

# **BUS PRIORITY PLAN**

## **2007**

*(Choose to take the bus)*

### **1.0 INTRODUCTION**

People are travelling more whether it is for work, social or recreational activities. When you put this together with a growing population it manifests in an increasing pressure on the road network. This is evidenced by a number of congested locations in the road network particularly noticeable at peak traffic times. It is unrealistic to expect to be able to build more roads to meet demand because it is difficult and expensive to do so considering Wellington's topography and constrained urban form. To ensure traffic can continue to move efficiently around the city another means of adding capacity to the road network is needed.

Mass transport is seen as an efficient and effective way of achieving this. While in the future light rail may be a more desirable form of mass transport, now and in the medium term enhancing the existing successful bus service will offer more affordable and tangible gains. Buses currently carry 28% of the city's commuters at peak travel times but are also hampered by congestion. Buses must be assisted at peak times to significantly improve their reliability and attractiveness to users.

A range of city and regional strategies support priority being given to buses to strengthen their position as a viable transport mode. Developing a bus priority plan is seen as an effective means of achieving this. By re-engineering the road corridor and reallocating road space to give buses greater priority on key transport routes to and from the city centre will effectively and efficiently create additional capacity to move greater numbers of people on the road network.

Priority must also be given to buses to make them an attractive choice for users. Without priority, buses will always be seen as a second choice. Priority for buses is predominantly achieved by dedicating road space to them. This may be achieved at the expense of parking or perhaps more contentiously by reallocating road space presently used by private vehicles. For every 1.3 people attracted to use the bus because they choose to, one car is reduced from the road. And if every year 3-4% of car users can be encouraged to use the bus, current traffic efficiency can be maintained and the current levels of congestion can be kept in check. To do better will improve the current situation and level of service for private vehicle users. The plan is therefore not anti car but a move to improving mobility for a growing number of people wanting to move about the city for work and recreation.

The following plan provides possible suggestions for implementing bus priority across the city. Some measures are easy to implement with little impact while others will test how far we should go to developing our bus passenger corridors to provide a real alternative to the private car.

## **1.1 Plan objective**

The purpose of this plan is to therefore to identify practical bus priority measures which can be readily implemented throughout the city to give priority to buses.

## **2.0 BACKGROUND**

### **2.1 Strategy and Policy context**

There are a range of national, regional and local policies that seek to ensure that an integrated, safe, responsive and sustainable transport system is developed. Developing a bus priority plan and implementing its measures has an integral part to play in helping to achieve this by providing a viable alternative choice of transport.

#### **2.1.1 Transport Strategy**

The Council's own transport strategy, which is based on supporting wider city objectives, has as one of its key five tasks:

- The development of passenger transport systems as the main means for the movement of people along the urban development strategy growth spine.

This is to be achieved within the overall goal for Wellington's transport network to support the economic, social, cultural and environmental well being of its citizens. The bus priority plans directly supports three relevant outcomes:

- More liveable – *Wellington will be easy to get around, pedestrian friendly and offer quality transport choices;*
- More sustainable – *Wellington will minimise the environmental effects of transport and support the environmental strategy;*
- Better connected – *Wellington will have a highly interconnected public transport, road and street system that support's its urban development and social strategies.*

More specifically the pertinent initiative to achieve these outcomes for public transport is:

- *A seamless passenger transport system along the growth spine including bus priority measures on all main arterial routes to and through the central area.*

This has culminated in one of the transport priorities in the next three years being for public transport to:

- *Improve the performance of the city's passenger transport system though bus priority measures.*

The introduction of bus priority measures will also support the Travel Demand Management initiative, another of the council's transport priorities.

### 2.1.2 Urban Development Strategy

The Urban Development Strategy also identifies support for public transport to influence the form of the city. A key intention is to coordinate transport planning to support the growth spine concept. This looks to intensify development along the key transport corridor between Johnsonville and Kilbirnie and is underpinned by the following objectives:

- Increasing capacity on the corridor from the eastern suburbs to the CBD;
- increasing capacity and services on the passenger transport corridor from Kilbirnie to the CBD; and
- improving passenger transport services from the northern suburbs to the CBD and integration with onward services to the airport.

## **2.2 Regional Strategies**

### Regional Land Transport Strategy (RLTS)

This Strategy is being reviewed and a draft is currently being consulted on. The objectives of the strategy are similar to the outcomes to the New Zealand Transport Strategy being:

- “- Assist economic and regional development
- Assist safety and personnel security
- Improve access, mobility and reliability
- Protect and prompt public health.

Their vision for the future is

“an integrated land transport system that supports the region’s prosperity in a way that is economically, environmentally and socially sustainable”

They see the main trade off is between roading investment to reduce congestion and public transport enhancement to provide an alternative to the car.

### Regional Passenger Transport Strategy

This plan has been developed and is also in draft for public comment. It identifies a number of service level targets for the regions public transport system and articulates an improvement plan for the future. It clearly supports further bus priority measures, increased service coverage and service frequency to ensure the public transport network helps people get around the region easily..

## **2.3 Other Studies**

### 2.3.1 Ngauranga to Airport

The Ngauranga to Airport study in its preliminary findings is also indicating the need to enhance public transport. The scope of this study is however more narrowly focused to the state highway corridor and immediate environs and takes a longer term view on possible solutions where as this bus priority plan applies city wide and is more focused on the short to medium term. Both studies are complementary in that they identify the need to maximise the capacity of the existing road network by reallocating road space between private car and public transport. Both agree the biggest gains can be made where there is already high

public transport use such as in the central city. Further gains can be achieved along arterial routes to serve future growth nodes such as Newtown and Johnsonville.

### 2.3.2 North Wellington Public Transport Study

The North Wellington Passenger Transport study concluded that the rail line between the city and Johnsonville is to remain. This will shape transport operations in the northern area of the city depending on the ability of rail to accommodate future travel demands. In the short term a combination of enhancements on existing bus routes and further feeder routes to the Johnsonville rail head will be developed to serve existing areas in the north. But as development intensifies and expands further north we will see greater use of express services to efficiently serve the area. At some point this will trigger the need for bus priority measures along the State Highway.

## 2.4 Climate Change

The Council is committed to mitigating the effects of, and adapting to, climate change. New Zealand's transport sector accounts for more than 40% of the nation's total energy consumption. The consumption of petrol and diesel produces greenhouse gases and the Council can make an important contribution in reducing these emissions through encouraging reduced automobile dependence. The promoting and enabling of public transport, through bus priority measures, will contribute to the Council's climate change commitments.

## **3.0 PERFORMANCE OF EXISTING BUS LANES**

2006 bus lane monitoring survey results show a continuation of previous trends for bus travel times. For bus lanes operating on Chaytor Street, Adelaide Road, Kiawharawhara Road and Manners Street bus travel time savings in the order of 1 minute are consistently achieved. The bus lane on Glenmore Street is the only aberration with no time savings being achieved. The likely cause being that Upland Road traffic have right of way on the roundabout and cause significant delay to all traffic on Glenmore Street. With increasing traffic using Upland Road increased delay is experienced by Glenmore Street traffic. Traffic signals may need to be installed at this intersection to readdress the in balance and give priority to buses in the future.

Cycle and pedestrian activity has remained relatively constant throughout the surveys with any variance being contributed to the weather and seasonal fluctuations.

The operation of bus lanes has not adversely affected the operation of adjacent businesses. There has been little movement in businesses and a number of new businesses have opened along side bus lanes since the start of their operation.

