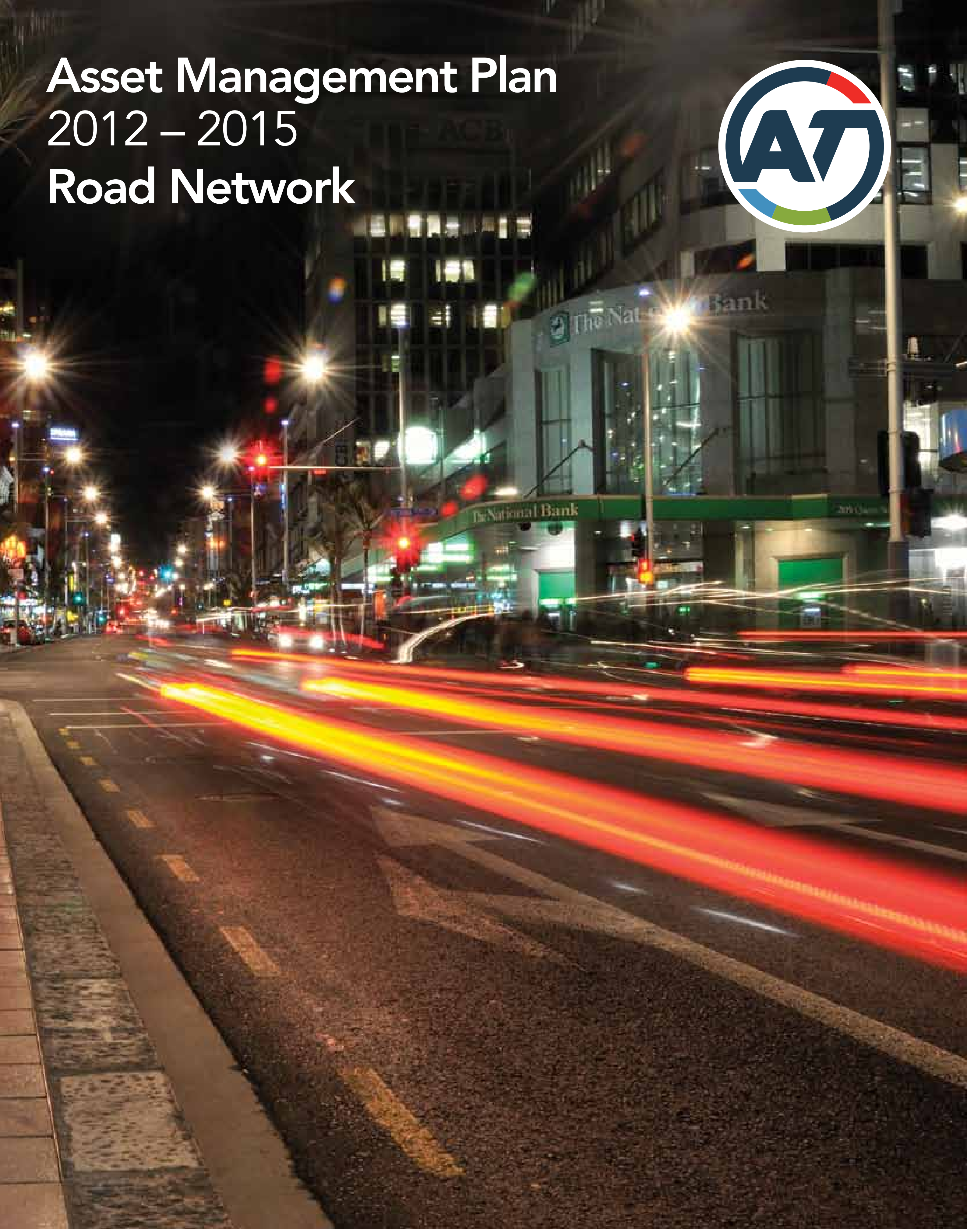
Asset Management Plan
2012 – 2015
Road Network



Auckland Transport
An Auckland Council Organisation

Asset Management Plan
2012 – 2015
Road Network

Quality Record Sheet

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Asset Management Plan – Strategic Context	
Asset Management Plan – Overview	
Asset Management Plan – Road Network	(this document)
Asset Management Plan – Public Transport Network	
Appendix document	

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Foreword

2012 – 2015 Asset Management Plan

Auckland's transport system is the largest in the country and one of the region's most valuable assets. The replacement cost of the road and public transport assets is $9.2b, excluding land under roads. Complex in space and scale, the network must accommodate the kind of rapid growth being experienced by all major world cities. Scenarios to 2041 put Auckland's population at around 2.1 million.

An expanding population creates pressure to prioritise spending on new assets. Auckland Transport must ensure this is not at the expense of maintaining, upgrading and renewing existing assets. The central task for Auckland Transport is to deliver best value for money and the best performance from existing assets.

Good communications, strong partnerships and leading-edge planning tools are required. This comprehensive 2012-15 Asset Management Plan is a critical tool. It is based on the asset management systems inherited from some of the legacy councils. A cycle of continuous improvement will see these systems, and this plan, refined as the organisation moves forward.

Local government amalgamation in late 2010 also gave the new Auckland Transport an opportunity to take stock of the transport portfolio, its size and condition, and to develop a "big picture" understanding of future costs and service consequences.

This plan is both strategic and tactical in its approach. It provides critical and detailed information on which to make decisions about future spending on assets and infrastructure-based services, and to develop policies for capital spending that give due weight to maintenance and asset renewal. It supports the organisation to manage assets in order to deliver an agreed standard of service, using multi-disciplinary management techniques over the lifecycle of each asset.

Auckland's transport network is being planned and managed as "One System", in partnership with the New Zealand Transport Agency's state highways and KiwiRail's railway infrastructure. This 10-year Asset Management Plan is closely aligned with the 30-year Integrated Transport Plan, which was developed collaboratively with NZTA. The two plans are being published together to provide the evidence base for the 2012 Regional Land Transport Programme and to support Auckland Council's Long-term Plan.

The Mayor's vision of Auckland as the world's most liveable city requires delivering a transformational shift in the public transport system. Over the past decade, Auckland has witnessed a revitalisation of its rail network through an injection of $1.1b from the Government. Every dollar spent on new assets contributes on average 10 cents every year to subsequent budgets for maintenance, operations and renewals. It is critical that asset maintenance and renewal keep pace with asset growth. In the 2010/11 year, renewals made up 38 per cent of all capital spending.

The benefits of sustaining, upgrading and renewing assets are numerous. Of the less obvious, asset management planning plays an important role in achieving road safety outcomes. Auckland Transport is a party to the Government's strategy of further reducing injuries and deaths on our roads – balancing this with the need to improve the region's productivity by moving people and goods faster and more efficiently.

Strategic and tactical asset management also plays a role in improving social and environmental outcomes for Auckland. This first 2012-15 Asset Management Plan is not a static document; it's an ongoing inquiry into what Auckland Transport should be doing with the region's transport assets to progressively improve the value for money delivered on behalf of Auckland's communities.

Mark Ford
Chairman
Auckland Transport

David Warburton
Chief Executive
Auckland Transport

1 Introduction

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Auckland Transport
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1 Introduction

1.1 Regional overview

Auckland Transport has transport asset stewardship and service delivery responsibilities on behalf of the Auckland Council. It is responsible for the day-to-day activities of the Auckland transport networks (excluding state highways) from roads and footpaths, to cycling, parking and public transport. These include the planning and funding of transport activities, promoting alternative ways to get around the city and operating the local road network.

Auckland Transport is the single agency responsible for managing local transport networks for the Auckland region. The replacement cost for these road and public transport assets is $9.2 billion (excluding buildings and land under roads). It is the second largest Road Controlling Authority (RCA) in New Zealand next to NZ Transport Agency (NZTA).

The Auckland region is dominant in the national economy and the transport network is essential for enabling economic growth. Economic activity and growth is affected by the movement of people, goods and services. Road congestion causes people and freight delays, which have a direct contribution to loss of productivity.

The Auckland Council sets the overarching strategy for transport for the next 30 years through the Auckland Plan. The Plan identifies a number of outcomes, strategic directions and targets directly related to transport. Auckland Transport gives effect to the Plan's transport priorities and is also required to consult with both the Governing Body and Local Boards in preparing the three-yearly Regional Land Transport Programme (RLTP). Integrated transport planning and land development is a key intervention for achieving the Plan's vision.

Infrastructure asset management

The application of management, financial, economic and engineering principles to infrastructure assets in order to provide an agreed level of service in the most cost-effective manner.

The local transport network has a strong urban bias but has more than 1,000 kilometres of rural unsealed roads, making it the ninth most unsealed road network in New Zealand.

The Auckland region is home to almost 1.5 million people or about a third of New Zealand's population and is the fastest growing region. A world-class transport system is needed to service Auckland's population of between 2.1 and 2.8 million people (low and high scenarios) by 2051. This will be achieved by making best use of our existing transport system, using demand management strategies and by increasing patronage of public transport to delay construction of new roads.

Auckland is a marine region with many hundreds of kilometres of coastline, inlets and streams. There is an extensive natural environment. Auckland is recognised for its rural settings but there is also a risk of natural hazards, including flooding and land instability. Appropriate land use is needed to help reduce the risk of these hazards to transport infrastructure.

1.2 Role of asset management

The role of asset management at Auckland Transport is to:

- Provide an effective and efficient transport system
- Develop asset management in keeping with the New Zealand Asset Management Support (NAMS) practice as presented in the suite of INGENIUM NAMS asset management publications
- Comply with statutory requirements in the Local Government Act (LGA) 2002, Schedule 10
- Provide information required for good asset management as set out in the Office of the Auditor General criteria for Asset Management Plans (AMP).

1.3 About this plan

The AMP is an umbrella document that gives effect to a range of other strategic and tactical planning documents. It achieves this through describing the planning, delivery and daily operations of Auckland's roads, footpaths, cycleways, bridges, street lighting, parking and other assets and services. The AMP gives effect to documents such as:

- Auckland Council's strategic direction and Long Term Plan (LTP)
- Regional Land Transport Programme (RLTP)
- Road safety, community transport and safety around schools.

This AMP demonstrates how the strategic goals and targets will be achieved through effective, sustainable management of transport assets.

The AMP develops and documents the levels of service to be provided and identifies the development, maintenance and renewal work programmes required to maintain those levels of service at the least cost over the lifecycle period of the assets. Asset management employs predictive modelling, risk management and optimised decision-making techniques to identify those long-term work programmes and funding requirements.

The AMPs provide evidence of:

- Compliance with the statutory requirements in the LGA 2002, Schedule 10
- Alignment with strategic planning in the Integrated Transport Plan (ITP), LTP and RLTP
- Quality and consistency of asset knowledge, levels of service, risk management, optimised lifecycle decision making, financial forecasting with growth and demand planning
- Planning assumptions and confidence limits
- Well-founded cost allocation between renewals, growth and levels of service elements
- Organisational performance monitoring
- Organisational commitment to good asset management practice.

1.4 Auckland Transport's asset management practices

1.4.1 Asset management frameworks

Auckland Transport uses two frameworks to provide asset management guidance, asset management and levels of service, as described below.

Asset Management Framework

The Asset Management Framework was adopted by Auckland Transport's Board in April 2011. The framework integrates planning processes, decision making and information across all transport assets and activities. It provides a management structure within which stakeholder needs, levels of service, asset information, finance, risk and resources are brought together to enable balanced, consistent and high-quality asset management decision making. Through this structure, the framework enables the delivery of agreed service levels to customers in the most cost-effective manner and provides proper stewardship of transport assets.

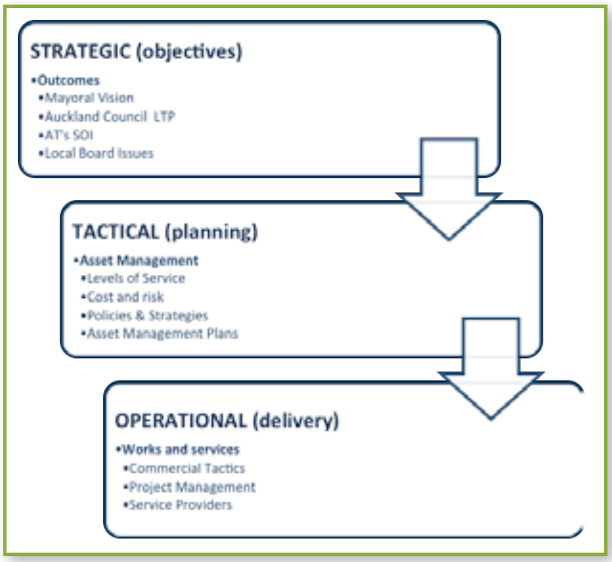
The framework enables consistent asset management practice by linking the asset management responsibilities of key Auckland Transport stakeholders. High quality asset management outcomes are highly dependent upon the consistent use of the framework by stakeholders, planners and decision makers.

Auckland Transport is working towards advanced asset management principles and practices to achieve these tasks. Our optimised decision-making techniques are discussed further in Section 4, Lifecycle Management Plan (LCMP) Overview.

Infrastructure asset management is the tactical decision making that links strategic objectives with the operational delivery of physical works. Asset management planning is the organisational activity used to produce the operational forward works plans that deliver the strategic objectives.

Figure 1.4-1 shows the importance of asset management and the AMP as a cornerstone of our business.

Figure 1.4-1 Asset management linkages



Levels of Service Framework

The Levels of Service Framework provides the structure to monitor and manage a common set of performance measures, outputs and outcomes. It provides the links between operational activities and strategic outcomes and aligns with Auckland Transport's Statement of Intent (SOI) and Auckland Council's LTP.

The key features of Auckland Transport's infrastructure asset management are:

- A whole-of-life asset management approach
- Planning for a defined level of service
- Long-term strategies for cost-effective asset management
- Performance monitoring
- Meeting the impact of growth through demand management and infrastructure investment
- Managing risks associated with asset and service failures
- Sustainable use of physical resources
- Continuous improvement in asset management practices.

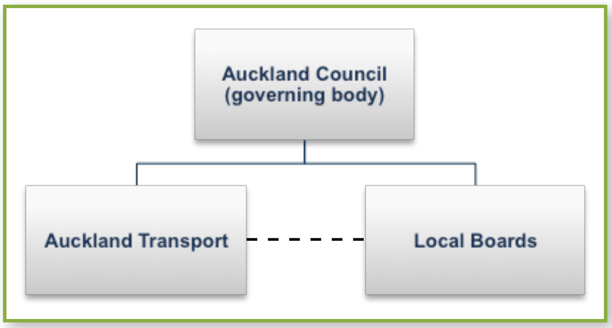
1.4.2 Governance

Auckland Transport was formed as a council-controlled organisation (CCO) of the Auckland Council. It was established under the provisions of Part 4 of the Local Government (Auckland Council) Act 2009. The transport assets were transferred to the new organisation on 1 November 2010.

