Notice is hereby given that an ordinary Meeting of the Growth and Infrastructure Committee will be held on:

Date:	**Tuesday 24 October 2017**
Time:	**9.30am**
Meeting Room:	**Council Chamber**
Venue:	**Municipal Building, Garden Place, Hamilton**

Growth and Infrastructure Committee

OPEN ATTACHMENTS

ATTACHMENTS UNDER SEPARATE COVER

Note: The attachments contained within this document are for consideration and should not be construed as Council policy unless and until adopted. Should Councillors require further information relating to any reports, please contact the relevant manager, Chairperson or Deputy Chairperson.

Attachment 2

Item 8

Access Hamilton Programme 2017:
Delivering a Balanced Transport System

9 October 2017

For Approval

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Appendices

Summary

This Access Hamilton Programme sets out the basis for Hamilton's transport planning and investment over the next 30 years. It contributes to the city's land use and transport objectives in Hamilton's 10-year plan and District Plan, and the Regional Policy Statement and Regional Land Transport Plan (RLTP). Hamilton's growth has been faster than projected and the gap between demand, supply and desirable levels of service and safety is growing.

Investment in the preferred programme will provide a balanced transport system for Hamilton that is safer, provides reliable access to greenfield development areas and maintains access for existing areas to support economic development and travel choice. We need to reduce our reliance on the car to achieve the investment objectives in the long term and the programme includes a package of interventions and activities to achieve that.

The outcomes and benefits sought from the programme align with the national, regional and local strategies and plans such as Safer Journeys, Future Proof, Hamilton's Biking Plan and Neighbourhood and City Centre Transformation Plans.

The key problems relating to Hamilton's transport system are:

1. Growth and economic development is happening faster than anticipated leading to congestion and demand for transport investment earlier than planned.
2. System failures from network characteristics, user behaviour and increasing demand result in deaths and serious injuries.
3. Our transport system has focused on cars resulting in low use of other modes and higher future cost for transport.

The main benefits from dealing with the problems are:

1. Efficient and reliable access between key activities for all users.
2. A transport system that is safe to use.
3. Infrastructure and services delivery contributes to strategic priorities[i].

The preferred programme best meets the investment objectives:

1. We will enable business and residential growth while reducing the cost of access.
2. We will reduce deaths and serious injuries.
3. We will enable access to essential services, employment and recreation by providing transport choice for all users.

Hamilton's growth has been faster than projected and the current investment approach has focused on looking after existing assets and prioritising investment at the right time. The current programme invests around $40M[1] each year and is largely prioritised towards car-based mobility to protect existing levels of service provided to the road user. Continuing the current programme is likely to mean increased travel times and congestion (within ten years; a doubling of areas where demand exceeds capacity, reduced travel time reliability), decline in safety performance and continued car focus (no increase in use of other modes).

Hamilton is a high growth urban area and is projected to grow by 40% to 236,000[ii] people in the next 30 years. Accommodating this growth requires over 34,000[iii] new houses in greenfield and infill in inner city areas. There are currently 50,000 commuters entering the city each day from the surrounding areas and residential growth means that this is expected to increase by 40% over the next 30 years, mainly from the south.

Achieving the outcomes will require a change to the current approach and bold targets have been set to promote this shift. The preferred programme will deliver a balanced transport system for Hamilton.

[1] $27M HCC, $15M WRC PT services, $8M NZTA state highways (excludes maintenance and renewals)

We need to:

- Provide access for around 34,000 new dwellings. Half of these are planned to be through infill and intensification. We need access to land for greenfield development for 17,000 dwellings.
- Manage congestion on the strategic connections.
- Reduce the number of people seriously injured or killed on our roads.
- Significantly increase passenger transport use, walking and cycling so that our problems do not become more difficult and expensive to resolve in future.

Achieving these outcomes in the next ten years will result in providing 11,638 more households, 30% fewer Deaths and Serious Injuries (DSIs), a doubling in walking, cycling and public transport and maintaining current travel time reliability across the network.

The preferred programme of work to achieve the outcomes will be delivered through the Hamilton One Network Framework between HCC, NZTA and WRC, along with policy and investment support from Waikato and Waipa Districts. The partnership has committed to implement the programme through its statutory processes, and have developed a heads of agreement that focuses on the implementation of the preferred approach.

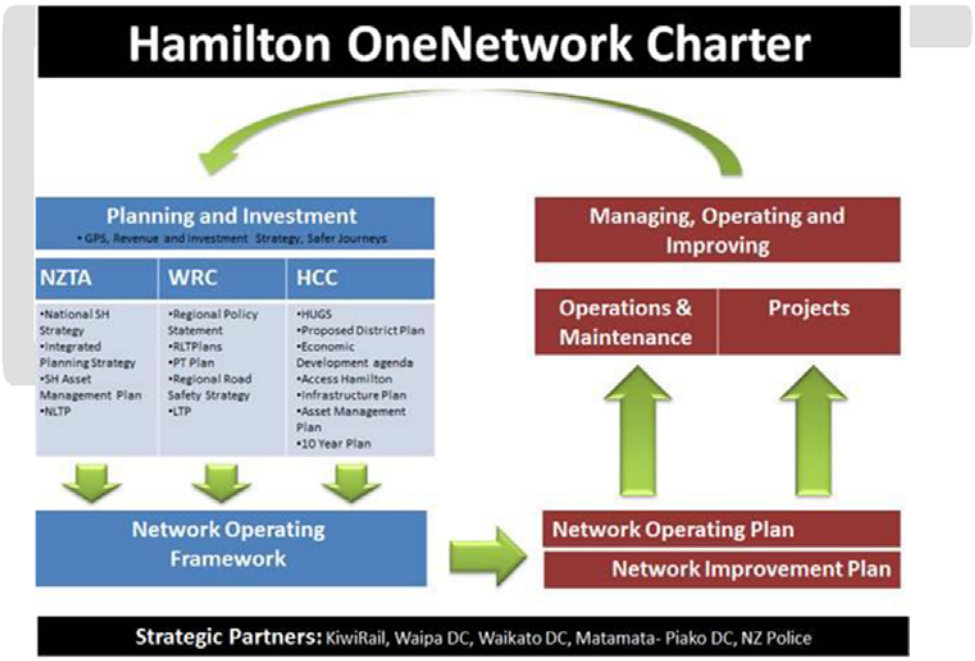

Figure 1: One Network Charter Organisation

Key activities of the preferred programme are:

- Policy Approaches, including a business case approach.
- Investing in strategic network (e.g. Cross City Connector, Northern River Crossing)
- Access for growth areas (e.g. Peacocke, Rotokauri, Ruakura)
- Southern Links
- Safety Improvements
- PT and Biking (Mass Transit Investigation, Biking Plan)

Hamilton City Council, NZ Transport Agency and Waikato Regional Council will collaborate to implement activities through HCC's Transportation Activity Management Plan, Waikato Regional Council's Public Transport Plan (RPTP) and NZTA's State Highway Improvement Plans (SHIP).

Risks to the programme achieving the investment objectives can be addressed through monitoring and review. The strategy, framework and plan for dealing with the management of risk are in accordance with HCC's risk management policy, which outlines HCC's risk management philosophy, risk threshold and approach to managing risk.

The key risks to successful implementation over the next 3 years are:

- Financial. The funding gap is significant in relation to current revenue options and recent investment rates.
- Political. National, Regional and Local policy changes on a 3-10 year timeframe may compromise very long term needs.
- Technical. Technological changes in fuel, communication and vehicle options make the medium term uncertain.
- Community. Acceptance of changes needed for transition such as prioritisation of passenger transport.

Funding is likely to be challenging, so we will prioritise maintaining and optimising use of our existing assets using lower cost interventions before significant cost projects. The proposed activities focus on significant network operating gaps with additional activities to meet growth demands and support a greater shift to walking, cycling and transit. Investigation of transit-oriented activities will guide future investment in services and infrastructure required to deliver the investment objectives in the long term. The approach is consistent with the Access Hamilton (2010) hierarchy of interventions:

1. Land use planning to minimise the need to travel
2. Behaviour change to reduce the demand for travel
3. Alternative transport modes to reduce the need for additional road capacity
4. Managing and optimising existing networks and infrastructure
5. Providing additional infrastructure and services to meet travel demand

1. Hamilton's Strategic Context

Hamilton and its neighbours in Future Proof form key parts of the upper North Island's economic triangle connecting Auckland and Tauranga, with nationally significant road and rail links to Auckland (125km) and Tauranga (110km). Approximately 2,000,000[iv] people live within 125km. NZ Government investment of $2.4B in the Waikato Expressway to south of Cambridge will be complete by 2020 reducing travel times and improving travel time reliability.

Figure 2: Upper North Island Golden Triangle and Future Proof Neighbours

Hamilton is the Waikato's main urban area. Neighbouring Waipa and Waikato Districts include Te Awamutu, Cambridge, Raglan and Ngaruawahia and lead to almost 50,000 people entering Hamilton's transport network daily. In 25 to 30 years, the surrounding communities' population is expected to increase by 40% . This has the potential to increase the demand and could mean more people will come to Hamilton to work or study – another 2,000 to 3,000[2] peak hour trips entering the city, mainly from SH1 and SH3 in the south.

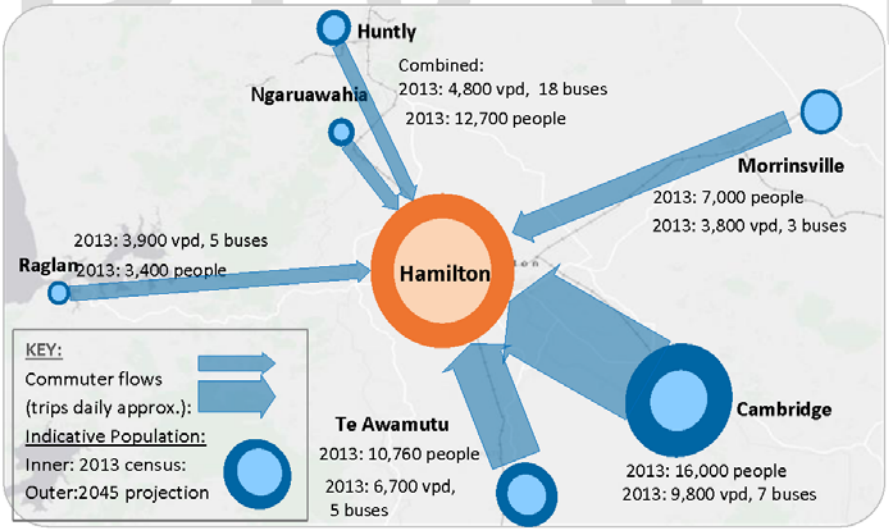

Figure 3: Hamilton's Neighbours and Commuting Traffic

[2] Based on current mode splits and commuter flows applied to projected populations

Attachment 2

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1.1. Hamilton's Key Features

The maps above in figures 2 and 3 illustrate that the key entry points to the city are SH1 to the southeast (Cambridge), SH1 to the north, SH3 to the south (Te Awamutu) and SH26 to the east (Morrinsville). Priority areas are where there is strong growth within the city and the surrounding areas, such as Peacocke/south and the SH1 corridor to Cambridge followed by movement from the north (Ngaruawahia, SH1 north gateway/corridor).

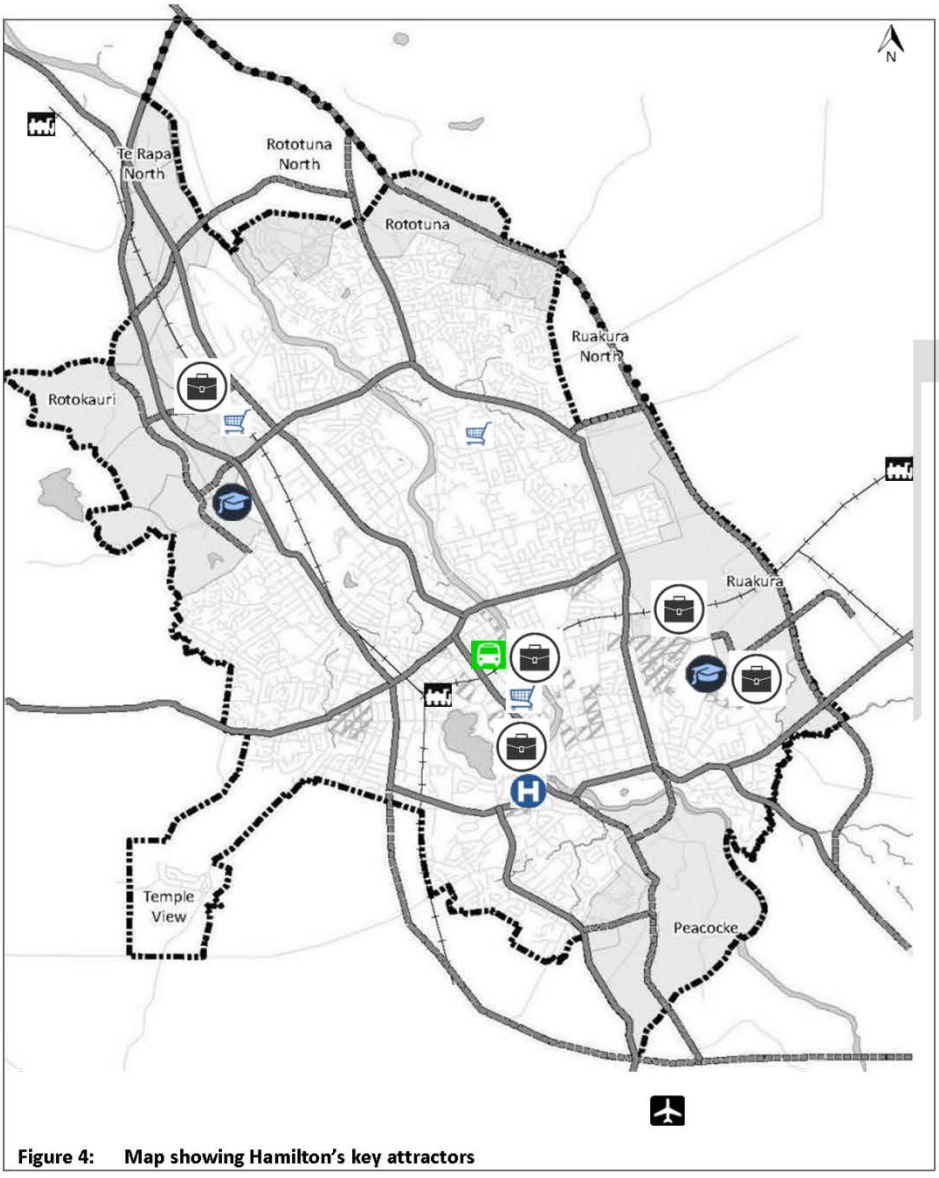

Figure 4: Map showing Hamilton's key attractors

Key attractors within the city include the city centre, the Waikato Hospital, Waikato University and WinTec. Key constraints are river/rail crossings, where arterials meet and city gateways.

1.2. Strategic Priorities for a Growing City

The preferred programme for the Greater Hamilton transport system contributes to the outcomes sought in key local, regional and national strategies. We will enable access to growth areas and reduce reliance on the car. The programme should deal with gaps in customer levels of service so that by 2045, Hamilton's existing and planned transport infrastructure and services will support the city's development and economic growth objectives with an appropriate level of service for all users.

The 10 Year Plan 2015 - 2025 describes what the city expects. The transportation activity makes Hamilton easy to get around by providing a safe, reliable and sustainable transport system that is accessible to everyone. Hamilton's transport services primarily contribute to five of ten Hamilton Plan strategic priorities:

- The third city economy in New Zealand.
- Providing outstanding infrastructure.
- Strongly connected to the River.
- An active, strong, commercial city centre with distinctive surburban villages.
- Access to affordable housing.