The level of compliance of bus lanes continues to be good. Generally the unauthorised use of bus lanes varies between 1% and 14%. The highest level of offending is on Adelaide Road and in Victoria Street in advance of Manners

Street. Typically on Adelaide Road offending increases the closer it gets to 9am when the restriction ceases. However 8.30am to 9am is the busiest period and compliance needs to be maintained during this period to maximise the benefits of the bus lane. In Victoria Street the restriction of cars is difficult because it is a part time restriction and the restriction doesn't apply to service vehicles and taxis. Motorists seeing these two groups using the street think it is alright for them to do likewise. Further restrictions may be needed in the future to again maximise the benefits for public transport.

The level of offending is seen as tolerable at this point. However the power to enforce bus lane restrictions will be pursued to ensure there is an ability to enforce bus lanes in the future to maintain good compliance as appropriate.

#### **4.0 DISCUSSION**

The plan identifies those measures which can be easily implemented with little impact on surrounding activities or with little disruption to current traffic. It also proposes more extreme solutions that if introduced, will have significant impact on how the road space is shared with the current traffic stream and how they will impact on adjacent activities and amenities such as kerbside parking. The plan takes into account present and future transport needs, and proposes solutions that best achieve these. Implementation of the plan will need to be assessed and prioritised in a manner that facilitates and supports current and future transport needs, land uses, social, business, recreational and other strategic goals. An attempt to identify and take account of these has been made in the development of the plan.

The plan takes into account the different route and transport mode options that exist and assumes where priority has been given to buses on a route that either equal road space is provided alongside for motorists or that other viable options exist for motorists in alternative corridors. Examination of the impact that potential solutions will have on the general efficiency of moving current traffic volumes on the route or upon other parts of the transport network will need to be analysed in more detail prior to the implementation of any individual scheme and assessed against any overall plan adopted. Although having been considered in the development of the plan a key aspect of any further assessment of implementing a route will need to be made in the context of the urban form surrounding the road corridor and how the route fits with the wider form of the city as a whole.

#### **5.0 CHALLENGES FOR THE BUS PRIORITY PLAN**

The challenge for the bus priority plan is to meet the increasing demand for travel resulting from increasing population and a predicted increase in vehicle usage in Wellington, in particular the central city area. Major regional facilities (such as the hospital, airport and port), will put pressure on the existing transport network and other parts of the roading network that are already at, or very close to capacity.

The key 'high-level' transport challenges facing Wellington that will need to be assisted by the implementation of a bus priority plan are:

- Addressing an overall increase in transport demand.
- Addressing an increasing number of commuter trips to the CBD.
- Providing more reliable bus travel times through the CBD.
- Providing relief to existing and future congestion points.
- Providing new services in new development areas such as for the business and residential development on Port land and the green field areas in the northern growth area.
- Providing higher frequency services particularly in developing areas.

## **6.0 THE PLAN**

### **6.1 Principles and criteria for decision making**

The goal of the Council's bus priority plan is to:

- Support a passenger transport service that is attractive to users by enabling services to operate faster and more reliable trips.
- Put in place measures which future proof the performance of bus service trips as the road network becomes more congested.

Implementation of a bus priority plan can lead to a virtuous cycle of bus service speed and reliability, leading to better service to the public and a greater demand for bus travel. Another advantage of faster, reliable trips is that a bus driver who can complete a trip in less time can return to provide an additional trip, thus providing greater frequency, at minimal cost.

### **6.2 Implementation**

Implementation of the plan relies on:

- Increasing capacity for freight and private vehicle movements in the State Highway corridor between Ngauranga and the Airport to improve access to the central city and to move traffic across the city. This will enable priority to be given to buses on key routes into and out of the city centre from areas of high residential density.
- Priority being given to buses over kerbside parking recognising that these two activities will frequently compliment one another ie the bus lane will often operate at peak times only, allowing parking outside operating times.
- Bus frequencies being increased to reduce waiting times and potential overcrowding; to match the sense of convenience and availability perceived of private transport.
- Increased coverage of the city and penetrate into more areas to improve accessibility
- Effective enforcement. Without effective enforcement options for more flexible utilisation of the bus lanes is limited.

Further benefits from the plan can be gained by:

- Linking with walking plans to improve access to public transport.
- Linking with cycling plans so cyclists can utilise the bus corridors.
- Adding to and increasing the size of existing park and ride areas to reduce traffic in the central city and increase bus ridership.
- Providing more and improving bus shelters to enhance waiting passenger comfort.
- Running state of the art buses to foster a sense in pride in public transport users.
- Improving traveller information and providing real time information at bus stops.

Accordingly the bus priority plan should be seen as a three way initiative between the Regional Council, Operators and the city to improve bus services where the Council provides quality infrastructure and priority in the road corridor. The Regional Council supports greater service coverage and higher frequency services and the Operator provides helpful customer service and high quality vehicles for user comfort.

More specific initiatives and improvements that will be promoted and expected to be actioned by the various parties to compliment other bus priority measures covered in this plan are:

#### 6.2.1 Improved accessibility

Advocate to Greater Wellington Regional Council for improved bus service frequency and the introduction of new Central City Shopper services and services to growth areas such as CentrePort and the northern growth area.

#### 6.2.2 Improved amenity

Improve waiting facilities at each bus stop. A resource consent has recently been applied for to provide shelters on another 128 bus stops on key city bus routes. The continuation of improvements in weather protection from the railway station to the inner city streets.

#### 6.2.3 Improved fleet

Advocate for high quality, clean, comfortable vehicles to encourage higher patronage. Advocate for hybrid buses including diesel-electric, hydrogen-electric, stored electric options to promote quiet, non polluting CBD running. Advocate for state of the art vehicle design to foster a sense of civic pride in public transport

### **6.4 Objectives**

Moving forward, the current objective of installing bus priority measures where there is no disadvantage to motorists will need to be revisited. To date, bus priority measures have either utilised parking clearways or surplus capacity in the road to achieve priority for buses without disadvantaging other road users.

While there are still significant gains to be made at the expense of parking some bolder initiatives can only be pursued at the expense of reducing capacity for general traffic. To judge the effectiveness of a particular initiative the following objectives will be tested and assessed:

- To create additional capacity to move more people on the road network.
- To create a viable, reliable, transport mode.
- To move more people more efficiently and faster.
- To promote an environmentally friendly mode of transport.

## **6.5 Performance measures**

To measure the success of implementing bus priority schemes will require the development of a number of performance indicators that will need to be monitored. Measures currently in place include the quality of life surveys. These show that satisfaction with public transport is high. 47% of people surveyed use public transport at least once a week. Some 75% believe that public transport is affordable and 87% agree that public transport is safe. It is expected that these surveys will continue and be improved going forward.

Further possible new performance indicators could include measurements against goals such as:

- There is no growth in trips made by car into the central city during the morning peak based on 2005 figures.
- The percentage share of trips made by bus for journey to work increases.

Or more specifically for the introduction of each bus priority measures:

- That the scheme makes travel time savings per bus trip.
- That the average journey time of the bus in the peak two hour period is reduced.

These measures could be applied over the public transport network or measured for each or a series of measures.

These might also be countered by other measures which would aim to limit any adverse effect on other traffic caused by the implementation of bus priority measures.

It should however be noted that a great deal of the plan would be implemented in the “good faith” well in advance of any real need for the bus priority measure to show an overall benefit. This is in an endeavour to provide a comprehensive network well ahead of demand and to ensure reliability in the route for buses on which patronage can be built. That is, providing the service and then encouraging the users rather than promising improvement if the service is well used.

## **6.6 Preliminary assessment of schemes**

A preliminary assessment of potential bus priority routes has been made. These schemes are described in more detail in Appendix 2. Based on what is considered

practical the following schemes have been assessed and merit further investigation.

Bus priority measures through the Central City and Bus lanes to and from the central city to:

- Ngauranga
- Karori
- Brooklyn
- Island Bay
- Newtown
- Kilbirnie

Collectively these schemes represent a radical plan for bus priority measures throughout the city to allow greater capacity to move people.