Auckland Transport is accountable as a CCO to the Governing Body of the Auckland Council. The council sets Auckland Transport's objectives and monitors its performance through the annually agreed SOI. The SOI sets the basis of accountability of the Directors of Auckland Transport to the Auckland Council. The key goals for the organisation are articulated as well as a comprehensive Programme of Action.

Auckland Council has two decision-making parts: a Governing Body (made up of the mayor and 20 councillors) and 21 Local Boards. The Governing Body focuses on issues, decisions and strategies affecting the whole region. The 21 Local Boards represent their communities and make decisions on local issues. Auckland Transport provides advice to Local Boards and asks them to investigate or report on local transport issues. The Governing Body is assisted by the CCO Governance and Monitoring unit. This three-way relationship between the Auckland Council and Auckland Transport is shown in Figure 1.4-2.

Figure 1.4-2 Governance hierarchy



1.4.3 One System

Auckland Transport's strategic focus has a One System, one customer approach. One System relates to treating the local and state highway networks in the Auckland region as one integrated system. Auckland Transport is responsible for the local networks and NZTA is responsible for the state highways and motorways. The travel experience for customers is independent of ownership or management techniques. The One System approach enables transport management from a user perspective.

A partnering charter between Auckland Transport and NZTA for the Joint Traffic Operations Centre (JTOC) was signed in March 2011. This was a major step forward for managing the Auckland roading network as One System. The partnering charter's objective is:

- To enable customers to make smarter more informed choices about the way they travel, achieving the most from Auckland's transport services and infrastructure and keeping Auckland moving by a single network approach.

One example of how this partnership will work is the use of NZTA's variable message signs to alert Northern Motorway users of delays on Quay Street. Another example is real-time travel information on the local network using electronic boards at key strategic locations in the city that advise the road user of the estimated travel time to the another destination, using the state highway network such as the city centre to Auckland Airport route. An integrated approach to operations will be progressed to enable the Auckland regional and state highway/motorway networks to be managed as a single system.

1.4.4 Resilient networks

The vision for the 2011 National Infrastructure Plan is:

- By 2030 New Zealand's infrastructure is resilient and coordinated and contributes to economic growth and increased quality of life.

The recent Canterbury earthquakes have highlighted the importance of resilient networks. Resilience is a guiding principle in the infrastructure plan, so that national infrastructure networks are able to cope with significant disruption from natural disasters and hazards and adapt to changing circumstances.

The transport network is a lifeline utility and outages such as coastal inundation, slips and extreme rainfall events have a significant impact on Auckland's communities. Auckland Engineering Lifelines Group (AELG) consists of key infrastructure providers and looks at how vulnerable infrastructure is towards hazards. This assists infrastructure providers to be prepared for natural hazard events so damage to lifelines is limited. (Refer to Section 8, Risk Management and Section 4.2 Road Pavements for further information on engineering lifelines.)

1.4.5 Transport safety

Auckland Transport plays an essential role in improving transport safety in the Auckland region and supports the success of the Government's Safer Journeys Strategy (2010). It is committed to making a step change to transport safety as well as achieving transport safety goals.

A red light camera pilot, a significant road safety project, was completed in July 2011. Red light running at traffic signals is a long-standing crash risk behaviour among Auckland motorists. The pilot monitored and assessed the impact of the cameras on red light running, including the impact on crashes and pedestrian injuries in Auckland's city centre from 2008 to 2011. The pilot report will assist the Ministry of Transport to develop a national policy for red light cameras.

Auckland Transport is working with NZTA to develop a KiwiRAP process for Auckland's local roads. KiwiRAP, the New Zealand Road Assessment Programme, is a road safety partnership between the Automobile Association and New Zealand government agencies (NZTA, Ministry of Transport, Accident Compensation Corporation, and New Zealand Police). KiwiRAP has been developed to date for the state highway network with the first set of risk maps published in January 2008 and the publication of Star Ratings in June 2010. It provides meaningful information on where the greatest level of road risk is faced.

Transport safety is considered in our lifecycle management processes. In particular the renewal and maintenance programmes make a significant contribution to transport safety by considering smart and efficient methods of achieving transport safety outcomes. Safety is a primary driver when selecting materials for asset renewals. For example, frangible poles are used for replacing signal poles to minimise casualties.

1.4.6 Road controlling authority responsibilities

Auckland Transport's RCA responsibilities include providing and controlling access to the road network and being a prudent asset owner. RCA operates under various legislation and these functions are discussed as follows:

Corridor access request

Auckland Transport manages the road reserve area but utility owners have legal rights of access to open the road corridor to install and maintain their assets. This represents a significant risk and cost on the road network. Auckland Transport cannot withhold permission for these works to be undertaken, but can impose reasonable conditions. This is achieved through the CAR (corridor access request) procedure that places conditions with respect to timing and restoration standards.

Auckland Transport has used the new CAR service since March 2011 and replaced the road opening notice (RON) system. This new service combines the current process of lodging a beforeUdig enquiry and having to apply separately for a RON if the intended excavation site is in the road corridor.

Over-weight and over-dimensional permits system

There is a formal process to control the use of over-weight and over-dimensional vehicles. The operators are required to obtain prior approval from Auckland Transport to operate these vehicles on the road network.

1.5 Strategic direction and linkages

The Mayor's vision for Auckland as the world's most liveable city by 2041 means Auckland will be the place to be for an outstanding quality of life, economic opportunity and sense of place. The Integrated Transport Plan (ITP) has been developed as a strategic response to coordinate the investment activities of the various network providers to deliver the Auckland Plan. Auckland Transport's strategic direction and context is detailed in the higher level documents Strategic Context and Overview. The alignment of this AMP to the Auckland Plan is provided in the Appendix.

The AMP is a central document linking with other strategic documents internally at Auckland Transport and externally with NZTA and the Auckland Council. Asset management is a key business function for Auckland Transport. This AMP forms the basis for providing inputs into the LTP as required by the LGA 2002.

The key planning documents that this AMP relates to are:

The Auckland Plan

The Auckland Plan is a long-term strategy for Auckland's growth and development to make Auckland the world's most liveable city by 2041. The Plan was adopted by the Auckland Council in March 2012 and published in May. Its aim is to simplify planning systems to enable integrated planning in the Auckland region by the various agencies.

Integrated Transport Plan

The ITP has been produced jointly by Auckland Transport and the NZTA, with input and support from the other network providers and the Auckland Council. It focuses on the transport investment that will be needed to deliver the vision and outcomes of the Auckland Plan, taking into account central government policy statements on transport. The ITP integrates key strategies, tactical plans, programmes and project packages developed by Auckland Transport, NZTA, Auckland Council and KiwiRail. It delivers an integrated One System approach to the development and operation of Auckland's transport system.

Government Policy Statement

The Government Policy Statement (GPS) on Land Transport Funding details the government's desired outcomes and funding priorities for the use of the National Land Transport Fund to support activities in the land transport sector. The GPS is issued by the Minister of Transport. The government's main priority is national economic growth and productivity. The GPS will ensure the use of land transport funding supports this goal.

The 2012 GPS builds on the realignment of funds to support economic growth. The main focus is funding projects that enable economic growth through moving people and freight between New Zealand's five main centres. The three priorities for the 2012 GPS are:

- Economic growth and productivity
- Value for money
- Road safety.

1.6 Legislative requirements

The transport activity is also influenced by key legislation as detailed in Table 1.6-1.

Table 1.6-1 Key legislation

Act	Description
The Land Transport Management Act 2003 (and LTMA Amendment Act 2008)	The purpose of this Act is to contribute to the national aim of achieving an integrated, safe, responsive and sustainable land transport system, an approach reflected in the New Zealand Transport Strategy (NZTS). The strategy's objectives are to: • Assist economic development • Assist safety and personal security • Improve access and mobility • Protect and promote public health • Ensure environmental sustainability. The funding framework was previously biased towards roads and now the Act expands the focus to land transport as a whole, including some water-based surface transport. This Act requires an integrated approach to land transport planning, management and funding with the intention of improving social and environmental responsibility and to allocate land transport funding in an effective and efficient manner. Land Transport Programmes must take into account how they will give effect to the objectives of the NZTS. Land transport funding applications must be supported by long-term planning. Information on activities and activity classes to be funded and also financial forecasts covering a period of 10 years need to be provided
The Local Government Act (LGA) 1974 (retained sections)	This act enables the formation, management, stopping, closing and control of roads (including limited access roads). It provides for public safety.
LGA 2002	This Act requires local authorities to: • Identify community outcomes and priorities, at least every six years. These must cover social, cultural, economic and environmental outcomes. Additionally indicators need to be developed which assess the contribution of transport assets to these outcomes • Prepare a range of policies, including Significance, Funding and Financial Policies • Prepare a LTP, at least every three years. Asset Management Plans are the main method of demonstrating Schedule 10 requirements. Schedule 10 requires the Council's LTP to contain information on the implications of changes in demand or service levels. The LGA 2002 is undergoing reform to improve the operation of local government in New Zealand. The Government's reform programme includes: • Refocus on the purpose of local government including financial prudence requirements • Develop a framework for the interface between central and local government regulatory roles, efficiency of local government infrastructure provision, and review of the use of development contributions.
Local Government (Auckland Council) Act 2009	The Act sets out Auckland Transport's core statutory obligations. The relevant sections are: • Section 39, Purpose of Auckland Transport. Purpose is to contribute to an effective and efficient land transport system • Section 45, Functions of Auckland Transport: Prepare the Regional Land Transport Programme for Auckland in accordance with the Land Transport Management Act 2003 Manage and control the Auckland transport system Carry out research and provide education and training in relation to land transport in Auckland. Undertake any other transport functions the council directs or delegates Undertake any functions NZTA delegates. Section 46, Functions and powers of Auckland Transport acting as local authority or other statutory body. These include prosecuting stationary vehicles, undertaking powers under the Land Transport Act 1998, closing roads, undertaking functions under Part 4 of the Government Roading Powers Act 1989, and making and enforcing bylaws Section 47, Auckland Transport is a requiring authority. Auckland Transport is a requiring authority and a network utility operator under the Resource Management Act 1991 Section 54, Delegations. Auckland Transport may delegate all but certain specified functions to a committee, an employee, or to the council, including one or more Local Boards.
The Resource Management Act (RMA) 1991	This Act establishes the planning framework for activities that affect the environment. It covers the process by which land is designated and the provision of resource consents. The RMA Simplification and Streamlining Amendment 2010 has simplified and streamlined the consent application and appeal processes
The Civil Defence Emergency Management Act 2002	This Act requires Lifeline utilities to function at their fullest possible extent during and after an emergency event. These are normally documented in business continuity plans, which identify critical services and infrastructure needed to maintain operations
The Health and Safety in Employment Act 1992	This Act requires safe work places to be provided for all activities undertaken by local authority staff, consultants and contractors. Compliance audits and the maintenance of an audit trail are also required
Vehicle Mass and Dimensions Amendment Act 2010	This Act came into effect on 1 May 2010 and allows high productivity vehicles (HPV; up to 53 tonnes gross mass instead of the current limit of 44 tonnes) to operate under specific over dimension / overweight permits on specific parts of our network. This increases risk to roads and bridges on these routes and could lead to shorter pavement lives and hence increased renewals as well the need to strengthen certain bridges
The Public Works Act 1981	This Act enables compulsory land purchases – it defines the procedural and informational requirements
Utilities Access Act 2010	The Utilities Access Act 2010 requires utility operators and corridor managers to comply with a national code of practice that regulates access to transport corridors

1.7 Transport services

The transport activity is essential for the wellbeing of people and the economy as it ensures community travel needs are satisfied and that goods and freight are delivered to the desired destinations. The purpose of the transport activity is to provide a network that is safe and efficient to use.

The core services Auckland Transport needs to consider in performing its role are network infrastructure and road services. For the road transport network, core services are about the following main functions:

- Moving people and goods efficiently so people reach their destination not just for employment but also for leisure activities
- Providing and controlling access to the road network for properties and businesses
- Providing parking for road users, properties and businesses
- Managing the road reserve area for utilities to access the road corridor to install and maintain their assets.

Some key facts about our road network services are:

8 billion vehicle kilometres travelled per year
5 per cent of network load is heavy vehicles (estimated)
3,650 customer requests for service each month
5,300 walking trips into the city centre during the morning peak
13,400 cycling trips throughout the region during the morning peak
5,400 children regularly use walking school buses
over **10,000** corridor access requests processed between 1 November 2010 and 30 June 2011
270 travel plans in place

1.8 Network overview

Transport enables the daily flow of people and commerce throughout the region by providing a range of diverse assets including roads, footpaths, street lights, signs, road markings, traffic signals, parking, cycleways, road drainage, kerb and channel, bridges and retaining structures. These assets are summarised in Table 1.8-1.

1.9 Customers and stakeholders

Strong partnerships are crucial to Auckland Transport's success as a new organisation. Auckland Transport has strong partnerships with the Auckland Council, NZTA, KiwiRail, Ports of Auckland Ltd, other CCOs, Auckland International Airport, contractors, industry groups and customer groups.

Table 1.8-1 Transport network summary
Source: Auckland Transport RAMM database (February to April 2012)

Asset group	Description
Roads	7,227km of roads – all roads in the region including sealed and unsealed excluding state highways and motorways which are owned and managed by NZT.
Footpaths and vehicle crossings	6,879 km of footpaths and vehicle crossings
Bridges	592 road bridges, 356 major culverts and 46 foot bridges
Retaining walls	2,584 (number) of retaining walls that support the road (not all retaining walls support roads)
Road safety structures	55km of roadside barriers and 10 gantries
Cycleways	114km of off-road cycleways that are dedicated to cyclists and pedestrians, and 100km of on-road cycleways
Road drainage	7,409km of road drainage kerb and channel used to drain water from the roads into the city's stormwater system. The network also includes 86,107 road drainage catchpits
Street lighting	100,677 luminaries on the roads, along with the columns and brackets and outreach arms that support the lamps
Street signs	94,935 regulatory and warning signs and advance destination signs
Road markings	High performance / long life road markings
Traffic systems	Equipment used to control and monitor the flow of vehicle and pedestrian traffic i.e. traffic signals, signs, markings and pedestrian crossings. Auckland Transport has 536 signalised intersections and 135 signalised pedestrian crossings
Parking	12 parking buildings, 933 pay-and-display units, on-street parking and 254 off-street facilities.
Streetscapes	Auckland Transport manages trees and gardens in the road corridors scattered throughout the region

Asset management exists to optimise stakeholder outcomes. Good knowledge of stakeholder values and drivers is essential for an effective, efficient, safe and sustainable regional transport activity. Table 1.9-1 shows Auckland Transport's stakeholders and their areas of interest in the transport activity. This includes the One System partners NZTA, the Auckland Council and KiwiRail.