The city's strategic priorities informed the problems, benefits and objectives that guided programme option development and selection of the preferred programme from a range of alternatives and options. Growth is a major factor. Hamilton has committed to a housing accord to facilitate residential growth:

- 160,000 population growing to 236,000[v] in 30 years:
- 11,638[vi] new greenfield dwellings needed in 10 years
- 34,000[vii] new dwellings needed in 30 years (50% infill)

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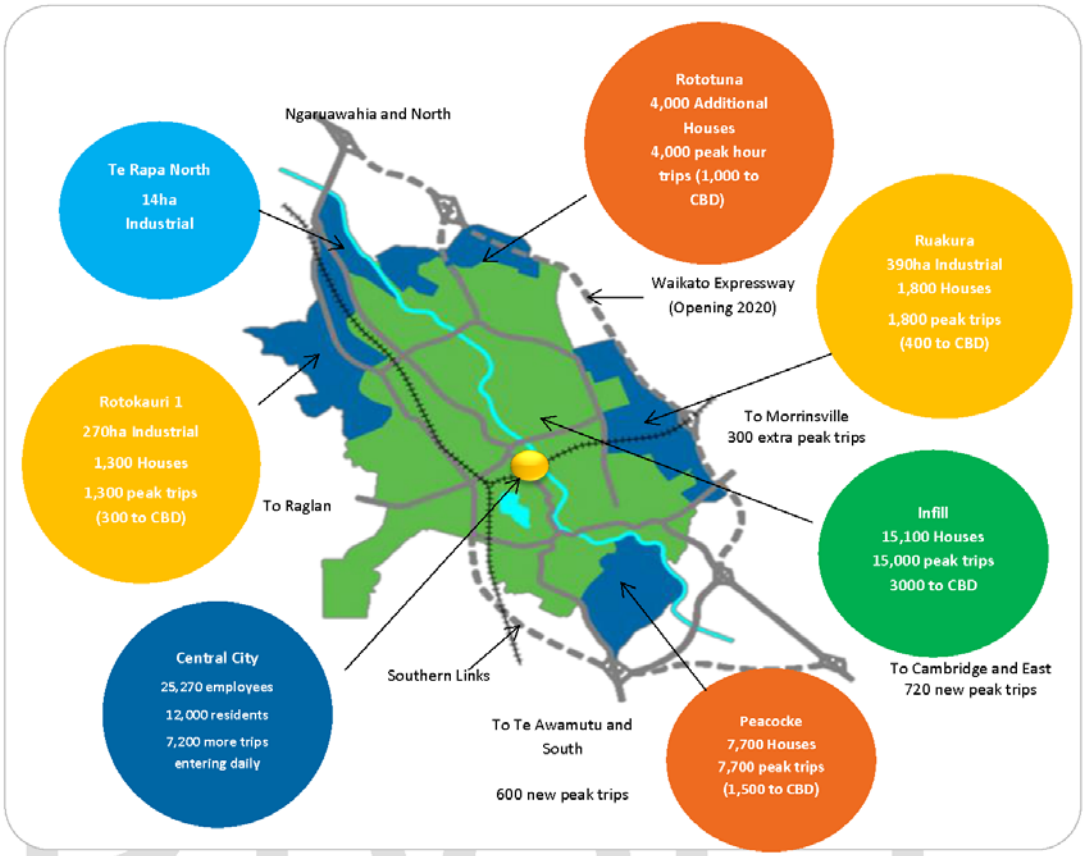


Figure 5: Hamilton's access needs for growth over 30 years[viii]

2. Hamilton's Transport Problems

Key partners and stakeholders including NZ Transport Agency, the surrounding Councils, NZ Police and Waikato Regional Health Board identified key problems for Hamilton's transport system. The problem statements were refined by Hamilton's elected representatives and further following consideration of evidence and consultation with NZTA staff.[ix]

Growth and economic development is happening faster than anticipated leading to congestion and demand for transport investment earlier than planned.	**System failures from network characteristics, user behaviour and increasing demand result in deaths and serious injuries.**	**Our transport system has focused on cars resulting in low use of other modes and higher future cost for transport.**

In the background to the key problems above, the programme also needs to deliver in the context of:

- Higher design standards to deal with climate changes, environmental standards and consents.
- Uncertainty from Increasingly rapid and significant changes in technology including intelligent transport systems, autonomous vehicles, data collection and application opportunities.

- Higher maintenance and construction costs for traffic management and safety in a congested network.
- Early lead infrastructure costs for growth and funding constraints reducing opportunities to address problems on the existing network.

The types of problems identified above are consistent with the RLTP Investment Logic Mapping (ILM) developed by the Regional Transport Committee.

Hamilton City Council, Waikato Regional Council and NZ Transport Agency collaborate in managing Hamilton's transport systems through the Network Operating Framework. HCC, Waikato RC and NZ Transport Agency signed a One Network Charter. The core objectives of the Charter are to work together to maximise the efficient use of the transport network in Hamilton city, optimise modal choice, stimulate economic growth and productivity and balance the needs of communities and transport users. The three transport partners have developed a Network Operating Framework, to implement a shared transport future and to operate a reliable and coordinated network across all modes in and around the city. The Network Operating Framework guides how best to make use of the network, including recognising land use, the different needs of different users, and transport objectives.

The Network Operating Framework includes:

- An Overview setting levels of service and the priorities for users by time of day, corridors and location
- A Network Operating Plan (NOP) covering day to day operations reflecting the priorities.
- A Network Improvement Plan (NIP) highlighting physical and operational changes desirable to deal with operating gaps between actual and desirable levels of service.

The Network Operating Framework means that Hamilton City Council, NZTA, and Waikato Regional Council work together to ensure Hamilton's problems are understood and reviewed in context. Access Hamilton sets the direction. The Network Operating Plan manages the network and highlights problems (operating gaps between customer levels of service and network performance). The Network Improvement Plan highlights activities to deal with existing and expected problems on the existing network. The NIP/NOP will form part of the Access Hamilton Implementation Plan which will combine improvement options and growth activities. The programme development balances costs, funding and levels of service.

2.1. Growth and Economic Development

Growth and economic development is happening faster than anticipated leading to congestion and demand for transport investment earlier than planned.

Hamilton's population is expected to continue to grow and increase from 160,000 to 236,000[x] people in 30 years. Cambridge and Te Awamutu will add another 20,000 people[xi]. We need to accommodate around 34,000 new dwellings evenly split between infill and greenfield development. The National Policy Statement on Urban Development Capacity (NPS-UDC) directs local authorities to provide sufficient development capacity in their resource management plans for housing and business growth to meet demand. Hamilton City is considered a high growth area and Council is required to increase feasible development capacity. This means land that is zoned, serviced and commercially viable. The NPS-UDC focuses on feasible development capacity for housing and business land to meet projected demand over the short, medium and long term (3, 10 and 30 years). Hamilton is required to include an additional margin of feasible development capacity of 20% over the Statistics NZ medium population projections in the short-medium term and 15% in the long term. The NPS-UDC[xii] requires Council to be ready with land available, but the timing of development is not certain.

Our strategic planning for land use and transport needs to manage demand in a way that supports our economic development and growth objectives. The existing strategic network needs to provide an appropriate level of service for any extra trips by whatever mode as well as linking to the new networks. Demand already exceeds capacity at some of our key rail and river crossings and where major roads cross each other. Hamilton's minimum desirable level of service for strategic arterials is stable flow[xiii], and for local and collector roads there will be an accepted level of peak period congestion. Growth means congestion on the existing network will get

worse if we do nothing to reduce demand or increase network productivity or capacity. By 2045 the demand during peak periods is expected to exceed practical throughput on over 15%[xiv] by length of the road network unless there is a change in travel habits.

Hamilton's and its neighbours' District Plans give effect to the Waikato Regional Policy Statement (RPS) that incorporates policies and development principles that support the implementation of Future Proof, sub-regional strategy. The RPS and Future Proof spatial framework for land use supports integrated transport planning including higher densities, intensification at nodes, infill for existing areas to support a compact form and a strong city centre to encourage transit options and active modes. Hamilton's integrated planning includes arterial roads recognised as significant transport corridors in the RPS and RLTP. These corridors are critical transport infrastructure to support growth and economic development.

Growth

Future Proof partners have worked together to integrate land use and transport planning for growth and to realise the benefits of the Waikato Expressway. Key growth and economic development activities identified in structure plans and agreements between Future Proof partners and developers include:

- Ruakura (includes inland port) – expressway connections being delivered (completion expected 2020) as part of the Waikato Expressway. Major arterial connection to Wairere Drive included in Ruakura growth activities.
- South Hamilton Arterials (Hamilton Southern Links) is designated and at pre-implementation stage (Investigations to date accepted as Detailed Business Case).
- Northern Growth Corridor (includes Te Rapa section of Expressway and supports Ports of Auckland at Horotiu). Key arterials are Rotokauri arterial network (next phase Detailed Business Case) and Northern River Crossing (Indicative Business Case required).
- Rototuna – Borman Road arterials, Resolution Drive as part of the Waikato Expressway (committed).

Timing, staging and funding for further development and implementation of these key activities is yet to be decided.

As well as the strategic arterial connections, access for growth requires upgrades to existing and new roads. These include capacity increases (e.g. minor arterials, or collector roads through separate developments) and for urbanisation (e.g. footpaths, lighting, etc.).

Figure 6: Significant transport corridors (key economic links) for Greater Hamilton

Economic Development

We cannot afford to build our way out of congestion, but we still need to be able to maintain access for freight and vehicular movement between Hamilton's industrial and commercial activities and our sub-regional and national connections, including inland ports and the Waikato Expressway.

Hamilton's strategic network is expected to provide sufficient capacity to provide reliable travel times. The capacity is not necessarily just for cars. The need for additional capacity for cars can be moderated through increasing occupancy and mode shift, considered in the Choice section.

As well as completing the ring road and strategic connections to growth and regional networks, sections are likely to require changes to deal with existing and expected congestion areas.

Previous investigations such as the Hamilton Alternative to Roading Study, Access Hamilton and Bus Patronage Targets have shown how challenging significant travel demand shifts are likely to be. A 50% increase in population, spread between growth areas and infill, will increase the number of trips on the network. Accommodating these trips, whether by supplying additional capacity for car travel, or targeting mode shift through bus priority or high occupancy lanes, is likely to require the existing congestion problem areas to be dealt with.

Modelling indicates that by 2045, travel time delays due to congestion would cost more than $12M annually, equivalent to a present value cost of over $180M over 30 years.

As well as lost time, the congestion will reduce travel time reliability, adversely affecting productivity.

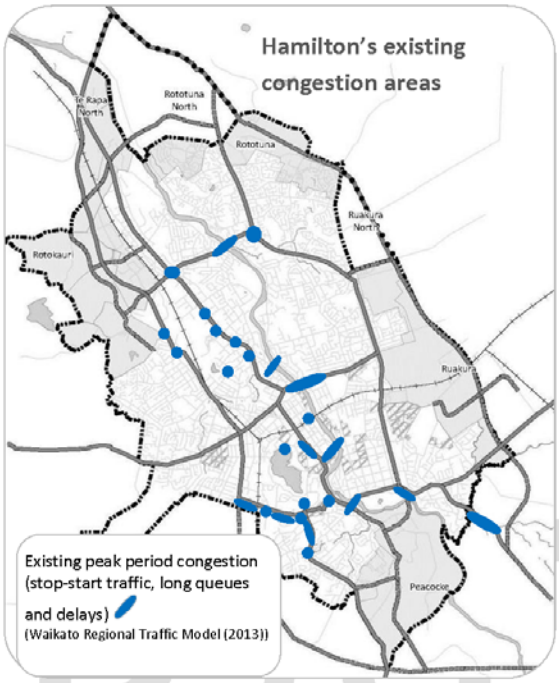


Figure 7: Hamilton's existing congestion areas (Waikato Regional Transportation Model 2013)

2.2. Safety

System failures from network characteristics, user behaviour and increasing demand result in deaths and serious injuries.

Approximately 50 people are killed or seriously injured in crashes within Hamilton City each year. Typically 9 are pedestrians or cyclists. The NZTA Communities at Risk Register 2015 (Data 2010-2014) Personal Risk highlights high speed intersections, pedestrians and cyclists as at risk. Hamilton's top three crash causes relate to user error and are Poor Observation, Failed to Give way/Stop and incorrect lane/position. 35% of high severity crashes are at intersections and 20% are loss of control crashes in urban areas[xv]. 45% of fatal and serious crashes in high speed areas are loss of control types. The city is overrepresented compared to other peer groups for all crashes involving speed.

Supporting the safe system philosophy, Hamilton and its transport partners target safe road, safe speeds, safe vehicles and safe road use to reduce deaths and serious injuries. We use proactive, risk-based methods to prioritise treatments based on the likelihood of future fatal and serious casualties. These include road assessment programmes like KiwiRAP and speed management.

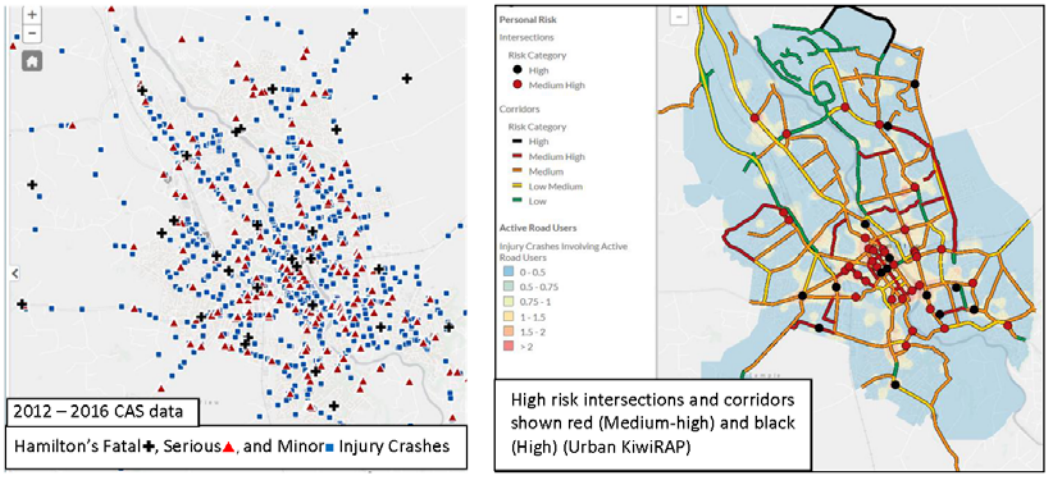


Figure 8: Crash Analysis System (CAS) data and Urban KiwiRAP high risk areas.

Hamilton has:

- 49 high risk intersections that account for a third of the city's injury crashes and fatal and serious injury crashes. [xvi]
- 144 km of high risk corridors, about 20.9% of the network that account for around half of the city's injury crashes.[xvii]

Hamilton is reviewing network speeds to ensure that infrastructure matches so they are appropriate for road function, design, safety, use and the surrounding environment (land use) and prioritise speed management interventions.

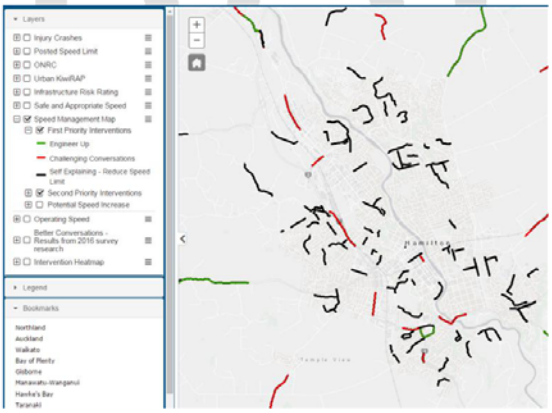
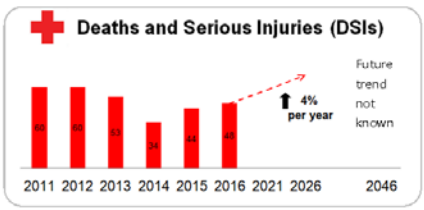


Figure 9: Hamilton's Safe and Appropriate Speed priorities and locations



There has been an increase in deaths and serious injuries since 2014, consistent with other areas although the City has a decreasing trend for crashes per 100,000 population. Vulnerable users are overrepresented compared to typical mode share. Without intervention, increased exposure to risk from higher traffic flows is likely to lead to more deaths and serious injuries each year. Safety concerns can also

discourage walking and cycling. Active road user crashes are more common around activity centres such as schools and shopping areas.

Hamilton has a high number of intersection crashes and maintains a prioritised list of the top 40 intersections to guide investment decisions.

