# Route Optimisation Programme 2013-2014 Results and Final Year Update

## Recommendations

That the Board:

i. Notes the update report for the third year of the route optimisation programme.
ii. Notes the direction for the route optimisation programme to be incorporated into the broadened Network Operating Plan (NOP) Optimisation programme.

## Executive summary

Route optimisation is an established programme to provide network efficiency, defined in terms of movement of people and goods, through traffic signal optimisation in conjunction with corridor operational assessment and minor improvements. The programme is currently in its final year of a four year programme. This report covers the third year results.

Since the introduction of the route optimisation programme, the strategic direction has steadily broadened to include additional metrics related to improving network efficiencies for all modes, and has been applied using the Auckland Network Operating Plan (ANOP), which translates strategic modal priorities into aspirational performance levels for routes on the network based on place and function, with priorities varied by time of day as and when appropriate.

Within the city centre, walking experience has been improved by reducing average waiting times at traffic signals, typically by 10 to 15s per intersection. Improvements to bus use has also taken place, particularly along the busy Fanshawe Street corridor, where the introduced bus lane has provided a consistent and reliable journey experience for the route.

Improved coordination between traffic signals on key corridors both within the city centre, but more so in routes outside the city centre has generally improved travel times for both general traffic and freight.

**A summary and results for the 2013-2014 (third year of the programme)** are:

- a further 30% of the region's 334km of urban arterial roads (30 routes and approximately 100km) was optimised, bringing the accumulative coverage for the programme to 70%.
- greater emphasis on multi-modal accessibility and optimisation in the city centre. Routes outside the city centre had greater emphasis on through movement functionality.
- optimisation focused on signal changes and minor works projects, such as changes to lanes, providing additional pedestrian crossings and rationalising turning movements at signals. Capital works have been undertaken to the value of $2.1 million.
- estimated first year Benefit Cost Ratio (BCR) as follows:
  - routes within the city centre: 14.0
  - routes outside the city centre: 13.4

**The current 2014-2015 route optimisation programme forms the final year of the programme** and is set to:

- optimise the remaining 30% of the arterial network
- incorporate traffic signal phasing improvements and related minor capital works projects in the Central isthmus, South and 2 routes in the North
- implement capital works to the value of $2.5 million, comprising minor capital works projects primarily developed through the 2013-2014 year programme, and implemented during the 2014-2015 year, due to programme timing
- results for this final year will be reported next year.

**The four year route optimisation programme** as a whole is estimated to have:

- overall combined first year BCR of 11.0, for combined capital works totalling $6.5 million.

**Going forward**, the future direction for the programme is two-fold:

1. Continue **Routine Optimisation** or traffic signal review across the network, approximately a quarter of the arterial network per year over four year cycles. In doing so, the network remains at a high level of efficiency.

2. Broaden the current scope of the route optimisation programme into the **Network Operating Plan (NOP) Optimisation programme**. The NOP Optimisation programme considers the wider and multi-modal network, and incorporates the context of the One Network, combining with the Metro-Efficiency Projects (MEP) programme being developed jointly with NZTA regarding the arterial and State Highway network.

For 2015-2016, the NOP Optimisation programme will have a particular focus on network efficiencies through the optimisation of movement within ten metropolitan centres, in the similar way to how the city centre optimisation has been undertaken. The programme will also

implement remaining capital works projects developed through the final year of the four year route optimisation programme and additional NOP-related efficiency improvement projects.

## Strategic context

Route optimisation is an established programme to provide network efficiency, defined in terms of movement of people and goods, through traffic signal optimisation in conjunction with corridor operational assessment and minor improvements. It directly improves the efficiency and flow of general traffic, freight, public transport, pedestrians and cyclists on the arterial roads of the Auckland region, thereby forming strong linkages to the following Auckland Transport strategic themes:

- build network optimisation and resilience (through the route and network-wide optimisation, network options, transport development and congestion management);
- prioritise rapid, high frequency public transport (in particular around the latter); and
- transform and elevate customer focus and experience (by supporting improved customer travel experience and place-making, and enabling modal choices).

The current region-wide route optimisation programme provides a coordinated approach and regular review of the signal performance and operation on strategic routes throughout the wider region on a four year cycle. By broadening this programme to adopt the recently approved ANOP, it provides increased ability to enable the Auckland road network to perform to plan, in closer alignment with the Integrated Transport Programme, Auckland Transport Strategies, and the Auckland Plan.

## Background

The long term projected outcome of the route optimisation programme is to maximise use of the existing arterial network by ensuring the traffic signals are working as efficiently as possible, as well as provide an understanding of specific operational issues on the arterial routes relative to the ANOP. This programme also identifies opportunities of a minor capital nature, such as the introduction of bus and/or transit lanes, additional pedestrian facilities and phasing, and further contributes to optimising the existing network from a multi-modal perspective.