Table 1.9-1 Key stakeholders

Stakeholders	Transport area of interest	Consultation method	Relationship
Transport network users	Network performance and safety Service charges	Surveys and focus groups	External
Auckland ratepayers	Rates impact	Surveys	External
Auckland Council	Strategic outcomes Rates impact Advice on transport policy and operational issues	Formal liaison through Auckland Transport's Key Relationships Unit	External
Local Boards	Transport programme Transport component of Local Plans	Elected Member Liaison Team	External
Other council-controlled organisations (CCO) including Waterfront Auckland and Tourism, Events and Economic Development	Transport planning within the waterfront area Road closures, transport services and planning for significant events	Direct liaison on specific liaison	External
NZTA	Planning for land transport needs Initiatives for efficiency gains Network performance and safety outcomes Network standards Subsidy funding levels Coordination of road works timetabling JTOC	Direct liaison Non- voting member to Auckland Transport's Board MoU (February 2012)	External
KiwiRail	Projects of high regional significance and interdependence	Relationship Plan	External
Ports of Auckland	Arterial road efficiency and reliability for carrying freight Long and short-term work plans	Liaison with industry group	External
Auckland International Airport Ltd	Joint study of transport solutions for Southern opportunity area Network efficiency and reliability Long and short-term work plans	Liaison with industry group	External
Iwi	Engagement on transport projects Establishment of consistent approach for engagement at earliest opportunity	Independent Māori Statutory Board, Tamaki Regional Mana Whenua Forum, Tamaki (Treaty Negotiations) Collective and several runanga, iwi and hapu authorities. Through the Auckland Council and NZTA Māori Relationships Managers	External
Industry and customer groups (including Road Users Forum, Business Forum and walking and cycling advocates)	Transport planning and projects Support brand development such as HOP	Whoa to Go online customer panel	External
Utilities e.g. Watercare, Telecom, Vector	Corridor access Programming	Direct and industry group liaison	External
Adjoining road corridor authorities	Network services alignment Standards and protocols	Direct liaison	External
Freight operators	Network efficiency and reliability Access to properties	Liaison with industry group	External
Business and commerce	Network efficiency and reliability Access to properties	Liaison with industry group	External
Transport operators	Customer service experiences Travel time reliability Public transport demand Network performance Scheduling, ticketing and information systems Service subsidies	Through commercial franchising model	External
Auckland Transport Road Corridor Operations	Long and short-term work plans Network performance and safety	Direct liaison	Internal
Auckland Transport Road Corridor Maintenance	Long and short-term work plans Network performance and safety	Direct liaison	Internal
Auckland Transport Road Corridor Access	Long and short-term work plans Network performance	Direct liaison	Internal
Auckland Transport Infrastructure Development	Strategic outcomes Network capacity	Direct liaison	Internal

1.10 Negative effects

The transport activity ensures the availability of a safe, efficient and effective transport system for the region. However, the transport system may have negative effects on the social, cultural, environmental and economic wellbeing of the region. These negative effects are managed through a variety of processes, summarised in Table 1.10-1, and Section 4, Lifecycle Management Plan, Section 5, Sustainability and Section 8, Risk Management.

1.11 Guide to plans

Auckland Transport produces a number of key planning documents that make up the AMP. Each document has a different purpose, target audience and level of detail as shown in Figure 1.11-1. The Briefing Paper, Strategic Context and Overview are the higher level documents. These documents cover all transport modes including roads and public transport by bus, rail, and ferry.

These higher level documents are supported by two Tactical AMPs; one for road-based activities, including footpaths and cycleways, and the other for public transport activities covering bus, rail, and ferry. The Tactical AMPs provide comprehensive source information for producing the higher level documents.

Auckland Transport's Briefing Paper and Overview contain summarised and key information that will be made available for public information and consultation and which will support the Council's LTP.

This AMP is the tactical AMP for the road-based activities. The Table of Contents, Table 1.11-1 provides a guide for key sections that detail asset management planning, processes and thinking.

Table 1.10-1 Summary of significant effects

Negative effect	Social	Economic	Environmental	Cultural	Mitigation measures
Traffic crashes and resulting injuries and deaths	✓	✓			This will be mitigated through measures such as incorporating good road safety practice in the design of roads, addressing crash black spots through appropriate engineering and regulation measures, and through community road safety programmes
Travel disruption and congestion due to construction and maintenance of transport infrastructure	✓	✓			This will be mitigated through measures such as programming the timing of works (as far as practicable) at times to minimise disruption. This will ensure the work is managed in a way that ensures public safety. Other measures include communicating effectively with customers and communities likely to be affected. We will work closely with NZTA through our One System approach to ensure works are well coordinated.
Disruption to communities affected by increased traffic flows and undesirable traffic behaviour	✓	✓			This will be mitigated through identifying locations where traffic characteristics are inappropriate to the function of the road and introducing measures such as traffic calming and traffic regulation to improve traffic behaviour
Environmental impacts such as air pollution and water pollution	✓		✓		Where local air quality issues are identified that relate to transport emissions, these will be mitigated through measures such as traffic management and regulation aimed at making traffic flows smoother or reducing traffic volumes. The impact of receiving water from run-off from road surfaces will be mitigated through collection management and treatment of the run-off where appropriate. We also support national and regional regulations on vehicle exhaust limits
Noise from transport activities disturbing neighbours			✓		This will be mitigated by complying with District Plan rules (and Unitary Plan in future years) and consent conditions, and actively implementing noise reduction measures on major transport projects
Major transport corridors divide communities	✓			✓	This will be mitigated by introducing pedestrian friendly features, and urban design features where possible

Figure 1.11-1 Planning document hierarchy

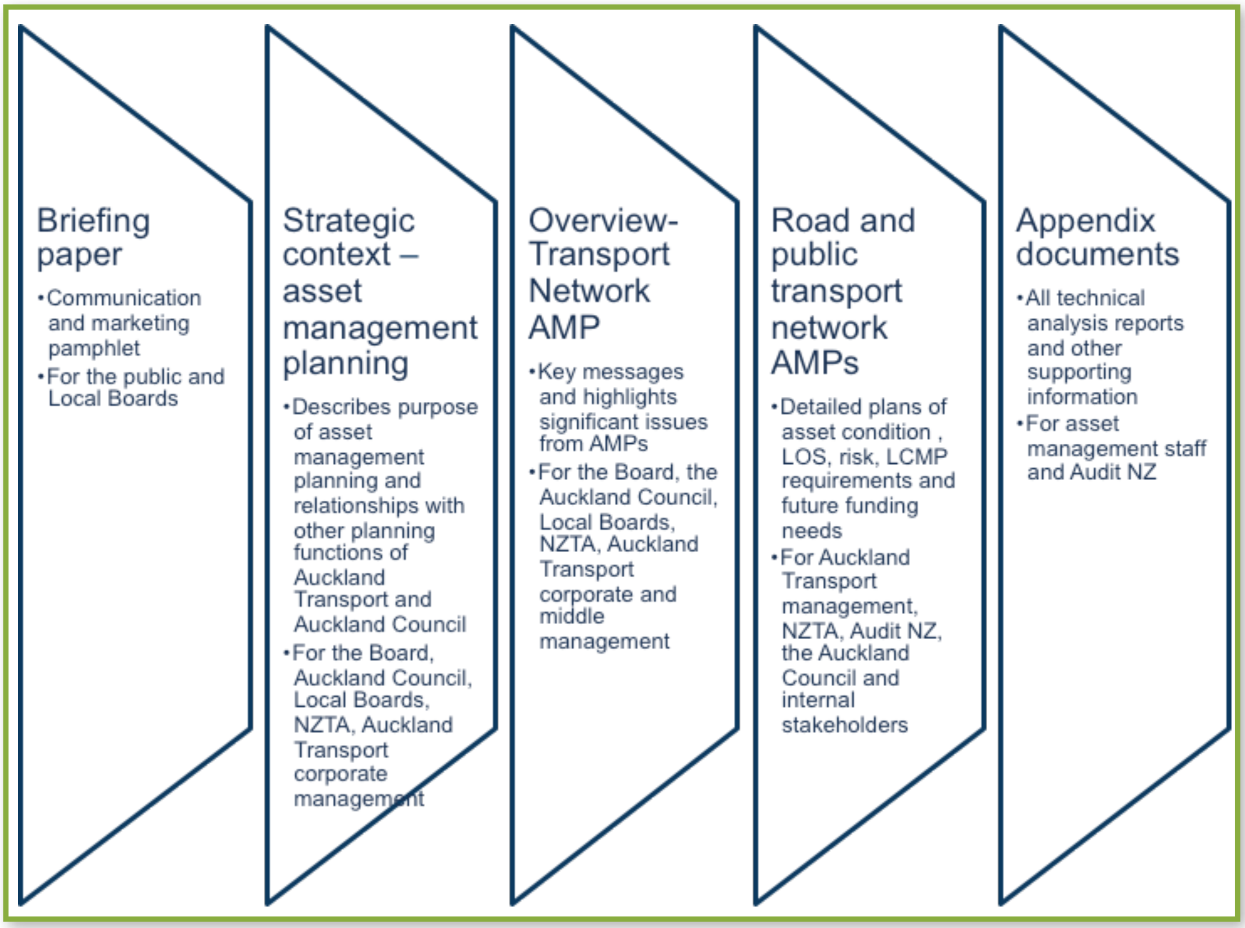


Table 1.11-1 Guide to Road AMP

Road AMP Table of Contents	
Section name	**Section overview**
Introduction (this section)	Describes Auckland Transport's role in asset management and practices. Also provides an overview of transport network assets and services
Levels of service	Describes what the community and stakeholders expect from the transport system and about plans to ensure these service levels are delivered
Growth and demand	Describes in detail the knowledge held of what changes are expected to the Auckland region including the Auckland Plan, and what will be required from the transport system in the next 10 years Explains the projects and plans intended to be implemented to meet these changes
Asset lifecycle management plans	Describes plans to maintain and renew existing and new transport assets. Auckland Transport's goal is to maintain the transport system so that each network component provides the required service level at least cost over its lifecycle. This lifecycle management ensures best use of funds. This section is divided into 13 asset groups, as the management of these assets varies from one group to another. There are also two service plans for Community Transport and Network Management and Planning Activities. This section is introduced with a LCMP Overview that describes the overall lifecycle approach and strategies
Sustainability	Describes Auckland Transport's intention to use more sustainable practices when developing and maintaining the transport system and the initiatives being implemented to meet sustainability goals
Value management	Describes the value management process through which Auckland Transport delivers value for money to its stakeholders and throughout the asset lifecycle; from inception to decommissioning and disposal
Financial summary	Summarises the financial plans detailed in the previous sections and provides a detailed analysis of the cost of developing and maintaining the transport system for the next 10 years
Risk management	Describes the risks related to managing the transport system and how those risks are managed and mitigated
Asset management practice	Describes the processes used to manage the transport system and the systems used to manage asset management information. Identifies requirements for asset knowledge and data. Includes frameworks linking strategies, information, decisions, plans and governance approvals. Describes the asset management systems, data and processes to support managing the transport network
Improvement plan and monitoring	Improvements can always be made to how the transport system is managed. Included in this section is an improvement plan for both managing the network and the next AMP

2 Levels of Service

Contents

Auckland Transport
An Auckland Council Organisation

2 Levels of Service

2.1 Introduction

Auckland Transport manages transport assets to deliver the levels of service in a sustainable manner over the long term.

service providers, customers and other stakeholders. As such, Auckland Transport's approach has been to focus the LOS on measurable outcomes and provide a structure that is easy to use.

Levels of Service – a definition

"The description of the service output for a particular activity or service area against which performance can be measured".[1]

Figure 2.1-1 LOS relationship to network outcomes

Levels of Service (LOS) is the term used for a series of statements that encapsulate the agreed standards that Auckland Transport services and assets will meet. LOS is an asset management tool that maintains organisational and operational focus on managing the transport infrastructure network in an effective, efficient, safe and sustainable manner. A LOS framework links operational activities with tactical and strategic outcomes in a robust and logical manner.

LOS plays a key role in determining investment levels across the transport network. It provides the performance, condition and operative targets to be achieved through expenditure on services, asset maintenance, renewals and new works, as shown in Figure 2.1-1.

"Our ability to manage effectively our levels of service lies at the heart of achieving good community outcomes from assets and services"[2].

All transport LOS inherited from legacy Long Term Council Community Plans (LTCCP) and AMPs have remained in effect until 30 June 2012. Beyond this date, some LOS measures, performance and targets will change, subject to Auckland Transport Board approval, as improved knowledge of assets, costs, stakeholder and customer needs are developed.

LOS will be a resource for consultations and discussions between governance, users, planners,

[1] NAMS – Developing Levels of Service and Performance Measures V2 2007.
[2] Audit New Zealand – Asset management for public entities: Learning from local government examples.

2.2 Legacy levels of service

Following local government amalgamation in Auckland in late 2010, all current AMPs and LTCCP LOS were consolidated for analysis and reporting. These existing LOS were aligned into various common categories such as service area, asset type, customer service value and technical performance measure type.

The following legacy councils were included in this LOS stocktake. They illustrate eight different ways of defining, measuring and managing LOS.

• **Auckland Regional Council**	• **Rodney District Council**
• **North Shore City Council**	• **Auckland City Council**
• **Waitakere City Council**	• **Manukau City Council**
• **Papakura District Council**	• **Franklin District Council**

2.2.1 Current LOS stocktake

The key findings of the stocktake of the current LOS are as follows:

- The previous councils shared core NAMS structures and concepts such as strategic outcomes, customer values, customer and technical LOS
- There is significant variation in LOS across previous councils, both in the number of LOS and the level of detail. Some are minimal and some are highly complex.

- There is wide variation in the consistency and rigour of linkages between outcomes and operational activities
- Several current LOS have no active measure and are noted for future development
- There is significant variation between current LOS methodologies, language, interpretation and measurements
- There are few LOS measures that are fully common across previous councils apart from technical measures linked to funding such as road roughness and safety statistics used for NZTA reporting.

The high degree of variation found between the LOS is not unexpected given the differences of scale and community focus and asset management maturity of previous councils.

A number of previous council AMPs have been recently acknowledged as examples of best practice LOS, e.g. Auckland City and North Shore City. The relevant aspects of these AMPs have been used in the development of the Auckland Transport LOS framework.

2.3 Key drivers and legislative requirements

The Local Government Act 2002 (LGA 2002) has prescribed that service levels must be developed from a community perspective. The LGA Amendment Act 2010 repeals the definition of community outcomes and substitutes the following definition:

"Community outcomes means the outcomes that a local authority aims to achieve in order to promote the social, economic, environmental, and cultural well-being of its district or region, in the present and for the future."

Service levels need to be presented to the community in a clear, informed way as service level statements are aligned with customer performance measures. These support the consultations that must be undertaken to obtain community perspectives.

In addition to community consultation, there are a number of infrastructure providers and other stakeholders who contribute to the region that need to be kept informed on service levels. This includes partners under the One System approach, Auckland Council, NZTA and KiwiRail.