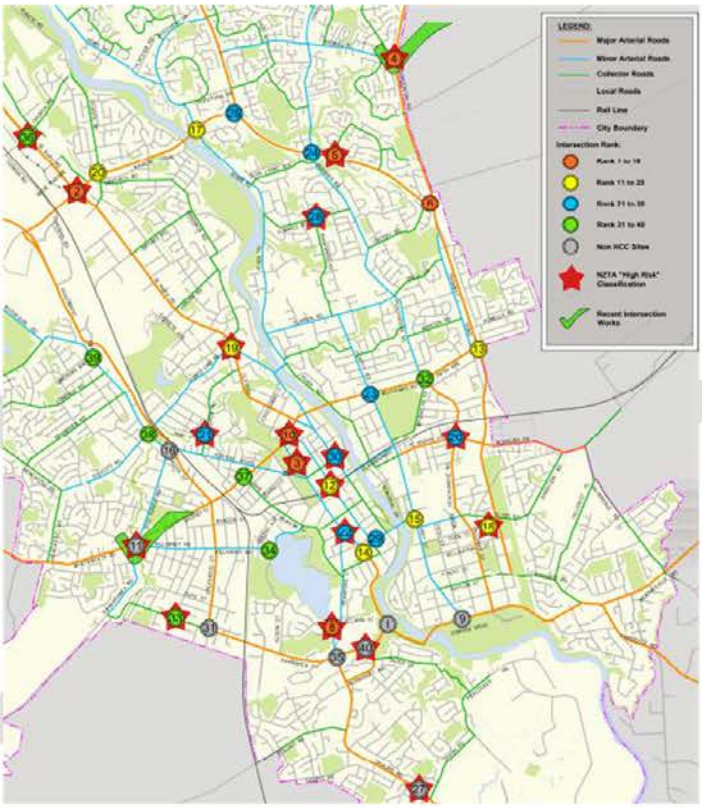


Figure 10: Hamilton's Priority Intersections 2017 (Based on 2012 – 2016 CAS data)

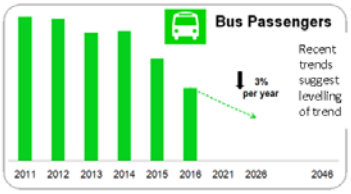
The Waikato Regional Road Safety Strategy[xviii] targets a 50% reduction in fatalities and a 25% reduction in serious injuries over 10 years. Increasing the safety of vulnerable and high risk road users is a priority in the Regional Land Transport Programme (RLTP). The Hamilton Biking Plan targets a decreasing trend in the number of death and serious injuries involving people riding bikes.

If we can reduce the number of deaths and serious injuries by around a third over 10 years, we would save $15M - $20M[xix] in social costs annually. The present value of $15M/year over 30 years is over $200M[xx]. As long as interventions deliver benefits greater than costs investing $10M -$20M/year in safety would deliver value for money.

2.3. Transport Choice

Our transport system has focused on cars resulting in low use of other modes and higher future cost for transport.

The dominant transport mode in Hamilton is private vehicles with around 90% of journeys to work[xxi] being by car. NZ Census 2013 data[xxii] for the main means of travel to work in Hamilton is 85% by car compared to 82% for the whole of NZ. Of those travelling to work by car, 5% were passengers (consistent for Hamilton and all of NZ). 4% were by public bus. 4% cycled and 7% walked.

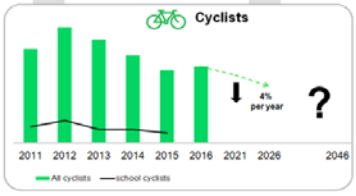


Within Hamilton central, 65% travel by car to work with higher proportions than in the rest of the city travelling by other modes (walking and cycling 27% and 6% by bus).

The NZ Household Travel Survey for Hamilton shows 92% travelling to work by car with 3% walking, 3% cycling and 2% by bus. For all travel by residents of Hamilton zone[xxiii], 98% of mode share by distance is by car and 87% of trip legs are by car. Around 14% of all trip legs were by cycling/walking and 1% by bus.

Our current approach is leading to a reducing proportion of trips by walking, cycling and bus leading to an increasing reliance and higher future demand for car travel. The mode share of cyclists and bus passengers over recent years has declined even though numbers are rising in some areas. The problem relates to capacity and means peak period travel which includes journeys to work and school. If we can achieve increased mode share for other modes for journeys to work it will flow on to travel habits for other trip purposes.

Changes that make public land transport more accessible for disabled people also improve access for all, and can lead to increased use of public transport. "Significant numbers of disabled people in NZ have acute and on-going difficulty with using public land transport services and infrastructure. Disabled people feel disempowered in terms of participation in public land transport planning, funding and implementation as their needs are not considered to be a core requirement of the current statutory process."[xxiv]



If the decline in cyclists and bus passengers continues, congestion will happen sooner affecting productivity, land use and safety as travel patterns respond. Key intersections are already congested. If the current dominance of car trips continues, vehicular demand into the city centre is likely to exceed lane capacity within 20 years.

The longer we leave it before taking action the harder the problem will be to address. We need to increase the mode share for passenger transport and active modes now to avoid significant costs and disruptive interventions in the future. As a nominal target, achieving a 20% mode share for walking, cycling and passenger transport would reduce the need to invest in additional road capacity for around 10 years[xxv], reduce crashes by around 10% and have significant health and environmental benefits. This can be because a reduction in cars of 10% reduces exposure and the potential for crashes by around 10%.

Recent corridor planning for access to new areas such as Peacocke includes space for walking, cycling and passenger transport facilities. However, the connections through the existing networks face significant space restrictions.

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Walking and Cycling Opportunities

The current approach to cycle planning in NZ recognises four distinct groups of cyclists, based on the work of Roger Geller and community surveys in Portland. Recent research (Dr Glen Koorey, ViaStrada Ltd & Karyn Teather, Christchurch CC) tested the application of Geller's cycling typology in Christchurch and found that 82% of respondents identified with Geller's four groups:

- **"strong and fearless"** - Will ride regardless of conditions.
- **"enthused and confident" -** Attracted to using a bicycle for transportation by the construction of bare bones infrastructure.
- **"interested but concerned"** - Identify safety as their primary reason for not riding; under conditions where people feel safe and where bicycling makes sense, they will ride.
- **"No way, no how"** - No discernible interest in transporting themselves in that way.

The largest group of the population tends to be the "interested but concerned" group. Cycling options on roads tend to be suited for the "strong and fearless" and are considered unappealing and dangerous by the majority of 'interested but concerned' cyclists who seek facilities that are quieter, safer and more aesthetically pleasing. Actual and perceived safety is a key influence on uptake.

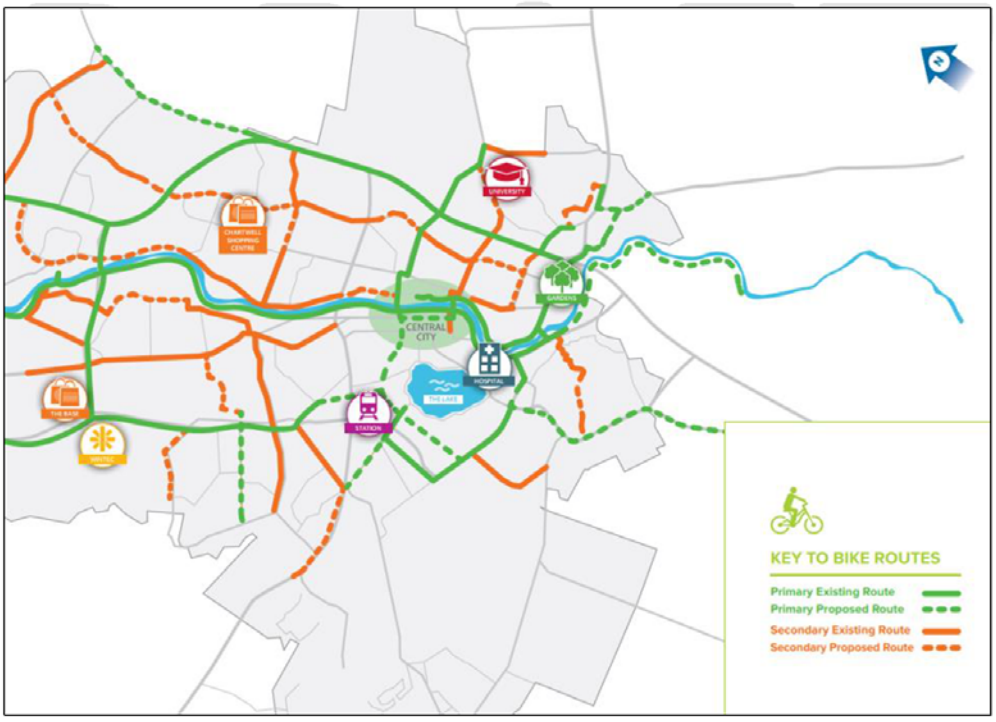


Figure 11: Cycle Network Map (Hamilton Biking Plan 2015-2045)

Hamilton has of 21km off road cycle paths, 97km on road cycle lanes and 28km of river paths. In spite of having comparable infrastructure, and a higher proportion of expenditure on walking and cycling, Hamilton has a lower proportion of trips by walking and cycling than other cities[xxvi]. The 2014 cycle survey raised perceived safety as a reason for not cycling. Sample user surveys suggest safety concerns and traffic flows as deterrents to walking.

The Hamilton Biking Plan included four priority major projects to improve the walking and cycling network.

- State Highway 3 – Provide a cycleway along State Highway 3 connecting southern suburbs to the city.
- Western Rail Trail – Providing an off road connection from the southwest suburbs to the central city.
- School link – Providing a safe cycleway for almost 9,500 students in the Hukanui/Peachgrove Road corridor.
- Resolution Drive – New cycleway facilities (under construction) to match residential growth and provide links to and across the Waikato Expressway.

The State Highway 3 and Western Rail projects are complete. The Western Rail Trail is attracting over 100 users daily. Increasing use of electric bikes is increasing the range and potential users for cycling facilities.

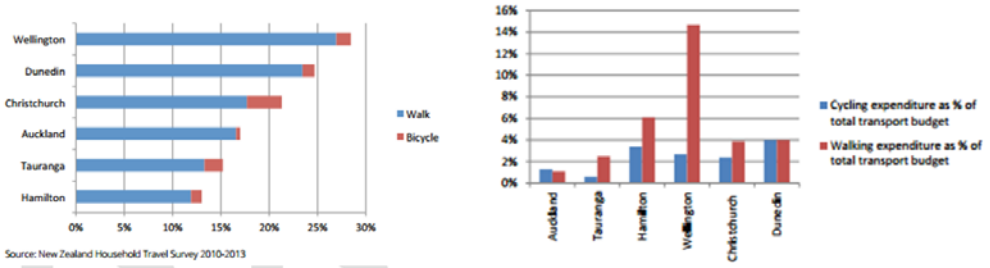


Figure 12: NZ Household Travel Survey walking and cycling participation and expenditure.

Passenger Transport Opportunities

The potential benefits from increased passenger transport patronage include improved safety, better health, reduced demand for infrastructure to deal with congestion and less space taken up for car parking, manoeuvring and access, allowing increased densities, better urban form and reduced environmental impacts.

To shift demand from cars, Hamilton's passenger transport system needs to increase peak period patronage as well as increasing PT and walking/cycling legs for all trip purposes. The main problems making that difficult are:

- Travel time reliability – bus services caught up in congestion make it difficult to reliably meet timetables.
- Travel time – using the car is perceived to be easier and faster option to get around the city than before.
- Free parking – Free, readily available parking at retail centres reduces the cost advantage of bus use.
- Investment constraints make it difficult to deliver significant changes in advance of demand.
- Negative social experiences and passenger amenity can deter customers.

Infrastructure activities such as bus priority and reliability improvements, bus stop amenity and accessibility enhancements targeted at corridors with frequent bus services will optimise the return on investment in bus services. The Peachgrove Road/Hukanui Road corridor is a key bus corridor that currently presents increasing bus reliability concerns.

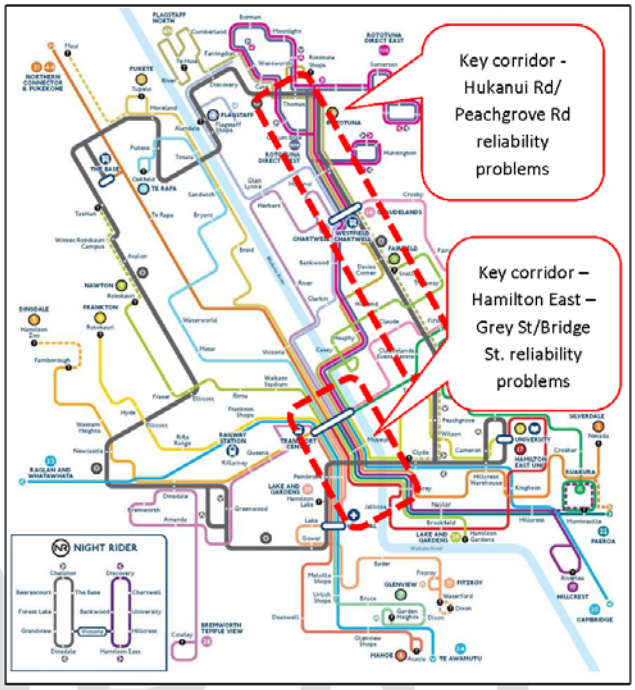


Figure 13: Hamilton City bus routes (busit.co.nz)

Modelling[xxvii] shows that investment in bus priority and travel time savings is a core component of activities to increase patronage. Without travel time gains increasing service frequencies would be a costly and inefficient way to attract people to go by bus. A scenario targeting 7% annual growth requires a reduction of around 25% in bus travel times and waiting times. Waikato Regional Council has highlighted that corridor treatments are preferred over localised bus priority measures and should focus on the primary routes with most services. To achieve a 7% mode share would require around 14% annual growth in patronage, and need widespread service frequency increases. This will require a combination of measures including better infrastructure (e.g. bus priority measures), optimising existing network, increasing service levels and supportive land use and car parking polices. High patronage growth is achievable, but the financial requirements are likely to be significant. Targets need to be established and agreed by all transport partners to support the basis for long-term infrastructure and service delivery planning. With increased frequency there is the potential for different route and interchange design principles and evaluations.

Parking strategy is a key consideration in reducing car dependence. The recent Hamilton District Plan review removed minimum parking requirements for the central city, providing opportunities for responsive development, unbundling land use and parking, and encouraging intensification. Council has recently commenced a first 2 hours free parking trial in the central city to attract short term visitors and revitalisation of the area. The policy also charges a high per hour rate for any stays over 2 hours to encourage a shit to off street parking or to other modes of transport for commuters and other longer term visitors.

Parking also presents opportunities to manage demand prior to capacity constraints. Problem areas such as entry corridors from Te Awamutu and Cambridge, and city centre access could be relieved by park and ride and enhanced interchange options. Detailed planning integrating land use, infrastructure and service planning is necessary to work out the optimum solutions on a long term network basis balancing the needs of all modes. That should include protection of space for future enhancements and options including rail links and park and ride.

