues in regard to triggering adjacent level crossing alarms. Further constraints are poor geotechnical conditions along parts of the corridor in this area, car parking availability and close proximity to residential activity.

Belfast: Belfast has an existing platform with no passenger facilities and the condition is very poor. The surrounding area is overgrown and the majority of car parking would need to be provided on street. Furthermore, one of the main activity centres, Northwood, is some distance (1.5km south) from the station. It should be noted though, that the Outline Development Plan for Belfast includes provision

of a PT interchange next to the Main North Line near Northwood, by Radcliffe Rd. Belfast Station does provide a passing facility for train services, which has been utilised in the time path analysis provided by KiwiRail.

Papanui: Papanui is well located close to Northlands Mall and Papanui High School and has an existing platform and station. The station is currently leased and occupied by a restaurant. A significant issue at this location is that the southbound train service will trigger the level crossing alarms at Harewood Road during the duration of the stop. North bound trains will also trigger Langdons Rd for duration of stop.

Riccarton: Riccarton station (Mona Vale) does not exist and some form of platform construction would be required. Two potential sites close to Christchurch Girls' High School and Mona Vale have been suggested, north of Matai Street and south of Matai Street. The first option would activate the crossing alarms at the Matai Street pedestrian crossing. Resource consents would be needed for development in this area and it has been suggested, based on historic issues, that residents in the area may be opposed to a train station development. These potential locations are within walking or cycling distance of Riccarton Mall and the CBD.

Addington: Addington Station is in excellent condition and has adequate parking but has limited time slot availability for trains. However, congestion on surrounding roads would be a significant constraint for any connecting bus services.

City Station: Addington Station would be the key drop off point for southbound trains. The Moorhouse Train Station was closed in the late 1980s and the current, smaller station is located alongside the tracks further west off Blenheim Road, in Addington. The train can no longer travel from Addington to the old Moorhouse station due to the removal of this link; this lack of connection limits direct passenger train connection to the CBD. A turn back manoeuvre would be required where trains would need to continue to Sockburn to connect with the Main South Line and then travel to the site of the Moorhouse Avenue site. Reversing trains would be subject to available time slots on the Main South Line and necessary rail operating procedures associated with such a movement or drivers would need to change ends. Building extra track would be expensive and has not considered as part of this short term assessment.

In terms of platform upgrades, existing concrete platforms at Rangiora, Belfast and Papanui could be utilised but the platform surfaces have deteriorated and require some level of upgrade, especially at Belfast. All of the platforms would require some level of upgrade to provide safe access to trains. Costs will vary with the level of treatment required and the permanency of the shelters provided. Resource consents would be required for any new platforms and stations at Kaiapoi (and Mona Vale if pursued).

Aurecon's Rail team have undertaken preliminary cost estimates as detailed in the following table. These costs are based on a temporary (2 year) platform that Aurecon were involved with at Avondale Station. An example photo and detailing of the cost estimates are detailed in Appendix D. These costs are comprehensive including design and consultancy costs as well as a 35% contingency.

To provide an indication of potential platform upgrade costs at the existing Rangiora and Papanui Stations, asphalt resurfacing of the platform area has been assumed, although it is likely that only patching would be required.

Table 2 Indicative Station Platform Construction Costs

Site	Capital Cost	Assumptions
Riccarton (Mona Vale)	$720,000	None
Belfast	$270,000	No level crossing and footpath to Factory Road or Belfast Road are allowed
Kaiapoi	$590,000	50m footpath is allowed to connect the main road
Rangiora	$30,150	Based on 670m2 and Asphalt Reseal cost of $45/m2
Papanui	$22,725	Based on 505m2 and Asphalt Reseal cost of $45/m2

4.2 Feeder Services

Feeder services would be required to pick up the travel demand to and from stations identified as key attractors, as detailed further, including the number of feeder services required, in section 5.1 of this report.

For the purposes of a short term service, specific feeder services may be required to provide access to a wider range of key destinations away from the northern railway line. In addition, there is some scope for passengers to connect with existing bus services on Papanui and Riccarton Road. These would provide links to the CBD, Hornby, Riccarton, University and the Airport. Inevitably, this will add travel time to the journey and passengers may experience road congestion while travelling to their final destination. In particular, the roads around Addington Station are very congested and are likely to cause delays for feeder buses at peak times and deter passengers.

4.3 Private Vehicle Parking

Parking provision is required at Rangiora and Kaiapoi stations as these two stations are key origins and are likely to attract park and ride users from the wider rural catchment areas. This study assumes that the short term rail service would predominantly act as a commuter service for Waimakariri residents travelling into Christchurch, rather than providing connections for Christchurch residents to access other parts of the city (e.g. Belfast to Papanui). This means that minimal parking would be needed at stations within Christchurch. Existing parking varies at each site as follows:

Rangiora – Existing parking is provided on rail land for a café and toy library. The Toy Library operates on Wednesday evenings and Saturdays. Outside of these hours there are approximately 30 car parking spaces available. The café operates from Tuesday - Sunday 8.30am-4pm and Thursday - Saturday 6pm-Late; the café has dedicated parking provided. On-street parking is also available a short distance from the station, however, much of this caters for customers using local shops and services and would be unlikely to be sufficient to cater for rail passenger demand. There is an area opposite the railway station that could be suitable for large scale parking. It is currently vacant and discussions would need to be held with the land owner over its availability in the short term. This location would require passengers to cross the rail tracks to reach the station so safe crossing arrangements would need to be provided. Any costs for this have not been included in this report.

Kaiapoi – Parking availability in Kaiapoi would be determined by the location of a platform and station. Access to the potential station site would be subject to transport provisions in the district plan which includes a rule on line of sight for rail crossings. On-street parking is available in the surrounding township but these would be competing with parking for the school, residential and commercial activities. Additional parking may be able to be provided on nearby red zoned land. At this stage, no costs have been allowed to form new car parking areas.

Belfast – Off street parking is available along Donegal Street. There is some land around the existing platform that could be graded to allow for parking to accommodate approximately 10 cars. Parking demand is likely to be lower than Rangiora and Kaiapoi due to a smaller catchment area. The land here is designated for rail purposes.

Papanui – Off street parking adjoining the station is dedicated to the restaurant operating from the old rail station. The restaurant operates on Monday, Wednesday to Saturday from 12pm-3pm then from

5pm. On Tuesdays and Sundays the restaurant operates from 5pm. Demand for parking should be low at this station as it is primarily a destination rather than an origin point.

Riccarton – Parking, including bus bays is available at this site but is used by visitors to Mona Vale. At a potential alternative site in Riccarton, adjacent off street parking is available. As with Papanui, this is primarily a destination so limited parking should be required.

4.4 Rolling Stock Maintenance and Operation

KiwiRail have indicated that it could provide staff to operate and maintain trains and infrastructure. Further discussion would be required to agree on which agency will have overall responsibility for the rail service.

As discussed in Section 3.4, KiwiRail have suggested the most appropriate available carriages to introduce on a passenger service on the Main North Line are the SX Carriages. KiwiRail have confirmed that they have the required resources to store, maintain and run this stock. Specification information relating to the SX stock is contained in Appendix C.

KiwiRail have provided initial cost estimates for the transportation of rolling stock to Christchurch from Auckland and operational costs. The operating costs include, repair and maintenance, fuel, servicing, loco engineers, train crew, track access, on train staff training, capital cost per Km, lease of locomotives.