Schedule 10, clause 2 (1) of the LGA 2002 provides some specific requirements for the development of service levels:

- Intended service levels, measures and targets are required to be stated for each group of activities
- Forecast capital costs need to be apportioned between growth and service levels
- Targets are to be set in detail for the first three years and in outline for the next seven years.

Sections 76-81 of the LGA 2002 state the way in which service levels are developed within the decision-making process:

- Section 76 Decision Making
- Section 77 Requirements
- Section 78 Community views in relation to decisions
- Section 79 Compliance with procedures in relation to decisions
- Section 80 Identification of inconsistent decisions
- Section 81 Contributions to decision-making process by Māori.

2.3.1 Service levels reporting requirements

Schedule 10 Part 1 Section 4 of the LGA 2002 requires a Statement of Service Provision in the Long Term Plan that must, in relation to each group of activities of the local authority, include a statement of the intended levels of service provision that specifies:

- Performance measures
- A performance target for each performance measure
- Any intended changes to the level of service that was provided in the year before the first year covered by the plan and the reasons for the changes
- The reason for any material change to the cost of a service.

2.3.2 Industry standards and guidelines

A listing of the industry standards and guidelines that influence the provision of customer service levels are included in the appendices. As a result of amalgamation, many of these refer to Auckland Transport policies, standards and guidelines that are currently under development.

Further to these standards and guidelines, the roading and transport services that we deliver to our customers are also influenced by a number of other bylaws and codes. The legacy bylaws are still in place and will be reviewed over time by Auckland Transport for the management of local roads and public transport.

2.4 Understanding stakeholder issues

Asset management endeavours to optimise stakeholder service and cost outcomes. As transport impacts almost all facets of life across the community, it is important to gain a good understanding of stakeholder and user perspectives of transport service levels and cost. Good knowledge of stakeholder values and drivers is essential to determining appropriate levels of service.

Auckland Transport's external stakeholders, their areas of interest in the transport activity and how the organisation will consult to gain knowledge of their requirements are detailed in Section 1.9 Customers and Stakeholders. Many consultation methods are now in place since Auckland Transport was set up including:

- Whoa to Go online customer panel
- Memorandum of Understanding with NZTA
- Relationship Plan with KiwiRail.

Auckland Transport is currently developing an understanding of stakeholder and community opinion on services through a range of surveys, market research, focus groups and stakeholder consultation. Surveys of customer opinion that are currently undertaken to provide monitoring data for the LOS include:

- Customer satisfaction monitoring of Auckland public transport services[3]
- Community perceptions of personal transport choices[4]
- NZTA reports e.g. Road Transport Road Casualties.

The One network initiative between NZTA and Auckland Transport is a special case of liaison and consultation. (Refer to Section 4.1.2 of this plan).

2.5 The development of levels of service

LOS measures and statements from the legacy AMP, annual plans and LTCCPs have been used as a starting point for the development of the LOS. These have been consolidated into a framework, a set of measures using good practice guidelines from NAMS, and feedback to the sector from the Office of the Auditor-General. Auckland Transport's LOS framework was developed through this process to align outcomes, impacts, organisation outputs and performance measures across four key result areas: effective, efficient, safe and sustainable networks.

The ITP identifies the transport impacts to be achieved to deliver 'better connections and accessibility within Auckland, across New Zealand and to the world'.

These impacts are the objectives that the LOS addresses. The service values of effective, efficient, safe and sustainable are translated through the LOS framework to levels of service which provide the output and performance targets for the AMP in general and the lifecycle management plans in particular.

2.5.1 Levels of service drivers

The LOS detailed in this AMP is aligned to the council's Long Term Plan (LTP) and other drivers through the ITP as shown in Figure 2.5-1.

A key role of asset management is to identify costs directly associated with LOS to support decision making. More work will be required to understand this relationship fully. Asset management improvement tasks that will establish cost and LOS links are described in Section 10 of this plan.

The LOS hierarchy in Figure 2.5-2 further illustrates the role of LOS in determining the operational performance of the transport system that is required to achieve Auckland Council's strategic outcomes.

[3] Gravitas Research and Strategy Ltd.
[4] National Research Bureau Ltd.

Figure 2.5-1 The ITP as driver for LOS

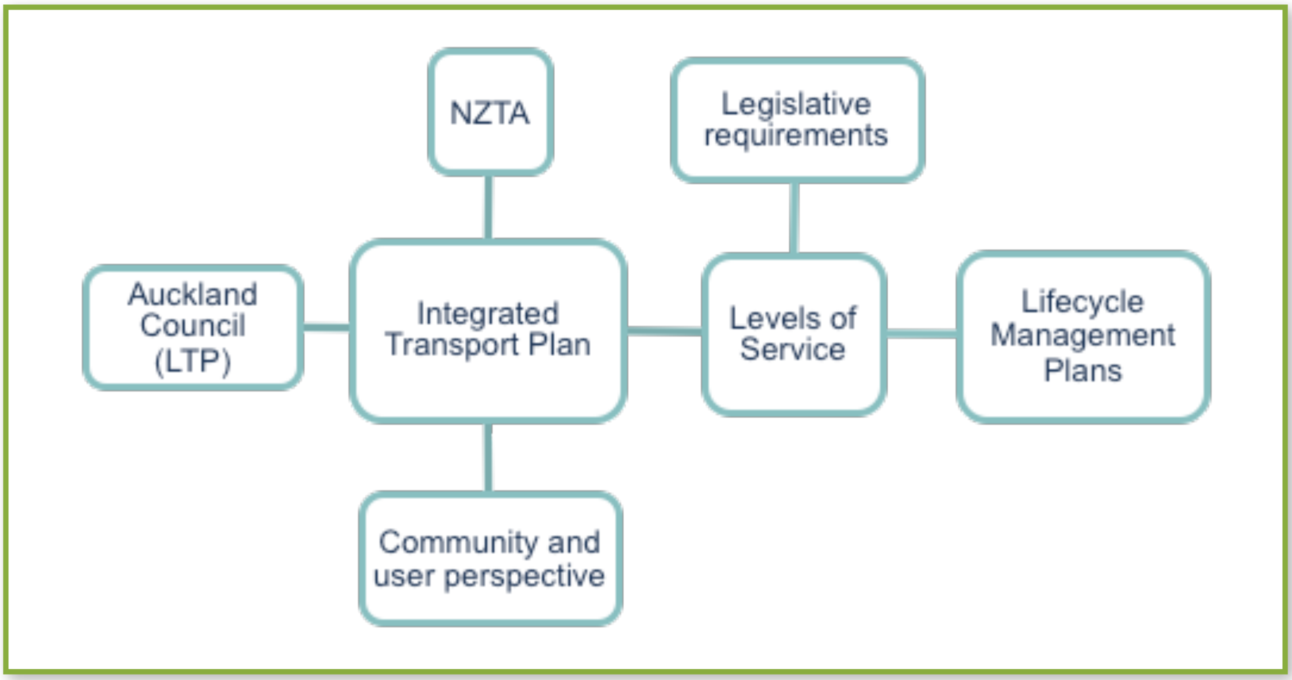
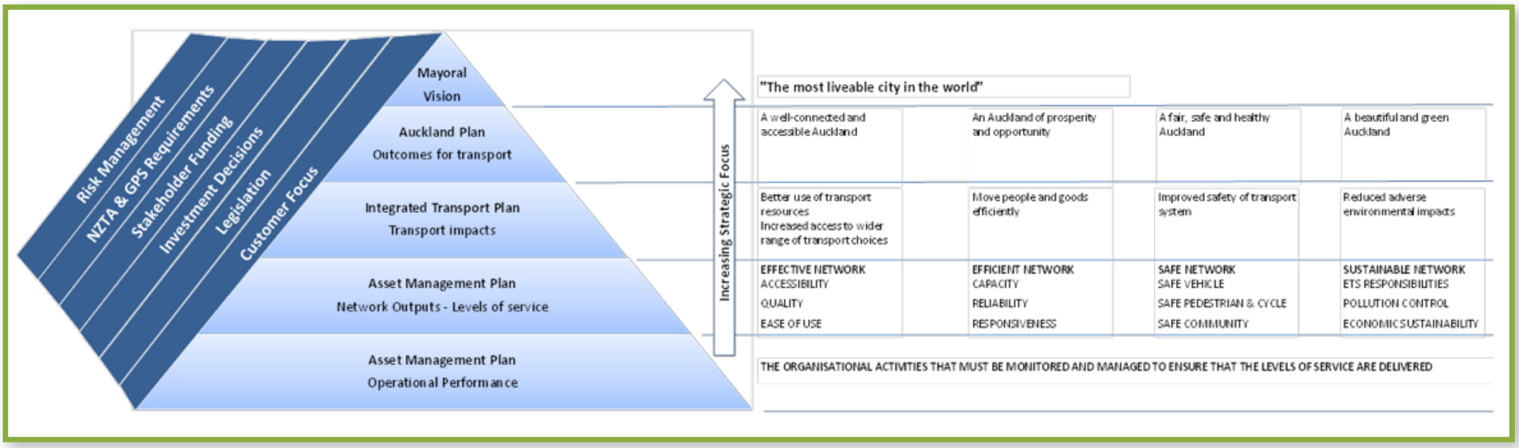


Figure 2.5-2 Levels of service hierarchy



2.6 Levels of service framework

The consolidation of legacy councils into a single unitary authority requires a strong focus on reconciliation of levels of service and their costs through consultation and discussion. The LOS framework shown in Figure 2.6-2 provides a common basis for discussing transport issues from multiple perspectives and has a strong emphasis on measurable outcomes. The framework embeds the concept of 'necessary and sufficient' and is designed to align LOS with asset and cost categories used within Auckland Transport.

To this end, the Auckland Transport LOS is developed to the following set of principles and criteria:

Guiding principles of Auckland Transport LOS

- LOS to reflect the Auckland Transport services
- LOS to reflect core NAMS LOS concepts and principles
- LOS to focus on delivery of measurable outcomes
- LOS must be easily understood, accessible and usable to provide a common resource for consultation and discussion between customers, stakeholders, governance, executive, planning and service delivery.

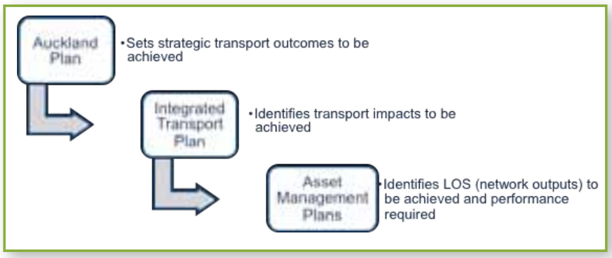
Criteria for LOS framework

- Clear definition of strategic goals
- Consistency of service values across service areas
- Correct use of asset categorisation and hierarchies
- Use of necessary and sufficient SMART measures (**S**pecific **M**easurable **A**chievable **R**elevant **T**ime-bound)
- Use of plain English language.

2.6.1 Framework structure

The Auckland Transport LOS framework translates Auckland Plan outcomes through the ITP and the AMPs as shown in Figure 2.6-1.

Figure 2.6-1 Levels of service planning framework



The Auckland Transport LOS framework uses three reporting levels below the Auckland Plan outcomes:

- **Level 1 – ITP impacts** includes key performance area measures to ensure multi-agency integration and optimised investment
- **Level 2 – network outputs** at service area level, e.g. rail, buses, roads, footpaths
- **Level 3 – operations performance** of assets and services, e.g. response times, condition.

An 'impact' is the equivalent of a milestone on the way to achieving a high-level outcome, such as well-connected and accessible Auckland. The ITP transport impacts listed in Figure 2.6-2 are:

- Better use of transport resources to maximise return on existing assets
- Increased access to a wider range of transport choices
- Moving people and goods efficiently
- Improved safety of Auckland's transport system
- Reduced adverse environmental effects.

Four key result areas, each having multiple service attributes (or values), are shown in Figure 2.6-2 across the three levels as follows:

- **Effective** (accessibility, quality, ease of use)
- **Efficient** (capacity, reliability, responsiveness)
- **Safe** (safe vehicle, pedestrian and cycle environments, support for community safety)
- **Sustainable** (Emissions Trading Scheme responsibilities, pollution control, economic sustainability).

The LOS framework contains key performance indicators (KPIs) with current performance and future targets. These KPIs demonstrate that progress is being made towards the results, impacts, outcomes and vision stated in the key 30-year planning documents, ITP and Auckland Plan. In some cases, measures of performance still need to be developed to enable effective monitoring of progress towards our key dates. The LOS also identifies where new baseline measures will need to be developed during the period covered by this plan. Auckland Transport will work with Auckland Council and, where appropriate, NZTA to develop additional suitable measures.

The AMP levels of service framework shown in Figure 2.6-2 thus provides a formal performance monitoring and reporting framework to demonstrate Auckland Transport is meeting the requirements of the Auckland Plan and statutory obligations under the Local Government Act 2002.