In considering these schemes it is evident that there will be a considerable disruption to and impact on, current parking, safety features and street amenity values. There is still a significant amount of work to be done to quantify the trade off between providing additional capacity to move people by bus versus the current demand for people to move by private vehicle. A balance needs to be found between building capacity to move people more efficiently and satisfying the growing demand for personal trips. The principles to be applied in the development of each scheme are:

- Where a route is used by buses and there is sufficient road space, equal road space will be provided to buses and private cars in the same direction.
- Dedicated road space is given to buses where the frequency dictates and alternative routes exist for private cars.
- Buses will be given priority over parking.
- The provision of bus priority will be dictated and justified for peak travel times because the primary demand for capacity is at peak travel times.
- Permanent bus lanes will only be installed where the current demand for road space is not affected or the demand for moving buses is warranted.

The case for using buses as the primary mover of large volumes of people is based on the following: an average inner city traffic lane might be expected to carry 900 vehicles per hour; at an average loading of 1.3 people per vehicle this is 1170 people per hour; the average bus carries 45 passengers during peak travel times; 26 buses per hour will shift the same volume of people but a traffic lane dedicated to buses might be expected to carry 60 to 70 buses an hour, that is potentially three times the volume utilised by general traffic.

By way of comparison Lambton Quay presently carries 140 buses per hour and could carry twice this volume if extensive bus priority measures were put in place along the route. This would equate to a staggering 12,600 people per hour. As an indicator it is expected that a minimum of 15 to 20 buses per hour will be required along a route to trigger the implementation of a bus lane or other bus priority measures. Where bus frequency is below this number but there is a strong indication that this could be grown it is proposed to introduce bus priority as a transit lane. This will allow cars and taxis with a minimum number of passengers to also use the lane thus getting better utilise the road space in the interim. It will also have the added benefit of encouraging ride share. In practice, a number of factors will need to be assessed on a case by case basis to determine

when bus priority measures are put in place and particularly whether the measures are full time or only activated at peak travel times.

At this point a practical assessment has been made on how to fit bus lanes into the current road cross section along key bus routes. If a bus lane is likely to be required along a route then the opportunity to provide it through the existing parking lane with some adjustment to adjacent lanes has been explored. Where extra road width is required this is achieved primarily by narrowing footpaths. Because of the cost of moving kerbside poles and services an innovative solution, using dynamic lane lines, is being investigated to better utilise the existing road area. Dynamic lane line technology will negate the need to narrow footpaths, and carry out earthworks and build expensive retaining walls. By using dynamic lane line technology will allow the traffic lanes to be reconfigured throughout the day to accommodate different demands for the road space within the existing kerblines. A project is presently underway with Land Transport NZ. (LTNZ) to develop a guideline on how this idea can be used.

Plan 1 in Appendix 3 shows how a bus lane can be achieved in a typical street without the need to physically alter it. To achieve a bus lane in each direction would require a minimum of 12 metre (4 x 3 metre lanes). The footpath would need to be cut back in most cases to achieve this. However by the use of dynamic lane lines the potential for a bus lane to operate alongside two-way traffic is achieved. In most cases the volume of bus traffic outside peak travel times is relatively low and allows the return of kerbside parking. Depending on the road width and the demand for bus priority a number of combinations of bus lane, travel lanes and parking can be achieved.

## **7.0 ECONOMIC EVALUATION**

An initial analysis of the economic benefits of possible bus priority measures show good benefits This was assessed using a conservative estimate of the travel time savings expected to be made for each scheme and using existing bus passenger numbers

While travel time savings are difficult to estimate prior to introduction of a priority measure further analysis of these and other effects on the wider road network will need to be quantified to assess the effects on the wider roading network before each scheme is put forward for approval.

Preliminary results however show schemes with a first year rate of return that range from 2 to 233. Corresponding benefit/cost ratios range from 0.2 to 22.

Not unexpectedly the central city route shows good returns because of the high concentration of buses and the high number of passengers carried through the central city daily. This is closely followed by the central city radial routes of Kent/Cambridge Tce and Murphy/Mulgrave and Molesworth Streets. On the growth spine, Adelaide Road and routes between the city and Kilbirnie show the strongest initial benefits for treatment. Where routes are not heavily used by

buses at present, better utilisation of the road space can be achieved by allowing cars including taxis carrying passengers. This will also increase the overall economic benefit of dedicating this space.

It is intended that more robust analysis of the benefits of each bus priority measure will be carried out and used to support their introduction as part of the implementation programme. Also work currently being carried out for the Ngauranga to Airport study will provide further economic analysis on the benefit of bus priority measures as part of the proposed transport packages being investigated for that corridor.

## **8.0 IMPLEMENTATION PROGRAMME**

Implementation of the bus priority schemes will require further study and closer scrutiny of the effects and benefits of each scheme. The implementation programme will be guided by projects which have the greatest benefit to the most people, address known constraints and problems in the road network and have the greatest potential to add capacity to move people. To further assist in refining the order in which further investigation and implementation will take place, each section along the proposed routes has been assessed and ranked as shown in Table 1 following:

Ranking has been based and scored on the following criteria:

- Bus volume
- Traffic volume
- Likely implementation time frame
- Implementation cost
- Impact of scheme
- Likely public acceptance of scheme.

On this basis emphasis will be given to implementing schemes in the following order:

- Central city
- Central city radial routes
- The growth spine southern route being Kilbirnie to the city via Newtown and Haitaitai and reverse
- The growth spine northern routes, Hutt Road, Thorndon
- Karori
- Island Bay
- Brooklyn
- Kaiwharawhara Road and others depending on the North Wellington Passenger Transport study outcomes.

There are a number of scenarios for the implementation of each of the proposed schemes. Many of the schemes could be implemented on an incremental basis as demand and resources dictate. These factors will need to be used in refining an implementation plan. While the proposals show what is ultimately possible it will be rare that a whole suburban route is implemented in its entirety. It is more likely the heaviest used segments will be implemented first, often meaning the direction with the highest peak volume being implemented. Counter peak

facilities and permanent bus lanes may follow as demand grows. The use of dynamic lane line technology for tidal operation will also make some schemes more feasible, earlier, while expensive road widening options can follow at a later date if it is economical and desirable to do so.

While the plan is predicated on providing bus priority measures ahead of demand the reality is, there are only limited funds available. A summary of estimated costs show that for the possible schemes identified it will cost in the order of \$33 million to achieve them. However if innovative dynamic lane line technology is used then the cost of providing bus priority measures can be reduced to about \$16 million. Currently budgeted in the LTCCP is just over \$12 million for the next ten years. If the full programme is to be achieved funding will need to be extended by four or five years or increased over the current budget period. If some of the more ambitious plans are to be pursued, such as widening Adelaide Road, turning Newtown shopping centre into a mall, then a further \$13 million will need to be found.

The plan in Appendix 1 shows what is possible in terms of a viable bus priority routes.

## **9.0 PROPOSED COMMUNICATION PLAN**

The implementation of these schemes will require a comprehensive communication strategy. This will involve the development of key messages and material to inform the public and stakeholders of the rationale for bus priority measures and the benefits to the community. Suggested messages include:

- Traffic is growing steadily and something needs to be done to curb congestion.
- Public transport is an efficient mover of people.
- If public transport continues to grow in use it will relieve traffic congestion and create the opportunity for more frequent services.
- Bus priority will ensure reliability of buses.
- Providing priority for buses is about creating a real transport choice.
- Supporting buses is an environmentally friendly transport choice.
- Giving priority to buses benefits all road users.

As individual schemes are developed, a more specific communication will be required for informing directly affected parties. Packages will be developed to explain how the bus priority measures will affect them, what measures have been taken to minimise the impact and what other options for adjusting to any proposed changes are open to them. The main area of concern will come from the loss of parking and this will need to be carefully considered against the benefits accruing to public transport. Another will be the trade off of private vehicle capacity over that for public transport. Public feed back will be important to gauge the impact of each scheme and will help to judge whether any scheme is placing to greater imposition on current behaviour or expectation on how the road network is to function.