To date 70% of the Auckland arterial roads network has been reviewed through the route optimisation programme, with the remaining 30% being covered in the final year (2014-2015) quarter part of the programme.

In 2011-2012, Auckland routes with obvious congestion were improved and this resulted in large benefits relative to expenditure. In 2012-2013, there were more moderate benefits as some of the routes covered were already operating at relatively efficient levels.

The 2013-2014 programme focused on the city centre, to align network operations to accommodate recent changes to the Public Transport services and land use changes that have required increased attention to pedestrian movements. By actively applying the ANOP, modal priorities adjusted by time of day were able to be applied, effectively resulting in significant multi-modal benefits.

Routes optimised to date in this programme are shown in Attachment 1. Routes being optimised in 2014-2015 are shown in Attachment 2.

**Achieved Benefits for the 2013-2014 year and overall programme**

The 2013-2014 programme targeted the inner city for efficiency with increased access and safety improvements. Gains achieved for public transport and pedestrians within the city centre played a significant role in contributing to increased efficiencies (BCR of 14).

Typically, benefits associated with network improvements are determined based on travel time reductions for private vehicle users, reductions in vehicle operating costs, improved safety and reduced maintenance costs. This approach was applied for those routes outside the city centre, and resulted in first year benefits of 97,000 hours of travel time savings and 190 tonnes of $CO_2$ emissions reduction.

For routes within the city centre, the inclusion of pedestrian, cyclist and public transport user benefits were considered due to the significance thereof relative to the ANOP and the particular magnitude of the pedestrian and public transport movements within the city centre. Details regarding the benefits achieved are reported in Attachment 3.

Overall summary of the measured results of the programme to date is tabled below:

| Year | | Network Optimised % | Network Optimised Km | Cost $ | First Year BCR |
|---|---|---|---|---|---|
| 1 | 2011-12 | 10 | 34 | 1.24m | 11.4 * |
| 2 | 2012-13 | 30 | 100 | 0.66m | 5.5 * |
| 3 | 2013-14 | 30 | 100 | 2.10m | 13.7 ** |
| *4* | *2014-15* | *30* | *100* | *2.50m* | *10* *** |
| | **Total** | **100** | **334** | **6.50m** | **11.0 ****** |

Notes:

1. * Reported in previous Board reports.
2. ** Measured results for 2013-2014 are for city centre routes and 2 routes in outlying areas. The average of the achieved BCR is used in this table (14 and 13.4).
3. *** Anticipated BCR for the 2014-2015 route optimisation programme in progress. NOP business case document cites expected BCR based on past delivery ranging between 10 and 18. The lower/conservative value is used here.
4. **** Estimated BCR for the overall four year programme based on the average for the previous three years.

Based on benefit results from the first three years of the four year programme, and anticipated benefits in the current final year, the programme as a whole is estimated to have a combined first year BCR of 11.0, for combined capital works totalling $6.5 million.

## Issues and options

The route optimisation programme is currently in the final year of its initial four year programme. With continued increase in travel demand related to Auckland growth and changing travel patterns, benefits achieved in the first year of the route optimisation programme can quickly diminish by 10% to 40% in the five year period post-optimisation. This can best be quantified by comparing route efficiency trends where there is no routine optimisation, and where routine optimisation is undertaken, shown in Attachment 4.

There is therefore a need for continued and regular routine optimisation of arterial routes to retain optimised performance of the network, beginning with those routes last optimised close to four years ago.

**Future direction for the programme as Network Operating Plan Optimisation programme**

Since its inception in 2011-2012 the route optimisation programme has achieved on-going benefits as the programme progressed, particularly as multi-modal approach was adopted into the programme through the application of the ANOP. The programme however has tended to be primarily focussed on traffic signal operation, which significantly contributes to corridor efficiency, but does not necessarily address broader network-wide and multi-modal deficiencies.

Consequently, based on the above and the need for routine optimisation to enable optimised traffic signal operation, the future direction for the programme is being developed to take a two-fold approach, as follows:

1. Undertake **Routine Optimisation** review of the arterial network, over a four year cycle maintaining an optimised level of efficiency.

2. Broaden the current scope of the route optimisation programme into the **Network Operating Plan (NOP) Optimisation programme**.

The NOP Optimisation programme considers the wider and multi-modal network, and incorporates the context of the One Network, combining with Metro-Efficiency Projects (MEP) programme being developed jointly with New Zealand Transport Agency (NZTA) regarding the arterial and State Highway network. NZTA (Auckland) have a current commitment to deliver MEP projects within Auckland to an average value of $6 million/year for the next three years. The NOP Optimisation programme is intended to compliment this NZTA commitment with MEP-related projects located on the organisations network. Given the State Highway-related nature of the MEP programme, these projects tend to be primarily people and freight throughput focussed.