Further calculation assumptions include

- Six Locomotive Engineers Auckland to Christchurch over 48 hours: $75 per hour = $3.600 each one way for locomotive engineers (LE) wages plus ferry crossings for 8 units each way plus fuel and maintenance.
- Average fuel cost running: 6 SX cars with 2 DBRs = 4 litres per km
- Maintenance costs each DBR: $1.22 per km x 2 = $2.44 / km.
- Maintenance for the SX Set (all 6 units cost $1.45 per km): Total operational costs are $7.89 / km minus LE/operational staff etc.) - Approximately. $236.70 per trip (Best option)

These assumptions, and information regarding the lease or purchase of rolling stock, have resulted in the following Capital and Operating Costs for rolling stock:

Table 3 Rolling Stock Costs

Capital Costs		
Component	**Cost**	**Source**
Lease Option		
Rolling Stock Lease	$275,000 – $425,000 per annum	Industry indications via ECan (Carriages and Locomotives)

Capital Costs		
Component	**Cost**	**Source**
Transportation from Auckland to Christchurch and return	$60,000	KiwiRail – based on preliminary calculations, includes all maintenance costs during transfer
Purchase Option		
Rolling Stock Purchase	$6million -$9million	Industry indications via ECan (Carriages and Locomotives)
Transportation from Auckland to Christchurch	$30,000	KiwiRail – based on preliminary calculations, includes all maintenance costs during transfer

Operational Costs		
Component	**Costs**	**Source**
Rolling Stock -Operational Costs of Carriages and Locomotives	$202,222 per month (46,666 per week)	KiwiRail - based on preliminary calculations which indicated 280,000 for a 6 week trial

4.5 Funding

A more detailed analysis of the costs, risks and benefits would be required should this project progress. This would need to take into consideration wider network benefits and implications.

As a public transport mode, funding could follow a similar model as current bus services. This would mean some cost recovery through fares, council funding through rates and a share sought from government (NZTA). NZTA's Business Case Approach would form the basis of any analysis where central government transport funding is sought. Under this approach, projects need to demonstrate that they fit with strategy and need to invest, provide the best value option which is affordable and deliverable, and have acceptable risks.

4.6 Monitoring

If a short term passenger rail service is implemented a monitoring programme should be developed to measure the success of the service.

Traffic count and travel time data could be used to monitor the impact of the rail service on traffic levels on the northern corridor to determine whether it has helped relieve congestion as intended. It would also be important to monitor the impact on other parts of the network, particularly around level crossings.

The monitoring programme would also need to consider patronage levels, which could simply be based on ticket sales. This would help monitor revenue and financial viability. Furthermore it would need to gain passenger and public feedback on what aspects worked and what did not, in particular service timings, destination monitoring and feeder service connections. This information should be captured from the onset of implementation so that improvements could be implemented as required,

where appropriate. A 6 month monitoring period is recommended to allow regular train use to be up taken and meaningfully monitored.

5 Costs and Revenue

The following section provides an overview of demand forecasting assumptions, indicative costs for implementing a short term passenger rail service and likely returns to inform fare pricing.

5.1 Passenger Demand and Revenue

Passenger Demand Catchments

The Christchurch Assignment and Simulation Traffic (CAST) model has been utilised to provide 2016 passenger demand data. While this model has been adjusted since the earthquakes, it has not been updated with the 2013 census results and needs major updates to better reflect post-quake land use patterns. These figures therefore provide the best indication with the data currently available. This data is totalled below to show total potential demand and further detailed by origin in Appendix D. A map of the origin and destination catchments used in the assessment is also provided in Appendix D.

Table 4 Total Person Trips from Rangiora and Kaiapoi (including Park & Ride catchments)

AM Peak 7am – 9am	
Destination	**Total Person Trips (2hrs)**
Airport	684
South CBD	597
Belfast	311
Hornby	307
Papanui	288
Uni/Church Corner	175
Redwood	126
Riccarton (Mall)	119
Middleton	90
Addington	64
Mona Vale	36
Sockburn	34

The data indicates the top five key destinations are (in descending order) Christchurch Airport, South CBD (which is generally around the area of the historic Moorhouse Avenue Stations), Belfast, Hornby and Papanui.

The following assumptions and observations have been made with respect to the catchment demands:

- The origin and destination catchments are based on an approximate 1km area around the potential station nodes. In Rangiora and Kaiapoi, it is anticipated that passengers originating more than 1km from the station would park or bus to the station. These park and ride passengers are included in each demand scenario analysed and captured as part of the "Park and Ride" figures as detailed in Appendix E.

- Tram Road park and ride has also been identified as a potential origin destination. However, a park and ride service from this zone has not been assessed as part of this study as there is no station at that location.

- Christchurch Airport area has been identified as a major destination catchment. The airport is some distance from the rail corridor zone and is served directly by buses (Comet Route) originating near Papanui and travelling along Harewood Road. The demand to this location is included in the analysis, although a mode shift of car commuters to uptake a rail and bus journey as opposed to a direct car journey around Johns Road is questionable.

- From the proposed Riccarton Station in Mona Vale, various existing bus routes operate along Riccarton Rd, providing access to the immediate Riccarton area, Riccarton Mall, Canterbury University, Hornby and inbound to the city. Hence this station has significant access potential. However the issues and investment to reinstate a station here is more substantial than other sites along the NML.

When calculating patronage volumes the following analysis assumptions were applied:

- In the morning peak, origin trips are based on pickups from Rangiora and Kaiapoi only. No internal Christchurch (e.g. Belfast to Addington) trips have been analysed.

- The outbound demand in the evening peak equals the morning inbound demand for the purposes of this study.

- No interpeak trips have been included in the analysis, however, the cost to implement an interpeak service is likely to be minimal and hence an interpeak service could be of value.

- No future year forecasting has been undertaken as part of this assessment. It is based on 2016 travel demands.

Passenger Rail Station Scenarios

For the purposes of assessing costs, passenger demand and revenue, four rail station scenarios have been considered, based on various station and demand options. All scenarios assume pickup from both Rangiora and Kaiapoi Stations, including park and ride patrons. The scenarios assessed are as follows:

- Option 1A – Utilises stations at Rangiora, Kaiapoi, Papanui and Addington

This option utilises the two Christchurch stations, Papanui and Addington, which require minimal or no upgrade to cater for passenger services.

- Option 2A – Utilises stations at Rangiora, Kaiapoi, Belfast, Papanui, Riccarton and Addington

  This option utilises all locations identified as potential Christchurch Stations along the MNL.

- Option 1B – Option 1A plus commuter buses to south CBD, Riccarton, Hornby and Airport.

  This option assumes commuters to the Airport will link up via existing Comet bus services from Papanui. However, if patronage is high then additional feeder services would be required and have been assumed in analysis.

  Direct feeder services have been assumed from Addington to south CBD, Riccarton Mall and Hornby. The Hornby service would service patrons to Middleton and Sockburn along the way. The Riccarton service would provide services to Riccarton Mall and the University. Passengers may also choose to walk or cycle to some of these nearby destinations.

  These assumptions have been applied for the purpose of analysis. The level of combined versus direct feeder services would need to be carefully considered to ensure efficiency for commuters to their final destination.

- Option 2B – Option 2A plus commuter buses to south CBD, Riccarton, Hornby and Airport.

  This option assumes commuters to the Airport will link up via existing Comet bus services from Papanui. However, if patronage is high then additional feeder services would be required and have been assumed in analysis.

  Riccarton Station would serve the Riccarton Mall and University destinations using feeder buses, although there is the potential for the patrons to also pick up existing bus services along Riccarton Road or walk or cycle. Riccarton Station would also serve the CBD with a dedicated feeder service.

  Feeder services would be provided from Addington to serve Hornby, including Middleton and Sockburn along the way.

Analysis of the above scenarios results in the following potential demand patronage (assuming 100% mode shift to train). The catchment for the CBD may be greater as the demand is based on a 1km radius from the old Moorhouse Ave station. This does not capture workers in the northern parts of the CBD even though it is likely that feeder bus services would run to Central Station on Lichfield Street as well, which would be walkable for some northern CBD employees.

Table 5 Total Potential Return Person Trips

Scenario	Total Person Trips
Option 1A	352
Option 2A	818
Option 1B	2359
Option 2BA	2705

Mode Shift

A percentage mode shift factor has been applied to each proposed scenario.