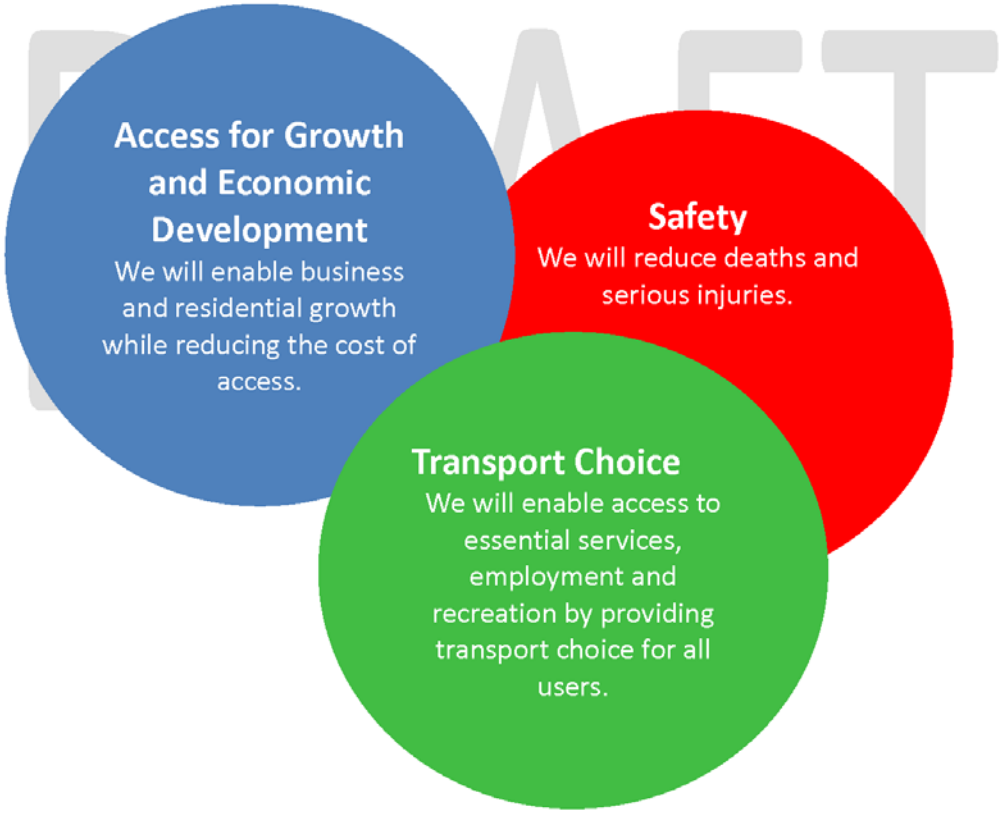
3. Benefits of Addressing the Problems

The benefits of addressing Hamilton's transport problems are:

Efficient and reliable access between key activities for all users.	A transport system that is safe to use.	Infrastructure and services delivery contribute to strategic priorities.

4. Hamilton's Transport Investment Objectives

Hamilton's transport investment objectives are:



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We will assess our progress using the following measures.

		Current	10 Year Target	30 Year Target
Measure 1:	Land accessible for development Targets based on NPS Urban Development Capacity	4,000 dwellings	11,638 dwellings	33,000 dwellings
Measure 2:	Intersections where demand exceeds capacity Measures based on holding our own in the face of extra traffic	27	<=27	<=27
Measure 1:	Deaths	5	0	0
Measure 2:	Serious injuries	45	34	17
Measure 3:	Serious injuries involving vulnerable users Current based on 6 yr average 2011-2016. Injury targets based on Regional Road Safety Strategy.	16	12	6
Measure 1	Single occupancy vehicles Targets based on increasing mode share. Measures from Journeys to Work (JTW) surveys.	80%	70%	TBC
Measure 2:	Mode share for alternatives (trips) Targets based on increasing mode share. Measures from Hamilton Census JTW data and MOT transport indicators (short trips (trips by foot))	3% bus 11% walking/cycling 26% of trips <2km by foot	7% bus 22% walking/cycling 50% of trips <2km by foot	TBC TBC TBC
Measure 3:	Public transport is easy to get to	80% agree	85% agree	TBC

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5. Continuing Business As Usual

The amount over 10 years of the current Hamilton City 2015-2025 Long Term Plan assigned to transportation (excluding ongoing maintenance and renewal activities ($120M)) is $127.4M. We have considered the transport investment objectives and assigned the spend according to the desired outcome area that an activity most contributes to. For example, the Integrated Transport Initiatives invests in cycling facilities within the city, contributing to the transport choice outcome. We recognise that there are secondary benefits for the other outcome areas, for example for economic development since in theory improving facilities and links for cyclists encourages trips by cycle and therefore reduces car trips. However for simplification the activities have been assigned to the outcome area they most contribute to.

The way that Hamilton City categorises the investment needed for the growth cells includes all the new transport activities. To be consistent with this and for simplification we have split economic development and growth activities. Economic development activities are upgrades to the existing strategic network and new links between growth areas/and within the city. Transport corridors within growth areas have been categorised as Growth. There is significant crossover between the two and the objective covers both.

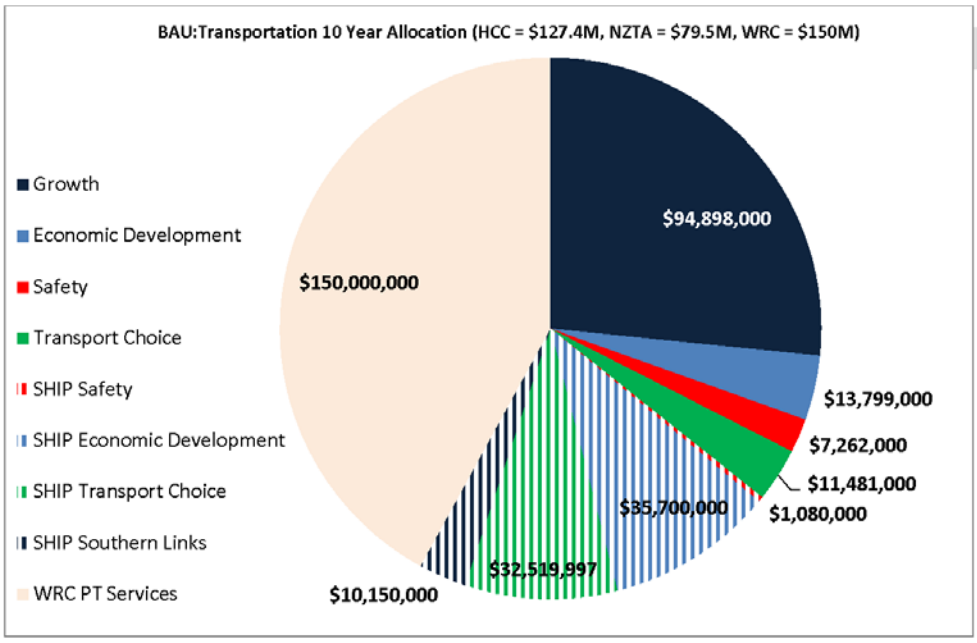


Figure 14: BAU 10 Year Transport Spend (excludes Maintenance)

Hamilton's 10-Year Plan looks after the existing assets and prioritises investment at the right time. Over recent years investment has been made on extending the strategic road network. Continuing what the city has been doing (BAU) would extend the transport network into new growth areas, including future additional river crossings in the north and south of the city. The Waikato Expressway and connections are under construction and the completion of the Ring Road (Cambridge to Cobham section) is a priority. The 30 Year Infrastructure Strategy states that growth in demand is to be managed through provision and facilitation of modal choice, i.e. ongoing development of public transport, cycling and walking options. Business As Usual (BAU) includes Hamilton City's current 2015-2025 10-Year Plan, the Waikato Regional Council's bus services and the aspects of the NZ Transport Agency's State Highway Improvement Plan (SHIP) that are applicable for the city.

The City's focus has been on living within its means, and reducing debt of the city. The following pie chart displays the 3 year allocation towards key areas and activities. The benefits of some of the activities may already be recognised since we are two thirds through the first 3 years of the 2015-2025 10-Year Plan.

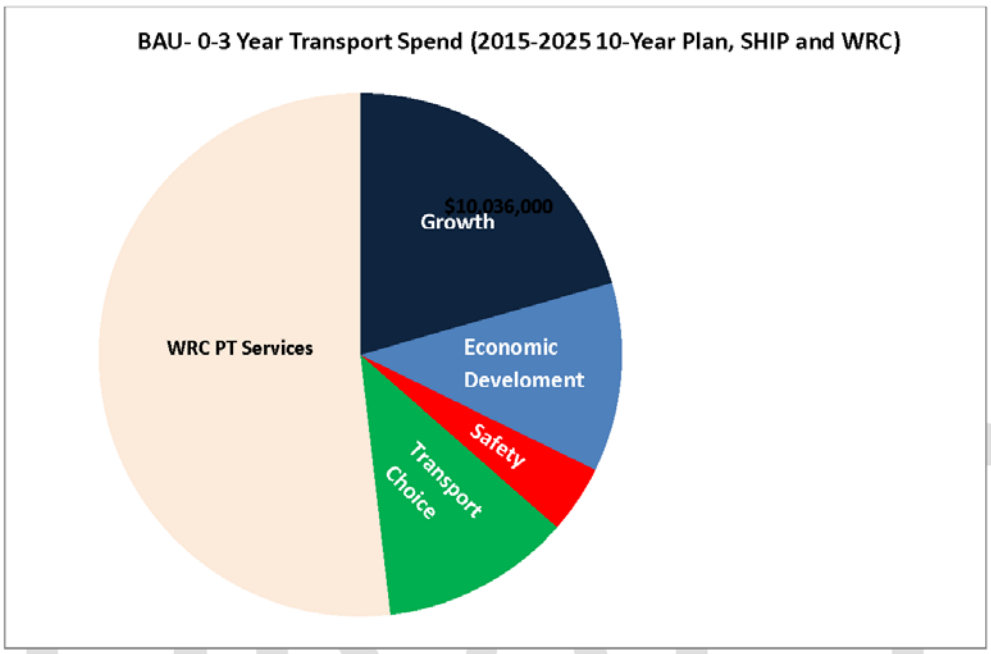


Figure 15: BAU 3 year Transport Spend (excludes maintenance)

BAU maintains a high priority on providing for private car use, investing to protect existing levels of service, provide for strategic growth and support PT and active modes with some safety investment. Given that cycling and PT users are not increasing and that there has been little change to Deaths and Serious Injuries (5-year averages), BAU is not considered to be performing in terms of achieving Access Hamilton (2010) safety and mode share targets. There is a need to reverse the safety and mode share declines. Since the safety trend has not improved in recent years, we do not expect the current investment programme to contribute to the ten year safety target.

The direction of the Access Hamilton Strategy 2010 remains valid. The journey to achieving the strategy needs to be tweaked. Change is needed to address the requirements of the National Policy Statement on Urban Development Capacity (NPS- UDC), to increase the PT mode share and to improve safety. A strong preference to make changes and address safety by targeting a significant reduction in deaths and serious injuries is sought and supported by the city, wider community, and government policy.

The targets for Hamilton's transport programme include no one being killed on the transport system. The programme also needs to address the prescribed objectives and policies of the NPS-UDC. Based on recent trends and expected growth and demand, continuing BAU goes a little way towards delivering on these outcomes but more is needed.

Based on the current safety trends and the PT trends, continuing the BAU will mean:

- More people are likely to be killed or injured on our transport system (since the current DSIs are not decreasing, spend is similar to historically and population and car growth is increasing);
- Mode share by bus and other modes is not likely to change significantly. For these purposes, we assume the mode share is maintained by the current 2015-2025 10-Year Plan since there is investment planned for integrated transport initiatives and cycling;

- Some access for growth is likely to be achieved (Total of 2,510 households: 253 in Peacocke, 1945 in Rototuna and 312 in Rotokauri);
- Increased congestion – baseline is 27 intersections where demand exceeds capacity. Modelling indicates that with no significant changes (to mode share or infrastructure) or investment in the transport system, and allowing for projected population growth, there will be at least 38 intersections where demand exceeds capacity in 10 years.

5.1. Likely Outcomes (BAU)

Hamilton City's 2015-2025 10 –Year Plan is reviewed on a three yearly basis and the immediate 3 year plan and outlook is fairly certain with the medium term (years 4-10) being flexible and responsive. Beyond 10 years, Hamilton City's Long Term Infrastructure Strategy (30 Year Plan) is indicative and provides for long term planning and future expectations. Presently, Hamilton City is completing review of the 10 Year Plan (2018-2028) and as part of this process the 30 Year Plan will be updated.

Continuing the BAU means that the immediate term (0-3years) is fairly certain. Changes in the immediate term can include bringing forward expected activities and increasing spend, but significant investment in newly identified activities are not expected. New activities will be incorporated in the 4-10 year term where there is more flexibility and time to accommodate any changes or assumptions that do not eventuate. The 30-year horizon is indicative and fluid.

Hamilton's current 2015-2025 10-Year Plan indicates a significant increase in spend on transport is expected within the medium term. This is illustrated in the graph below which displays the BAU spend assignment colour-coded according the desired outcome the activity mostly contributes to:

- Dark blue – facilitating access for growth
- Light blue – economic development
- Red – safety
- Green –transport choice
- Orange – WRC PT services

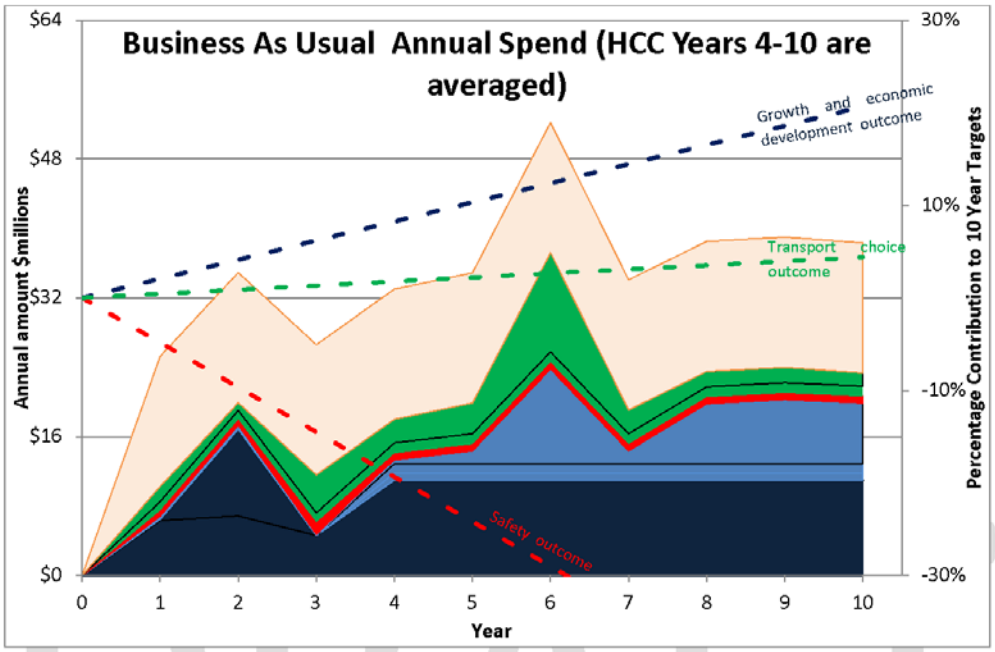


Figure 16: Area graph of 10 year spend under the current situation (dark blue = growth, blue = economic development, red = safety, green = transport choice, orange = WRC PT services) (dashed lines show contribution to target)

The dotted lines are indicative based on recent history, continuing the BAU with no real change means that there will be a contribution to growth and economic development, no real change for mode share (Transport choice) and safety performance is likely to be slightly worse than now.

6. Developing the Programme

In order to achieve the transport targets, strategic interventions to counter the direction the BAU appears to be going are needed. A change is clearly required to achieve the objectives, realise the benefits and address the problems. Doing less than the BAU, such as maintenance only will accelerate/bring forward the consequences of what we have been seeing in relation to congestion, safety and car trips. Given the current high proportion of trips (distance<3km) made by car, there is an opportunity to divert short car trips to other modes. Other opportunities are likely to be presented as technology evolves, such as electric bikes, autonomous vehicles, operational technology/communications (such as traffic signals control etc.).

Stakeholders developed and evaluated a long list of alternatives and options as ways to deal with the problems. The list of strategic interventions included:

- Supply measures, such as new roads, widening existing roads or major intersection changes;
- Demand management measures: reducing the demand for single occupant travel by supporting walking, cycling and passenger transport; and
- Operational measures: getting the most out of the existing network e.g. improving signals, parking management, Intelligent Transport Systems (ITS), traffic operations centre.

A qualitative analysis of the long list of options was completed for a 10 year outlook based on a scoring matrix of criteria that reflect the desired outcomes:

- Providing safe, accessible and active transport choices to improve community wellbeing
- Providing reliable access for existing centres and growth areas to support economic development
- Optimising the use of the transport system to delay the requirement for new infrastructure.

The method was tested for sensitivity to different weightings (growth, safety and choice) and determined to be robust and appropriate.

The BAU option did not score towards all objectives since it is not currently achieving safety or mode shift targets. In order to establish the preferred programme, variations based on the BAU were tested. These included the BAU with a focus on safety, BAU with a focus on growth and economic development and BAU with a focus on mode shift.