For 2015-2016, the NOP Optimisation programme has a particular focus on the optimisation of movement and network efficiencies within ten metropolitan centres, in the similar approach way to the city centre optimisation. The programme will also implement remaining capital works projects developed under the final year of the four year route optimisation programme and additional NOP-related efficiency improvement projects.

## Next steps

Complete the current Route Optimisation programme, with related projects being incorporated into the NOP Optimisation Capital Works programme.

Prepare and develop a prioritised Routine Optimisation programme for the next four years, in collaboration with Auckland Transport Operations Centre (ATOC) and NZTA.

Continue and further develop the NOP Optimisation programme, incorporating metropolitan centre-related projects, MEP projects and additional NOP-related efficiency improvement projects.

## Attachments

| Attachment Number | Description |
|---|---|
| 1 | GIS map of Route Optimisation completed to date |
| 2 | GIS map of Route Optimisation programme for 2014-2015 |
| 3 | Additional information on Achieved Benefits for the 2013-2014 programme |
| 4 | Benefits of Routine Optimisation – Technical note |

## Document ownership

| | | |
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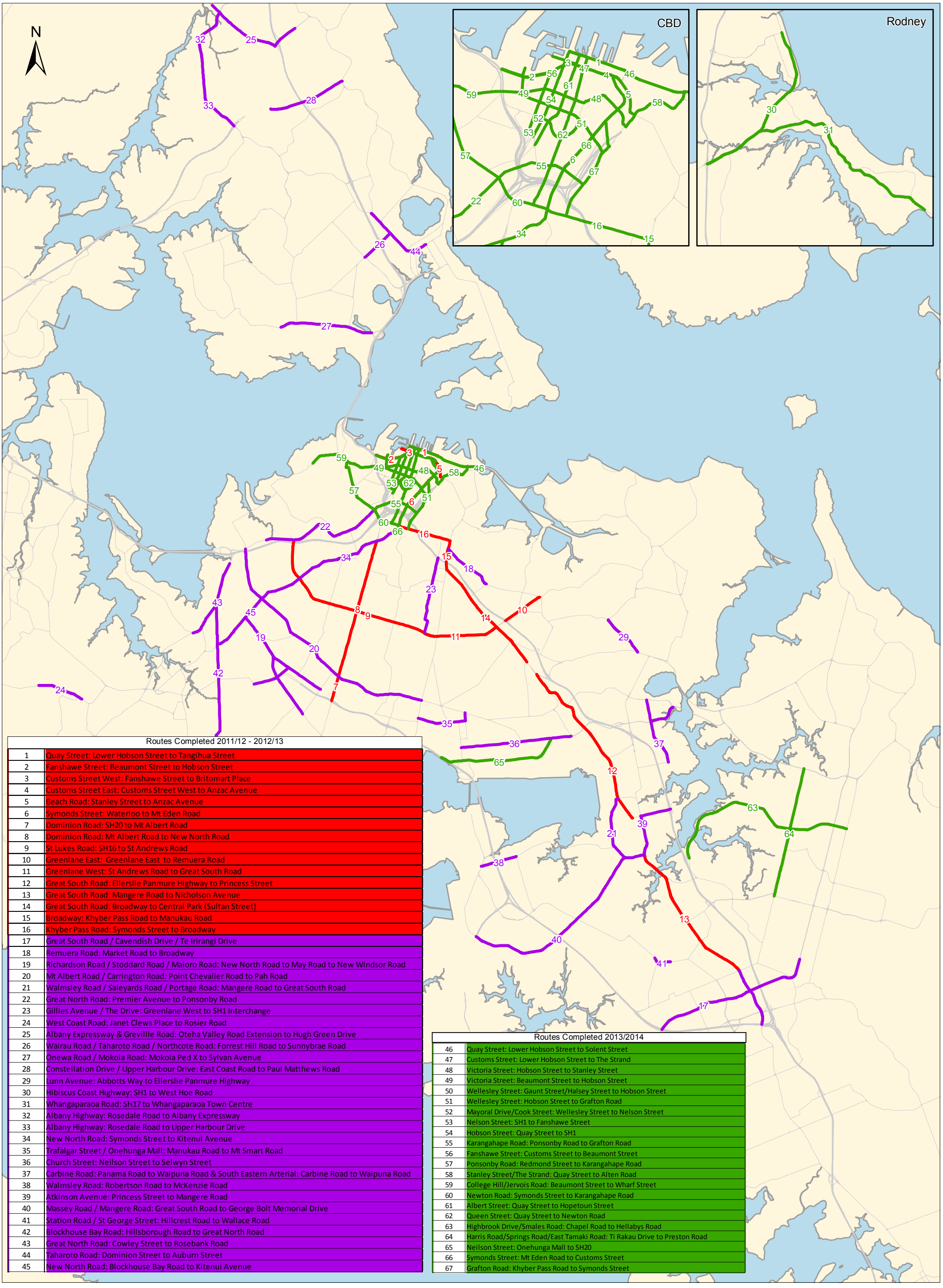
# Glossary