## 10.0 SUMMARY

Traffic is continuing to grow because of a growing population and an ever increasing demand for people to travel for a wide variety of activities. We therefore need to find ways to meet the demand. Recognising that it is not possible to build more roads in many areas across the city, to meet this demand because of the city's build form and difficult topography, we are looking at public transport to do this. Public transport is recognised as:

- An efficient mover of large numbers of people.
- Using less road space.
- Environmentally friendly.

Accepting that giving priority to buses is a viable solution to the problem of growing congestion, a bus priority plan has been developed which shows how it can be developed on the existing city road network. It will only be achievable if it is accepted that bus priority measures are given priority over on street parking. Buses have the potential to carry more people and need to travel along the corridors most accessible to the people they serve. In these corridors road space may need to be given to buses over the private vehicles. To do this there needs to be surplus capacity in that route or sufficient capacity in the alternative routes private vehicles will be moved too. The dedicated routes for freight and private vehicle access need to be designed and dedicated for this use. In Wellington city the primary route for this purpose is the State Highway corridor. This runs from Tawa and the Hutt in the north to the Airport in the south. Sufficient capacity needs to be provided in this corridor to be able to take freight and private vehicle trips into and across the city creating the flexibility to implement bus priority on the key routes leading in and out of the city.

Based on demand for relief from congestion and recognising the greatest benefit to the largest number of people it is proposed to implement bus priority measures starting in the central city and working out from there along the radial routes. Good benefits are also to be gained along the growth spine particularly on Adelaide Road and routes between the city and Kilbirnie.

Where the frequency of buses under utilises a route, this can be complimented by vehicles with a high occupancy encouraging ride share. While this will require more resource in enforcement it provides the opportunity for the most efficient use of the road space. This sharing of the road space will create benefits for both mass transport and private car users.

## 11.0 APPENDICES

### **Appendix 1: Plans of Proposed Bus Priority Routes**

### **Appendix 2: Proposed Bus Priority Schemes**

### **Appendix 3: Bus Priority Techniques**

### **Appendix 4: Typical Application of Dynamic Lane Lines**

# **Appendix 1**

## **Plans of Proposed Bus Priority Routes**

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## Appendix 2

### Proposed Bus Priority Schemes

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#### **BUS PRIORITY SCHEMES**

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##### **Central City**

While a lot of work has been done to improve the flow of buses along Lambton Quay and in the Manners/Dixon Streets area a lot more work is required. There are still significant delays to buses in the Manners Street area which regularly effect the level of service expected. To improve the level of service here and in other central city locations, particularly Courtenay Place, there will need to be significant improvements made which can be delivered through the implementation of bus priority measures. If services are to grow and route frequency increase a greater number of buses will need to be accommodated through the central city. This can only be done and the benefits gained if further consideration is given to bus priority measures in the area.

##### **Courtenay Place**

For example in Courtenay Place increasing constraint on extraneous traffic movement will be required as the number of buses travelling through the area grows.

This will also allow further enhancement of Courtenay Place as a pedestrian and public transport street complimented by Cable/Wakefield Streets providing the high capacity general traffic corridor for this area of the city.

### **Lambton Quay**

Similarly Lambton Quay is proposed to be the northern end of the pedestrian/public transport corridor with Featherston Street and the Waterfront providing the general traffic capacity in this area of the city.

As bus numbers rise, extraneous traffic will increasingly be discouraged from Lambton Quay by restricting access onto and off Lambton Quay by banning turning movements and tightening access from side streets. Limited access would be retained for general traffic to allow circulation through the area to service businesses and parking.

### **Willis Street (Manners Street to Lambton Quay)**

It is proposed that as bus numbers warrant, the section of Willis Street between Manners Street and Lambton Quay be restricted to buses only. This is envisaged to be at peak traffic times to start with and may extend to business hours as demand dictates. This scheme would place a heavy reliance on Ghuznee Street to provide access to the central city via Taranaki Street and Jervois Quay. It would however significantly improve the Boulcott/Manners/Willis Streets and Mercer/Willis Streets intersections for all users when combined with a Manners Street bus only restriction.

### **Manners Street**

Similarly Manners Street is proposed to have further traffic restrictions imposed on it to improve bus movement through the area. To start restricting peak hour traffic turning right off Victoria Street would have an immediate benefit to bus travel times and reliability through the area. A peak hour restriction rather than a full time restriction will require active enforcement of both the proposed right turn ban from Victoria Street into Manners Street and the right turn ban from Dixon Street into Victoria Street. In the scenario where general traffic is restricted only for peak periods service vehicles and taxis would also be excluded.

However, these restrictions are likely to be considered for use throughout the business day as bus trips through the area grow and it may be seen as unreasonable to restrict service vehicles and taxis at these times. To allow these vehicles and not further erode the benefits gained for public transport, an effective enforcement system will need to be in place.

With the completion of the Inner City Bypass consideration will be given to a fulltime closure of the right turn from Victoria Street into Manners Street as general traffic will be able to use Ghuznee Street as access to The Terrace and Kelburn, or use the new Inner City Bypass route for access to the motorway. This scenario will place less reliance on the need for effective enforcement.

### **Wakefield/Cuba/Manners Streets**

Beginning with a dedicated bus lane using the north side lane of Mercer Street a bus advance signal would allow buses to move ahead of other traffic to either turn right into Victoria Street or progress to a fulltime bus lane down the centre of Wakefield Street. This could be achieved with the modification of the central island and the removal of the central pedestrian refuge outside the Council building. The pedestrian crossing would be replaced with a signal controlled crossing.

In Cuba Street the eastern kerbside loading area would be removed in both the morning and evening peak to allow a bus lane to operate similar to the present evening operation.

In Manners Street a bus lane is proposed to run alongside the northern kerbside parking at all times.

### **Further improvements**

Further consideration will be given to signal pre-emption through the golden mile. This will require restrictions on side road traffic and turning traffic to be effective. Promotion of electronic ticketing by operators will also provide benefits through reduced loading times. The Greater Wellington Regional Council is continually monitoring the market for a cost effective real time information system to be rolled out on streets at bus stops to complement improvements to their other traveller information systems. By coordinating these state of the art technology systems it is expected that substantial gains can be made for public transport and its users through the central city. However, it is acknowledged that the roll out of these as an integrated package will be expensive to do well.

### **Radical central city proposal**

Development of the bus corridor through the central city area has continued to route buses along the main shopping streets. This is done to provide access to the central city but it also services the centre of employment of the city's business heart. Concentrating buses along Lambton Quay also gives a simple legibility to the service making it particularly easy for casual users and visitors to the city. The fact that you can catch any bus in Lambton Quay adds to the ease of moving around Wellington city.

If this concept is to be expanded then we need to look at the bus route as it goes south. South from Lambton Quay the routes diverge off Willis Street and don't remerge again until Courtenay Place making the bus service less legible through this area of the city. One option to extend the concentration of buses along a single corridor would be to dedicate a route along Manners, Cuba, and Wakefield Streets to a dedicated two-way bus corridor. This would build on the route legibility identified earlier while still maintaining the bus service on the premier shopping spine. It would also improve access to the Civic centre.

This option would still allow general traffic through the area westbound on Wakefield Street together with parking. However, general traffic would be excluded from Cuba Street and Manners Street. Any extra road space could be utilised to widen footpaths in Cuba Street and Te Aro Park in Manners Street with parking pockets for servicing and taxis.