Appropriate mode shift factors have been based on recent reported survey information, in particular those reported in *Travel to Christchurch – Summary Information Paper April 2014, Waimakariri District Council.* This report summarised results from a recent *Greater Christchurch Omnibus Survey by Research First*. The survey is indicative of significant positive sentiment towards a rail option. However it is not seen as representative due to the small sample size (n=78 from a total sample of 380). Furthermore, the surveyed question implies the rail service would drop people at their desired final destination at the time required. Further surveys could be conducted to determine how many people may use the service when shown the potential route and timetable, although this will still be an indication and may not reflect reality. Only a trial service on the ground will reveal actual demand.

On the above premise, four mode shift scenarios were used in the analysis:

- 63% Based on survey reported in *Travel to Christchurch Paper*, in which 63% of the respondents replied they would regularly or occasionally use a rail service if it was available.
- 36% Based on survey reported in *Travel to Christchurch Paper*, in which 36% of the respondents replied they would regularly use a rail service if it was available.
- 20% Included to provide a middle figure between that surveyed and a lower bound scenario.
- 10% Included to provide a lower bound scenario, required for a potentially viable option.

The above mode shift percentages and demand scenarios provide various patronage predictions, as detailed in the following table.

Table 6 Forecasted Return Passenger Trips per day

Station Stop Scenario		Mode Shift Scenario			
		10%	20%	36%[4]	63%[5]
Option 1A	Rangiora, Kaiapoi, Papanui and Addington	35	70	127	222
Option 2A	Rangiora, Kaiapoi, Belfast, Papanui, Riccarton and Addington	82	164	294	515
Option 1B	Option 1A plus commuter buses to Airport, CBD, Riccarton (University) and on route to Hornby.	236	472	849	1486
Option 2B	Option 2A plus commuter buses to Airport, CBD, Riccarton (University) and on route to Hornby.	271	541	974	1704

To undertake a check of the potential passenger trips calculated above, a comparison has been made to the following existing bus services:

[4] Based on Survey reported in WDC Travel to ChCh Paper, of Regular Users
[5] Based on Survey reported in WDC Travel to ChCh Paper, of Regular and Occasional Users

- Blue Line Bus Service, which covers a route from Rangiora and Kaiapoi, via Papanui Road to Princess Margaret Hospital - the majority of this patronage disembark prior to or at the City, as opposed to continue south to Princess Margaret.

- Bus service provided from Waimakariri down Papanui Road to service schools.

Current bus data indicates approximately 440 passengers (290 general public + 150 students) use the bus service from Waimakariri District into the City, along Papanui Road, during the two hour morning peak period. Furthermore, in the PM peak (3pm-6pm) bus data indicates approximately 350 passengers board the bus at Northlands and head northbound to Kaiapoi and Rangiora.

The above figures do not provide a direct correlation to train patronage, as the catchments and frequency of services do not completely overlap between the existing Blue Line bus service and that proposed by the rail service. Furthermore, research indicates that in general, passenger rail is a more desirable form of passenger transport. Assuming a greater uptake of rail patronage will occur, a figure of around 500 return passengers per day is not unrealistic.

Patronage may decline on some peak bus trips as existing passengers change to rail and this would lower cost recovery on the Blue Line. However, it is unlikely that any money could be saved on the Blue Line service as buses will still need to go to all the bus stops in between the stations and destinations not on the rail corridor.

Current vehicle occupancy survey data indicates a vehicle occupancy rate of 1.2. This is based on an average of three location surveys undertaken on the morning of Wednesday 21 May 2014, at Tram Road, Lineside Road and Main North Road, provided by Abley Consultants.

Consequentially, 500 return passengers would equate to 600 vehicles being taken off the Northern Road corridor in the morning and the evening hour peak periods. This is a maximum value as a portion of these will likely be people already using the bus.

Feeder Services

Feeder bus services are required for Options 1B and 2B. The number of feeder services required depends on the mode shift being analysed. The table below shows the number of feeder services required, based on different mode shift scenarios, and the following assumptions:

- A single feeder service can provide for one return run from the Station to final destination, for each rail trip provided (i.e. two AM runs and two PM runs).

- A capacity of 60 passengers per bus.

- On the Papanui to Airport feeder route, it is assumed that one load of passengers (60 people) will be accommodated by existing bus services.

- 70% of the train passenger demand will be captured in one train service (i.e. the demand will not be split evenly over the two peak services provided).

- The cost for feeder services has been provided by ECan and is estimated at 70,000 per year per feeder bus, plus $3/km. The overall costs are further detailed in sections 5.2 and 0 of this report.

Table 7 Number of Feeder Bus Services

Mode Shift Scenario	To CBD South Option1B from Addington, Option 2B from Riccarton	To Riccarton (Including Riccarton Mall and University) Option1B from Addington, Option 2B from Riccarton	Addington to Hornby (Including Middleton and Sockburn)	Papanui to Airport	Subtotals
10%	1	1	1	0	**3**
20%	2	1	2	1	**6**
36%	3	2	3	2	**10**
63%	5	3	5	5	**18**

The above table indicates that the number of feeder bus service ranges from 3 to 18 depending on the potential mode shift to train.

Ticket Pricing

In assessing potential revenue three ticket price scenarios have been used for assessment:

Table 8 Ticket Price Scenarios

Scale	Return Fare	Basis
Low	$9:00	Equals return adult bus fare from Rangiora to Christchurch (zone 1 to 3) using a Metrocard
Mid	$12:40	Equals return adult bus fare from Rangiora to Christchurch (zone 1 to 3) using cash
High	$14:00	Allows for a higher fare scenario, based on passenger willingness to pay for a higher level of service on the train compared to bus.

The above prices, and analysis in this report, are based on adult paying fares and do not take into account concession fares, including reduced fares for children (aged under 18).

An alternative analysis of fare tolerance is comparison with the cost of car travel. Applying the IRD rate of 77c per km the total journey costs results, excluding potential additional car parking costs:

Table 9 Comparative Car Journey Costs

Scale	Distance	Cost per Return Trip
Rangiora to Addington or CBD	33	$50.82
Rangiora to Hornby	37	$56.98
Kaiapoi to Addington or CBD	21	$32.34
Kaiapoi to Hornby	24	$36.96

The above detailed car costs do not necessarily reflect an individual's perceived travel cost, which is often just based on petrol costs, and hence their willingness to accept and pay for alternative public transport.

5.2 Capital and Operating Costs

The cost analysis undertaken for this rapid assessment is at a high level and hence a number of components have been excluded. Costing components that have been identified but excluded from the estimate include:

- Any staffing requirements outside of those provided directly on the train by KiwiRail.
- Park and Ride Facilities – this is most relevant at Kaiapoi and Rangiora with their wider rural catchments and will be considered as part of the wider northern access options.
- Installation of appropriate signage at Rail Stations.
- Potential lighting upgrades at stations and access ways.
- Steps or ramp requirements at existing platforms at Rangiora and Papanui;
- Other safety aspects that may need upgrading at stations as a consequence of safety auditing undertaken prior to introduction of any passenger service.

Some of the aspects above will be key components of the capital cost if the service commenced and would need to be included in further assessment.

Table 10 Capital and Operating Costs – excluding the components outlined in previous bullet points

Capital Costs		
Component	**Cost**	**Source**
Purchase Option		
Rolling Stock Purchase	$6million -$9million	Industry indications via ECan (Carriages only)
Transportation from Auckland to Christchurch	$30,000	KiwiRail – based on preliminary calculations, includes all maintenance costs during transfer
Lease Option		
Rolling Stock Lease	$250,000 – $400,000 per annum	Industry indications via ECan (Carriages only)
Transportation from Auckland to Christchurch and return	$60,000	KiwiRail – based on preliminary calculations, includes all maintenance costs during transfer
Applicable to Both Lease and Purchase Options		
Ticketing	$21,000	ECan – provide one fare collection trolley per carriage. Additional trolleys would be $3,500 each.
Station Upgrades	Mona Vale – $720k Belfast – $270k Kaiapoi – $590k Rangiora - $30k Papanui - $23k	Analysed by Aurecon Rail team.
Operational Costs		
Component	**Costs**	**Source**
Rolling Stock -Operational Costs of Carriages and Locomotives	$202,222 per month (46,666 per week)	KiwiRail - based on preliminary calculations which indicated 280,000 for a 6 week trial, including the lease of locomotives.
Bus Transfer -Operational Costs	$5,833 per bus per month +$3/km ($1346 per week)	ECan – based on $70,000 per bus per annum

5.3 Revenue Cost Analysis

Revenue Cost analysis for Option 1B are summarised below. This scenario stops in Rangiora, Kaiapoi, Papanui and Addington and includes commuter buses to CBD, Riccarton and Hornby. This scenario is considered the most simplified option, with minimal complications and station requirements, while capturing a reasonable destination catchment. Accordingly, if a short term passenger rail service be pursued, it is recommended that stops be provided at Rangiora Kaiapoi, Papanui and Addington and includes commuter buses to CBD, Riccarton and Hornby.