| Acronym | Description |
|---|---|
| NOP | Network Operating Plan |
| ANOP | Auckland Network Operating Plan |
| BCR | Benefit Cost Ratio |
| MEP | Metro-Efficiency Project |
| NZTA | New Zealand Transport Agency |
| ATOC | Auckland Transport Operations Centre |




| Routes Completed 2011/12 - 2012/13 | |
|---|---|
| 1 | Quay Street: Lower Hobson Street to Tangihua Street |
| 2 | Fanshawe Street: Beaumont Street to Hobson Street |
| 3 | Customs Street West: Fanshawe Street to Britomart Place |
| 4 | Customs Street East: Customs Street West to Anzac Avenue |
| 5 | Beach Road: Stanley Street to Anzac Avenue |
| 6 | Symonds Street: Waterloo to Mt Eden Road |
| 7 | Dominion Road: SH20 to Mt Albert Road |
| 8 | Dominion Road: Mt Albert Road to New North Road |
| 9 | St Lukes Road: SH16 to St Andrews Road |
| 10 | Greenlane East: Greenlane East to Remuera Road |
| 11 | Greenlane West: St Andrews Road to Great South Road |
| 12 | Great South Road: Ellerslie Panmure Highway to Princess Street |
| 13 | Great South Road: Mangere Road to Nicholson Avenue |
| 14 | Great South Road: Broadway to Central Park (Sultan Street) |
| 15 | Broadway: Khyber Pass Road to Manukau Road |
| 16 | Khyber Pass Road: Symonds Street to Broadway |
| 17 | Great South Road / Cavendish Drive / Te Irirangi Drive |
| 18 | Remuera Road: Market Road to Broadway |
| 19 | Richardson Road / Stoddard Road / Maioro Road: New North Road to May Road to New Windsor Road |
| 20 | Mt Albert Road / Carrington Road: Point Chevalier Road to Pah Road |
| 21 | Walmsley Road / Saleyards Road / Portage Road: Mangere Road to Great South Road |
| 22 | Great North Road: Premier Avenue to Ponsonby Road |
| 23 | Gillies Avenue / The Drive: Greenlane West to SH1 Interchange |
| 24 | West Coast Road: Janet Clews Place to Rosier Road |
| 25 | Albany Expressway & Grevillle Road: Oteha Valley Road Extension to Hugh Green Drive |
| 26 | Wairau Road / Taharoto Road / Northcote Road: Forrest Hill Road to Sunnybrae Road |
| 27 | Onewa Road / Mokoia Road: Mokoia Ped X to Sylvan Avenue |
| 28 | Constellation Drive / Upper Harbour Drive: East Coast Road to Paul Matthews Road |
| 29 | Lunn Avenue: Abbotts Way to Ellerslie Panmure Highway |
| 30 | Hibiscus Coast Highway: SH1 to West Hoe Road |
| 31 | Whangaparaoa Road: SH17 to Whangaparaoa Town Centre |
| 32 | Albany Highway: Rosedale Road to Albany Expressway |
| 33 | Albany Highway: Rosedale Road to Upper Harbour Drive |
| 34 | New North Road: Symonds Street to Kitenui Avenue |
| 35 | Trafalgar Street / Onehunga Mall: Manukau Road to Mt Smart Road |
| 36 | Church Street: Neilson Street to Selwyn Street |
| 37 | Carbine Road: Panama Road to Waipuna Road & South Eastern Arterial: Carbine Road to Waipuna Road |
| 38 | Walmsley Road: Robertson Road to McKenzie Road |
| 39 | Atkinson Avenue: Princess Street to Mangere Road |
| 40 | Massey Road / Mangere Road: Great South Road to George Bolt Memorial Drive |
| 41 | Station Road / St George Street: Hillcrest Road to Wallace Road |
| 42 | Blockhouse Bay Road: Hillsborough Road to Great North Road |
| 43 | Great North Road: Cowley Street to Rosebank Road |
| 44 | Taharoto Road: Dominion Street to Auburn Street |
| 45 | New North Road: Blockhouse Bay Road to Kitenui Avenue |