## **ADDITIONAL CENTRAL CITY ROUTES**

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To further augment the frequency of buses on the golden mile a shopper/visitors bus could be introduced to circulate a route following Lambton Quay, Willis Street, Victoria Street, Ghuznee Street and The Terrace. This would be run in parallel with a service circulating the Waterfront following a route Lambton Quay, Molesworth Street, Pipitea Street, Mulgrave Street, Bunny Street, Waterloo Quay, CentrePort, Waterloo Quay, Jervois Quay, Cable Street and Courtenay Place. These services would improve

accessibility for the central city area particularly to fringe parking, the Waterfront and the new development area on CentrePort land.

As further connectivity is introduced to the port area with roundabouts planned for Aotea Quay near the Inter-Island ferry terminal and the Hutt Road; services could be routed through Thorndon Quay and back through the Waterfront.

New services will be worked through with the Greater Wellington Regional Council and conditions placed on new developments to ensure facilities for public transport are incorporated in development works.

## **CENTRAL CITY RADIAL ROUTES**

### **The Terrace**

It is proposed to provide a bus lane in the morning peak by removing parking from the east side of the street. The bus lane will run from Bowen Street to Salamanca Road. From just south of the Boulcott Street overbridge it will be necessary to remove parking from both sides of the street to provide for a bus lane and two lanes of general traffic. However, if the road is widened to a minimum of 11 metres then a bus lane could be created and parking retained on the west side of the street. If a bus lane is to be provided in the evening peak the road will need to be widened to 12 metres. To do this and retain a footpath width of 1.5 metres would require an encroachment into adjacent properties. It is therefore proposed that a tidal flow system be installed which will provide three lanes, one for buses and one lane in each direction for general traffic.

Between Bowen Street and The Terrace off-ramp parking will also be removed from the western side of the street to aid the heavy demand of right turning traffic into Bolton Street and Aurora Terrace and the movement of traffic into numerous parking facilities in the area. The pedestrian crossing outside St Andrews church will be signalised to compensate for the removal of kerb extensions and to ensure pedestrian safety.

If an evening peak bus lane is provided for, not only will the top section of The Terrace need to be tidal flowed but parking will need to be restricted on the west side of The Terrace during its operation.

### **Bowen Street**

It is proposed to utilise the existing clearway parking lane for a bus lane in the peak direction on Bowen Street. This will require some minor signage and roadmarking changes to achieve within the existing road width.

### **Mulgrave Street**

It is proposed to remove parking on the east side of Mulgrave Street to provide for a bus lane in the morning peak on Mulgrave Street. If bus numbers warrant it in the future then the parking could be removed altogether to provide a fulltime bus lane. Midway along Mulgrave Street the signalised crossing adjacent to New World supermarket will need to be amended by removing the kerb extension and moving the signal pole back. At the southern end of Mulgrave Street it is proposed to install a bus advance facility at the Aitken Street signalised intersection to assist buses moving from the eastern kerbside lane to the western kerbside lane so as to access Lambton Interchange.

### **Molesworth Street**

Similarly an evening peak bus lane is proposed for Molesworth Street by removing kerbside parking on the western side of the street as far as Aitken Street and from both sides thereafter. Further creation of parking laybys will reduce the need to lose parking at peak times but will be costly to provide because of the need to relocate services in the existing footpath. The bus will need to merge with general traffic at May Street to negotiate the pedestrian crossing kerb extension unless this is removed and the crossing signalised.

### **Taranaki Street (Buckle Street to Courtenay Place)**

It is proposed that a bus lane be operated at peak times on both sides of Taranaki Street starting at Buckle Street and finishing north of its intersection with Courtenay Place. To do this parking will need to be removed to accommodate the bus lane. Outside bus lane operating times parking will be permitted. Bus priority in this area will advantage services to and from Mt Cook and campus connection buses which link Victoria and Massey university campuses in the area.

A number of intersections will need to be readjusted in response to the Inner City Bypass project in this area. Ghuznee Street will revert to a two-way street, Vivian Street will be reversed in direction and Arthur Street will be widened as a continuation of Buckle Street west to The Terrace tunnel. Kerblines and kerb extensions at Vivian/Taranaki Streets will need to be adjusted to facilitate the bus lane.

In the medium term, any opportunity to utilise signal pre-emption on this route will be explored to maximise bus progression along this route.

### **Willis Street (Webb to Manners Street)**

It is proposed to widen the street by narrowing the footpaths on both sides of the street. A one metre widening will enable three lanes to operate by removing parking on the western kerblines while parking remains on the east side of the street.

An alternative to road widening would be to remove parking from both sides of the street during the operation of the bus lane but this will require the lane markings to be moved. To do this, laning in the street would need to be managed by Dynamic lane line technology in such a way that it would enable the lanes to be moved to suit how the street is to be used at the time.

In the two-way section of Willis Street between Manners Street and Ghuznee Street the same would apply.

### **Victoria Street**

It is proposed to implement a bus lane by removing parking on the east side of Victoria Street from Manners Street to Webb Street. Some modest road widening will be required beyond Dixon Street and beyond Able Smith Street the road will need to be widened on the western side to enable a bus lane to be installed alongside two lanes of traffic. This could operate at all times on the basis that there is currently no kerbside parking through this area. But it could also revert to kerbside parking outside peak times adding valuable parking stock to the area until bus volumes dictate its full time use.

If four lanes can be achieved in Webb Street then better lane utilisation will assist buses through the Webb/Willis Streets intersection.

### **Kent and Cambridge Terraces**

It is proposed that the clearways on Kent and Cambridge Terraces be converted to bus lanes in the morning and evening peaks respectively. This has been started on Kent Terrace where the bus lane operates in the evening peak from Elizabeth Street to the Basin Reserve. Buses are given priority at the signalised pedestrian crossing at the Basin Reserve end to allow buses to move ahead of the general traffic to manoeuvre into the right hand lane for access to Newtown. This will be complimented by extending this facility southward to Courtenay Place. To achieve this, the central island will need to be narrowed at the Elizabeth Street end to enable a third lane to be created. Because of the footpath extension outside the Embassy Theatre the bus lane will start beyond this.

If bus volumes warrant it, the part time bus lanes on Kent and Cambridge Terraces could be made permanent at the expense of kerbside parking. Parking would remain against the central median, or if desirable, could be switched to the side of the businesses with bus boarders built to accommodate bus loading.

A further alternative would be to keep parking on both sides and convert one of the general traffic lanes to a full time bus lane.

Full time bus lane options will be explored as future demand dictates.

## **GROWTH SPINE**

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The growth spine looks to intensify development along the corridor between Johnsonville and the Airport. While the State Highway can provide the key freight and private transport corridor, public transport will need to deviate from this to more readily service the surrounding residential centres. The key corridor from Johnsonville to the city centre was the subject of the North Wellington Passenger Transport study. Options for this route were explored through that study. It was concluded that the rail line provide the key transport corridor with bus routes acting largely as feeder routes. There is however scope for this to be complimented by express buses using the state highway to link between developing northern areas and the city. Other feeder routes will serve the rail head at Johnsonville. The northern approach will consists of improvements to Kaiwharawhara Road and the introduction of bus lanes on the Hutt Road and Thorndon Quay. The route through the central city is proposed above and the route south is covered below. In principal the route south diverges via two principal routes. These routes converge at Kilbirnie using either Hataitai or Newtown. These routes are of equal importance. Neither has priority over the other in terms of developing priority measures. The Newtown route is important for its penetration into heavily populated areas, the presence of the education facilities, zoo, hospital and the possible future urban redevelopment of the Adelaide Road area. Equally, Hataitai offers the potential of catering for an increased number of express services between the city and the eastern suburbs of Miramar, Kilbirnie and Seatoun. With this in mind the following bus priority schemes have been developed.