Figure 2.6-2 Levels of Service framework

Auckland Plan	Mayoral Vision	**World's most liveable city**		**World's most liveable city**	
	Auckland Plan Outcomes linked to transport	**A well-connected and accessible Auckland**	**An Auckland of prosperity and opportunity**	**A fair, safe and healthy Auckland**	**A green Auckland**
	Transformational shift	**Move to outstanding public transport within one network**			
	Strategic directions	**Create better connections and accessibility within Auckland, across NZ to the world**	**Keep rural Auckland productive, protected and environmentally sound**	**Create a strong, inclusive and equitable society that ensures opportunity for all Aucklanders**	**Contribute to tackling climate change and increasing energy resilience**

Integrated Transport Plan	AT Overarching Outcome	**Auckland's transport system is effective, efficient and provides for the region's social, economic, environmental and cultural wellbeing**		**Auckland's transport system is effective, efficient and provides for the region's social, economic, environmental and cultural wellbeing**	
	AT Impacts	**Better use of transport resources** **Increased access to wider range of transport choices** **Effectively connects communities** **Provides for Auckland's compact urban form**	**People and goods move efficiently**	**Improved safety of transport system**	**Reduced adverse environmental impacts**
		Increased customer satisfaction		**Increased customer satisfaction**	
	ITP & AMP Levels of Service	Public transport patronage Peoples access to jobs Public transport access Mode share Public transport morning peak mode share Asset quality	Road congestion Commute travel times Arterial road network productivity Strategic freight route mobility Bus congestion Transport delay Public transport efficiency	Road fatalities and serious injuries Public transport safety and secuity	Greenhouse gas emissions Air quality Fossil fuel energy consumption Active modes Split Transport affodability

Asset Management Plan	Key result areas	**Effective Network** Provide an effective, resilient and good quality transport network that is easy to use			**Efficient Network** Provide an efficient and reliable transport network			**Safe Network** Provide a safe transport environment for users and the community					**Sustainable Network** Provide a regional transport network without compromising the environment for future generations		
	Service values	**Accessibility**	**Quality**	**Ease of use**	**Capacity**	**Reliability**	**Responsiveness**	**Safe vehicle environment**	**Safe pedestrian environment**	**Safe cycle environment**	**Safe public transport**	**Support for community safety**	**ETS responsibilities**	**Pollution control**	**Economic sustainability**
	Network Outputs	Increase availability of travel options	Assets and services are fit for purpose	Improve signage and real-time information	Reduce road peak congestion	Improve or maintain road travel time reliability	Improve or maintain resolution rate for Requests for Service	Minimise fatal and serious injuries per 100 million VKT	Minimise number of pedestrian fatal and serious injuries	Minimise number of cycle fatal and serious injuries	Minimise the number of PT fatal/serious injuries	Increase coverage of school travel programmes	Minimise carbon footprint	Minimise air pollution	Provide assets and services at least whole of life cost
		Provide appropriate levels of parking	Assets are in good condition	Improve inter-modal links across public transport	Public transport capacity to match demand	Improve or maintain public transport travel time reliability	Improve or maintain timelines for clearance of network blockages	Eliminate road black spots	Improve availability of pedestrian crossings	Increase cycle safety education programmes	Minimise the number of PT safety and security incidents	Provide community safety programmes	Maximise the economic value of recycled materials	Minimise water pollution	Capital projects are managed within budget
		Improve distribution of the freight network	Increase resilience of the network	Provide inter-modal single ticketing across public transport	Reduce or maintain journey time for public transport			Increase road safety education programmes	Eliminate very poor condition footpaths	Provide targeted cycle safety projects	Provide targeted PT safety and security programmes	Provide transport component for emergency services		Minimise soils pollution	
		Improve integration of utilities within the corridor			Reduce or maintain road journey times			Increase police road safety liaison programmes				Provide transport component for Civil Defence		Eliminate prosecutions for RMA non-compliance	
		Improve availability of footpaths in the urban area			Improve capacity and efficiency of freight routes			Provide targeted road safety work programmes							
		Improve distribution of cycle networks across the region													
	Operational performance	Accessibility performance Measures	Quality performance measures	Ease of use performance measures	Capacity performance measures	Reliability performance measures	Responsiveness performance measures	Vehicle safety performance measures	Pedestrian safety performance measures	Cycle safety performance measures	Public transport safety performance measures	Community safety performance measures	ETS performance measures	Pollution control performance measures	Economic sustainability performance measures

SOI performance measures

Auckland Transport's 2012 Statement of Intent (SOI) is a key document that describes the performance measures that are to be reported to Auckland Council. The SOI sets the accountability of Auckland Transport to Auckland Council. Some of the SOI measures are considered in the LOS statements and these are specifically identified within the LOS tables.

2.7 AMP levels of service tables

The levels of service tables in this section identify current and target performance measures within key result areas:

- Section 2.7.1 Network outputs
- Section 2.7.2 Operations performance.

A mix of customer perception measures (mainly customer satisfaction ratings) and related output measures are used for the network outputs level within the framework. The operations performance level comprises performance measures and does not include customer satisfaction ratings.

The LOS tables have the following structure:

- Key result – the key result or service value to be delivered (effective, efficient, safe, sustainable)
- Level of service – a statement that describes the output or objective to be delivered
- Service area – road, footpath, cycle or whole of network
- Measure – the description of how performance is quantified
- Current performance – the most recent published or available measure of performance
- Target performance – the intended standard or performance to be achieved. Target dates are provided for some Auckland Transport measures but are otherwise not stated due to the wide variation in legacy approach. Target performance in this document is indicative only.

Note that the target performance area is still to be consulted widely, discussed and agreed.

2.7.1 Network outputs

The network outputs LOS table is shown in Table 2.7-1.

Initial Auckland Transport LOS statements have been developed to be consistent with the outcome requirements of the ITP and the major funding stakeholders, i.e. Auckland Council and NZTA. They incorporate the intent and direction of the legacy LOS as much as possible. This distillation of multiple values and statements means that some LOS are more generic at this point in time than the legacy LOS that they replace.

Plans that will evolve over time are to focus Auckland Transport LOS on service and geographic-specific issues through community and stakeholder consultation. The exceptions to this are those LOS that can already be directly aligned with the major funding stakeholders. These include LOS already being measured at a regional level such as safety, road condition, travel times and loading.

Network output measures are focused on the outputs of each specific service area and some measures apply across all service areas within each network. Where possible, they include customer opinion paired with network output or performance measures.

Measures at this level are provided to lead the discussion for further development with stakeholders following the publication of this AMP. Several areas are already subject to existing measures and should only require stakeholder review and confirmation. A few areas such as sustainability will need significant development to be ready for community and stakeholder discussion.

Table 2.7-1 Network outputs – road network
Source: Levels of service final draft.xlsx – June 2012

Key Result	Level of Service	Service Area	Measure	Current Performance	Target Performance (indicative / to be further developed and agreed)	Source
Effective	Increase availability of travel options	Transport Network	Percentage user satisfaction with the availability of travel options within the transport network	39%	70-80%	ARC Community Perceptions survey 2010
		Road	Vehicle Kilometres Travelled (VKT)	8 billion		RAMM
		Footpath	Walking trips into the CBD during the morning peak	5,297	2% increase each year (2012/13, 2013/14 and 2014/15)	SOI
		Cycle	Cycle trips into the CBD (inbound cycle counts) in morning peak	12,970	2% annual growth	AT reporting 2011-12
			Percentage user satisfaction with level of cycle access across the network	35%	TBD	ARC Community Perceptions survey 2010
			Cycling trips throughout the region during the morning peak	13,406	3% increase each year (2012/13, 2013/14 and 2014/15)	SOI
	Improve distribution of the freight network	Road	Percentage satisfaction with level of with freight vehicle accessibility across the network	TBD	TBD	
	Provide appropriate levels of parking	Road	Percentage of drivers complying with parking restrictions	83%	82%	AT reporting 2011-12
			Percentage user satisfaction with access to parking	75%	80%	ACC
	Improve navigability across the network	Road	Percentage of arterial network with real time information(signage) available	TBC	8%	AT reporting 2011-12
			Percentage user satisfaction with network signage and information	63%	>65%	ACC
	Assets are maintained in good condition	Road	Percentage of residents very satisfied, satisfied or neutral about the quality of roads in the Auckland region	79%	Not less than 75%	SOI
			Urban Smooth Travel Exposure Index	79-95%	Maintain or improve on baseline	RAMM
			Rural Smooth Travel Exposure Index	64-98%	Maintain or improve on baseline	RAMM
			Percentage arterial routes that score 3 or better on AMEM Traffic Environment survey	95%	95%	AMEM
		Footpath	Percentage of Footpaths that score 3 or better on AMEM Pedestrian Environment survey	98%	95%	AMEM
			Percentage of residents very satisfied, satisfied or neutral about the quality of footpaths in the Auckland region	76%	75%	SOI
			Percentage of residents very satisfied, satisfied or neutral about the quality of footpaths in their local area	76%	Not less than 75%	SOI
			Percentage of footpaths in moderate (condition grade 3) or better	92% (97% of known assets)	95%	RAMM
		Cycle	Percentage user satisfaction with the condition of cycleways	68% off-road 65% on-road	80%	ACC
			Percentage of cycleways in moderate (condition grade 3) or better	76%	95%	

Table 2.7-1 Network outputs – road network. Continued...

Key Result	Level of Service	Service Area	Measure	Current Performance	Target Performance (indicative / to be further developed and agreed)	Source
Efficient	Reduce road peak congestion	Road	Number of morning peak (7-9am) car trips avoided through travel planning initiatives	8,417	9,600 (2013/14)	SOI
			Percentage user satisfaction with peak travel times	TBD	TBD	
			Primary Arterial roads – Ratio of peak hour traffic volume and road capacity (V/C Ratio)	TBC	No greater than 25% of LOS E (V/C=0.82)	NSCC
			Secondary Arterial roads – Ratio of peak hour traffic volume and road capacity (V/C Ratio)	TBC	No greater than 25% of LOS D (V/C=0.64)	NSCC
			Collector roads – Ratio of peak hour traffic volume and road capacity (V/C Ratio)	TBC	No greater than 25% of LOS C (V/C=0.49)	NSCC
			Local Roads – Ratio of peak hour traffic volume and road capacity (V/C Ratio)	TBC	No greater than 10% of LOS C (V/C=0.47)	NSCC
			Degree of saturation at key intersections (congestion) TBD	TBD	TBD	AT reporting 2011-12
	Improve or maintain road travel time reliability	Road	Percentage of users satisfied with consistency of travel times	80% estimated	Baseline maintained or improved	WCC
			Percentage of arterial routes with signal optimisation in place	5%	10%	SOI
	Improve or maintain resolution rate for Requests for Service	Transport Network	Percentage of users satisfied with service request response	45-95%	Maintain or improve on baseline	

Key Result	Level of Service	Service Area	Measure	Current Performance	Target Performance (indicative / to be further developed and agreed)	Source
Safe	Minimise fatal and serious injuries	Road	Percentage of vehicle users consider the network to be safe	88%	TBD	Transport Perceptions Report
			Number of fatal and serious crashes on local road network	356 (year to 31 Dec 2010)	2% reduction each year (years to 31 Dec 2012, 2013 and 2014)	SOI
			Number of fatal and serious injuries per 100 million Vehicle Kilometres Travelled (VKT)	5.1 (year to 31 Dec 2010)	Average annual reduction of 2% per year	AT reporting 2011-12
			Number of fatal and serious injuries on the local road network	410 (year to 31 Dec 2010)	Average annual reduction of 2% per year	AT reporting 2011-12
	Minimise the number of pedestrian fatal and serious injuries	Footpath	Percentage of pedestrians consider the network to be safe	67%	TBD	
			Number of fatal and serious pedestrian injuries on local roads	62 (year to 31 Dec 2010)	Reducing trend	
	Minimise number of cycle fatal and serious injuries	Cycle	Percentage of cyclists consider the network to be safe	21%	TBD	Transport Perceptions Report
			Number of fatal and serious cycle injuries on local roads	36 (year to 31 Dec 2010)	Reducing trend	
	Improve community road safety	Road	Quality of customer responses related to traffic and safety in the road corridor	TBC	TBC	AT reporting 2011-12
	Provide a safe parking building environment		Percentage of customers satisfied with vehicle security	70%	80%	ACC
			Percentage of customers satisfied with level of personal security	85%	80%	ACC

Table 2.7-1 Network outputs – road network. Continued...

Key Result	Level of Service	Service Area	Measure	Current Performance	Target Performance (indicative / to be further developed and agreed)	Source
Sustainable	The network is managed to minimise carbon emissions	Transport Network	Percentage of the community consider that the network is being managed in an environmentally sustainable manner	TBD	TBD	
			Total CO_2 vehicle (petrol and diesel powered) emissions	3,790 kilotons (year to 30 June 2011)	Reduce baseline	SOI
			Auckland Transport Carbon footprint	TBD	TBD	

2.7.2 Operational performance

The operational performance LOS table is shown in Table 2.7-2.

The operational performance measures cover the performance of those assets and services that are considered necessary and sufficient to deliver the network outputs. These operational measures are aligned with their relevant service area outputs, which are in turn delivering stakeholder values of effectiveness, efficiency, safety and sustainability.

Table 2.7-2 Operational performance – road network.
Source: Levels of service final draft.xlsx – June 2012

Key Result	Level of Service	Service Area	Measure	Current Performance	Target Performance (indicative / to be further developed and agreed)	Source
Effective	Increase availability of travel options	Footpath and Cycle Network	Percentage of residents walking or cycling to work (%)	3.5% - Census 2006	5%- Census 2011	FDC
		Cycle	Increase in cycle parks	TBD	TBD	NSCC
			Number of cycle training events held	90	70	AT reporting 2011-12
			Kilometres of cycleways, cycle lanes and shared footpaths	214	Improve on baseline	WCC
	Improve the availability of pedestrian crossings	Footpath	Percentage of urban pedestrian crossings with facilities for the disabled	60%	Improve on baseline	PDC
	Increase the resilience of the network	Road	Number of slips classified as low, medium, high risk	20	20	RDC
			Percentage of drainage openings not functioning in retaining walls	<= 5% defects total on all walls	<= 5% defects total on all walls	RDC
			Number of high-risk locations left unprotected	None - Compliance 100%	None - Compliance 100%	NSCC
	Provide appropriate levels of parking	Road	On street parking occupancy rates	59%	TBC	AT reporting 2011-12
			Parking: off-street occupancy rates: casual	TBD	TBD	AT reporting 2011-12
			Parking: off-street occupancy rates: early bird	TBD	85%	AT reporting 2011-12
			Response time to infringement queries (days)	1.6 days	5 days	AT reporting 2011-12
			Reliability (uptime) for pay-and-display machines	100%	97%	AT reporting 2011-12
			Reliability (uptime) of parking building ticket machines	96%	95%	AT reporting 2011-12
			Reliability (uptime) for parking building barrier arms	100%	95%	AT reporting 2011-12
	Improve navigability across the network	Road	Percentage of clearly visible street name plates on all major intersections	80%	TBC	ACC
			Percentage primary destinations with way finding (e.g. ADS) signage	TBD	TBD	AT reporting 2011-12
	Assets are maintained in good condition	Road	Km of road base rebuilt annually (reconstruction and Rehabilitation)	55	TBC	
			Km of road surface renewed annually	472	TBC	
			Amount of repeat remedial work required	TBC	TBC	AT reporting 2011-12
			Percentage compliance with maintenance and cleaning schedules for bridges, traffic control structures and large culverts	TBC	100%	
			Rate of compliance with frequency of weed control • 7 weekly cycles for arterial roads • 13 weekly cycles for collector and local roads.	TBC	100%	NSCC
			Percentage of utility work sites that meet required quality standards	94%	90%	AT reporting 2011-12
			Percentage of street lights with one or more defects	20%	< 2%	AT
			Percentage of catchpits in moderate (condition grade 3) or better	72% (92% of known assets)	95%	RAMM
			Percentage of street lights in moderate (condition grade 3) or better	59% (94% of known assets)	95%	RAMM
			Percentage of traffic control systems in moderate (condition grade 3) or better	98%	95%	RAMM
			Percentage of signage in moderate (condition grade 3) or better	79% (99% of known assets	95%	RAMM
			Percentage of bridges and major culverts in moderate or better condition (condition grade 3 or better)	70% (96% of known assets)	TBC	RAMM
			Percentage of drainage network in moderate or better condition	52% (95% of known assets)	95%	RAMM
			Percentage compliance with mechanical and regenerative carriageway sweeping programme – primary roads	TBC	100%	
			Percentage signal uptime	99%	98%	AT reporting 2011-12

Table 2.7-2 Operational performance – road network. Continued...