The total Capital and Operating Costs for Option 1B (20% mode shift) for a six month period are detailed below.

Table 11 Capital and Operating Costs for Option 1B

Capital Costs	Cost	Subtotals
Purchase Option		
Rolling Stock Purchase	$7,500,000	
Transportation from Auckland to Christchurch	$30,000	$7,530,000
Lease Option (6 months)		
Rolling Stock Lease – Carriages	$162,500	
Transportation from Auckland to Christchurch and return	$60,000	$222,500
Other Capital Costs		
Rangiora Station (platform resurfacing)	$30,150	
Kaiapoi Station (new platform)	$590,000	
Papanui Station (platform resurfacing)	$22,725	
Ticketing	$21,000	$663,875
Subtotal Purchase		**$8,193,875**
Subtotal Lease (6 months)		**$886,375**
Operating Costs	**Costs (6 months)**	**Subtotals**
On Train Rolling Stock Costs Carriages and Locomotives	$1,213,333 ($202,222 per month)	
Bus Transfer Operational Costs (6 feeder services)	$318,576 ($53,096 per month)	
Subtotal Operational (6 months)		**$1,531,909**
Cost Subsidy (50%)		**$765,954**

To assess the feasibility of Option 1B, a 50% cost recovery on operating cost only has been calculated for the various Mode Shift Scenarios. This analysis indicates the mode shift required to achieve a fare that is comparative to existing Bus Fare Scenarios. The analysis assumes:

- Operating Cost = $225,000/month – $335,000 /month depending on mode shift scenario being analysed. With a 20% mode shift the operating cost is $246,270 per month, or $1,477,621 for 6 months.

- An operating cost subsidy of 50%, Public transport services have a national target of reaching 50% cost recovery by 2017. However, a short term service may be able to run at a lower cost recovery rate if the public or central government would provide a higher subsidy.

- Subsidied Operating Cost = $112,000/month to $167,000/month depending on mode shift scenario being analysed. With a 20% mode shift the operating cost is $123,135 per month or $738,810 for 6 months.

Table 12 Revenue for Mode Shift Scenario 1B

Mode Shift Scenario	Daily Returning Passengers	Fare to achieve 50% cost recovery
10%	236	$22.29
20%	472	$12.49
36%	849	$ 7.90
63%	1486	$ 5.63

To achieve 50% cost recovery on operational costs (like the bus network target) and provide a comparative fare to buses ($12 to $14), uptake patronage would need to be around 500 return passengers per day. To return a fare comparative to car expense costs ($30 - $50) less than 10% mode shift would be required but this is likely to be too high to attract patronage. Capital costs would need additional funding which would need their own funding model which may come from a combination of local or regional council rates or NZTA funds.

The funding approach for passenger rail would need further exploration as this is new for Canterbury, but it could be assumed that it would be similar to existing bus services where the Regional Council funds and manages the services (operating costs) and Territorial Authorities fund and implement the infrastructure (capital costs). Both aspects could therefore have impacts on local and regional rates.

5.4 Travel Time and Reliability Comparisons

To provide a high level comparison of journey time benefits, current travel time data was collated and compared from a number of alternative sources. The results do not enable reliable comparisons for all modes along the entire route, due to gaps in data availability. As such, a comparison has been made for trips from Rangiora to Papanui for train, bus and car.

Table 13 Travel Time Comparison Rangiora to Papanui

Mode	Train Travel Time (mins)	Difference from Rail (mins)
Train	25 (incl stops)	
Bus	60	35
Car	32 - 60	7 - 35

The results suggest a significant time saving of 35 minutes for this portion of the journey compared to the current bus services which stops at all bus stops along the route. There may be potential to provide faster express bus services and priority lanes to enhance travel times, but these are still unlikely to be as fast as train travel times.

Car journey survey data from Waimakariri to Christchurch city has been provided for this study, however it was not current nor appears reflective of current conditions. The data suggested a maximum travel time of 32 minutes from Rangiora to Papanui which may no longer be realistic. However general discussion with commuters suggests travel from Rangiora to Papanui could take an

hour or more in the peak. Further car survey and analysis would be required to provide a reliable indication of potential journey time benefits compared to a train journey but the train journey is likely to be quicker than car.

The total travel time for the entire train journey from Rangiora to Addington would be 30 minutes, including stops. Feeder bus connections could then add another 20 minutes to some journeys (i.e. to Hornby) depending on final destination.

The additional benefit of train journey times is their scheduled reliability, as they are not impacted by traffic congestion unlike car and bus journeys. This is a key advantage of rail over cars or buses, as reliability is an important factor to ensure people can arrive at their destination on time. Accidents and road works can cause significant delays for road traffic on occasions and this is less likely to impact a rail service.

5.5 Implementation

Implementation will depend on availability for rolling stock, resource consent requirements and the level of improvements undertaken on sites. KiwiRail have anticipated that it would take approximately 10 weeks to establish the service once it was finalised, although this may depend if implementation occurs in the off-season. Resource, building consent applications and improvements would also need to be considered, although in a perfectly planned scheme these could be undertaken in a parallel 12 week process. Hence a 3 month establishment period may be achievable although optimistic. This timeline could only begin once the service had been finalised as more work would be required to obtain the rolling stock and negotiate contracts with operators. Given that the preferred rolling stock is not available until mid-October at best, a new rail service may be able to start in the New Year.

6 Key Findings

It is technically feasible to implement a short term passenger rail service on the Main North Rail line between Rangiora and Christchurch using the existing track and signals. The service is constrained by issues such as track availability, rolling stock availability, and station conditions. The need to support the service with bus feeder services to increase coverage will also undermine some of the user benefits by adding to the total journey times for some passengers. None of these issues are insurmountable but will require careful analysis with regard to the costs and benefits of investing in a short-term service.

If a short term service proceeded, scenario 1B is recommended as the best approach, with stations at Rangiora, Kaiapoi, Papanui and Addington and feeder bus services to the CBD, Riccarton and Hornby. This option would require the least capital investment in station upgrades by using existing facilities at Rangiora, Papanui and Addington, whilst providing access to the key travel demand destinations.

Feasibility

- **Time slot availability:** The Main North Line rail infrastructure is limited in its potential for supporting a basic passenger service. A basic passenger rail service during peak travel times is restricted by existing use of the single track line during peak and the basic signalling system. Services currently using the Main North Line are aligned with ferry timetables in Picton providing limited flexibility. There are limited time slots available from September to May when the Coastal Pacific passenger train operates on the Main North Line. There are limited passing loops available (Rangiora and Belfast only) which limits the ability to cross trains.

- **Key Destination Location:** Previous studies on using existing rail for Christchurch CBD indicate that the “Achilles Heel” of the rail network as a public transport facility is the lack of connection to the centre of Christchurch. This has been compounded to some extent by the Blenheim Road deviation which made no allowance for a high speed or heavy rail connection loop to link the north to the east rail lines (MWH, 2009). Even with redistribution of traffic from the CBD, demand data (2016) indicates CBD south around the old Moorhouse station is still a major destination for journeys from Waimakariri and this is likely to grow as the central city rebuilds. Other key destinations of Hornby and the Airport are poorly serviced by the proposed rail service.