Programme development needs to continue Hamilton's intervention hierarchy principles and prioritise maintaining our existing assets and lower cost interventions before significant cost projects. Network management and minor improvements are delivered through Hamilton's Transportation Activity Management Plan. This groups activities in portfolios for delivery.

The portfolios roughly align with the target outcome areas and the programme development considers activities being delivered as part of the portfolios and as sub-programmes and stand-alone activities. Some of the activities are at an advanced stage of planning or are at pre-implementation and implementation stages. Whilst grouped in portfolios that align with outcome areas, we recognise that activities do not contribute only to one outcome area.

The following illustration demonstrates that taking the BAU and targeting a specific area is not going to achieve the programme objectives. A balanced programme investing in all areas and in a range of interventions is needed.

Attachment 2

Item 8

Economic Development

Strategic transport network eg. existing arterials, Ring Road Capacity upgrades- intersections and corridors.
Eg. Cross City Connector

Secondary benefits: some for growth and a little for safety at intersection upgrades, but without investment in transport choice car growth is expected to continue (more cars = more risk).

Overall Contribution to Targets

Safety	Transport Choice (w/c)	Transport Choice (PT)	Growth (HH)	Economic Development
5%	0%	0%	20%	100%

Growth

Growth areas eg. Peacockes, Rotokauri, Ruakura
New arterials and collector upgrades. Key connections to existing strategic network eg. Southern Links

Secondary benefits: some for economic development and a little for safety since new network will consider safety in design but without investment in transport choice car growth is expected to continue (more cars = more risk).

Overall Contribution to Targets

Safety	Transport Choice (w/c)	Transport Choice (PT)	Growth (HH)	Economic Development
5%	0%	0%	100%	20%

Business as Usual (BAU)
Plus additional effort in:
- **Economic development**
- **Growth**
- **Safety**
- **Transport choice**

Safety

City wide minor improvements and intersections Eg. Gordonton/Thomas. Along with promotion and education to meet targets.

Secondary benefits for all users (capacity improvements, walking/cycling)

Overall Contribution to Targets

Safety	Transport Choice (w/c)	Transport Choice (PT)	Growth (HH)	Economic Development
100%	10%	10%	0%	25%

Transport Choice

MT infrastructure and priority (key corridors eg. School link).
PT Services (WRC) need to approximately double to give full effect and meet 10 year targets.
Transport Centre Rejuvenation , Park and Ride facilities (eg. Rotokauri)
Biking and walking facilities (Biking Plan, Frankton Neighbourhood Plan)

Secondary benefits for safety since less cars means less exposure and for efficiency since less congestion.

Overall Contribution to Targets

Safety	Transport Choice (w/c)	Transport Choice (PT)	Growth (HH)	Economic Development
20%	100%	100%	0%	30%

6.1. Facilitating Access for Growth and Economic Development

The National Policy Statement for Urban Development Capacity (NPS-UDC) requires high-growth areas such as Hamilton to plan and coordinate for future growth in accordance with the Statistics NZ Medium projections +20% for short-medium term and +15% for the long term planning. The NPS-UDC was released in November 2016 and the Government has made $1billion available within the Housing Infrastructure Fund (HIF) to assist high growth council to advance infrastructure projects important to increasing housing supply. Hamilton has an opportunity for a share of the 10 year interest free fund to bring forward transport and water infrastructure required for new housing in the Peacocke growth cell. The detailed business case, due to be completed this year, will provide certainty for how the loan would work.

The current Long Term Plan invests in growth and economic development but since it pre-dates the HIF and the NPS-UDC is not going to fully achieve these new requirements in terms of access for new subdivision/development.

Access for growth within Hamilton city can be achieved through infill (development of existing areas) and development of new areas. The ten year target is 7,638 more households. The current 10-Year Plan is likely to achieve less than half of this (additional 2,510hhs).

Investing more in growth and economic development activities will get closer to achieving the targets. The ten year target of 11,638 households in the new growth areas is 7,638 more than likely to be delivered in the BAU.

Hamilton City has planned for growth areas within the Peacocke, Rototuna, Rotokauri, Ruakura and Te Rapa growth areas.

To enable access for development to meet the ten year targets, significant investment in Peacocke, Rototuna and Rotokauri growth cells, as well as investment in economic development is needed.

Whilst delivering access for growth, safety or capacity problems can become apparent on the existing network. For example, in the north of Hamilton where there has been considerable traffic growth safety issues have arisen at intersections. An intersection upgrade to address safety issues probably would not have been needed without the significant growth that has happened. Intersection upgrades to address safety will also deliver secondary benefits for facilitating growth and economic development outcome areas since capacity is likely to be improved as a result of an upgrade investment. Upgraded and safer facilities for pedestrians and cyclists have secondary benefits for transport choice outcomes as well. Although much less significant than the targeted outcome, the secondary benefits are recognised.

The Preferred Programme investment is displayed in the graphs opposite and compares to the current BAU. In order to make the difference needed to achieve growth and economic development targets, additional investment is needed. Key activities include developing the Southern Links arterials including a new bridge over the Waikato River enabling access for the Peacocke growth cell, arterials within the Rotokauri growth area, a new arterial spine road within Ruakura and upgrade/urbanisation of roads within Rototuna growth cell.

The graphs are based on every $1M spent on growth profile providing access for 18-19 households. This reflects the high upfront cost of access and is averaged over all the growth cells. Beyond 10 years, the amount per household will reduce since the initial costs to install the lead infrastructure will already be in place.

Attachment 2

Item 8

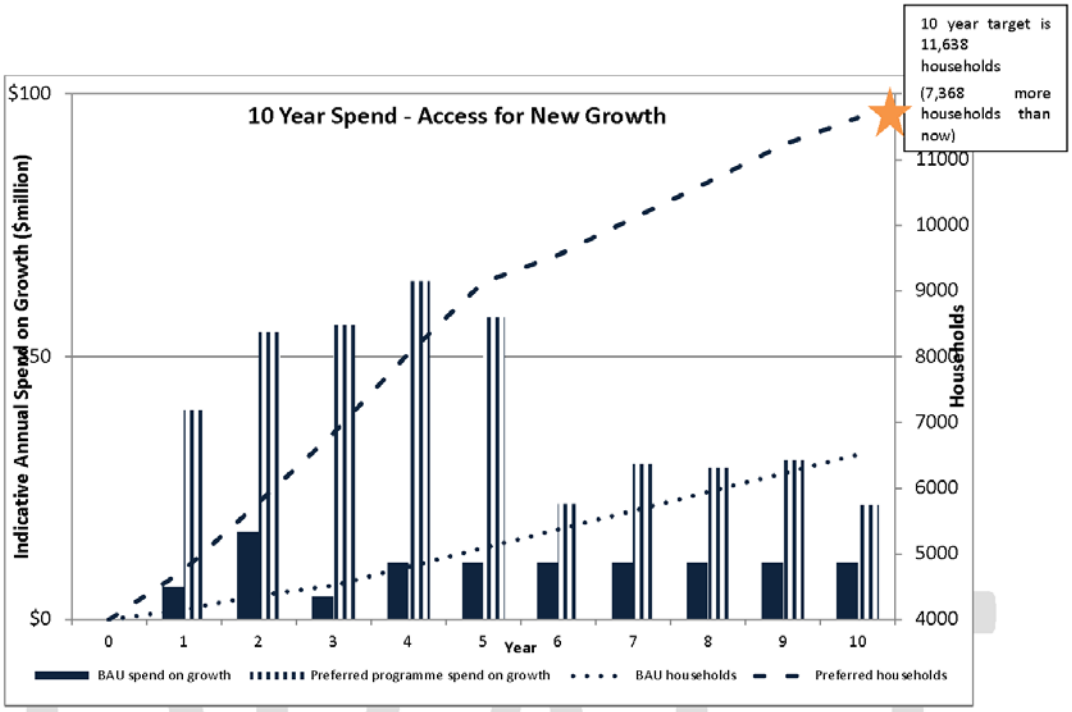


Figure 17: Indicative 10 Year Spend in order to achieve growth (11,638 hhs in 10 years) compared to BAU

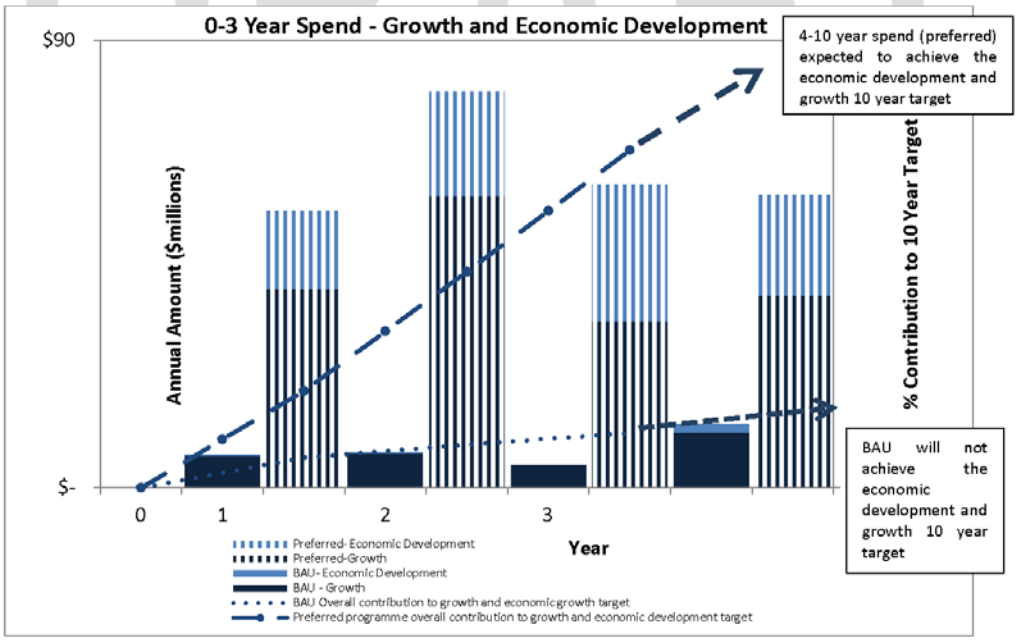


Figure 18: Likely 3 year spend in order to achieve growth and economic development targets compared to BAU

6.2. Improving Safety

The target adopted for the programme is challenging (0 deaths and 25% reduction in serious injuries by year 10). Continuing what we are doing is not likely to improve the safety performance seen in recent years. With growth expected there is no reason to expect a change in the dominant car use and more people mean more trips means more cars. Without considerable intervention, more cars are likely to lead to more crashes. Even with an increase in trips by bus and other modes (walking and cycling) leading to a decrease in car trips, given there will be more travel because of population growth there is not likely to be an improvement in the current trends without a considerable effort. Vulnerable users (pedestrians and cyclists) are already over-represented in crashes in Hamilton. Making people feel safer using the transport system can encourage more active trips.

In terms of benefits, a reduction of 5 deaths and 9 serious injuries is equivalent to $30 million in savings. For a benefit-cost ratio of 1, this would justify $30 million invested over 10 years. The BAU has included around $600,000-700,000 as an annual amount for minor safety improvements, such as improving pedestrian crossing facilities and traffic calming measures. Safety improvements at intersections and to improve facilities for vulnerable users target the investment to areas of high risk. Safety promotions achieve BCRs of around 6, so investing in promotion is effective in combination with other measures including infrastructure improvements.

Significant increase in safety interventions investment based on the current spend of less than $1M per year not positively contributing and above that every $6-7M spent (over and above the BAU spend), would save 1 death and 2 serious injuries. In order to reach the 10 year targets in that timeframe, then an extra $35M is needed. This roughly aligns with the BCR calculation above.

The graph below illustrates the likely decline in safety if we don't do something different as well as the preferred option with the additional investment in safety needed to achieve the targets.

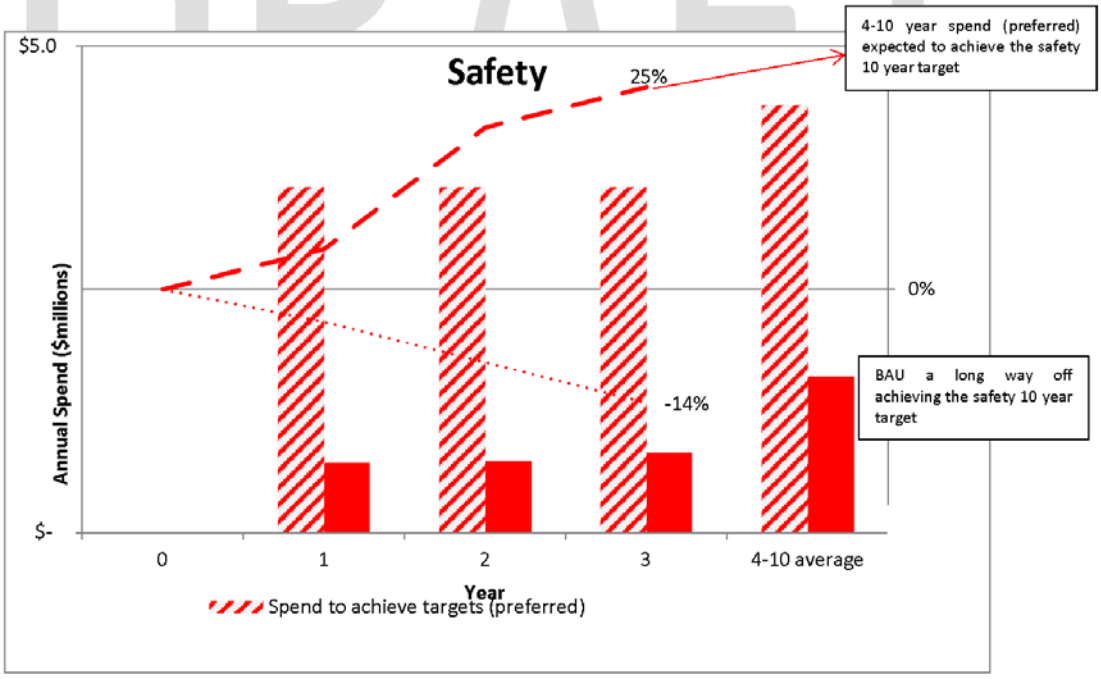


Figure 19: Indicative spend on safety to achieve 10 year measure compared to BAU

6.3. Transport Choice

The target adopted for the programme achieves a doubling in trips by walking and cycling and a little more than a doubling in the trips by bus/PT. We need to increase the mode share of walking, cycling and mass transit in order to reduce the demand for car trips. There has been some recent investment in cycling within the city, and the total BAU investment of $11.5M over ten years is expected to make a small contribution towards mode shift. Traveling by bus has little advantage in terms of travel times, since there are currently only a handful of prioritisation measures on the citywide transport network. Along with population growth and continued traffic growth, PT is not likely to be an attractive option unless travel times are protected or enhanced. Interventions such as parking policy within the CBD can influence travel modes but without more effort PT services are not likely to be any more attractive than current. A significant change will be needed to reduce private vehicle trips and achieve mode shift. In order to achieve the ten year target significant effort is needed in the immediate term to determine how and what should be done to effect a step change in the role of mass transit and active modes.

The Regional Public Transport Plan for the Waikato Region Paper on Growth Targets Modelling and Analysis, indicates that in order to increase mode split to 7% an investment of around $40M on infrastructure is needed, plus an additional $150M on the services (a doubling of the services). For simplicity, our evaluation of the likely contribution towards the ten year targets for PT is based on this. Specific investigation into mass transit options is needed to identify what, where and how the change will be needed to confirm the assumptions.

In order to achieve an increase we need priority measures and would need to build on services. Investing $30M on transport choice activities in the first three years recognising that land is needed to protect future mass transit options such as park and ride sites in the new growth areas. For the purposes of evaluation, we have assumed an annual increase of PT patronage.