## **SOUTHERN ROUTE**

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### **Adelaide Road (John Street to Basin Reserve)**

It is proposed to use the peak hour kerbside lane for a bus lane. The northbound morning peak hour lane is in operation and would be complimented by a southbound lane from the Basin Reserve to Hospital Road. A bus advance signal will enable buses to proceed in the kerbside lane to Riddiford Street or move to the middle lane to proceed south up Adelaide Road. The central median island is to be removed and replaced by a mast arm to enable straight through traffic for Adelaide Road to move unimpeded past traffic waiting to turn right into John Street.

At the northern end by the Basin Reserve it is proposed to control the pedestrian crossing with traffic signals. This is to manage the adhoc crossing of Adelaide Road by pedestrians who interrupt the efficient flow of traffic. It is expected that traffic signals will make travel time savings for both public transport and private motorist's alike and make the pedestrian crossing safer. It is likely that this work will be linked to the implementation of the Inner City Bypass to better coordinate traffic movement through this area of the Basin Reserve.

Adelaide Road has been identified as an urban renewal area as part of the city's growth spine. To meet future demands expected of this road so that it can serve new developments, provide access to the hospital and other regional facilities the road is proposed to be widened to accommodate a parking/bus lane in each direction together with two lanes in each direction divided by a central turning median. To do this, a road widening designation is required to future proof a road reserve of 26.5 metres (a widening of four metres on the current width). If streetscape amenity is to be provided in the street in the form of tree planting either in the centre of the road or at the edges, additional road width will be required. If central planting is required to mirror Kent and Cambridge Terraces then an additional 1.5 metres is probably desirable. A similar addition would provide for edge planting if preferred.

At the northern end of Adelaide Road bus priority will ultimately need to be achieved through grade separation between north/south local traffic and east/west State Highway traffic. It is expected that this will be highlighted and costed in the Ngauranga to Airport study.

At the southern end an improvement to the John Street intersection is required to address long standing safety issues and a lack of capacity. It is envisaged that the row of shops on the east side of the John Street intersection be moved back to create an extra lane to allow buses unimpeded access through the area. Widening the road will also allow the intersection to be reconfigured to improve safety particularly for pedestrians.

### **Riddiford Street (Mein Street to John Street)**

It is proposed to use the kerbside parking lane on Riddiford Street for a bus lane at peak times in both directions. The road is to be widened through this section as part of developing the new hospital and the new road cross section will enable bus lanes to operate at peak times in both directions. The northbound bus lane will end at the hospital's main entrance. A bus advance signal will enable buses to move ahead of other traffic approaching the John Street signals before bus lanes resume in both John Street and Adelaide Road. At the southern end the bus will use a bus advance signal at the signalised pedestrian crossing to advance southward. Buses progressing through Newtown will be able to continue in the left lane and utilise a peak hour kerbside lane through Newtown. Buses progressing up Rintoul Street will move to the straight ahead lane to then proceed to the right turn lane on Riddiford Street for access to Rintoul Street.

## **KILBIRNIE**

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### **Rongotai Road**

It is proposed to create a fulltime bus lane on both sides of Rongotai Road between Troy Street roundabout and Onepu Road. This can be achieved alongside the existing traffic lane while maintaining the parking lane. However, kerb extensions at pedestrian crossing points will need to be modified so that they do not extend beyond the line of the parking lane.

Between Onepu Road and Crawford Road a peak hour bus lane is proposed to be established by removing parking during peak hours in both directions. Loss of shopper parking at peak times will be a concern for local businesses especially those fronting the street in this location.

## **KILBIRNIE THROUGH NEWTOWN**

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### **Crawford Road**

It is proposed to provide a peak time bus lane on either side of Crawford Road by removing parking while the bus lane operates. Some localised road widening will also be required to achieve a continuous route along the road in addition to some island remodelling. Where kerb extensions have been installed to assist pedestrians at pedestrian crossings these will be removed and signals installed to maintain pedestrian safety.

At the Wellington Road roundabout the bus lane will be suspended before continuing on the departure side.

### **Constable Street**

It is proposed to remove parking from both sides of Constable Street at peak times to allow a bus lane to operate in the peak direction. It is envisaged that this would be controlled by variable lane markings using Dynamic lane line technology. This technique still needs to be pioneered and may possibly require a legalisation change to allow its operation.

The alternative is expensive civil works to widen the roadway. Road widening could be achieved by narrowing the footpaths on either side of the road and by removing kerb extensions at intersections. The road can not be sufficiently widened to retain kerbside parking at peak traffic times without the acquisition of properties. This has been dismissed because it is believed that this is an unaffordable option.

### **Riddiford Street (Newtown shopping street)**

It is proposed to remove parking at peak traffic times and remove kerb extensions from both sides of the street to allow for a bus lane in either direction. Formal street crossings for pedestrians will be established using traffic signals. It will be difficult to gain acceptance to the removal of parking through the shopping centre because of the impact on businesses. Alternative areas for parking in side streets will need to be explored, similar to the public off street parking area in Wilson Street. Opposition to the removal of

kerb extensions may also be prevalent. Kerb extensions were used as an integral element of the streetscape to improve pedestrian safety and amenity.

### **Alternative for Newtown shopping street**

An alternative to removing parking and increasing bus traffic through the shopping street is to create a link between Constable Street and Rintoul Street so as to run traffic in a one-way loop. That is, traffic would run southbound on Riddiford Street between Rintoul Street and Constable Street and northbound on Rintoul Street between an extension of Constable Street and Riddiford Street. This would not only assist bus movement through the area but would also cater for a growing demand for trips through the area while preserving the integrity of the shopping street.

A second alternative is to divert all traffic onto Rintoul Street and turn Riddiford Street into a mall. This would require removing parking from Rintoul Street between an extension of Constable Street and Riddiford Street. Also Green Street would need to be connected to Wilson Street for access. Creating Riddiford Street as a mall would allow further pedestrian and amenity improvements to be made to the shopping precinct.

## **KILBIRNIE THROUGH HATAITAI**

### **Kilbirnie Crescent**

It is proposed to remove parking at peak traffic times and remove kerb extensions from both sides of the street to allow for a bus lane in either direction. Formal street crossings for pedestrians will be established using traffic signals.

### **Kupe Street/Moxham Avenue**

To create a bus lane in the peak direction on Moxham Avenue the road will need to be widened and the parking on both sides removed. This will involve narrowing footpaths and relocating street side poles and services.

An alternative to civil works is to use Dynamic lane line technology along Moxham Avenue to alter the lane configuration by time of day. This will allow the bus lane to be tidal flowed in the peak direction.

## **NORTHERN ROUTES**

The northern routes into the city are via the Hutt Road and Kaiwharawhara Road. A morning peak bus lane operates on Kaiwharawhara Road from west of Old Porirua Road. The Hutt Road will ultimately provide a feeder route connecting bus lanes coming in off State Highway 1 and 2 as they are developed in liaison with Transit New Zealand.

### **Hutt Road**

It is proposed to widen the Hutt Road to provide a bus/parking lane into the city in the morning peak. It will require the footpath/cycle track to be moved along side the buildings and parking to be moved to the street. The parking lane will be used as a bus lane during the morning peak traffic period. It is proposed to start the bus lane at Onslow Road to pick up Khandallah services. This scheme however has the potential to be

extended back to Ngauranga as demand warrants. The demand for this extension will depend on the ability of the Johnsonville rail line to meet demand. However as express services from the north grow we will work with Transit to provide bus lanes on the state highway shoulders and link these through bus lanes on the Hutt Road as access to the city.

Travelling south, it is planned for the bus lane to converge at the Kaiwharawhara Road traffic signals. The bus lane will discontinue until after the Aotea overbridge before being continued on a widened carriageway using road reserve on the eastern side of the Hutt Road. Again roadside parking will give way to the bus lane in the peak period. There may need to be some further investigation into defining property boundaries abutting Tranzrail land between the rail overbridge and Tinakori Road as detailed plans are developed.