Additional Infrastructure Requirements

- **Station and Platforms**: These are in varying condition and will required investment to improve condition and safety. Costs for this infrastructure vary across stations. Preliminary platform upgrade costs have been estimated at Mona Vale $720k, Belfast $270k and Kaiapoi $590k. These activities are likely to require resource consents.

- **Signalling**: At some locations, the proximity of level crossings to station platforms will result in signals at the adjacent street(s) being activated during passenger stops at station. This is a particular issue at Kaiapoi Station and Papanui Station and could delay traffic on those roads.

- **Feeder Services:** A passenger rail service would need to be supported by feeder buses to provide connections to more destinations for passengers who cannot walk to their ultimate destination. This will increase potential patronage significantly, although the mode share attracted to destinations requiring a bus transfer is likely to be lower due to the time this will add to their journeys and is likely to impact efficacy of the service. There will be additional ongoing operational costs to run those feeder services which could increase in the future if demand grows.

- **Rolling Stock:** There is a limited opportunity to lease or purchase suitable rolling stock from Auckland Transport as a competitive process is underway. Additional rolling stock is likely to come onto the market as Auckland Transport converts its rail system to electrification.

Costs and Revenue

- **Scenario:** If a short term passenger rail service be pursued, it is recommended that stops be provided at Rangiora, Kaiapoi, Papanui and Addington and includes commuter buses to CBD, Riccarton and Hornby (i.e. Option 1B). This scenario is considered the most simplified option, with minimal complications and station requirements, while capturing a reasonable destination catchment.

- **Passenger Demand:** Analysis of Option 1B, indicates to achieve 50% cost recovery on operational costs (like the bus network target) and provide a comparative fare to buses ($12 to $14), uptake patronage would need to be around 500 return passengers per day. This would require a mode share of over 20% for trips to those destinations.

- **Mode Shift:** The stop locations and frequency of the Blue Line bus service are more comprehensive than that proposed by the rail service. Patronage may decline on some peak bus trips as existing passengers change to rail, but the proportion of this has not been fully determined. This will lower cost recovery on the Blue Line, however it is unlikely that any money could be saved on this service. Based on a vehicle occupancy rate of 1.2, 500 return passengers would equate to a maximum value of 600 vehicles being taken off the Northern Road corridor in the morning and the evening hour peak periods.

- **Capital Cost:** The capital cost to implement Option 1B for 6 months is estimated at 8.2 million to purchase and 900,000 to lease, with operating costs for 6 months of 1.54 million. Based on

a six month period and a 50% cost recovery, this would result in a funding requirement in the region of 770k.

Capital Costs	Cost	Subtotals
Purchase Option		
Rolling Stock Purchase	$7,500,000	
Transportation from Auckland to Christchurch	$30,000	$7,530,000
Lease Option (6 months)		
Rolling Stock Lease – Carriages	$162,500	
Transportation from Auckland to Christchurch and return	$60,000	$222,500
Other Capital Costs		
Rangiora Station (platform resurfacing)	$30,150	
Kaiapoi Station (new platform)	$590,000	
Papanui Station (platform resurfacing)	$22,725	
Ticketing	$21,000	$663,875
Subtotal Purchase		**$8,193,875**
Subtotal Lease (6 months)		**$886,375**
Operating Costs	**Costs (6 months)**	**Subtotals**
On Train Rolling Stock Costs Carriages and Locomotives	$1,213,333 ($202,222 per month)	
Bus Transfer Operational Costs (6 feeder services)	$318,576 ($53,096 per month)	
Subtotal Operational (6 months)		**$1,531,909**
Cost Subsidy (50%)		**$765,954**

- **Travel Time and Reliability:** The total journey travel time by train from Rangiora to Addington is 30 minutes, including all station stops. Train journey data indicates that a train journey from Rangiora to Papanui would save 35 minutes compared to bus travel. Limited current data has made meaningful comparison to car journeys difficult but the train trip would be significantly faster than car. However, many passengers would have additional travel time to and from the train station which will add to the overall journey. The reliability of the train service is a key benefit over car or bus travel and this could attract more passengers.

Strategic Considerations

- UDS partners are developing an agreed long term direction for public transport, which may include other modes such as rail in the future. This will need to be carefully integrated within land use growth and the current public transport network to provide maximum benefits.. If a short term rail service goes ahead, the long term implications would need careful consideration.

- There has been a wealth of research undertaken on future public transport options in Greater Christchurch. A key finding in work to date is the need to undertake step changes that enable a more seamless transition towards long term public transport goals. The implementation of a short-term rail service, requiring reasonable significant capital outlay and without direct connections to some key destinations appears to be inconsistent with these findings.

- The implementation of a short-term passenger rail service is not common practice and no examples were identified during this study. There is political risk from implementing a short term passenger rail system. Should the system not meet expectations this could jeopardise future passenger rail development. Conversely, long term public expectations may be built up if the short term service was successful.

- Papanui Road will continue to be a high demand public transport corridor even with the implementation of the short term rail option and will still require public transport services and priority measures to service those bus stops which are not serviced by the rail line.

- An effective rail system needs to be seamless to provide the expected level of service associated with rail – faster, more efficient, more direct etc. Multiple transfers, delays and limited services can all impact on the travel experience and patronage.

- Previous reports have considered a passenger rail system on the existing rail network as a potential option for relieving future capacity constraints on the bus and road network in some areas, noting that "strong political support and planning decision making would be required to prevent further land use development making this option prohibitively more expensive in the future". A long-term service would provide greater benefit and could be better planned for and integrated with strategic planning for land use and transport in Greater Christchurch.

In summary, an effective rail system needs to be seamless to provide the expected level of service associated with rail – faster, more efficient and more direct. Multiple transfers, delays and limited services can all impact on the travel experience and patronage. A long-term service would provide greater benefit and could be better planned and integrated with strategic planning for land use and transport in Greater Christchurch. At present there is no clear champion for public transport in Greater Christchurch. Responsibility for PT is spread across a number of agencies. As indicated by the recent gap analysis (Aurecon, 2014), a clear champion is needed to provide direction and clarity on long term public transport goals.

It is important to reiterate that this rapid assessment considers a **short term** passenger rail service, with the very specific function of helping to alleviate peak congestion on the main north corridor. Based on the risks identified with delivering a successful service, a short-term passenger rail system is not considered a feasible option. Furthermore, Papanui Road will continue to be a high demand public transport corridor even with the implementation of the short term rail option and will still require public transport services and priority measures to service those bus stops which are not serviced by the rail line.

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Appendices

Appendix A
Summary of Existing Condition of Stations and Platforms

Potential Station Site	Platform	Height of Platform	Platform Condition	Access to Platform	Signalling/Level Crossing (LX) Alarms	Additional Comment
Tower Junction – existing central station	174m	550-600mm	Excellent; curved Platform.	Good pedestrian access with adjacent off street car parking.	KiwiRail have not identified any issues with signalling and alarms for this station.	Addington is a busy station and has limited slots for stopping trains. Some distance from key employment areas.
Mona Vale *Option A (adjacent car park) 2.0km.* *North of Matai St level crossing.*	Not an existing station	NA	Requires construction	Parking is available at this site and is currently used by visitors to Mona Vale.	It is considered feasible for a train to stop close to Matai Street Pedestrian crossing however, this would activate alarms during duration of the stop for south bound trains	Residents are opposed to a station at this location Feeder services would be provided to destination points Good direct pedestrian and cycle access to CBD and Riccarton Resource consents would be required.
Riccarton / Mona Vale between Matai St Crossing at Kilmarnock St	Not an existing station	NA	Requires construction	Adjacent street parking.	When stopping, trains would be limited a distance of >132m between the signal 73L Kilmarnock St and the edge of Matai St level crossing to prevent operation of Kilmarnock St alarms and fouling Matai St level crossing.	
Papanui – Restell Street	101m	470mm	The Station comprises a platform and leased building. The platform is in fair condition with some tripping hazards. Resurfacing would be required.	Platform access is provided through a childproof gate at west end and. A fence is located at the eastern end but could be removed to allow access from the cycleway. On-street parking is available in the surrounding area, but relatively well used at present.	South bound trains would trigger Harewood Rd level crossing alarms during duration of train stop. North trains would cancel crossing alarms if the trains end clears approx. 10m from footpath edge. North bound trains will also trigger Langdons Rd for	Reinstatement of crossing controls would be a significant cost.