| Routes Completed 2013/2014 | |
|---|---|
| 46 | Quay Street: Lower Hobson Street to Solent Street |
| 47 | Customs Street: Lower Hobson Street to The Strand |
| 48 | Victoria Street: Hobson Street to Stanley Street |
| 49 | Victoria Street: Beaumont Street to Hobson Street |
| 50 | Wellesley Street: Gaunt Street/Halsey Street to Hobson Street |
| 51 | Wellesley Street: Hobson Street to Grafton Road |
| 52 | Mayoral Drive/Cook Street: Wellesley Street to Nelson Street |
| 53 | Nelson Street: SH1 to Fanshawe Street |
| 54 | Hobson Street: Quay Street to SH1 |
| 55 | Karangahape Road: Ponsonby Road to Grafton Road |
| 56 | Fanshawe Street: Customs Street to Beaumont Street |
| 57 | Ponsonby Road: Redmond Street to Karangahape Road |
| 58 | Stanley Street/The Strand: Quay Street to Alten Road |
| 59 | College Hill/Jervois Road: Beaumont Street to Wharf Street |
| 60 | Newton Road: Symonds Street to Karangahape Road |
| 61 | Albert Street: Quay Street to Hopetoun Street |
| 62 | Queen Street: Quay Street to Newton Road |
| 63 | Highbrook Drive/Smales Road: Chapel Road to Hellabys Road |
| 64 | Harris Road/Springs Road/East Tamaki Road: Ti Rakau Drive to Preston Road |
| 65 | Neilson Street: Onehunga Mall to SH20 |
| 66 | Symonds Street: Mt Eden Road to Customs Street |
| 67 | Grafton Road: Khyber Pass Road to Symonds Street |



Legend

Complete Routes 2011/12 - 2013/14

- 2011/2012
- 2012/2013
- 2013/2014

# Route Optimisation Programme
## Completed 2011-2014

Kilometres 0 1 2

Scale 1:100,000 @ A3

Date: 04-09-2012

| | Draft | Rev1 | Rev2 |
|---|---|---|---|
| Drawn By: | | | |

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| Planned Routes 2014/2015 | |
|---|---|
| 1 | Glenfield Road: Sunset Road to Downing Street |
| 3 | Lake Road: Northcroft Street to Williamson Avenue |
| 4 | Rata Street: Rosebank Road to Margan Avenue |
| 5 | Rosebank Road: Jomac Place to Blockhouse Bay Road |
| 6 | Lincoln Road: SH16 to Great North Road |
| 7 | Henderson Town Centre |
| 8 | Great North Road:Norcross Avenue to Clark Street |
| 9 | Papakura Town Centre |
| 10 | Chapel Road: Kilkenney Drive to Dawson Road |
| 11 | Great South Road: Redoubt Road to Mahia Road |
| 12 | Ti Rakau Drive: Gossamer Drive to Chapel Road (subject to roadworks) |
| 13 | Pakuranga Road: Bucklands Beach Road to Glenmore Road |
| 14 | Manukau Road/Pah Road: Great South Road to SH20 |
| 15 | Manukau Station Road/Wiri Station Road: Redoubt Road to Roscommon Road |
| 16 | Ormiston Road: Preston Road to Murphy's Road |
| 17 | Te Irirangi Road/Botany Road: Cascades Road to Dawson Road (subject to roadworks) |
| 18 | East Tamaki Road: Preston Road to Great South Road |
| 19 | Browns Road: Roscommon Road to Orams Road |
| 20 | Roscommon Road: SH20 to Browns Road |
| 21 | Mt Wellington Highway: Waipuna Road to Sylvia Park Road |
| 22 | Tiverton Road/Wolverton Street: Maioro Road to Portage Road |
| 23 | Parnell Road: St Stephens Avenue to Khyber Pass Road |



Legend

Stage 1 Planned | Stage 2 Investigation | Stage 3 Traffic Signal Changes

# Route Optimisation Programme 2014/2015

0 1 2 Kilometres

Scale 1:100,000 @ A3

Date: 04-09-2012

| | Draft | Rev1 | Rev2 |
|---|---|---|---|
| Drawn By: | | | |

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## Attachment 3

# Additional information on Achieved Benefits for the 2013-2014 programme

The SmartRoads tool used in conjunction with the ANOP enables net benefits associated with multi-modal changes to be translated and represented in terms of overall network performance impacts of the optimisation introduced. This also considers the network by time of day. The figure below is a snapshot of the SmartRoads tool representing overall benefits achieved during the interpeak periods, where significant benefits for pedestrians in particular were possible through several measures. These measures included:

- reducing average waiting times for pedestrians at the traffic signals. This was generally applied at all traffic signals during the interpeak, and to a lesser degree during peak periods where specifically appropriate and possible.