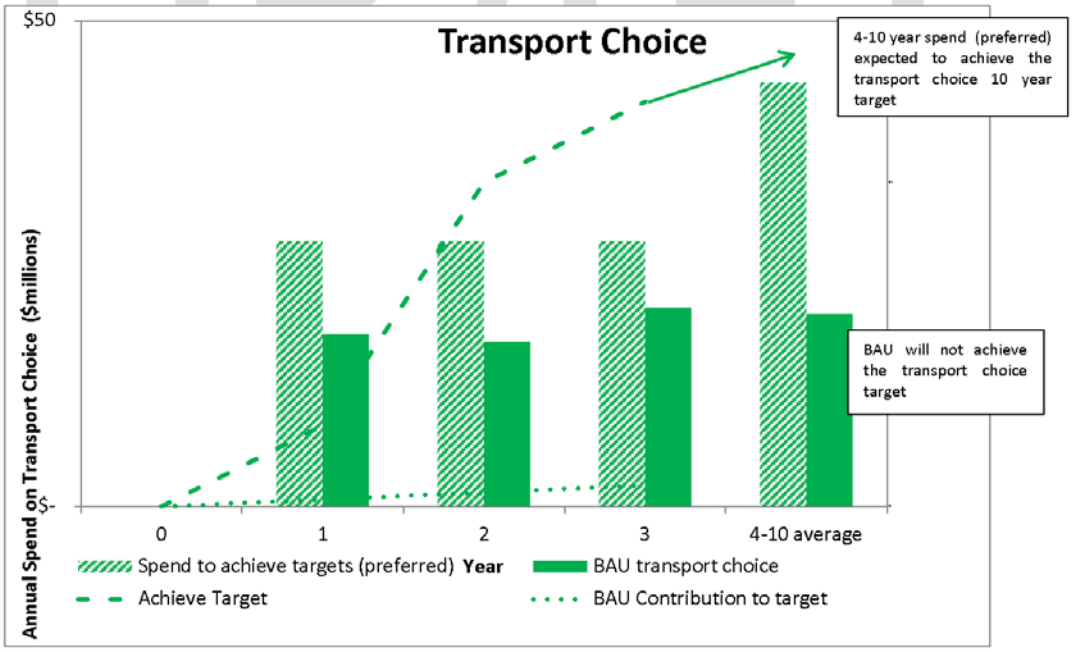


Figure 20: Indicative spend to achieve 10 year targets (transport choice) compared to BAU

7. Fine-Tuning the Preferred Programme

The preferred programme for Hamilton's transport delivers benefits for all modes. It includes capital works, PT services and state highway improvements. Focusing on one area will not achieve Hamilton's desired outcomes for the programme. A balanced approach combines interventions and recognises the primary outcome areas with overlapping contributions. The 2018-28 10-Year Plan is dominated by growth. It is recognised that the growth areas will provide wider benefits including safety, transport choice and economic development.

The Hamilton City 2015-25 10 Year Plan is currently undergoing a 3 year revision. It needs to include activities that contribute towards achieving the Programme targets. With the NPS requirements for access to households, the Facilitating Growth Portfolio is significant compared to what we have been doing. The State Highway Improvement Plan and the Waikato Regional Council bus services are key partners to achieving the targets. In particular, to achieve the desired mode shift, PT services need to be increased following significant infrastructure investment in order to fully realise the benefits.

Delivering the preferred programme for transport will achieve:

- 11,638 households
- No deaths and one quarter fewer serious injuries (than now)
- Levels of service on transport network no worse than now
- Increased trips by other modes (22% walking and cycling, 7% by PT)

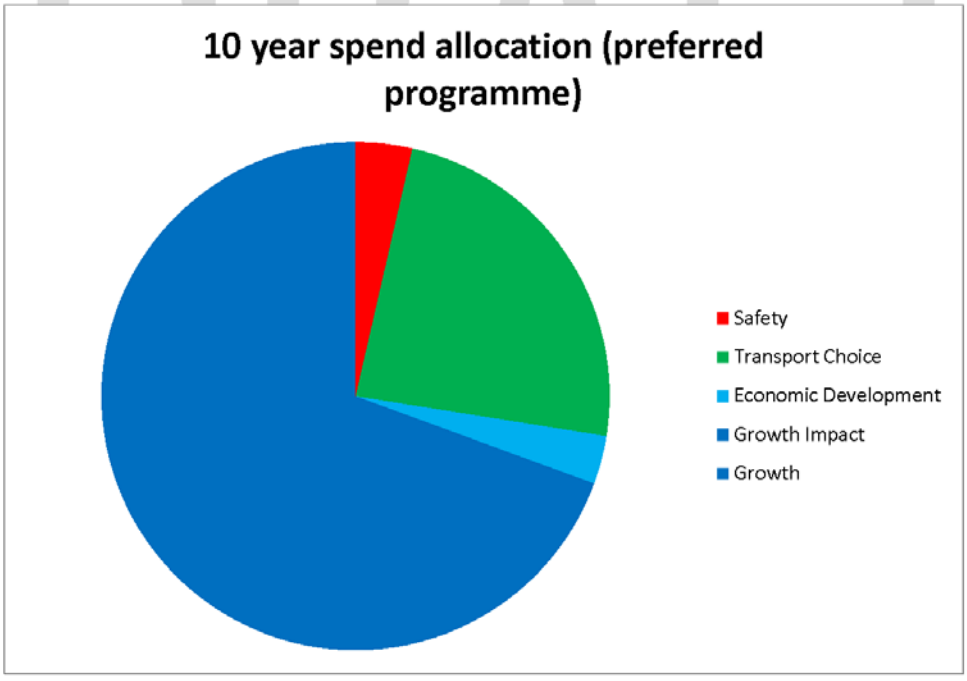


Figure 21: Pie graph illustrates the spend allocation of the preferred programme to achieve the 10 year targets across all partners: HCC, NZTA and WRC

The area graph in the figure above indicates spend levels for the outcome areas that are likely to be needed to achieve 100% of the desired targets. The table below is indicative of the level of investment needed by the funding partners.

Funding Party	Ten Year Total
Hamilton City Council - (incl. growth)	$1,090,050,780
Waikato Regional Council – PT services	$210,000,000
New Zealand Transport Agency- Capital Works (Draft SHIP excl WEX)	$444,275,000
PROGRAMME TOTAL (Incl. Growth)	$1,744,325,780

Table 1: Indicative Spend for the Preferred Programme

8. Programme Implementation Strategy and Trigger Points

The programme will be implemented by HCC, WRC and NZTA through the SHIP, AMP, RPTP and the HCC Access Programme as delivery portfolios consistent with the Activity Management Plan (AMP) portfolios and an additional portfolio "Travel Choice" has been included:

- Managing and facilitating growth.
- Improving safety.
- Environmental sustainability.
- Supporting economic development.
- Maintaining our network.
- Travel choice.

The table below displays the expected 1-3 year spends and 10 year total in order to achieve the 10 year targets.

Portfolio		Ten Year Total	Years 1-3	30 Year Outlook
Growth	HCC	$815,825,030	$370,652,030	Expected to reduce once lead infrastructure is in place
	NZTA	$395,000,000	$5,500,000	
Economic Development	HCC	$34,414,750	$431,000	30 Year forecast expected to be similar to 10 year spend
	NZTA	$19,120,000[3]	$9,120,000	
Improving Safety	HCC	$57,927,000	$25,342,000	Investment expected to reduce slightly once 10 year target has been achieved but reduced investment likely to still continue
	NZTA	$4,790,000	$4,200,000	
Travel Choice	HCC	$181,884,000	$58,024,000	Expected to reduce once significant infrastructure in is in place. Some investment likely to continue improved Travel Choice
	NZTA	$25,365,000	$18,365,000	
	WRC	$210,000,000	$45,000,000	Additional services expected
AHS Implementation	HCC	$5,000,000	$1,500,000	Similar investment expected to continue

Table 2: Spend Profiles

Key programme activities outside Hamilton's Transportation Activity Management Plan programme will be delivered by NZTA, WRC and HCC, working with other parties such as developers.

[3] This does not include the amount committed to the WEx

A key new activity for Hamilton's programme is the investigation and development of a mass transit plan. This will determine and coordinate how and when to develop services and infrastructure to effect mode shift that is required within the city, how mass transit services and infrastructure such as bus, rail, park and ride, high occupancy lanes and intersection priority will deliver future changes. The mass transit plan needs to ensure convenient and affordable access in the long term. It is likely to require significant infrastructure and operational changes to services to provide sufficient mode shift to maintain levels of service. This will determine initiatives for access to the city centre and improved connections along strategic corridors such as Wairere Drive, Hukanui and Peachgrove Road.

Existing activities already identified in the 2015-2025 10-year plan and SHIP will be prioritised and implemented through the portfolios. Subprogrammes within the portfolios, such as Southern Links, combine a number of existing activities and are likely to maximise the desired outcomes. Individual activities address specific problems and have their own benefits, which as a combination contribute to the overall programme objectives.

New activities in the short term are maintenance, renewals and minor improvements identified by the NIP. These will be implemented as per Business as Usual through the Activity Management Plan (AMP). This includes activities in the Maintaining our Network portfolio as well as minor works within the portfolios. The Infrastructure Technical Specifications (ITS) provide guidelines for design standards based on accepted industry practice such as the NZTA MOTSAM (Manual of Traffic Signs and Markings) and Austroads Road Design guides. Acceptable levels of service are set in the Hamilton City 2015-2025 10-Year plan which filters to detail in the AMP and the Network Operating Plan. Absolute minimum levels of service should be protected with desirable minimum levels. Desirable levels for user groups are included in the NOP. These will be the triggers for activities and timing of implementation. The network will continue to be measured through the AMP as well as the NOP. Safety improvements are expected to be identified as the NOP develops, and the High Risk Intersection Guide is a tool for identifying and prioritising safety locations. Any work identified that can be completed as minor works will feed into the AMP for implementation. Significant activities will be prioritised through the portfolios and considering the investment assessment profile for the individual activity.

Activities with established Business Cases or their equivalent for include:

- Access for Peacocke residential area and Southern Links (Pre-implementation phase). Investigation to date supported as equivalent to Detailed Business Case.
- Access for Rotokauri residential area (Detailed Business Case phase). Investigation to date supported as at least equivalent to Indicative Business Case.
- Hamilton's Transportation Activity Management Plan activities (Programme Business Case)

Other activities outside the Activity Management Plan will require Indicative Business Cases. These include:

- Mass transit plan
- City centre access (Part of Strategic Network)
- Cross City connector (Part of Strategic Network),
- Northern River Crossing (Part of Strategic Network)
- Cobham Drive improvements (Part of Strategic Network)
- School Link

To determine how the programme is achieving the desired objectives, the programme will be monitored on a 3 yearly basis and measured against the KPIs to determine performance.

Attachment 2

Item 8

8.1. Key Activities

Project	Construction From 30yr Infrastructure Plan	Preparation Activities*		Construction Funding* (1-3 years prior to Construction)	Possible Point of Entry to Activity Business Case Phase
		Investigation (3 years before Design)	Design (3-5 years prior to Construction)		
Resolution Drive Extension	2017 – 2019	Complete	With WEx	With WEx	n/a - done
Northern River Crossing	2023, 2026 – 2032, 2034 – 2038	2018	2021	2023	Indicative
Southern Links – Wairere Drive Extension – Bridge to Peacocke	2026 – 2030	Complete	2021	2023	Pre-Implementation
Ring Road Improvements	2027 – 2029, 2036 – 2038	2019	2022	2024	Implementation
Cross City Connector Capacity Upgrade	2020 – 2041	2017	2020	2021	Indicative
Upgrade Bridges Capacity and Strength	2026 – 2036	2018	2021	2023	Indicative
Rail and Passenger Transport Interchange Development	2029 – 2039	2021	2024	2026	Strategic Case
Transport Centre Redevelopment	2035 – 2037	2027	2030	2032	Strategic Case
Southern Links – Arterial roads in Peacocke	2041 – 2045	Complete	2036	2038	Pre-Implementation
Rotokauri – Arterial roads	2025 – 2026, 2027 – 2028, 2034 – 2035	2017	2020	2023	Detailed
Ruakura –Spine Road and Arterials	2019-2025 2026-2035 2036-2045	2017	2020	2023	Detailed

*ESTIMATED DATES SHOWN ARE INFERRED AND SHOULD NOT BE RELIED UPON.

Time Risk
High
Medium
Low

South Hamilton Arterials – Peacocke Arterials and Southern Links State Highways

The Southern Links activity includes the development of the arterial road network within the Peacocke growth cell area and the state highway connections linking SH1 south of Tamahere, crossing SH21 and linking to urban SH1 at Kahikatea Drive, with a realignment of SH3 to link into the Peacocke north-south arterial.

30

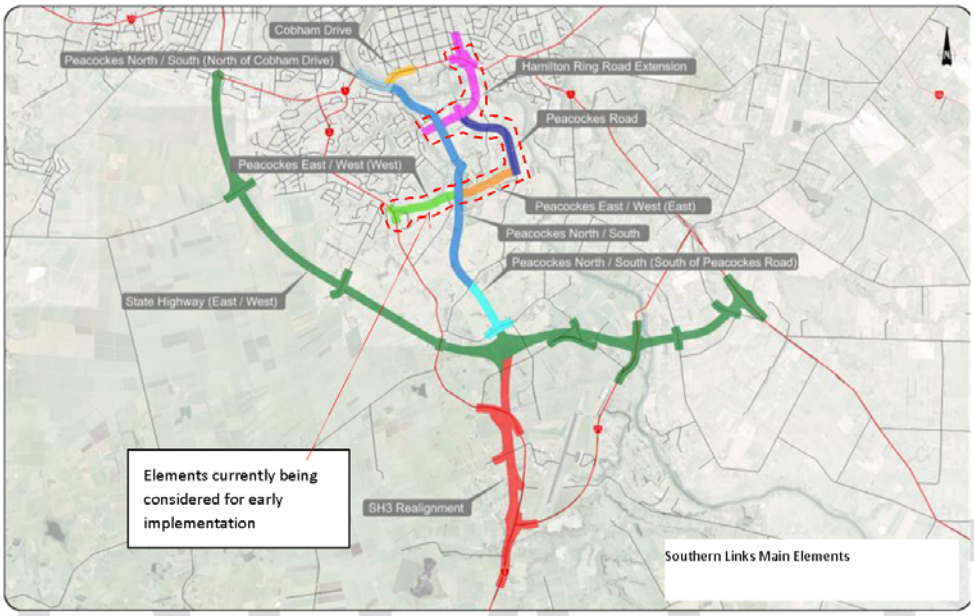


Figure 22: Hamilton Southern Links

The Southern Links project is the only Waikato Highway project that is mapped to NZTA's 'Target rapid growth' focus area. Residential growth in Peacocke is planned with around 7,700 households expected and development in three stages. The development of the Peacocke area will contribute to delivering on the NPS – Urban Capacity Development targets. Higher than expected population growth and demand is accelerating problems relating to:

- Access for growth in Peacocke Structure Plan (residential) and Hamilton Airport Business Park areas
- Congestion, safety and conflict on SH1 between Hillcrest and Kahikatea Drive
- Congestion affecting freight to Hamilton's Western Corridor to and from the south (use of urban SHs)
- Capacity, safety and alignment on SH3 and SH21
- Increasing pressure from developers in the Peacocke area for transport and trunk utility access

The benefits to be realised include improved trip reliability, economic growth from enhanced access to employment and planned residential markets, improved safety and amenity on existing corridors (SH1, 3, 21 and local roads) and better opportunities for managing travel demand though facilities for walking, cycling and passenger transport.

The point of entry in the Business Case process for Southern Links is confirmed as Pre-implementation Business Case stage.

There is robust economic justification for the Southern Links project, which would increase if accepted as a HIF project. The Package benefit Cost Ratio (BCR) is 2.0. The expected construction cost is approximately $600M. The expected cost for the early stages would be around $200M (approximately $52.3M net present value option cost), with present value of benefits mainly from travel time savings around $170M. This results in a benefit cost ratio of 3.2 for a phase including partial implementation including an east west connection and a bridge linking Peacocke to the Wairere Drive ring road at Cobham Drive, although reliant on comparatively high do minimum costs. Additional benefits are available if the project is recognised as lead infrastructure as part of the Housing Infrastructure Fund, with higher discounted option costs, leading to a BCR around 3.1.

2015-18 IAF:

The 2015 – 18 IAF Strategic Fit criteria includes providing access to housing development in high growth urban areas, which Hamilton is. The Strategic Fit is HIGH.

Effectiveness rating requires an assessment against a combination of components as tabulated below. The overall rating (lowest component rating) for Effectiveness is HIGH.