Potential Station Site	Platform	Height of Platform	Platform Condition	Access to Platform	Signalling/Level Crossing (LX) Alarms	Additional Comment
					duration of stop. Level crossing controls have been partially removed.	
Belfast –Donegal Street	93m	400mm	The based on the island platform is still in situ. The platform sealed surface condition is poor and would need repair before use. Several site hazards to attend to in locality such as potholes. The site is covered in grass and poorly maintained.	Proper access would need to be provided off Donegal St to platform and attend to adjacent site hazards. There is on street parking in Donegal Street.	No issues with adjacent level crossing alarms.	This platform and site needs considerable investment to upgrade to working order. Parking would generally need to be provided on street. The site is some distance from key activity areas in Belfast. Resource consents would be required.
Kaiapoi - South of Williams St near level crossing	Original station no longer exists	NA	A station and platform would need to be constructed. There are some limitations here due to the curvature in the track and close proximity to the Williams Street level crossing.	Commercial properties adjoin the site to the east. Residential properties adjoin the site to the west. A small reserve to the north of the area may provide some pedestrians access	No level crossing Controls at Williams St level crossing. North trains would trigger level crossing alarms at Williams and Peraki Streets during duration of train stop. South trains will cancel level crossing alarms approximately 7m from edge of Williams St level crossing footpath.	There is little available space for parking. The cost of development would be high and may be met with opposition from neighbouring properties. The site provides good access to the township. Resource consents would be required.
Kaiapoi Alternative new site- north of Courtney Drive level crossing	No station at this site	NA	A station and platform would need to be constructed. There are some limitations here due to the curvature in the track.	There is some reserve land to the northeast of the track that may provide for parking. Location south end of town.	Alarms would remain on at Courtney Drive level crossing for south bound trains but for shorter period. Northbound trains would clear level crossing alarms approx.	There is little available space for parking. This site is further from the township and close to red zoned land. Geotechnical and resource

Potential Station Site	Platform	Height of Platform	Platform Condition	Access to Platform	Signalling/Level Crossing (LX) Alarms	Additional Comment
					15m from footpath edge.	consent issues would need further assessment,
Rangiora -	134m	225mm	Generally good, there are some minor trip hazards and repairs required to surfacing. The southern end comprises 30m metalled.	Good, however, there is limited parking which is shared by a toy library and café.	No issues with adjacent level crossing alarms.	Station building is leased and occupied by a café. The café has right over parking. Good access to the township.

Appendix B
Photographs of Key Sites

Rangiora: Platform and Station, looking North

Rangiora: Platform and Station, looking South

Kaiapoi: View looking southbound at potential station site

Kaiapoi: Level Crossing, looking north from potential station site

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Belfast: Existing Platform

Belfast: Existing access from Donegal Street

Papanui: Existing station (leased)

Papanui: Platform

Appendix C
SX Trains


1199
SXV 1697
MAXX
REGIONAL TRANSPORT
1199

SXV 1697

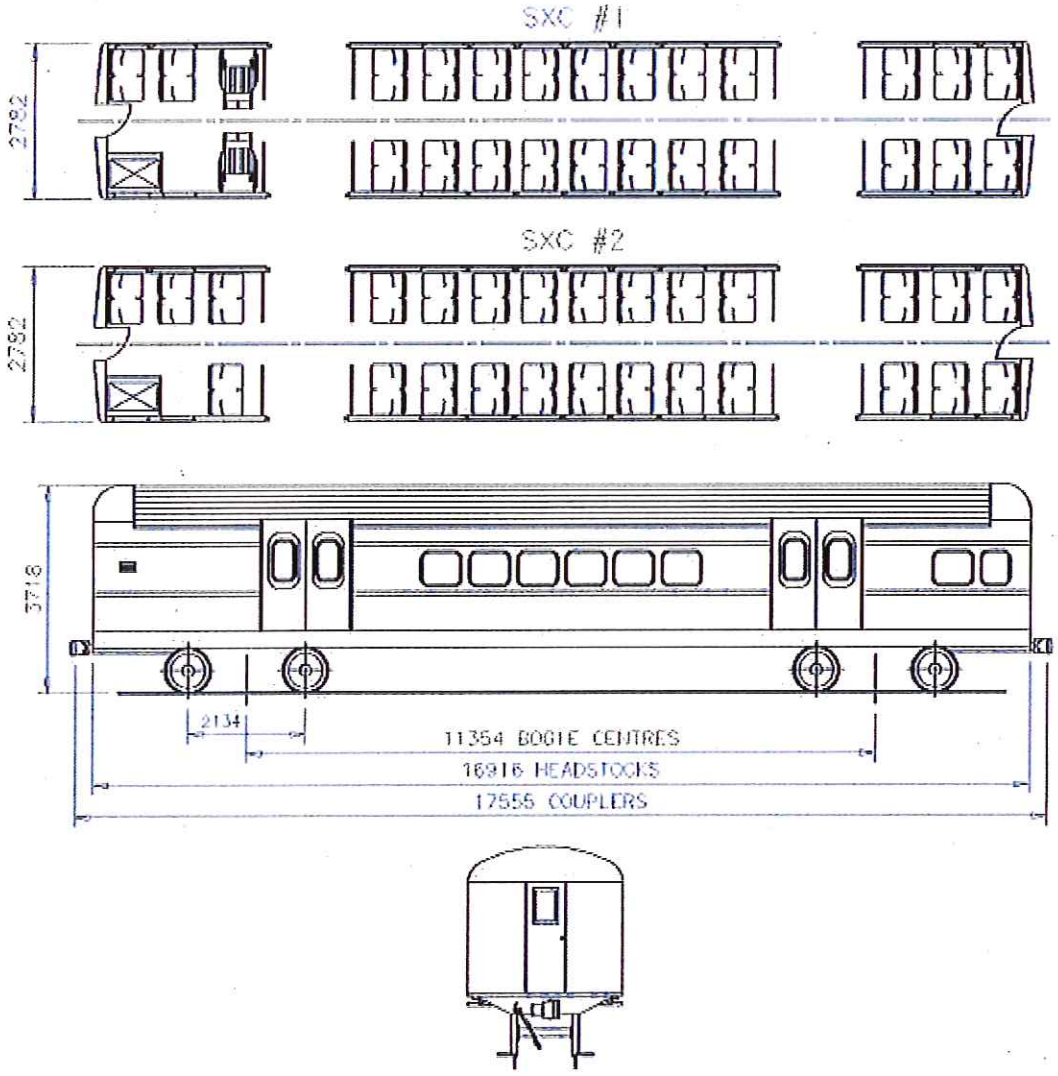
Kiwi Rail
Professional Services Group

SXC Car X 4

SXC1

Description
Auckland Tranz Metro Passenger car.

Length over couplers	17555 mm
Length over headstocks	16916 mm
Bogie centres	11354 mm
Overall width	2782 mm
Overall height	3718 mm
Floor height	1115 mm
Tare	23000 kg
Seating capacity	SXC 1 - 48 seated, 87 standing, 2 wheelchairs SXC 2 - 52 seated, 87 standing
Max. running speed	80 kph



SXC

Kiwi Rail
Professional Services Group

Technical Data

Diagram	SXC
General arrangement	15011770
Car set diagram	15011771
Clearance diagram	15011772
PA & 24V schematic	15011840
400V schematic	15011841
24V train line circuits	15011842
24V car only circuits	15011843
Door panel physical wiring	15011844
HB & door control air circuit	15011845
Foot step motive control schematic	15011846
Brake system	15011847
Handbrake type	HSL park brake
Seat type	Original
Drawbar	Original
HVAC system	Coolzone custom built "split" system 10kW heating / 16kW cooling
Fleet numbers	SXC1741 SXC1742 SXC1743 SXC1745

History Information

Original SX cars purchased from "ZIG ZAG" railway in Sydney, Australia, and refurbished at Hillside workshops in 2003 for use on the Auckland network.