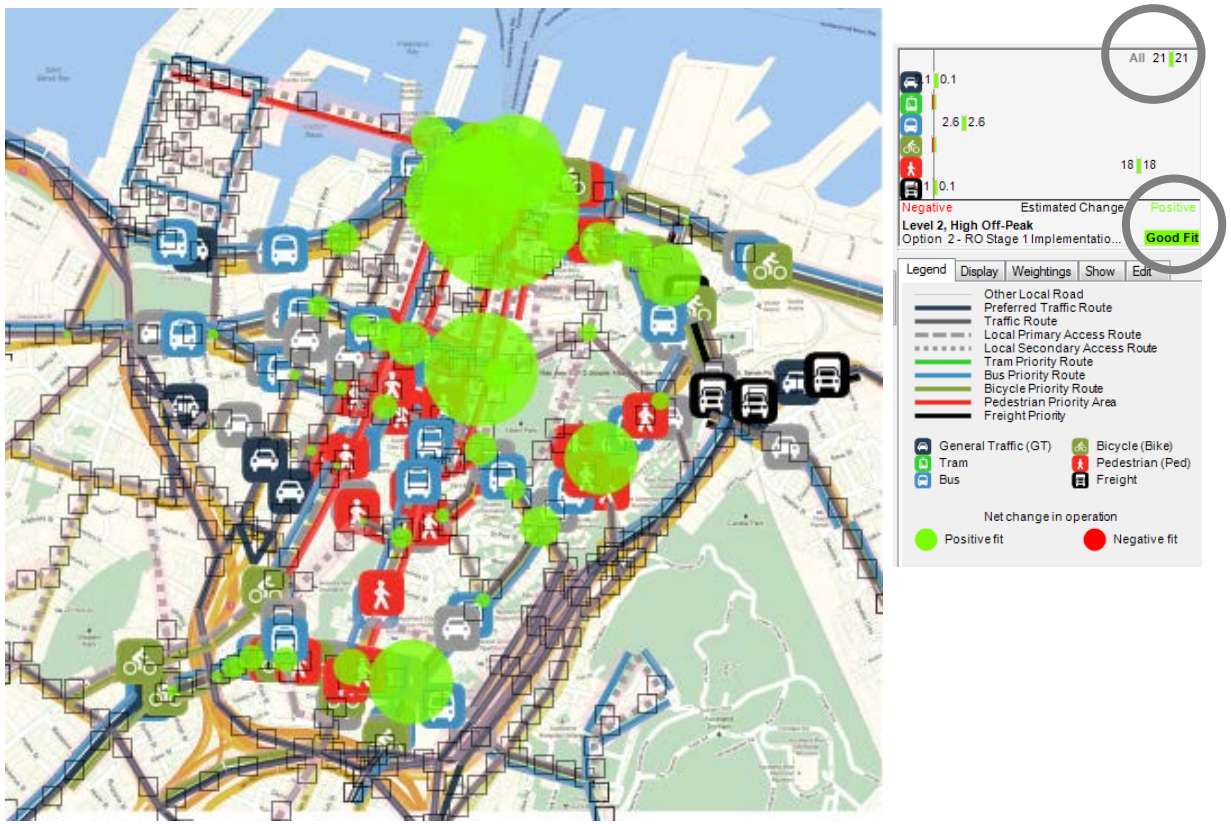
- pedestrian phase re-introduction (whereby a pedestrian phase is able to be re-introduced after it has already been run, during the same vehicle phase it is associated with). This particularly applies across one-way approaches and between traffic islands where appropriate. Examples are at all pedestrian crossings across Hobson Street at all intersections along the route; and across High Street at Victoria Street.

- additional pedestrian crossings where these were previously missing. A good example is at the Sturdee St/Fanshawe St/Nelson St/Market Pl intersection, where additional pedestrian crossings are complete across Fanshawe Street east, Sturdee Street and Market Place.

- extended pedestrian green times, where pedestrian green times are able to be greater than the standard 6 seconds, such as across Tangihua Street at Beach Rd.