Key Result	Level of Service	Service Area	Measure	Current Performance	Target Performance (indicative / to be further developed and agreed)	Source
Efficient	Improve capacity and efficiency of freight routes	Road	85% maintained for inter-peak travel times from SH 20 to SH 1 via Nielson St	16 mins	16 mins	SOI
			85% maintained for inter-peak travel times from SH 1 to SH 20 via Nielson St	13 mins	12 mins	SOI
			85% maintained for inter-peak travel times from Sylvia Park to East Tamaki via South-eastern arterial	11 mins	11 mins	SOI
			85% maintained for inter-peak travel times from East Tamaki to Sylvia Park via South-eastern arterial	12 mins	11 mins	SOI
			85% maintained for inter-peak travel times from SH1 to SH18 via Wairau Rd	8 mins	8 mins	SOI
			85% maintained for inter-peak travel times from SH18 to SH1 via Wairau Rd	8 mins	8 mins	SOI
			85% maintained for inter-peak travel times from East Tamaki to SH1 Highbrook interchange via Harris Rd	10 mins	10 mins	SOI
			85% maintained for inter-peak travel times from SH1 Highbrook interchange to East Tamaki via Harris Rd	11 mins	10 mins	SOI
	Reduce road peak congestion	Road	Special Vehicle Lane compliance	97%	98%	AT reporting 2011-12
			Arterial network delays related to approved activities in corridor	TBD	TBD	AT reporting 2011-12
			Number of travel plans in place (schools, workplaces)	278	300	AT reporting 2011-12
			Bus lane compliance	97%	TBC	AT reporting 2011-12
	Improve or maintain road travel time reliability	Road	Travel times on key arterials (4x general traffic, 4x freight)	8/8 General Route Times maintained 6/8 Freight Route Times	Maintain target times over 2012	AT reporting 2011-12
			Percentage of faults responded to within service level timeframes.	97%	90%	AT reporting 2011-12
			Percentage of the corridor productivity ideal (19,000 person km/hour/lane) to be achieved for Airport to CBD (via Manukau Rd)	50% est.	52%	SOI
			Percentage of the corridor productivity ideal (19,000 person km/hour/lane) to be achieved for St Lukes to St Johns via St Lukes; Rd/Greenlane/Remuera Rd	50% est.	52%	SOI
			Percentage of the corridor productivity ideal (19,000 person km/hour/lane) to be achieved for Albany to Birkenhead (via Glenfield Rd)	50% est.	52%	SOI
			Percentage of the corridor productivity ideal (19,000 person km/hour/lane) to be achieved for Henderson to CBD (via Gt North Rd)	50% est.	52%	SOI
			Percentage Corridor Productivity maintained or improving on key arterial routes	TBC	Maintain at 50% of the ideal	AT reporting 2011-12
	Improve or maintain timelines for clearance of network blockages	Road	Compliance with response and resolution times for network blockages	85-95%	TBD	
			Percentage compliance with drainage maintenance repair response timeframes	TBC	1	
			Percentage response time to signal outages within standard timeframes	88%	90%	AT reporting 2011-12
	Improve or maintain resolution rate for Requests for Service	Road	Corridor Access Requests (CARs) received	840	TBC	AT reporting 2011-12
			CARs processed within 15 days (%)	96%	95%	AT reporting 2011-12
			CARs processed within 5 days (%)	89%	80%	AT reporting 2011-12
			RCM - total number of RFS received	TBC	TBC	AT reporting 2011-12
			RCO - percentage RFS reponses within standard timeframes	90%	85%	AT reporting 2011-12
			Percentage of Resource Consent requests processed within agreed timeframes	92%	90%	AT reporting 2011-12
			RCM percentage RFS reponses within standard timeframes	92%	80%	AT reporting 2011-12
	Provide appropriate levels of parking	Road	Car park turnover	1.4	TBC	AT reporting 2011-12
			Infringement review response time	1.6	TBC	AT reporting 2011-12
			Parking compliance	83%	TBC	AT reporting 2011-12
			Monthly average infringements issued	36,386	TBC	AT reporting 2011-12

Table 2.7-2 Operational performance – road network.

Key Result	Level of Service	Service Area	Measure	Current Performance	Target Performance (indicative / to be further developed and agreed)	Source
Safe	Minimise fatal and serious injuries	Road	Crash reductions on local roads associated with crash reduction programme	27%	20%	AT reporting 2011-12
			Compliance with average Level of illumination on residential streets – 2 lux	50%	100%	
			Compliance with average Level of illumination on collector roads – 3 lux Primary and secondary arterial roads – 4 lux	80%	100%	
			Compliance with average Level of illumination at major intersections – 7.5 lux	90%	100%	
			Compliance with average Level of illumination at commercial centres – 6 lux	>90%	100%	
			Percentage of urban streets and roads provided with streetlights and operational hours	Compliance 100% (Estimated)	% Streets – 100% Annual burning hours – Not less than 4,250	AT
			Percentage of items identified for correction in RCO H&S Audit reports committed to action within 10 working days	TBC	100%	AT reporting 2011-12
			Percentage speed reduction in areas where speed projects have been implemented	TBC	5%	AT reporting 2011-12
	Eliminate road black spots	Road	Number of improvements at black spot locations implemented	20	Improve on baseline	ACC
	Minimise number of cycle fatal and serious injuries	Cycle	Number of participants in cycle training	7,181	5,000	AT reporting 2011-12
	Improve community road safety	Road	Number of participants in safety programmes (annual)	70,000	70,000	AT reporting 2011-12
			40kph variable school speed zones implemented	10	Improve on baseline	ACC
			No of pupils participating in walking school buses	>4,000	TBC	
			Percentage on-time completion of Safety Around Schools Programme (Travel Plans)	TBC	100%	AT reporting 2011-12
			Percentage on-time completion of Speed Limit Review Programme	TBC	100%	AT reporting 2011-12
			Number of school safety and transport events held	TBC	TBC	AT reporting 2011-12
			Number of participants in school safety and transport events	TBC	TBC	AT reporting 2011-12
	Maintain a safe working environment	Road	Lost time incidents	0	0	AT reporting 2011-12
			Serious harm incidents	0	0	AT reporting 2011-12
			Minor harm incidents	3	5	AT reporting 2011-12
			Near miss incidents	23	N/A	AT reporting 2011-12
			Safety audits	149	52	AT reporting 2011-12
			Percentage of worksites with satisfactory temporary traffic management	90%	80%	AT reporting 2011-12
			Number of reported near-miss incidents on site	TBC	0	AT reporting 2011-12
			Number of reported injury accidents on site	TBC	0	AT reporting 2011-12
			Parking warden – on street incidents	1	0	AT reporting 2011-12
			Parking warden – off street incidents	0	0	AT reporting 2011-12
	Provide a safe parking building environment	Road	Number of health and safety incidents	0	0	AT reporting 2011-12

Table 2.7-2 Operational performance – road network.

Key Result	Level of Service	Service Area	Measure	Current Performance	Target Performance (indicative / to be further developed and agreed)	Source
Sustainable	The network is managed to minimise carbon emissions	Transport Network	Number of projects incorporating recycled materials	TBD	TBD	
		Road	Percentage of network installed with energy efficient street lighting (LED lamps)	5%	15% by year 2014	AT
	Eliminate prosecutions for RMA non-compliance	Transport Network	Number of prosecutions for RMA non-compliance	TBD	Improve on baseline	
	Minimise network pollution	Transport Network	Percentage compliance with regulatory environmental standards for air pollution	TBD	TBD	
			Percentage compliance with regulatory environmental standards for soil pollution	TBD	TBD	
			Percentage compliance with weed control policy	TBD	TBD	
			Percentage compliance with regulatory environmental standards for water pollution	TBD	TBD	
			Percentage coverage of environmentally sensitive catchments with appropriate treatment	TBD	TBD	
	Provide assets and services at least whole-of-life cost	Transport Network	Percentage of Capital Works projects selected based on defined prioritisations and economic criteria (e.g. BC/NPV)	TBC	100%	ACC
			Sum of value of overspend on individual capital projects	TBD	TBD	
		Road	Percentage of savings on electricity costs when streetlights are fitted with 'smart controls' or LED technology	2%	60% by year 2018	ACC
			Cost per CAR, and/or CAR cost recovery	TBD	TBD	AT reporting 2011-12

2.8 LOS reporting system

Auckland Transport currently monitors many key performance measures (KPIs) across a wide range of business activities such as:

• Financial performance	• Asset management
• Operational performance	• Risk management
• Project and contract management	• Marketing and communications
• Network performance for planning	• Customer relations

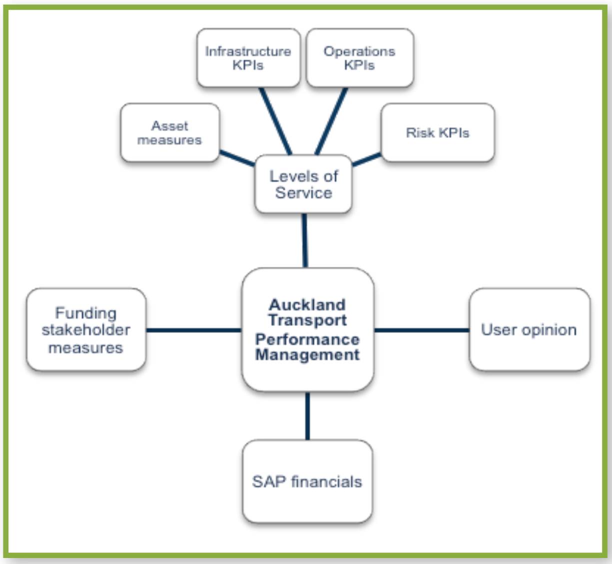
The LOS framework includes only those KPIs that are considered necessary and sufficient to monitor and manage particular LOS. There is an ongoing process to assess these KPIs for inclusion in the LOS framework.

There are also areas within the LOS framework that are not currently covered well by existing KPIs, e.g. freight, civil defence and sustainability. KPIs for these areas have been assessed and developed where appropriate for inclusion in the first Auckland Transport AMP.

The LOS framework is being developed as an information system in the short term to manage the LOS data, linkages and categorisations that comprise the LOS measures. A performance management system is being considered to integrate the monitoring of financial and non-financial KPIs with LTP and LOS to provide management, executive and governance reporting.

The role of LOS within the general arrangement of a performance management system is shown in Figure 2.8-1.

Figure 2.8-1 Performance Management and LOS



2.9 LOS future improvements

Ongoing work on the LOS will be undertaken beyond the 2012 AMP. Through this work, some key improvements to LOS will be provided:

Improvement in the selection and alignment of output measures with key Auckland Transport plans (SOI, ITP, Statement of Priorities) and key plans of the principal funding stakeholders: Auckland Council and NZTA	This work will entail further consultation with stakeholders. Required for this first AMP but will require on-going development
Development of more meaningful KPIs in several areas	This work will entail further consultation with stakeholders. Required for this first AMP but will require on-going development
• Sustainability	
• Road network congestion	
• Value for money	
• Economic productivity, e.g. freight network efficiencies	
• Public transport accessibility	
Improvement in the identification of long-term regional and local LOS targets	This work will entail further consultation with stakeholders. Required for this first AMP but will require on-going development
Improvement in the performance management systems used to integrate, monitor and report LOS within Auckland Transport	Programme to be developed
Identification and alignment of costs directly associated with LOS	Programme to be developed. This item is dependent in part upon the previous item

A specific programme of improvement works has been developed, identified and costed within the 2012 AMP.

3 Growth and demand

Contents

Auckland Transport
An Auckland Council Organisation

3 Growth and demand

3.1 Overview

3.1.1 Regional issues

Auckland is New Zealand's most populous and fastest growing region, from a population of just over 1.2 million residents in 2001 to almost 1.5 million residents in 2011. The region has experienced successive decades of rapid growth with much of it being accommodated through intensified development in specified areas. This rapid population increase has impacted our existing transport system infrastructure.

This section focuses on how we assess the current demands on the transport system and how we intend to manage future demand. Our approach is to maximise the use of our existing transport system and increase patronage of public transport to delay the construction of new roads. This approach will help address road traffic congestion to enable our economic goals for the Auckland region to be achieved and support the national economy. A world-class transport system is needed to service Auckland's population of between 1.9 and 2.8 million people (low and high scenarios) by 2051.

A well-connected and accessible Auckland is one of the six outcomes to enable the Mayor's vision of the world's most liveable city. Integrated investment is required in all transport modes as a One System approach to achieving this vision. The transport network is a major shaper for Auckland to accommodate current and future populations and reduce congestion. Freeing up Auckland's roads for freight and commercial movement is an important element of improving productivity.

The Auckland Plan enables the Mayor's vision and uses spatial planning as a method to distribute people and activities in a space. One of the four fundamental components of spatial planning is the rational land use plan for where growth will be accommodated. The Auckland Plan is discussed in detail in the following sections in relation to the transport network and growth.

3.1.2 Managing growth and demand

There is a range of pressures, risks and opportunities for the region that have a bearing on how we plan our road network and services in response to growth and demand. Mayoral vision, strategies and plans are supported by analyses of population, environmental changes, economic and transport trends and regional issues to give a picture of future requirements of the transport network.

The transport response to regional growth and demand is planned in alignment with the wider Auckland vision and outcomes. The relationship between Auckland Council and Auckland Transport plans is outlined in Figure 3.1-1.

The Auckland Plan, adopted by the Auckland Council in March 2012, sets out the spatial vision and outcomes that drive the strategic direction of the activities Auckland Transport undertakes.

The Integrated Transport Plan (ITP) strategically coordinates the planning of the Auckland Transport network with other network providers, prioritising and sequencing investment over the next 30 years to deliver the spatial vision, outcomes and other requirements of the Auckland Plan.

The Asset Management Plan supports the preparation of the Long Term Plan (LTP) and Regional Land Transport Programme (RLTP) to deliver initiatives in travel demand management and capital programmes to address travel options and network capacity.

3.1.3 Section layout

The long-term plans described in the ITP and Section 1, Introduction determine transport and land use planning. These plans shape the pattern of development and the existing transport system detailed in Section 4, Lifecycle Management Plans. The strategic asset management response to growth and demand management outlined in this section identifies strategies to manage the gap between anticipated demand and current asset capacity. It enables staged development of new assets to meet future demand over time, and optimises utilisation of resources by considering demand management strategies and other non-asset solutions.

Current growth and demand trends including population, economics and transport are detailed in Section 3.2. Demand forecasts at the regional level are covered in Section 3.3, as well as the impact on the road network. Auckland Transport's demand management plan is covered in Section 3.4 including regional strategies and the travel demand management plan to minimise the need for new assets. It also covers the growth driven capital projects for the next 20 years, with detail on our significant projects and programmes for the next three years.