These cars run in 2 fixed car sets :

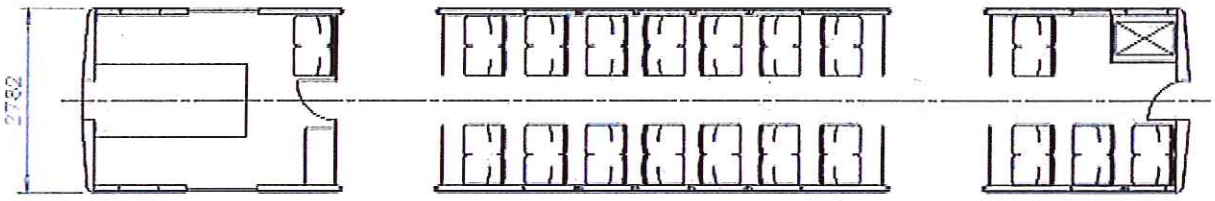
SXV1697 – SXC1741 – SXC1742
SXV1746 – SXC1745 – SXC1743

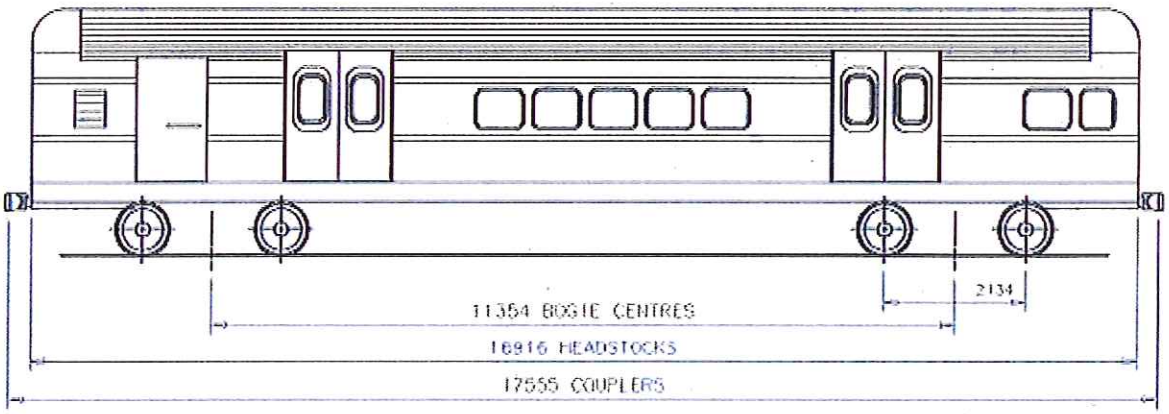
Kiwi Rail
Professional Services Group

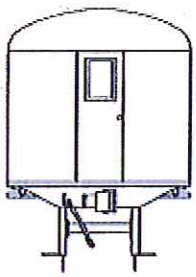
SXV Car GENERATOR CAR x 2 SXV1

Description
Auckland Tranz Metro Passenger car.

Length over couplers	17555 mm
Length over headstocks	16916 mm
Bogie centres	11354 mm
Overall width	2782 mm
Overall height	3718 mm
Floor height	1115 mm
Tare	23000 kg
Seating capacity	36 seated, 74 standing
Max. running speed	80 kph







SXV

GENERATOR CAR

Kiwi Rail

Professional Services Group

Technical Data

Diagram	SXV
General arrangement	15011770
Car set diagram	15011771
Clearance diagram	15011772
Handbrake type	HSL park brake
Seat type	Original
Drawbar	Original
PA & 24V schematic	15011840
400V schematic	15011841
24V train line circuits	15011842
24V car only circuits	15011843
Door panel physical wiring	15011844
HB & door control air circuit	15011845
Foot step motive control schematic	15011846
Brake system	15011847
Handbrake type	HSL park brake
Seat type	Original
Drawbar	Original
Generator type	65kVa Perkins/Leroy Somer
HVAC system	Coolzone custom built "split" system 10kW heating / 16kW cooling
Fleet numbers	SXV1697 SXV1746

History Information

Original SX cars purchased from "ZIG ZAG" railway in Sydney, Australia, and refurbished at Hillside workshops in 2003 for use on the Auckland network.

These cars run in 2 fixed car sets :

SXV1697 – SXC1741 – SXC1742
SXV1746 – SXC1745 – SXC1743

Appendix D
Station Costing

Example Temporary Platform (2 Years) Constructed at Avondale Station

aurecon

Client Ref:	**Northern Passenger Rail**	**Date:**	12/06/2014
Project:	**New / Modified Rail Station Platforms**	**Job No:**	241996
Location:	**Christchurch / Canterbury**	**Prepared By:**	TGP
	Main North Line	**Checked By:**	TIGS

Notes: *The figures in this document are for outline indicative costs comparison and should not used as budgetary or construction cost estimates.*

These estimates are exclusive of escalation and GST.

Item	Description	Site 1 - Monavale (MNL 2.0Km) Base estimate	Contingency	Funding risk
			35%	0%
A	**Nett project property cost**	**$ -**	**$ -**	**$ -**
	Investigation and reporting:			
	- consultancy fees	$ 7,130	$ 2,496	$ -
	- the ECRC managed costs	$ 2,377	$ 832	$ -
B	**Total investigation and reporting**	**$ 9,507**	**$ 3,327**	**$ -**
	Design and project documentation:			
	- consultancy fees	$ 16,637	$ 5,823	$ -
	- the ECRC managed costs	$ 4,753	$ 1,664	$ -
C	**Total design and project documentation**	**$ 21,390**	**$ 7,487**	**$ -**
	Construction			
1	***MSQA***			
	- consultancy fees	$ 14,050	$ 4,917	$ -
	- the ECRC managed costs	$ 7,025	$ 2,459	$ -
	- consent monitoring fees	$ 5,620	$ 1,967	$ -
	Sub-total base MSQA	**$ 26,694**	**$ 9,343**	**$ -**
	Physical works			
2	Environmental compliance	$ 7,018	$ 2,456	$ -
3	Earthworks	$ 68,900	$ 24,115	$ -
4	Ground improvements	$ 7,000	$ 2,450	$ -
5	Drainage	$ 24,350	$ 8,523	$ -
6	Pavement and surfacing	$ 1,300	$ 455	$ -
7	Bridges	$ -	$ -	$ -
8	Retaining walls	$ -	$ -	$ -
9	Traffic services	$ -	$ -	$ -
10	Service relocations	$ 50,000	$ 17,500	$ -
11	Landscaping	$ 23,900	$ 8,365	$ -
12	Traffic management and temporary works	$ 12,500	$ 4,375	$ -
13	Preliminary and general	$ 82,872	$ 29,005	$ -
14	Extraordinary construction costs (inc Rail)	$ 197,500	$ 69,125	$ -
	Sub-total base physical works	**$ 475,339**	**$ 166,369**	**$ -**
D	**Total construction**	**$ 502,034**	**$ 175,712**	**$ -**
E	**Project base estimate (A+B+C+D)**	**$ 532,931**		
F	**Contingency** (Assessed/Analysed) **(A+B+C+D)**		**$ 186,526**	
G	**Project expected estimate (E+F)**		**$ 719,456**	
	Project property cost expected estimate		$ -	
	Investigation and reporting expected estimate		$ 12,834	
	Design and project documentation expected estimate		$ 28,877	
	Construction expected estimate		$ 677,745	
H	**Funding risk** (Assessed/Analysed) **(A+B+C+D)**			**$ -**
I	**95th percentile project estimate (G+H)**			**$ 719,456**
	Project property cost 95th percentile estimate			$ -
	Investigation and reporting 95th percentile estimate			$ 12,834
	Design and project documentation 95th percentile estimate			$ 28,877
	Construction 95th percentile estimate			$ 677,745

Date of estimate	**Cost index (Qtr/Year)**
Estimate external peer review by	**Signed**
Estimate accepted by the ECRC	**Signed**

aurecon

Client Ref:	**Northern Passenger Rail**	**Date:**	12/06/2014
Project:	**New / Modified Rail Station Platforms**	**Job No:**	241996
Location:	**Christchurch / Canterbury**	**Prepared By:**	TGP
	Main North Line	**Checked By:**	TIGS

Notes: *The figures in this document are for outline indicative costs comparison and should not used as budgetary or construction cost estimates.*

These estimates are exclusive of escalation and GST.