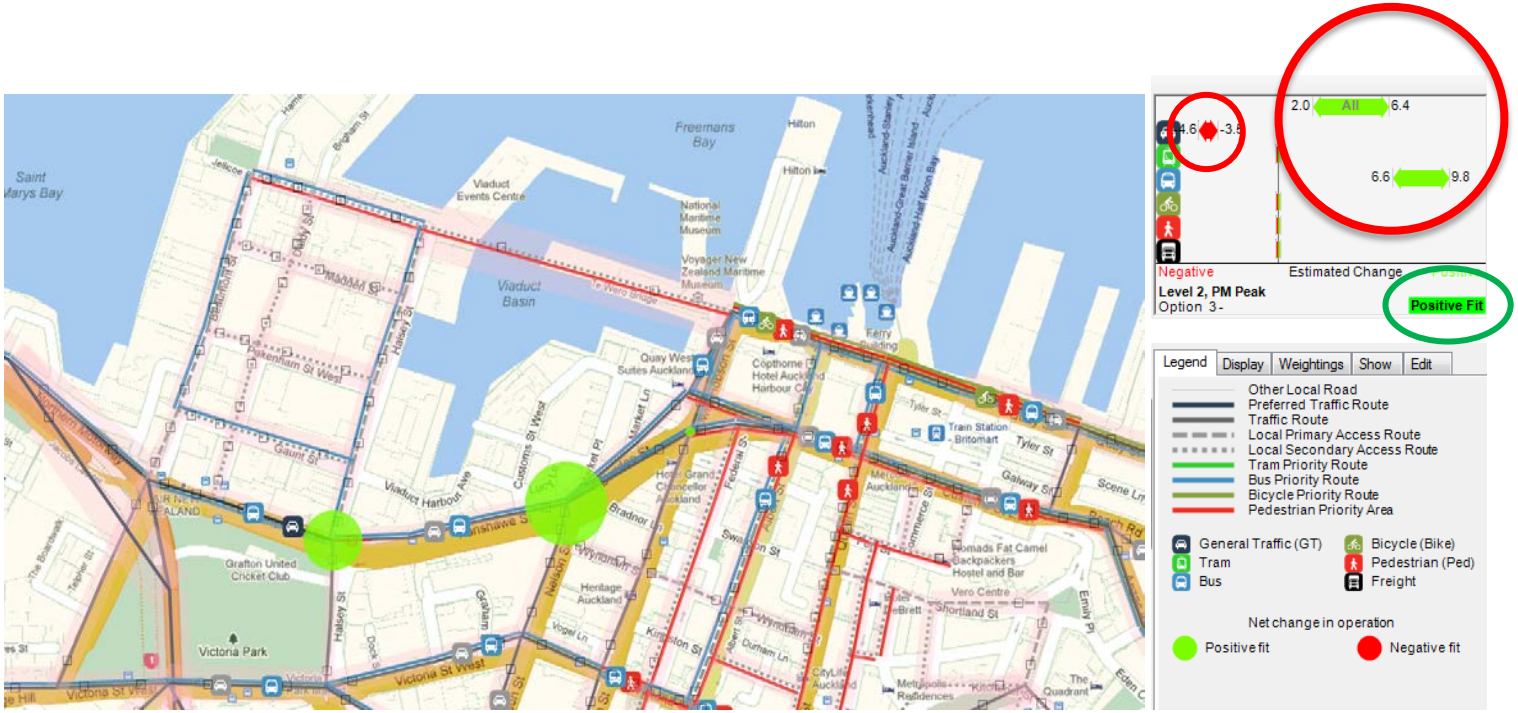
- exclusive pedestrian phasing and Barnes Dance, such as introduced at Quay St/Lower Hobson St/Viaduct and Quay St/Lower Albert St.

Being the interpeak period, the benefits to pedestrians achieved came at little or no disbenefit to other modes and the network as a whole, as the changes effectively reduced the spare capacity that existed on the network. The benefits are shown visually below using the SmartRoads tool, whereby multi-modal performance before and after the intervention are input into the tool.




In a similar way, the SmartRoads tool was particularly useful in translating and representing overall network performance benefits associated with the introduction of the westbound bus lane on Fanshawe Street, which was undertaken in conjunction with the route optimisation programme as an accelerated project.

Positive overall people-movement benefits achieved through this particular improvement during the afternoon peak periods are represented below, where it can be seen that the significant benefits achieved for commuters travelling by bus outweigh the moderate dis-benefit incurred by general traffic commuters.




Fanshawe Street, before and after the introduction of the westbound bus lane, is pictured below.


To accurately quantify these benefits is complex; the methodology adopted involved a detailed investigation of the benefits achieved for one of the five city centre sub-zones. This was undertaken by T2 Traffic and Transportation Engineers and reported in their 2014 report (a copy of which can be received upon request). Benefits achieved in the one zone were then assumed representative of benefits achieved across the city centre.

It was noted that in some instances, the increase in benefits to pedestrians and public transport passengers resulted in some disbenefit to general traffic. However, in all instances the overall net benefit was positive and was in alignment with the NOP. Based on estimated costs of the city centre optimisation, benefits achieved equated to a BCR of between 10-18.