Figure 3.1-1 Transport network growth and demand planning context

Source: Strategy and Planning (April 2011)

Auckland Plan

Sets out spatial vision and outcomes

↓

Integrated Transport Plan

Coordinates and sequences long term investment across agencies over 30 years

↓

Asset Management Plans

Provide agencies with guidance on cost effective delivery of activities with a focus on the next 10 years

↓

Regional Land Transport Programme

Recommends activities for funding over 3 financial years with a 10 year forecast

3.2 Growth and demand trends

3.2.1 Population trends

Auckland is New Zealand's fastest growing region with a population increase of 286,000 between 2001 and 2011 (based on population estimates from Statistics New Zealand). The estimated resident population at 30 June 2011 for the Auckland region was 1.486 million (adjusted for the new Auckland Council boundaries). Population growth drives the increasing demand on transport infrastructure and other services.

Where and how these additional people live is the primary driving force for change in Auckland. The Auckland region was the fastest growing region at 1.6 per cent in the June 2010 year compared to the national average at 1.2 per cent. It was the only region to grow faster than the national average. Auckland is currently home to about one third of New Zealand residents.

3.2.2 Economic trends

National level

The Auckland region is dominant in the national economy as indicated by the following:

- Economic growth in the Auckland region accounts for 35 per cent of New Zealand's GDP
- Auckland is the gateway to over 70 per cent of all international arrivals to New Zealand
- Auckland Airport and Ports of Auckland account for 46 per cent of New Zealand's exports / imports by value.

Transport infrastructure is an enabler of economic growth through increased productivity. The transport chapter of the National Infrastructure Plan supports the Government's overall vision for transport as 'an effective, efficient, safe, secure, accessible and resilient transport system that supports growth of our country's economy in order to deliver greater prosperity, security and opportunities for all New Zealanders'.

Table 3.2-1 Summary of dwelling authorisations in the Auckland region
Source: Auckland Council, April 2011

Annual number of dwelling authorisations								
Year	Rodney District	North Shore City Council	Waitakere City Council	Auckland City Council	Manukau City Council	Papakura District	Franklin District	Total
2006	821	1,244	843	1,873	1,698	239	623	7,341
2007	727	1,049	697	1,747	1,198	126	745	6,289
2008	717	430	608	1,438	715	163	349	4,420
2009	604	549	514	916	541	199	234	3,557
2010	599	569	443	897	623	260	290	3,681

An economy delivering opportunities and prosperity for all Aucklanders and New Zealand is one of eleven strategic directions of the Auckland Plan.

Auckland is New Zealand's largest commercial centre and main international gateway. The roading network and services is important to the total transport system by relieving congestion caused by growth and thus supporting economic growth in the region and nationally.

Economic activity and growth is enabled by the movement of people, goods and services. Maintaining and increasing the level of regional economic productivity in the near and long term is affected by transport factors including travel distances, increasing numbers of vehicles on the road, and transport mode choices. These factors have contributed to increasing traffic congestion and delays along some of the region's main transport routes. Road congestion causing people and freight delays has a direct impact on the cost of doing business and contributes to loss of productivity.

Auckland's airport and seaports play a vital role in connecting New Zealand nationally and internationally. This global connection will enable Auckland to transform and will improve our economic prosperity. Auckland International Airport is an export port and processes over 70 per cent of international arrivals. Increased tourism through Auckland International Airport is expected to continue to be an important sector of the economy. Ports of Auckland has an essential role in New Zealand's freight capacity with ports on Waitemata and Manukau harbours and an inland port at Wiri. Wiri is an inland port and rail siding and connects road freight to the harbour ports.

Building activity

Building activity has slowed in the Auckland region with the global financial crisis and economic conditions. The number of new dwelling authorisations declined to 3,681 in December 2010, as shown in Table 3.2-1. Continued effects of the global financial crisis are expected to limit growth in building activity. This may have a positive effect on changing people's behaviour, with an increased uptake of public transport as people manage their living costs carefully.

3.2.3 Transport trends

How transport issues and trends contribute to demand growth is detailed below. Greenhouse gas emissions within the transport network are also a factor influencing demand and this is covered in this AMP in Section 5 Sustainability.

Car ownership

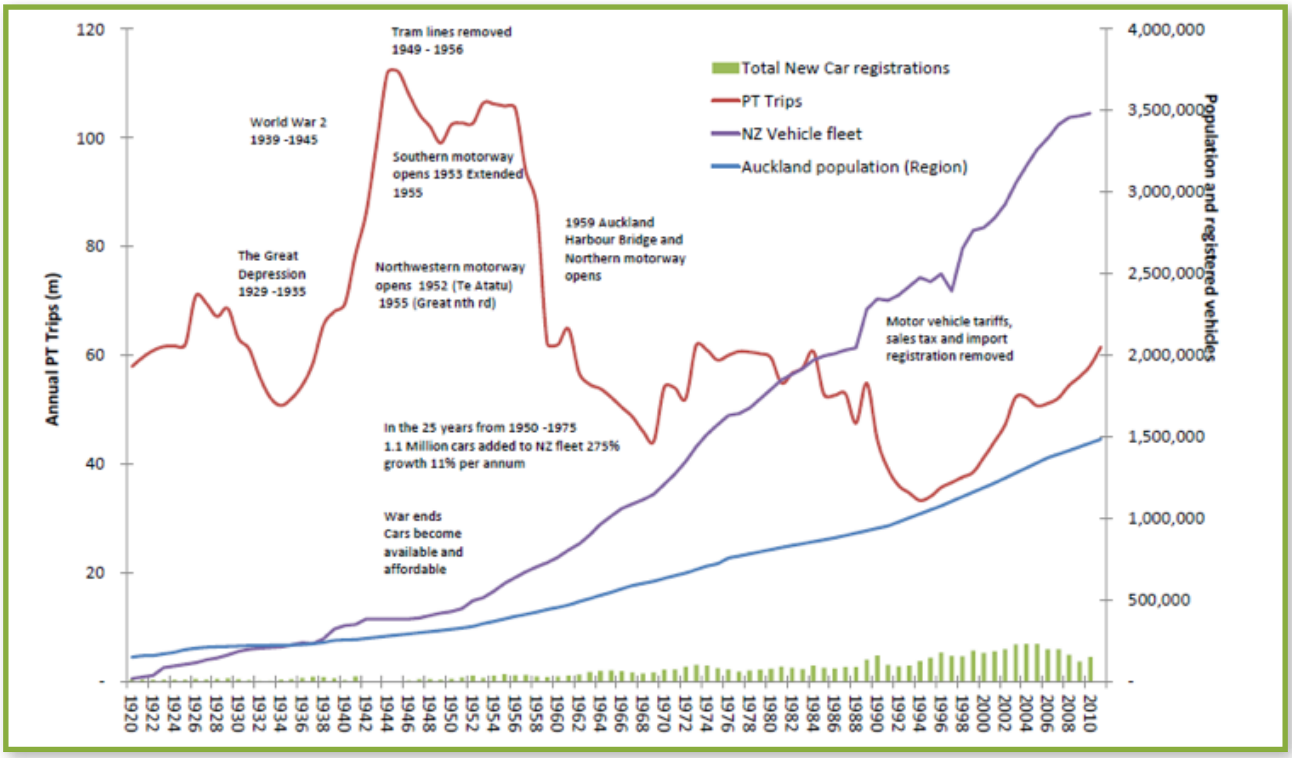
Private car usage affects people's accessibility to their destination. Ready availability of other transport options can lead to significant reductions in private car usage. Since the advent of the motorway system and car import deregulation, Aucklanders have relied on private vehicles to get around.

The trends in public transport use, registered vehicles and population growth since the 1920s are shown in Figure 3.2-1. Significant milestones included car affordability after World War 2, the opening of the Southern and Northern motorways and the Harbour Bridge. These milestones of increasing road network capability directly impacted annual public transport trips.

Destination accessibility describes how close and accessible the daily things that we do are to where we live, for example, work, shopping, and leisure. Auckland has poor destination accessibility by world standards, which is exacerbated by a relatively low investment in public transport infrastructure. Car ownership and public transport trends need to be viewed together to gain a holistic understanding of accessibility.

The number of households with no access to a motor vehicle in the Auckland region has declined in the last three censuses as shown in Figure 3.2-2.

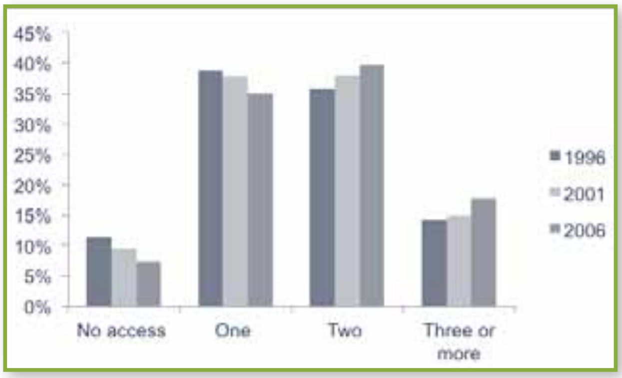
Figure 3.2-1 Population, car and public transport use (1925-2011)
Source: Auckland Transport's website (October 2011)



This number accounted for 11.3 per cent in 1996, but in 2006 had declined to 7.4 per cent of all households. Single-vehicle households also declined from 38.8 per cent in 1996 to 35.1 per cent in 2006.

The proportion of households with access to two, three or more cars has increased, from 35.7 per cent in 1996 to 39.7 per cent in 2006. Households with access to three or more cars increased from 14.2 per cent in 1996 to 17.7 per cent in 2006. It is expected as the region in-fills people will be more encouraged to use public transport and become less reliant on private vehicles.

Figure 3.2-2 Access to motor vehicles in the Auckland region
Source: Auckland Council (20 May 2011) and Statistics New Zealand Censuses

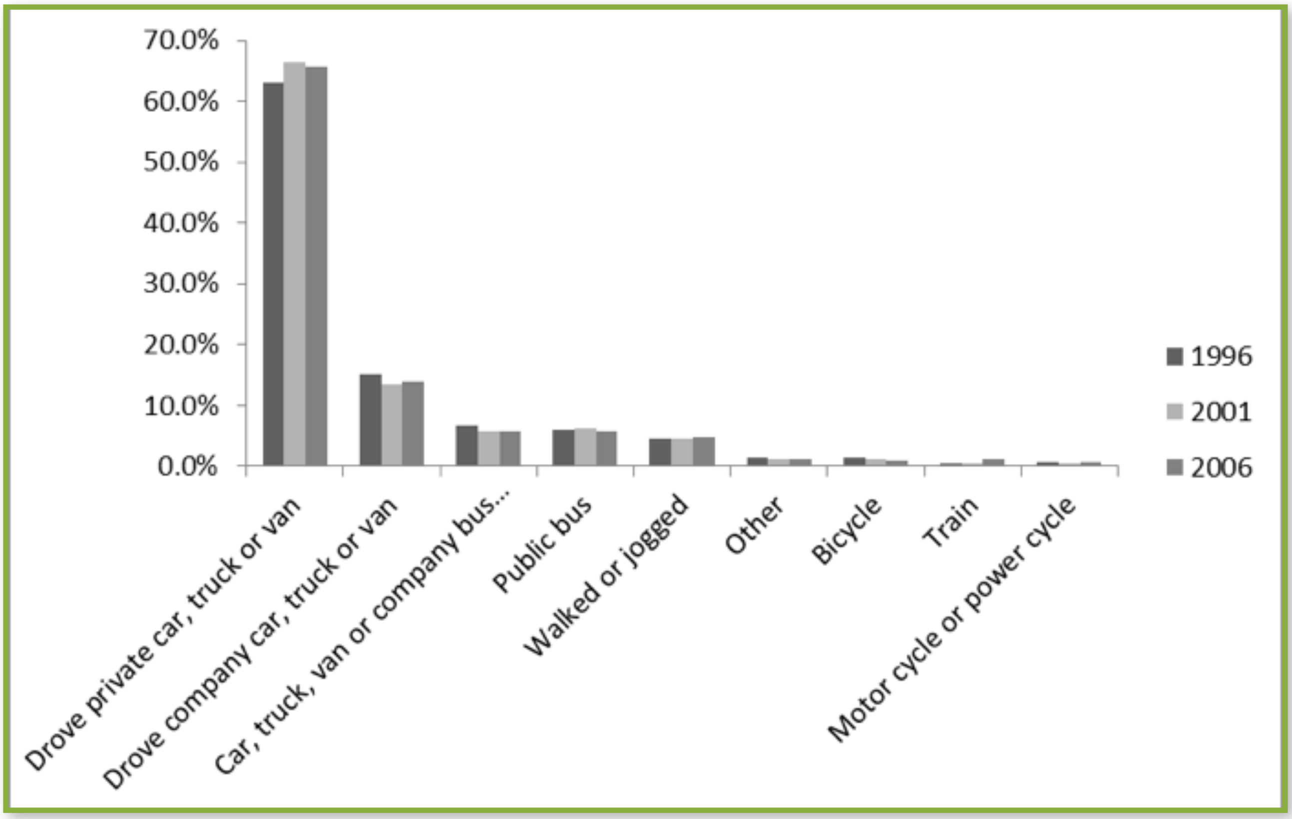


There has been increased growth in public transport trips into the Auckland CBD due to significant investment in the public transport network and services coupled with higher fuel prices. Public transport patronage is currently growing and this will directly affect private car usage in the medium term. Sustained growth in public transport is essential for economic prosperity and liveability. Public transport has the ability to move people more efficiently and free up motorway arterials for freight and other travel needs that cannot use public transport. There is also a change in people attitudes with using private vehicles which uses a scare resource. This value is making public transport more attractive.

Travel to work

Driving a private car, truck or van was the most common means of travel to work on census day in the Auckland region, consistently accounting around two thirds (66 per cent) in each of the three censuses (1996-2006) as shown in Figure 3.2-3. The second most common means of travel to work was driving a company car, truck or van at around 14-15 per cent of all modes.

Figure 3.2-3: Main means of travel to work
Source: Auckland Council and Statistics New Zealand (22 June 2011)



Driving a private or company motor vehicle to work in the Auckland region over the last three censuses has consistently accounted for approximately 80 per cent of work travel trips. Public transport bus was the next most common means of travel to work on census day. Around 6 per cent opted for this option on each of the three censuses. People arriving by train remained just over half a per cent (0.6 per cent) between 1996 and 2001, but in 2006 this increased to 1.1 per cent.

The proportion of people walking or jogging to work increased marginally from 4.5 per cent in 1996 and 2001 to nearly 5 per cent in 2006. People cycling to work decreased from 1.5 per cent in 1996 to 1 per cent in 2006.

Energy costs and availability

Energy needed to run the transport fleet and to move goods drives the economy. Rising and fluctuating fuel prices is a factor affecting transport trends.