As part of developing better connectivity to the ferry terminal and the CentrePort development area a roundabout is planned just north of the Aotea overbridge on the Hutt Road. Provision for public transport priority through this area will be investigated in more detail as that project is developed.

If demand dictates there is scope for a northbound bus lane in the evenings; although this is not shown in present plans beyond Kiawharawhara Road. This will link to bus lanes on the state highways 1 & 2.

### **Thorndon Quay**

It is proposed to utilise the parking area on each side of Thorndon Quay in the peak direction for a bus lane. There is scope to retain parallel parking during the peak period bus lane operation. There are a number of kerb extensions that will require modification. The pedestrian crossings at Davis Street and Moore Street will be signalised for pedestrian safety. From Moore Street, buses will use the permanent central southbound bus lane to access the interchange. This will require the bus stop on the east side to be moved north of the crossing and a bus advance signal installed to give buses priority to move into the centre of the road ahead of other traffic.

It is again possible to make the bus lane permanent if demand dictates this by turning angle parking into parallel parking. However, local businesses are likely to oppose the reduction in kerbside parking. A further variation is to provide for bus stops against a built out bus boarder to allow the maximum kerbside for parking. While this will not achieve the same number of carparking spaces as angle parking it will provide additional parking currently taken up by bus stops. Also a permanent bus lane should be seen in the context of further development of the rail yards behind Thorndon Quay which opens up the possibility of extensive development which could include car parking to compensate for any demand for spaces lost from Thorndon Quay to provide for buses.

## **ROUTES FROM KEY SUBURBS**

### **Kaiwharawhara Road**

There is potential to extend the Kaiwharawhara Road bus lane to Perth Street at the top of Ngaio Gorge. This will provide an unimpeded morning peak bus lane into the city. There is scope to operate an evening peak bus lane if demand warrants this in the future.

## **ISLAND BAY**

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### **The Parade**

It is proposed to remove kerbside parking to provide a bus lane in the peak travel direction. The bus lane will stop through the Island Bay shopping centre and resume thereafter.

### **Adelaide Road (The Parade to John Street)**

It is proposed to remove kerbside parking to provide a bus lane in the peak travel direction. This can be achieved between The Parade and Wakefield Park while maintaining parking on the opposite side of the street.

Between Wakefield Park and John Street the road is too narrow to accommodate a bus lane without taking parking off both sides of the street and narrowing the footpath. However, there is little scope to narrow the footpath to sufficiently widen the road without incurring significant expense. An option is to use Dynamic lane line technology to alter the lane configuration by time of day. This will allow the bus lane to be tidal flowed in the peak direction within the existing road configuration.

Until demand dictates the need for dedicated bus lanes and because of the heavy demand for kerbside parking by residents it is proposed to extend the kerb out at the bus stops rather than remove parking in the section between Stoke Street and John Street. This will create bus boarders which the bus can pull alongside to pickup and set down passengers. This operation will however block the traffic lane while the bus is stopped but is not expected to be a significant disruption to motorist's although some patience will need to be exercised.

### **Rintoul Street**

A number of buses also use Rintoul Street as part of the Island Bay services. To provide bus priority through this area parking will need to be removed from both sides of the street and footpaths will need to be narrowed to achieve a bus lane in the peak direction. Even a technology solution such as Dynamic lane lines will require the removal of parking and repositioning of lane lines to enable a peak period bus lane to operate within the existing road width.

To maintain parking on one side of the street while the bus lane operates under tidal flow conditions would require the street to be widened by about one metre. This will be expensive because of the need to relocate kerbside poles and services.

## **MT COOK**

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### **Wallace Street**

It is proposed to remove kerbside parking to provide a bus lane at peak times in both directions. This can be achieved along John Street by removing parking from both sides of the street.

Between John Street and Bidwill Street it is too narrow to accommodate a bus lane without taking parking off both sides of the street. There is little scope to narrow the footpath to widen the road. Because of the heavy demand for kerbside parking by residents it is proposed to extend the kerb out at the bus stops rather than remove parking.

This will create bus boarders which the bus can pull alongside to pickup and set down passengers. This operation will however block the traffic lane while the bus is stopped but is not expected to be a significant imposition on motorist's although some patience will need to be exercised.

### **Taranaki Street (Bidwill Street to Webb Street)**

From the traffic signals at Bidwill Street to Webb Street it is proposed to widen the road by cutting back the footpath on the west side of Taranaki Street. This will create a bus lane in both directions at peak times with kerbside parking at off peak times.

## **BROOKLYN**

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It is proposed to create a peak hour bus lane on Brooklyn Hill Road. This will be achieved by removing kerbside parking from Washington Avenue to Webb Street. There are some sections that will require retaining structures to be modified or installed to allow the bus lanes to operate in both directions at peak times. Between Todman Street and Washington Avenue parking would need to be removed from both sides of the street. There is little scope to widen the road through this section without extensive physical works so it is proposed that the section be managed using Dynamic lane line technology to enable the traffic lanes to be moved to suit the direction of the bus flow. Some modification of traffic islands and footpaths will be required to achieve this.

## **KARORI ROUTE**

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This proposal runs from the Karori Terminus along Karori Road, Chaytor Street, Glenmore Street, Tinakori Road and Bowen Street. Two sections of the bus lane are in place; a permanent bus lane on Chaytor Street to the city and an evening peak bus lane on Glenmore Street from The Rigi to Upland Road intersection.

### **Karori Road**

It is proposed to remove parking in the peak direction on Karori Road. A number of kerb extensions and traffic islands will need to be removed to accommodate the bus lane. Two sections; Donald Street to Fancourt Street and Lancaster Street to Flers Street will need extensive physical works carried out in the form of retaining walls to enable the road to be widened sufficiently to provide for a bus lane.

An alternative is to use Dynamic lane line technology in these locations to run a tidal bus lane in the peak travel direction. The use of traffic signals will enable buses to advance ahead of general traffic at these converge points to maintain a reliable progression along the route.

### **Chaytor Street**

To provide for a morning and evening bus lane operation in the peak direction kerbside parking would need to be removed and banks would need to be cut back on the western side of the road. However, the cost of cutting back banks is expensive so it is proposed

that a tidal system operate in the section starting north of Curtis Street to north of Joll Street.

As an incremental approach, the existing citybound bus lane would be extended to Old Karori Road as a morning peak extension after which the tidal flow system proposed would be implemented as demand dictated.

In the section between Curtis Street and the Karori tunnel the citybound bus lane would continue to operate at all times with the introduction of a Karori bound evening peak bus lane utilising the kerbside parking area alongside Appleton Park.

### **Glenmore Street**

It is proposed that Glenmore Street is widened in areas to achieve a 12 metre wide road. Kerbside parking would be removed in the peak traffic direction to provide a bus lane along the street. Two pedestrian crossings outside the Botanical Gardens at the main entrance and Orangi Kaupapa Road would be replaced with signalised pedestrian crossings to maintain pedestrian safety because the kerb extensions could no longer be retained.

# Appendix 3

## Typical Bus Priority Techniques

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### **BUS PRIORITY MEASURES**

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#### **Bus lanes**

Bus lanes are dedicated carriageway lanes that are created adjacent to existing traffic lanes or replace existing traffic lanes. They provide a dedicated right of way for buses so that they are not subject to general traffic conditions and have an uninterrupted priority over lengths of street allowing buses to pass queued traffic. The advantages to bus lanes are seen to:

- Allow the bus to move unhindered to the ‘front of the queue’.
- Make the trip for bus passenger quicker and more reliable.
- Allow buses to make pick-ups and drop-offs without disrupting other traffic.
- Allow bus routes to be kept clear of parked cars.