The benefit and cost appraisal – Efficiency is MEDIUM/HIGH:

- MEDIUM/HIGH if considered solely as a transport project (BCR 2.0 -3.2 depending on how do minimum is assessed – see sections 8 and 10).
- HIGH if calculated assuming that the level of housing development that cannot occur without the investment is advanced (HIF lead infrastructure approach).

The IAF profile is therefore HHM to HHH.

2018-21 NLTP Assessment Framework[xxviii]:

The 2018-21 NLTP Assessment Framework Results Alignment criteria includes transport access to enable housing development in high growth urban areas, which Hamilton is. The **Results Alignment is VERY HIGH**.

The cost-benefit appraisal: BCR 2.0-3.2 (depending how do minimum is assessed) if considered solely as a transport project.

The IAF profile is therefore:

- Very High Results Alignment
- Cost-benefit appraisal 2.0-3.2.

This achieves a priority rank of 1.

Rotokauri Arterials

Rotokauri is Hamilton's north-west growth area and part of the Future Proof Northern Growth Corridor. NZTA, HCC and Waikato DC have an agreement for integrated planning including the Rotokauri arterials as key infrastructure elements.

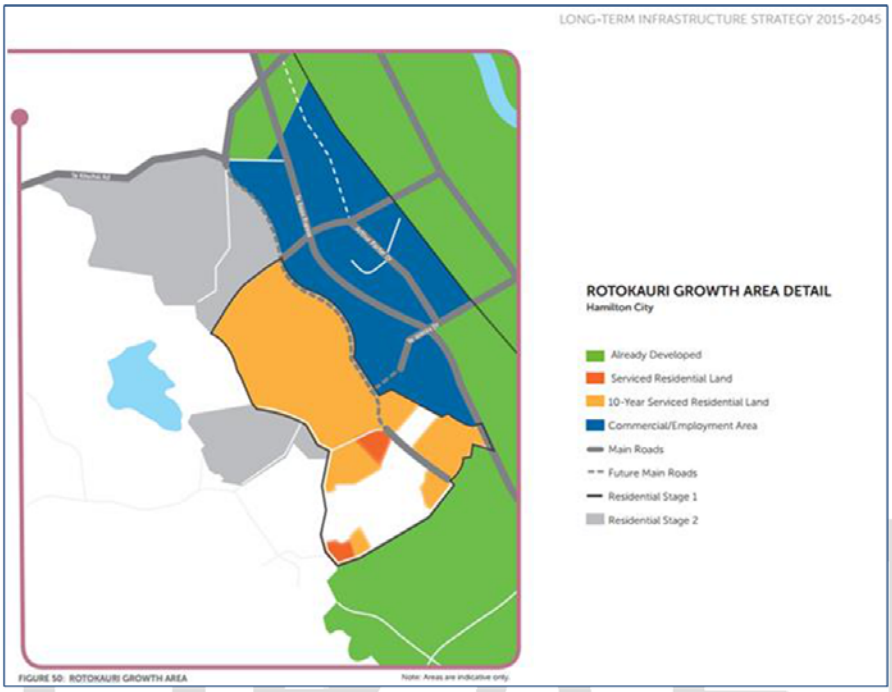


Figure 23: Rotokauri Arterials

The current problem is that higher than anticipated growth and growth projections have resulted in investment in strategic infrastructure not keeping pace with demand and potentially constraining economic growth and travel choice and leading to adverse outcomes on the existing network. HCC is investing in 3 Waters infrastructure so transport may become the last constraint.

The current problems form a subset of the original Te Rapa Bypass problems:

- Access for growth in Rotokauri Structure Plan (residential) and Northern Corridor areas
- Congestion, safety and conflict on existing road network affected by growth and Te Rapa section of Waikato Expressway
- Congestion affecting freight to Hamilton's Northern Corridor to and from Waikato Expressway
- Increasing pressure from developers in the Rotokauri area for transport access and stormwater management

The benefits to be realised include improved trip reliability, economic growth from enhanced access to employment and planned residential markets, improved safety and amenity on existing corridors (SH1 and local roads) and better opportunities for managing travel demand though facilities for walking, cycling and passenger transport.

There is robust economic justification for the project, with benefits relating to its function as lead infrastructure as part of the Housing Infrastructure Fund. The benefit Cost Ratio (BCR) is 1.4. The expected construction cost is approximately $57M (approximately $50.2M net present value option cost), with present value of benefits mainly from travel time savings around $70M.

Investigation and option development to date is equivalent to an Indicative Business Case or beyond. Although the option development is well advanced it would be beneficial to review the strategic context, problems and benefits and retest the proposal against current investment objectives.

The next step for new activities part of the Northern Hamilton Area Transport Infrastructure is therefore Detailed Business Case. HCC will continue to work with NZ Transport Agency to scope the Detailed Business Case activities.

2015-18 IAF:

The 2015 – 18 IAF Strategic Fit criteria includes providing access to housing development in high growth urban areas, which Hamilton is. The Strategic Fit is HIGH. The overall rating (lowest component rating) for Effectiveness is HIGH. The benefit and cost appraisal – Efficiency is LOW.

The IAF profile is therefore **HHL.**

2018-21 NLTP Assessment Framework:

The 2018-21 NLTP Assessment Framework Results Alignment criteria includes transport access to enable housing development in high growth urban areas, which Hamilton is. The **Results Alignment is VERY HIGH**.

The cost-benefit appraisal: BCR 1.4.

The IAF profile is therefore:

- Very High Results Alignment
- Cost-benefit appraisal: BCR 1.4.

This achieves a priority rank of 1.

Strategic Network

Hamilton's strategic network is defined in the District Plan, RPS and RLTP and includes HCC roads and urban State Highways.

The problems for the strategic network are:

- Dealing with the traffic effects of growth in Ruakura – Ruakura arterials and Ruakura Spine Road
- Dealing with the traffic effects of growth in Rototuna/Te Rapa – Northern River Crossing
- Increasing traffic and access demands is leading to congestion, safety and conflict on the existing HCC strategic network including Wairere Drive and the Hall Street, Mill Street, Boundary Road, Fifth Avenue corridors (cross-city connector)
- Increasing traffic and access demands is leading to congestion, safety and conflict on the urban State Highway network including SH1 Cobham Drive, Kahikatea Drive, Greenwood Street

The benefits relate to:

- Reduction in deaths and serious injuries
- Access for residential development and economic growth
- Travel time reliability.

The point of entry for the strategic network business case is likely to be the Indicative Business Case phase.

2015-18 IAF:

The point of entry for the strategic network business case is likely to be the Indicative Business Case phase.

Based on similar projects, Southern Links, Rotokauri and the Hamilton Ring Road, the Indicative Benefit Cost Ratio is likely to be LOW-MEDIUM.

The IAF for the strategic network would therefore be **H (L-M)**

2018-21 NLTP Assessment Framework:

The 2018-21 NLTP Assessment Framework Results Alignment criteria includes transport access to enable housing development in high growth urban areas, which Hamilton is. The **Results Alignment is VERY HIGH**.

In other areas of the strategic network, the criteria include addressing significant gaps in levels of service and supports economic growth and development. The **Results Alignment is HIGH.**

The IAF profile for the strategic network is therefore:

- High-Very High Results Alignment
- Indicative Cost-benefit appraisal: BCR 1-2

Mass Transit Plan/Integrated Transport Plan and Subsequent Activities

The problems for mass transit are:

- Uncertainty in the coordination of network infrastructure and service planning
- Short term service planning and potentially high infrastructure or other user costs discourages investment.
- Increasing congestion that buses are stuck in reduces the potential for travel time advantage and increased patronage.
- Hamilton cannot afford to build its way out of congestion and needs a significant mode shift to maintain access between activities and support social and economic benefits.

The benefits relate to:

- Travel time reliability
- Access for residential development and economic growth
- Lower long term infrastructure costs.

The point of entry for the strategic network business case is likely to be the Indicative Business Case phase.

The mass transit activity has a medium- high rating for strategic fit because it makes a positive contribution to providing access to social and economic opportunities and reduces severe congestion in the Hamilton major urban area. The Hamilton urban area includes Cambridge.

A shift of 2% would be equivalent to a year's traffic growth and defer the need for that expenditure.

2015-18 IAF:

The benefit cost appraisal is in the range of 2-3, so Low – Medium. However, the efficiency of investing in an effective evidence base in directing expenditure of around $40M is very high. The IBC is essential and can determine what approach is best to deliver benefits.

The IAF for mass transit would therefore be **H (L-M-H).**

2018-21 NLTP Assessment Framework:

A Public Transport Improvement Activity providing transport access to enable housing development in high growth urban areas achieves a **Very High Results Alignment**. An activity that addresses significant gaps in levels of service and supports economic growth and development or has capacity and demand that are mismatched (in a high urban growth area) has a **High Results Alignment.**

Strategic walking and cycling network activities within high urban growth areas have a **High Results Alignment** as do those activities on a corridor with high cycling or walking crash risk.

The benefit cost appraisal is therefore in the range of 1-2.

The IAF for mass transit would therefore be:

- High- Very High Results Alignment
- Cost-benefit appraisal: BCR 1-2.

Town Centre Access

Supporting access to the city centre is fundamental to achieving and maintaining a compact form for Hamilton. The transport cost implications of dispersed land use are extremely high.

Town centre access activities are spread throughout the programme, including bus priority hotspots, cross-city connector, intersection improvements and pedestrian/cycle improvements. Many will be delivered separately or through the Hamilton Transportation AMP but Town Centre Access needs to be recognised as a key activity.

2015-18 IAF:

The results alignment for town centre access would be medium-high based on its component assessments.

The cost benefit appraisal would be medium-high based on the individual activities. However, avoiding an inefficient land use outcome would have significant additional benefits. The IAF for town centre access would therefore be H (M-H)

2018-21 NLTP Assessment Framework:

The Results Alignment for town centre access would be **medium-high** based on its component assessments.

The IAF for town centre access would therefore be:

- Medium- High Results Alignment
- Indicative Cost-benefit appraisal: BCR 1-2

8.2. Programme Assessment Profile

The NZTA Investment Assessment Framework for the 2018-21 NLTP uses two assessment factors to determine the degree to which the programme meets the Government's investment strategy (as set out in the GPS).

The assessment profile of the programme achieves:

- High – Very High[4] Results Alignment
- Indicative cost-benefit appraisal: BCR 2

The assessment profiles on activity by activity basis will determine prioritisation and timing. During delivery each activity's assessment profile will be updated to determine prioritisation within the programme. The two assessment factors form an assessment profile for priority ranking. The Housing Infrastructure Fund (HIF) allows for lead infrastructure to achieve Very High Results Alignment achieving the highest priority ranking. An activity with a Very High Results Alignment has the highest priority ranking, followed by activities with Cost-benefit appraisals exceeding 10, then on a combined Results Alignment and Cost-benefit appraisal basis.

The Network Improvement Plan focuses on significant level of service gaps. The cost-benefit appraisal criteria are assessed on an activity by activity basis and the focus will be on activities with higher cost-benefit appraisals.

8.3. Programme Outcomes

Investment in the programme will provide access for growth areas, reduce deaths and serious injuries on our transport system and improve levels of service for all users contributing to the economic growth and development of the city and wider region.

8.4. Programme Risks

Risks to the programme achieving the investment objectives can be addressed through monitoring and review. The strategy, framework and plan for dealing with the management of risk are in accordance with HCC's risk management policy, which outlines HCC's risk management philosophy, risk threshold and approach to managing risk.

The implications of technological developments, climate change and higher environmental standards in the future are recognised and will need to be dealt with as they arise. Since these cannot be anticipated or fully

[4] Likely "VERY HIGH" for activities needed for access for residential growth – others likely to be HIGH

understood yet, the balanced programme allows flexibility and will be monitored to ensure the uncertainty of climate change, technology and environmental standards are managed to reduce risk of the programme not delivering the desired outcomes.

The investigation of mass transit options avoids the risks associated with a potentially polarising programme. Investigation and additional effort towards a transformational change needs more evidence than currently available. Mass transit planning needs to be coordinated with WRC service planning and strategic network infrastructure.

The projected growth of Hamilton and surrounding towns means the programme delivers access for this growth. There is a risk that the demand does not eventuate as predicted however the current demand already exceeds the available lots for development. The programme response to households is gradual and monitoring of the programme will ensure supply does not overtake demand. Infrastructure delivery for growth is planned, timed and coordinated. Hamilton is recognised as an area of high urban growth and the Housing Infrastructure Fund means that lead infrastructure may be implemented early.

Matching affordability and balancing levels of service benefits is a programme risk since travel with cost of providing or maintaining the levels of service is a programme risk. For example balancing capacity, travel time reliability and providing for PT within the same corridor is not likely to be achievable. User and network hierarchies will inform desired outcomes and programme monitoring and review should address these types of issues.

Affordability is a significant risk. This will be managed through the 10 year Plan, Annual Plan and Regional Land Transport Plan processes.

Each major project will maintain a risk register, issues register, and change register, and update the project management plan following governance approval of any changes. We will complete a post-implementation review within 6 months of completion (Level 3 assurance).

We will prepare a Benefits Realisation Plan as part of the detailed business case for activities. HCC's strategy for management and delivery of benefits is to establish clear measures and milestones for benefits and to test proposals and outcomes against these as the project develops and is refined and delivered.

9. Delivering and Monitoring the Programme

Hamilton City Council, NZ Transport Agency and Waikato Regional Council will continue to collaborate in implementation through the Hamilton One Network Framework. This sets and reviews levels of service in accordance with the One Network Road Classification (ONRC) Customer Levels of Service. A Network Operating Plan establishes agreed corridor functions for different times of day and guides user priorities in different sections of the network. Operating gaps between minimum Customer Levels of Service and actual conditions, in conjunction with crash data and infrastructure condition and safety ratings, highlight desirable improvements which are prioritised for treatment through the Network Improvement Plan.

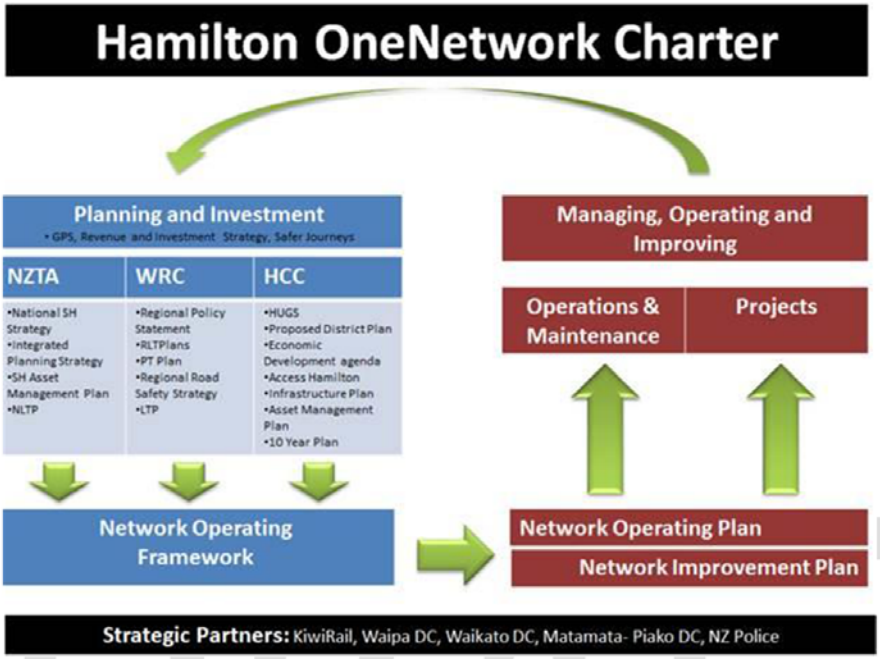


Figure 24: Hamilton One Network Charter Framework

HCC will monitor the programme on an annual basis against the key measures to determine how the programme is achieving the objectives. This allows reprioritisation of activities in response to growth and other changes. It is more likely to impact on the timing of implementation rather than scope changes but will provide opportunities for new activities to be considered.

The documents which provide the framework for programme delivery are:

- Activity Management Plan (AMP) and a series of activities – Maintenance and renewals
- Network Operating Plan (NOP)
- Network Operating Framework (NOF)
- One Network Road Classification (ONRC)
- State Highway Improvement Plan (SHIP)
- Regional Public Transport Plan (RPTP)

Programme delivery will be guided by levels of service identified in the AMP for the existing network and NOP/NOF for new infrastructure. Design standards are set by the Regional Infrastructure Technical Specification.