Item	Description	Site 2 - Belfast (MNL 11.5Km) Base estimate	Contingency	Funding risk
			35%	0%
A	**Nett project property cost**	**$ -**	**$ -**	**$ -**
	Investigation and reporting:			
	- consultancy fees	$ 2,661	$ 931	$ -
	- the ECRC managed costs	$ 887	$ 310	$ -
B	**Total investigation and reporting**	**$ 3,548**	**$ 1,242**	**$ -**
	Design and project documentation:			
	- consultancy fees	$ 6,210	$ 2,173	$ -
	- the ECRC managed costs	$ 1,774	$ 621	$ -
C	**Total design and project documentation**	**$ 7,984**	**$ 2,794**	**$ -**
	Construction			
1	***MSQA***			
	- consultancy fees	$ 5,269	$ 1,844	$ -
	- the ECRC managed costs	$ 2,634	$ 922	$ -
	- consent monitoring fees	$ 2,108	$ 738	$ -
	Sub-total base MSQA	**$ 10,011**	**$ 3,504**	**$ -**
	Physical works			
2	Environmental compliance	$ 1,789	$ 626	$ -
3	Earthworks	$ 22,250	$ 7,788	$ -
4	Ground improvements	$ -	$ -	$ -
5	Drainage	$ 3,300	$ 1,155	$ -
6	Pavement and surfacing	$ 7,600	$ 2,660	$ -
7	Bridges	$ -	$ -	$ -
8	Retaining walls	$ -	$ -	$ -
9	Traffic services	$ -	$ -	$ -
10	Service relocations	$ 50,000	$ 17,500	$ -
11	Landscaping	$ 23,900	$ 8,365	$ -
12	Traffic management and temporary works	$ 12,500	$ 4,375	$ -
13	Preliminary and general	$ 31,078	$ 10,877	$ -
14	Extraordinary construction costs (inc Rail)	$ 25,000	$ 8,750	$ -
	Sub-total base physical works	**$ 177,417**	**$ 62,096**	**$ -**
D	**Total construction**	**$ 187,428**	**$ 65,600**	**$ -**
E	**Project base estimate (A+B+C+D)**	**$ 198,960**		

F	**Contingency** (Assessed/Analysed)	**(A+B+C+D)**	**$ 69,636**
G	**Project expected estimate**	**(E+F)**	**$ 268,596**
Project property cost expected estimate			$ -
Investigation and reporting expected estimate			$ 4,790
Design and project documentation expected estimate			$ 10,778
Construction expected estimate			$ 253,027

H	**Funding risk** (Assessed/Analysed)	**(A+B+C+D)**	**$ -**
I	**95th percentile project estimate**	**(G+H)**	**$ 268,596**
Project property cost 95th percentile estimate			$ -
Investigation and reporting 95th percentile estimate			$ 4,790
Design and project documentation 95th percentile estimate			$ 10,778
Construction 95th percentile estimate			$ 253,027

Date of estimate	**Cost index (Qtr/Year)**
Estimate external peer review by	**Signed**
Estimate accepted by the ECRC	**Signed**

aurecon

Client Ref:	**Northern Passenger Rail**	**Date:**	12/06/2014
Project:	**New / Modified Rail Station Platforms**	**Job No:**	241996
Location:	**Christchurch / Canterbury**	**Prepared By:**	TGP
	Main North Line	**Checked By:**	TIGS

Notes: *The figures in this document are for outline indicative costs comparison and should not used as budgetary or construction cost estimates.*

These estimates are exclusive of escalation and GST.

		Site 3 - Kaiapoi (MNL 19.0Km)		
Item	**Description**	**Base estimate**	**Contingency**	**Funding risk**
			35%	0%
A	**Nett project property cost**	**$ -**	**$ -**	**$ -**
	Investigation and reporting:			
	- consultancy fees	$ 5,842	$ 2,045	$ -
	- the ECRC managed costs	$ 1,947	$ 682	$ -
B	**Total investigation and reporting**	**$ 7,790**	**$ 2,726**	**$ -**
	Design and project documentation:			
	- consultancy fees	$ 13,632	$ 4,771	$ -
	- the ECRC managed costs	$ 3,895	$ 1,363	$ -
C	**Total design and project documentation**	**$ 17,527**	**$ 6,134**	**$ -**
	Construction			
1	***MSQA***			
	- consultancy fees	$ 11,425	$ 3,999	$ -
	- the ECRC managed costs	$ 5,713	$ 1,999	$ -
	- consent monitoring fees	$ 4,570	$ 1,600	$ -
	Sub-total base MSQA	**$ 21,708**	**$ 7,598**	**$ -**
	Physical works			
2	Environmental compliance	$ 8,642	$ 3,025	$ -
3	Earthworks	$ 92,100	$ 32,235	$ -
4	Ground improvements	$ 7,000	$ 2,450	$ -
5	Drainage	$ 24,350	$ 8,523	$ -
6	Pavement and surfacing	$ 2,400	$ 840	$ -
7	Bridges	$ -	$ -	$ -
8	Retaining walls	$ -	$ -	$ -
9	Traffic services	$ -	$ -	$ -
10	Service relocations	$ 50,000	$ 17,500	$ -
11	Landscaping	$ 25,100	$ 8,785	$ -
12	Traffic management and temporary works	$ 12,500	$ 4,375	$ -
13	Preliminary and general	$ 67,392	$ 23,587	$ -
14	Extraordinary construction costs (inc Rail)	$ 100,000	$ 35,000	$ -
	Sub-total base physical works	**$ 389,483**	**$ 136,319**	**$ -**
D	**Total construction**	**$ 411,191**	**$ 143,917**	**$ -**
E	**Project base estimate (A+B+C+D)**	**$ 436,508**		
F	**Contingency** (Assessed/Analysed)	**(A+B+C+D)**	**$ 152,778**	
G	**Project expected estimate**	**(E+F)**	**$ 589,285**	
Project property cost expected estimate			$ -	
Investigation and reporting expected estimate			$ 10,516	
Design and project documentation expected estimate			$ 23,661	
Construction expected estimate			$ 555,108	
H	**Funding risk** (Assessed/Analysed)		**(A+B+C+D)**	**$ -**
I	**95th percentile project estimate**		**(G+H)**	**$ 589,285**
Project property cost 95th percentile estimate				$ -
Investigation and reporting 95th percentile estimate				$ 10,516
Design and project documentation 95th percentile estimate				$ 23,661
Construction 95th percentile estimate				$ 555,108

Date of estimate	**Cost index (Qtr/Year)**
Estimate external peer review by	**Signed**
Estimate accepted by the ECRC	**Signed**

Appendix E
Passenger Demand Data

Total Person Trip Data From CAST model

Year	2016
Period	0700-0900
Duration (hrs)	2
Mode	All
Unit	Total Person Trips

O\D	Belfast	Redwoo	Papanui	Monavale	Riccarto	Addingto	South CBD	Middleto	Uni/Chur	Sockbur	Hornby	Airport
Rangiora	63	26	71	10	33	18	188	24	44	9	99	216
Kaiapoi	149	59	117	12	45	25	190	35	70	13	92	188
Rangiora P&R	19	7	20	3	8	4	44	6	12	2	25	61
Kaiapoi P&R	81	34	81	11	33	17	175	25	50	9	91	219
Tram Rd P&R	87	34	76	8	30	15	138	22	44	8	74	180
Sum	398	160	364	44	149	79	734	112	219	42	381	864
Sum (exc Tram Rd)	311	126	288	36	119	64	597	90	175	34	307	684

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