#### **Operation**

A bus lane can operate at all times. However many of the city’s bus lanes operate at peak traffic times only, being 7am to 9am in the morning and 4pm to 6pm in the evenings. Some bus lanes operate at both these times. There is growing evidence that these operating times will need to be extended to meet heavy traffic demand spreading over a longer peak period. Outside peak times the bus lane can be used for parking, loading, or general traffic usage.

Cyclists, motorcyclists and emergency vehicles can use a bus lane. All other vehicles are prohibited. Vehicles are not permitted to stop or park on a bus lane during its operation.

A bus lane can be used for up to 50 metres to exit or enter a side street or driveway.

#### **Markings and signs**

Bus lanes are marked on the road with the words “BUS LANE” in white roadmarking paint. The words are repeated along the length of the lane at intervals not exceeding 100 metres to remind motorists of their existence.

Signs are used if the lane does not operate at all times. The hours of operation are shown on a sign positioned adjacent to the lane.

### **Greening bus lanes**

Bus lanes were first painted green in 2003. This was done to:

- Effectively highlight the existence of a bus priority lane.
- Increase the observance by a majority of law abiding motorists.
- Produce a feeling of special treatment for bus passengers which results in a more positive attitude to the use of public transport.
- Put the enforcement agency in a better position of countering claims of lack of awareness.
- Convey a sense of permanence of the measure and commitment to public transport.

While the whole length of the bus lane has been painted to date it is planned to only paint green blocks intermittently along the length of the lane in the future to reduce the cost of maintaining the lanes and to reduce the visual impact of painting on the surrounding area

### **Contra Flow Bus Lanes.**

These are used on city streets where buses are run in the opposing direction to traffic in a one-way street. In Wellington this type of lane is operated southbound on Lambton Quay and in Willis Street. These lanes are marked “Buses Only” to exclude all other vehicles. This is because it is unsafe for other vehicles to operate in the same lane. The contra-flow lane is only one lane wide and offers no passing opportunity without traffic pulling out in direct conflict with opposing traffic. It would therefore be unsafe to allow cyclists or other vehicle which can not pass a stopped bus to use the lane. There use is highly effective in congested inner city environments but are known to cause safety issues with unwary pedestrians who can be caught out by the infrequent presence of buses.

### **Transit lanes**

Whereas bus lanes allow only buses, cyclists, motorcyclists, and emergency vehicles to use them transit lanes can open their use to vehicles carrying a number of passengers. Transit lanes can define the number of people that must be in the vehicle before the vehicle can use the transit lane. Typically these are classed as T2 and T3 lanes where the number denotes the number of people required to be in the vehicle before the vehicle can use the lane. With appropriate enforcement, the use of these lane classifications offer the Council wider flexibility to best utilise the road space dedicated for such purposes.

### **Bus pockets**

Bus pockets are installed where the bus requires priority at an intersection to advance ahead of traffic such as with a bus advance signal or where the bus needs to manoeuvre through an intersection contrary to other vehicle movements. This technique can be successfully used to exploit lanes where there is less traffic, less delay due to lower traffic demand or freer flow to allow the bus to bypass busier lanes.

### **Bus advance signal**

A bus advance signal is a phase for buses at a traffic signal controlled intersection. The bus movement through the intersection is controlled with a white “B” phase signal. This signal allows busses to move through the intersection ahead of other traffic. They are particularly useful if a bus needs to move out of a bus lane into a traffic lane to make a turn.

### **Bus boarders**

A bus boarder allows a bus to load passengers away from the natural kerbline. They are often used in areas where parking is at a premium and it is difficult for the bus to get to the kerb. When a bus platform is used it often means the bus will stop in the traffic lane and vehicles will either need to wait behind the bus or manoeuvre carefully past the bus if the roadway is clear. When the bus moves away from the platform it can do so without having to give way to traffic. This reduces the time taken by the bus to leave or rejoin the traffic stream.

Bus boarders can also be successfully used to reduce the loss of kerbside parking in areas of high parking demand where car parking would otherwise be lost to provide for a bus stop.

### **Signal pre-emption**

Signal pre-emption uses an intelligent detection system to alter the traffic signal timings in favour of the bus. If a bus is running late it will give more green time to the signal phase to get the bus through thus saving it having to stop and start again. Also if the signals are on red it will shorten the active phase and bring forward the green phase for the bus so as to minimise any delay. Typically up to a ten second adjustment to the signal timings can make significant travel time savings for the bus with no real disadvantage or delay to other traffic.

Absolute signal pre-emption would mean that buses always get green lights and would only stop en route to pick up and set down passengers

### **Electronic ticketing**

A ticketing system that will allow issuing tickets off the bus. This will remove the need for driver interaction and reduce boarding times. It also allows for other initiatives such as integrated ticketing and linkage to other intelligent technology solutions. A further spin off of ITS use is for information gathering to better understand traveller needs, to tailor services and to provide other traveller information.

### **Dynamic lane line technology – tidal lane application**

The use of Dynamic lane lines is new technology proposed to be used in a new application. As such the application is untested and may need specific approval to be used in the way proposed. It is proposed to use Dynamic lane lines to more effectively use the existing road cross section to achieve bus priority by being able to reconfigure parking and traffic lanes on an existing road so that space can be created to operate a bus lane. It has been identified that a number of Wellington city streets investigated for bus lanes have insufficient width to provide a bus lane without widening the street. Typically if a minimum road width of 12 metres can be achieved then a number of possibilities are available for bus priority measures to be implemented. With 12 metre road widths bus lanes can be implemented without the need to reconfigure lane markings. Although in many cases it is possible to widen the road by narrowing the footpath this will be very expensive because of the cost of moving street side poles and services. However, in most cases by removing parking off both sides of the street three lanes can be created so that a bus lane can operate in the peak travel direction. By using Dynamic lane lines the lanes in use can be lit and different lane configurations achieved for each situation during the course of the day to meet demand. By being able to vary the lane arrangement at different times will also enable parking to be maintained outside the peak travel times when buses are not using the space. The concept is very similar to a tidal flow situation commonly

used on road networks around the world except with the added complexity of physically moving the lane positions.

### **Enforcement**

Council's will soon be able to apply to the Commissioner of Police for the power to enforce bus lanes. The police at present do not give enforcement high priority when weighed against other demands on their time. The process for enforcement of bus lanes is a very labour intensive exercise because of the burden to obtain proof of an offence for the successful prosecution of offenders. It may be that with the increased use of smart technology the onus to record and provide information on an offence can be reduced or at least streamlined in the future.

It is necessary to enforce bus lanes to:

- Maintain road safety particularly for pedestrians and right turning vehicles who don't expect cars, which are less visible, to be in the bus lane.
- Protect the unimpeded progress of buses to avoid reducing trip reliability.
- To protect travel time savings available to buses and avoid increases in passenger trip times.
- To act as a deterrent to errant drivers.
- To maintain the goodwill of law abiding motorists who will become frustrated at others using the bus lane and seeing no enforcement leading to further illegal use.

As part of the bus priority plan enforcement is seen as integral to being more flexible in how they might be used. At present bus lanes are restricted to use by buses, cyclists, motorcyclists, and emergency vehicles. Service vehicles and taxis have been excluded to ensure the gains made for buses are preserved. To allow taxis, service vehicles or vehicles carrying a prescribed number of passengers would require active enforcement because to do otherwise would encourage others to use the bus lanes thus undermining the benefits gained for buses. While not critical at this point because of the small number of bus lanes the issue of better utilisation of future lanes needs to be addressed. With enforcement, more utilisation of transit lanes could be made particularly on routes where bus volumes are low. Also in areas of the city where the creation of a bus lane may preclude general traffic then more consideration can be afforded to other vehicles that may have justification for using the same facility.

## **Appendix 4**

### **Typical Application of Dynamic Lane Lines**

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