The programme's governance structure involves the following parties:

- Hamilton City Council (Programme owner, local roads and PT infrastructure)
- NZ Transport Agency (Funding provider and state highway authority)
- Waikato Regional Council (PT services)

Hamilton operates three levels of assurance to ensure effective delivery, starting from the ground up and comprising:

Level 1: Project management oversight, capability and experience (L1);

Level 2: Project/programme governance (L2); and,

Level 3: Independent and objective assurance (L3)

These will apply to the programme as a whole and, as appropriate, for individual activities within the programme. The project management and governance structure will follow HCC's standard practice for large infrastructure projects as shown below.

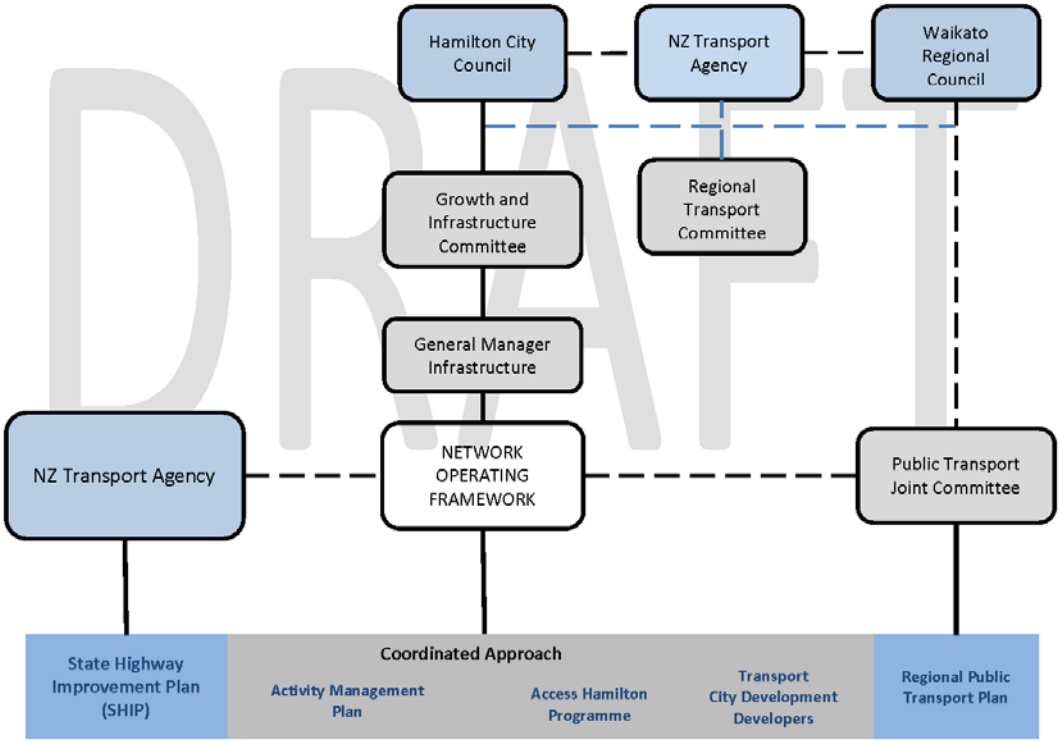


Figure 25: Project Management and Governance Structure

Hamilton's programme management arrangements will continue as follows:

- Activity development in accordance with NZTA's Business Case approach
- Optimisation and prioritisation as part of RLTP and Hamilton 10 Year Plan processes.
- Procurement and implementation in accordance with HCC's procurement procedures (NZTA Approved)
- Monitoring in accordance with One Network Road Classification and Road Efficiency Group requirements

Stakeholder engagement to date has involved a series of workshops to assist in developing the programme. It is expected that this approach for stakeholder engagement and communication will continue throughout the programme.

Stakeholders involved in programme development were:

- Waipa District Council
- Waikato District Council
- Waikato District Health Board
- NZ Police
- ACC
- Automobile Association
- Road Transport Association

Further engagement of the public and statutory stakeholders will be managed by the Hamilton City Council Significance and Engagement Policy and through the Hamilton 10 year Plan and Annual Plan and the RLTP and NLTP processes.

The ONRC provides performance measures aimed at both customer and technical outcomes related to:

- Safety
- Resilience
- Amenity
- Travel Time Reliability
- Cost Efficiency

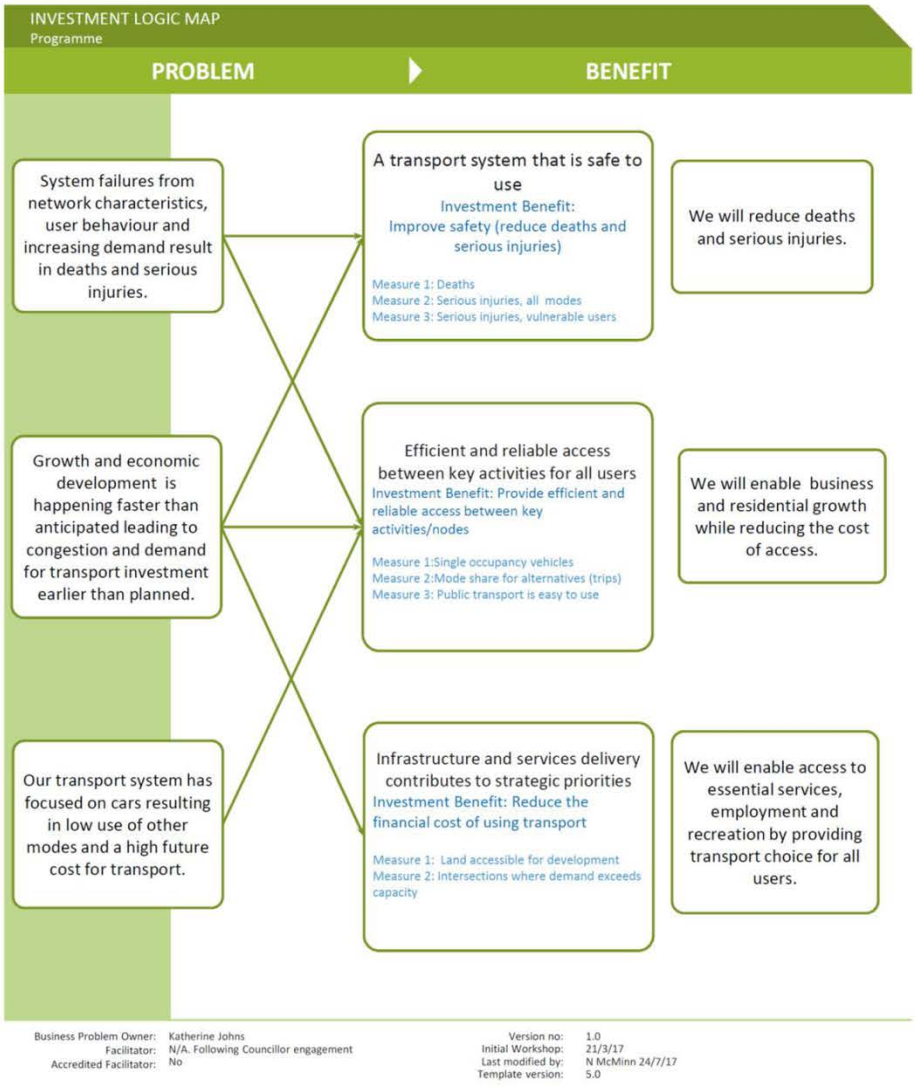
Programme delivery will be monitored by:

- Network Operating Framework (NOF)
- Network Operating Plan (NOP)
- Activity Management Plan (maintenance activities)
- Hamilton Plan
- District Plan Monitoring (households)
- RPTP performance
- One Network Road Classification (ONRC) reporting.

District Plan reviews at approximately 10 year intervals provide opportunities for infrastructure and transport strategies to respond to advances in technology and changes in land use (e.g. change in road hierarchy based on throughput by mode).

Appendix 1: ILM

Access Hamilton (2017)



Attachment 2

Item 8

Appendix 2: Development of Long List Options

	Description/focus	Effort applied to:			
		Car	Freight	PT	Active
3	Focus on Travel Choice (Portfolio)	-H	-L	H	H
28	Variation of BAU +more safety, PT, active modes	N	N	M	M
29	Balanced	L	L	M	M
16	Medium focus on Active Modes	-M	-L	M	M
1	Environmental sustainability outcome	-H	-H	M	H
7	Focus on land use/urban form	-H	-H	M	H
9	High focus on Buses	-H	-L	H	L
12	High focus on Active Modes	-h	-L	L	H
11	Focus on Accessibility	-L	-L	L	M
22	Medium focus on Buses	-L	-L	M	L
24	High focus on Rail	-H	-H	H	L
10	Focus on technology	L	L	L	L
6	Facilitating growth outcome	L	-L	L	L
14	Low focus on Active Modes	-L	N	N	L
4	Economic development outcome	L	H	N	-L
17	Low focus on Buses	N	N	L	N
18	Low focus on Rail	N	N	L	N
23	Medium focus on Rail	-L	-L	L	N
0	Business As Usual (BAU)	N	N	N	N
8	Safety outcome - engineering, education, enforcement	N	N	N	N
19	Safety - Education	N	N	N	N
20	Safety - Enforcement	N	N	N	N
21	Safety - Engineering	N	N	N	N
13	Low focus on Cars	L	N	N	N
26	Low focus on Freight	N	L	-L	-L
5	High focus on Freight	-M	H	-M	-M
27	Medium focus on Freight	-L	M	-M	-M
15	Medium focus on Cars	M	L	-L	-L
2	Focus on Car	H	L	-M	-M
30	High anti-car balanced by High PT and active	-H	L	H	H
31	Medium anti-car balanced by High PT and active	-M	N	H	H
32	Low anti-car balanced by medium PT and active	-L	N	M	M
33	No change to current effort on cars with low effort on PT	N	N	L	L
34	Variation of 16 above but with no change to freight	-M	N	M	M
35	Variation of 11 above to include freight effort	-L	N	L	M
36	Variation of 22 above to include freight effort	-L	N	M	L

Appendix 3: Shortlist Scoring Matrix and Commentary

The options were assessed against the BAU as the baseline rather than the Do Minimum since the Do minimum (maintenance and renewals only) is not a feasible option. An indicative quantitative evaluation for each of the short list option was completed against the SMART investment objectives and the measures. Indicative values were assessed for each of the measures. Options 0, 1, 4 and Do Minimum were not considered further since they did not achieve the desired outcomes and overall scored less than 0%. A final further "value for money" rank was included (option score/option nominal cost).

Short List Options: Evaluation of Outcomes		Target	Do minimum	10 Year Plan and extra safety	Maintain LOS and extra safety	Balanced approach	Balanced extra safety	Mode shift Transform
Cost range (10 years)		n/a		$0.7B	$2.1B	$1.5B	$1.6B	$1.7B
Reduction in deaths and serious injuries (DSIs)								
1: DSIs		34		34	34	50	34	34
2: Vulnerable user DSI		9		9	9	19	9	9
% of contribution				100%	100%	0%	100%	100%
Infrastructure and Services contribute to strategic priorities								
1: Land for development		8,200		4,000	5,000	8,200	8,200	8,200
2: Intersections (V>C)		<=27		38	27	27	27	27
% of contribution				0%	60%	100%	100%	100%
Efficient and reliable access between key activities for all users								
1: Single occupancy vehicles		70%		85%	85%	75%	75%	60%
2: Mode share for alternatives		20%		5%	5%	10%	10%	20%
3: PT is easy to get to		85%		80%	80%	85%	85%	95%
% of contribution			-50%	-10%	-10%	70%	70%	100%
Uncertainty/Risk	**Short term**	Low	High	Medium			Low	High
	Long term	Low	High	Medium	High	Medium	Medium	
Ranking			-	3	4	5	1	2
		Not preferred					**Preferred**	

The value for money check did not alter the overall rankings for the two preferred programme Gradual change or transformational change. The preferred programme needs to address the declining mode share of walking, cycling and mass transit by effecting a change in the role of mass transit and active modes.

[i] http://www.hamilton.govt.nz/our-council/strategiesandplans/Pages/default.aspx
[ii] Based on Statistics NZ population projections for Hamilton City and extrapolated beyond 2043 to 2048 (as 30 years).
(http://m.stats.govt.nz/browse_for_stats/population/estimates_and_projections/SubnationalPopulationProjections_HOTP2013base-2043.aspx Hamilton City growth teams use NIDEA Low which identifies a 2048population of 221,351
[iii] Total households based on the NPS requirement of Statistics NZ medium population projection plus 20% to year ten, then +15% to year 30. Baseline year = 2013 (total of 33,297 households required in 30 years).
[iv]http://m.stats.govt.nz/browse_for_stats/population/estimates_and_projections/SubnationalPopulationProjections_HOTP2013base-2043.aspx
Hamilton City growth team use NIDEA Low which identifies 33,087 additional households by 2048.
[v] Based on Statistics NZ population projections for Hamilton City and extrapolated beyond 2043 to 2048 (as 30 years).
(http://m.stats.govt.nz/browse_for_stats/population/estimates_and_projections/SubnationalPopulationProjections_HOTP2013base-2043.aspx
[vi] Total households based on the NPS requirement of Statistics NZ medium population projection plus 20% to year ten. Based on current access to 4,000 households and total 11,638 hhs by year 10 (as agreed with HCC).
[vi]http://m.stats.govt.nz/browse_for_stats/population/estimates_and_projections/SubnationalPopulationProjections_HOTP2013base-2043.aspx

[vii] 34,000 households in 30 years advised by HCC Infrastructure team
[viii]Hamilton City Infrastructure Strategy
http://www.hamilton.govt.nz/our-council/consultation-and-public-notices/haveyoursay/201525%2010Year%20Plan/HCC_InfrastructureStrategy_web.pdf
Vehicle trips based on 1 peak hour trip per household.

[ix] Problem statements accepted by the Growth and Infrastructure Committee, 20 June 2017.
[x]http://www.stats.govt.nz/browse_for_stats/population/estimates_and_projections/SubnationalPopulationProjections_HOTP2013base.aspx
[xi]http://www.stats.govt.nz/browse_for_stats/population/estimates_and_projections/SubnationalPopulationProjections_HOTP2013base-2043.aspx
[xii]http://www.mfe.govt.nz/publications/towns-and-cities/national-policy-statement-urban-development-capacity-2016
[xiii] Desirable level of service is stable flow. Drivers have reasonable freedom to select their desired speed and to manoeuvre within the traffic stream.
[xiv] Waikato Regional Transportation Model 2013 Version 10, AM PM and interpeak interpolation of length with LOS E or F.
[xv] https://www.nzta.govt.nz/resources/communities-at-risk-register/
[xvi] https://roadsafetyrisk.co.nz/maps/reports#Hamilton
[xvii] https://roadsafetyrisk.co.nz/maps/reports#Hamilton
[xviii] https://www.waikatoregion.govt.nz/Council/Policy-and-plans/Transport-policy/road-safety-strategy/
[xix] 1SI is equivalent to $475,000 and 1 death is equivalent to $4.6M. 50DSIs is around $500M-$600M over ten years. Saving a third is around $150M-$200M over 10 years or $15M-$20M per year.
[xx] NZTA EEM Appendix A1 Table A1.1 USPWF = 14.17318
[xxi] 85% (NZ Census 2013), 87% (JtW-supplied), 93% (MOT household Travel survey)
[xxii] NZ Census 2013 (http://www.statistics.maori.nz/census/2013-census/data-tables/tables-about-a-place)
[xxiii] MoT household Survey
[xxiv] The Accessible Journey, Human Rights Commission 2005
[xxv] 10% reduction in cars reduces conflict and potential for crashes by 10%
[xxvi]http://sustainablecities.org.nz/wp-content/uploads/Benchmarking-cycling-and-walking-in-six-NZ-cities.pdf

[xxvii] Waikato Regional Council Patronage Target Assessment modelling Report (Gabites Porter, 2011)
[xxviii]https://www.nzta.govt.nz/planning-and-investment/planning-and-investment-knowledge-base/2018-21-nltp-assessment-framework/assessment-of-road-improvements-2/