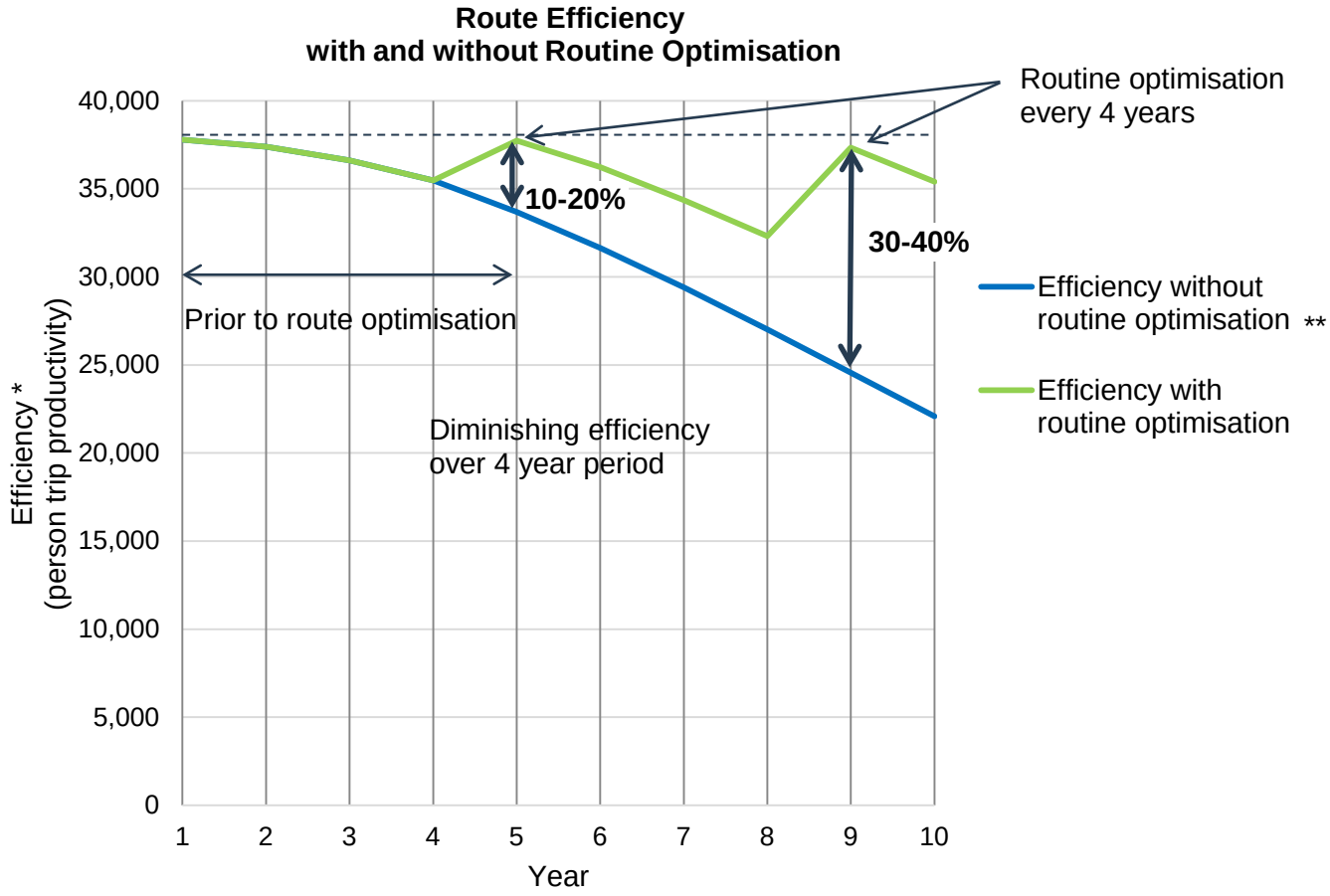
**Example:** Sturdee St/Fanshawe St/Nelson St/Market Pl intersection example of improvements through NOP/Route Optimisation. Pedestrian crossings and phasing (highlighted below), with bus lane provision (in both directions) on Fanshawe Street were provided.


For routes outside the city centre, the optimisation was also carried out in alignment with the NOP. Ten capital works projects were completed and work was in progress on a further 7 projects. With these routes being outside of activity centres, benefits are determined by travel time savings, emission reductions and fuel savings. These have an average first year BCR of 13.4 based on traffic signal improvements implemented on these routes. Detailed calculation for two of the non-city centre routes included first year savings of 97,000 hours of travel time savings, 84,000 litres fuel savings and 190 tonnes of $CO_2$ emissions reduction.

## Attachment 4

**Benefits of Routine Optimisation – Technical Note**

The benefits of routine optimisation can best be quantified by comparing annual route efficiency trends where there is no routine optimisation, with where routine optimisation is undertaken (in this case every four years). This is illustrated below for a corridor that experiences moderate traffic growth of 2% per annum for 3 years, and 1% thereafter.



* Efficiency is defined as corridor (person trip) productivity ( = average travel speed x vehicular volume x average occupancy).

** Estimated performance of a route subject to 2% traffic growth for 3 years, and 1% thereafter, and diminishing travel speed (reduces by half over 10 years).

Efficiencies achieved in the first year of the route optimisation programme can diminish by over 10%. In some instances this can be as high as 20%. By addressing this increasing deficiency through routine optimisation within a four year cycle, will mitigate this from worsening any further, noting that if left unattended this can be as high as 40% less efficient than optimised in eight years' time, depending on traffic growth and travel pattern changes.

There is therefore a need for continued and regular routine optimisation of arterial routes to retain optimised performance of the network, beginning with those routes last optimised close to four years ago.