Fuel prices are dependent on underlying oil prices and at this point in time the long-term trend for oil prices has been higher; for example as shown in Figure 3.2-4 which tracks the trend Brent crude prices in constant (2010) US dollar terms. Not only has the trend been higher, but a critical issue for transport services provision is the volatility of prices around the trend. It is volatility, defined by price swings over one to two years, that creates problems in estimating transport demand, particularly for public transport provision in the short term and makes longer term capacity planning more difficult.Trends in oil prices are influenced by supply and demand factors. The growth and industrialisation of countries in Asia, particularly China and India, is helping to push growth in demand for crude oil. Increases in activity and living standards in this region are helping to drive trends, competing with the western developed economies for supply. Price volatility is driven by related geopolitical and economic events that have both actual and perceived impacts on supply and demand. Strikes and conflict in known producing areas signal potential supply shortages, while economic events such as the 2008 global financial crisis and ensuing recession influence views around current and future demand. The trend towards higher oil prices seems fairly established, but that event-driven volatility will continue to generate short-term noise.

Figure 3.2-5 shows volume-based price forecasts from 2008 to 2060 for a range of transport fuels. This figure shows significant increases in prices for all fuels to 2060.

Figure 3.2-4 Long-term trends in constant US dollar Brent crude oil prices
Source: BP Statistical Review of World Energy 2011

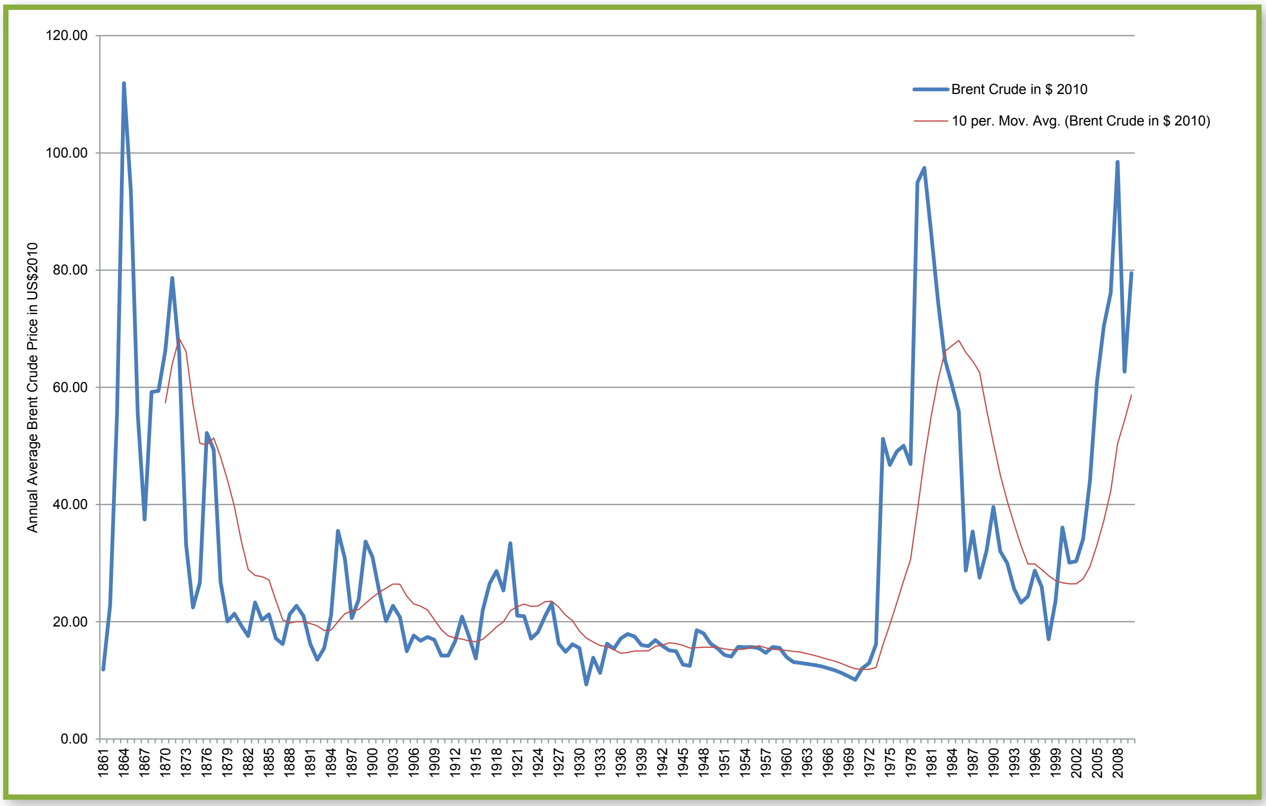


Figure 3.2-5 Volume based prices for transport fuels
Source: Auckland Regional Council (prepared by McCormick Rankin Cagney)

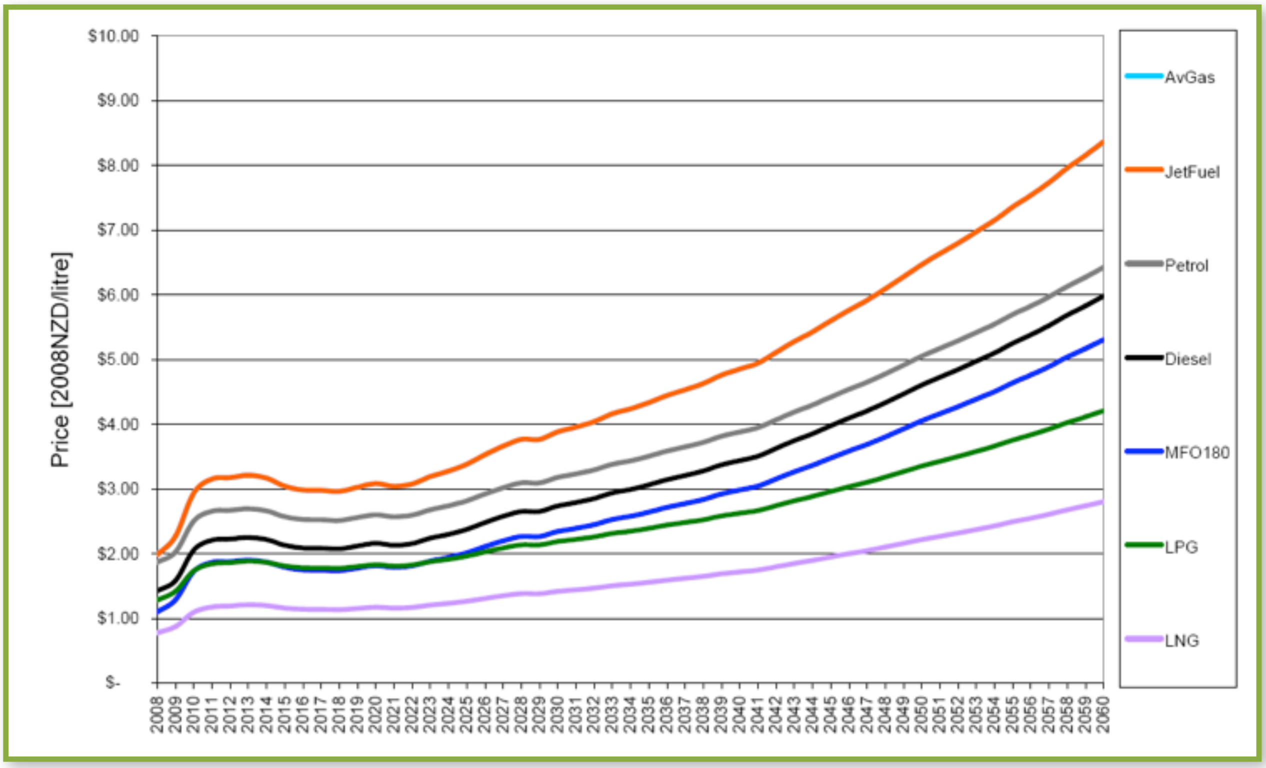


Table 3.2-2 Regional road capacity
Source: Auckland Transport (15 April 2011)

Attributes	Road classification			
	Regional arterial road	District arterial routes	Collector roads	Local roads
From hierarchy entered in RAMM (km)	458	858	1,112	5,612
From traffic volume (km)	338	437	709	6,460
Functional capacity (AADT)	20,000 to 40,000	10,000 to 20,000	4,000 to 10,000	4,000

Note that MFO 180 is a fuel used in marine diesel engines, boilers, furnaces and other combustion equipment.

Fluctuating fuel prices support the need to reduce the reliance on transport modes that use non-renewable fossil fuels, in particular the private car. To achieve destination accessibility will require a significant shift to a range of energy-efficient travel modes.

Fossil fuel reserves are peaking and once demand outstrips our ability to supply oil-based fuel, we can expect future price shocks. While alternative energy and fuel sources are being developed, we can still expect price and availability shocks. This is a bigger picture than fuel price alone and has huge potential to disrupt the global economy. Therefore, modern cities need to adapt to more resilient transport modes.

Bitumen and ready-mix concrete are important construction materials for Auckland's transport network. Forecasts of bitumen prices are strongly influenced by international oil price forecasts. NZTA publishes the Bitumen Price Index, which is linked to Singapore oil prices and the United States / New Zealand exchange rate. The Bitumen Price Index started at 906 in March 1998 and was 3,257 in November 2011. It peaked at 3,701 in August 2008 at the start of the global financial crisis.

Heavy vehicles

Heavy vehicle volumes are an indicator of economic activity. Freight efficiency is therefore important for enabling regional economic development. The region is economically dependent on road-based freight movement.

The potential for allowable axle loadings, vehicle mass or length to be increased was approved with the NZTA Vehicle Dimension and Mass 2010 rule. The vehicle limit is changing from 44 to 62 tonnes on controlled routes. Heavy vehicles contribute to increased pavement deterioration and shorter asset lives over the longer term. This will result in cost increases to maintain the existing road network condition.

A preliminary assessment to select the preferred routes for High Productivity Motor Vehicles (HPMV) was completed for the Auckland region in 2010 along with discussions with industry groups. Nine routes were identified as candidates for HPMV operation although there will likely be more. The routes were based on using the state highways as a backbone but this is still being progressed with NZTA.

The finalisation of the HPMV routes with NZTA and industry groups and the subsequent impact on the pavement asset has been identified as an action for future improvement.

A preliminary analysis found that seven out of the nine routes achieved a benefit cost ratio of one or greater for the Auckland community. The analysis also found that there were relatively few structures that would limit the total use of HPMVs. A separate analysis has found that bridges on five of the nine routes require strengthening based on age and design loading. (Refer to Section 4.3, Bridges Lifecycle Management Plan).

Movement

Movement on Auckland's motorways and arterial roads are vital to our economy and communities. They comprise only nine per cent of the network but provide for 70 per cent of all road passenger transport trips, and almost 60 per cent of all peak and commercial vehicle travel.

Road congestion occurs as traffic volume approaches maximum capacity. Local road congestion and other general traffic issues tend to be focused on some of the key arterial corridors such as Dominion Road and Mount Eden Road. Population growth and increased road freight transport will continue to place significant pressure on road capacity.

Typically, road congestion occurs at morning and afternoon peaks as people move to and from their place of work or study. The morning peak hour is the main constraint on the Auckland transport network and is generally two hours in duration. Movement is also important so people reach their destination not just for employment but also for other activities such as sports events, shopping and recreational activities. This is also commonly referred to as destination accessibility or the ease of reaching goods, services, activities and destinations.

Congested roads can indicate that the infrastructure has inadequate capacity. However, congestion typically occurs only in certain areas of the network at peak times. Congestion is first addressed through more efficient use of the existing network and by encouraging public transport use and by travel demand management planning (refer to Section 3.4.2) before building new road capacity. Maximising the capacity of the existing network and achieving an integrated network is detailed in Section 3.4.2. It is expected that capacity in the future may be addressed through peak hour spreading. Road users will be encouraged to travel at different times of day and by different routes. This has been an effective method for managing congestion overseas and is frequently linked to road user charge schemes.

Auckland's congestion is considered to be more severe than in other similar sized cities internationally such as Brisbane. For example, using minutes delay per kilometre as a measure in the New Zealand Council for Infrastructure Development's Meeting New Zealand's Infrastructure Needs Report to 2025 (dated 2006), Auckland's congestion exceeded Brisbane's for morning and afternoon peak periods and all day.

The regional transport network is classified into a hierarchy based on traffic volume. The diverse network ranges from busy arterials to low volume local roads.

The number and capacity of regional roads is summarised in Table 3.2-2. Most regional arterials have two lanes with additional lanes provided around intersections to facilitate turning movements. They provide a good level of service at most times but become congested during peak periods. The traffic capacity of regional arterials ranges from below 20,000 to over 40,000 Average Annual Daily Total (AADT). There are also 160 kilometres recorded as having four lanes and 30 kilometres as having more than four lanes.

An efficient transport network is now considered in terms of movement rather than just the traditional congestion parameter. The regional arterial network has been assessed in terms of functional requirements and future strategic role as follows:

- General traffic level
- Passenger transport level of service provided
- Extent of cycling facilities
- Freight level of service
- Safety targets in terms of traffic volume in 2016 against present day accident rate
- Place in terms of relative sensitivity.

The 2010 Auckland Regional Land Transport Strategy (RLTS) assessed the regional arterial network against these criteria and priorities identified for action. The deficiencies of the regional arterial network are shown in Figure 3.2-6. Roads with multiple deficiencies and that are high priority requiring further attention are:

Albany Highway	Upper Harbour Highway to Wairau Road
Wairau Road	Target Road to Tristram Avenue
Lincoln Road	Te Pai Place to SH16 Interchange
Te Atatu Road	Edmonton Road to SH16
Great North Road	Blockhouse Bay Road to SH16
Wolverton Street	
Broadway	Khyber Pass Road to Manukau Road
Khyber Pass Road	Symonds Street to Broadway
Ellerslie Panmure Highway	Panmure Roundabout to Great South Road
Great South Road	Church Street to Portage Road
Pakuranga Road	Panmure Bridge to Ti Rakau Drive
South-Eastern Highway	Waipuna Road to Ti Rakau Drive
Church Street	Neilson Street to Great South Road
Neilson Street	SH20 Interchange to Onehunga Mall
Ti Rakau Drive	Harris Road to Pakuranga Road
Great South Road	Redoubt Road to Te Irirangi Drive

The capital programmes to address these deficiencies are detailed in Section 3.4.3. There is a move away from addressing congestion through building additional capacity to looking more holistically through Corridor Management Plans (CMP) development where multiple factors are considered such as movement, providing choices with other travel modes and integrated land use.

Some regional arterial deficiencies (Lincoln Road, Te Atatu Road, Great North Road and Wolverton Street) are directly impacted from motorway congestion. The One System approach will help address these issues in specific areas where there are different partners involved (refer to Section 3.3.2). Auckland Transport has adopted this One system approach with NZTA and KiwiRail to achieve an integrated system. This means planning, operating and developing transport to achieve the best overall system outcomes, without being constrained by the limitations faced by each of the partners working alone.

Figure 3.2-6 Regional Arterial Network with significant deficiencies
Source: Regional Arterial Road Plan (February 2009)

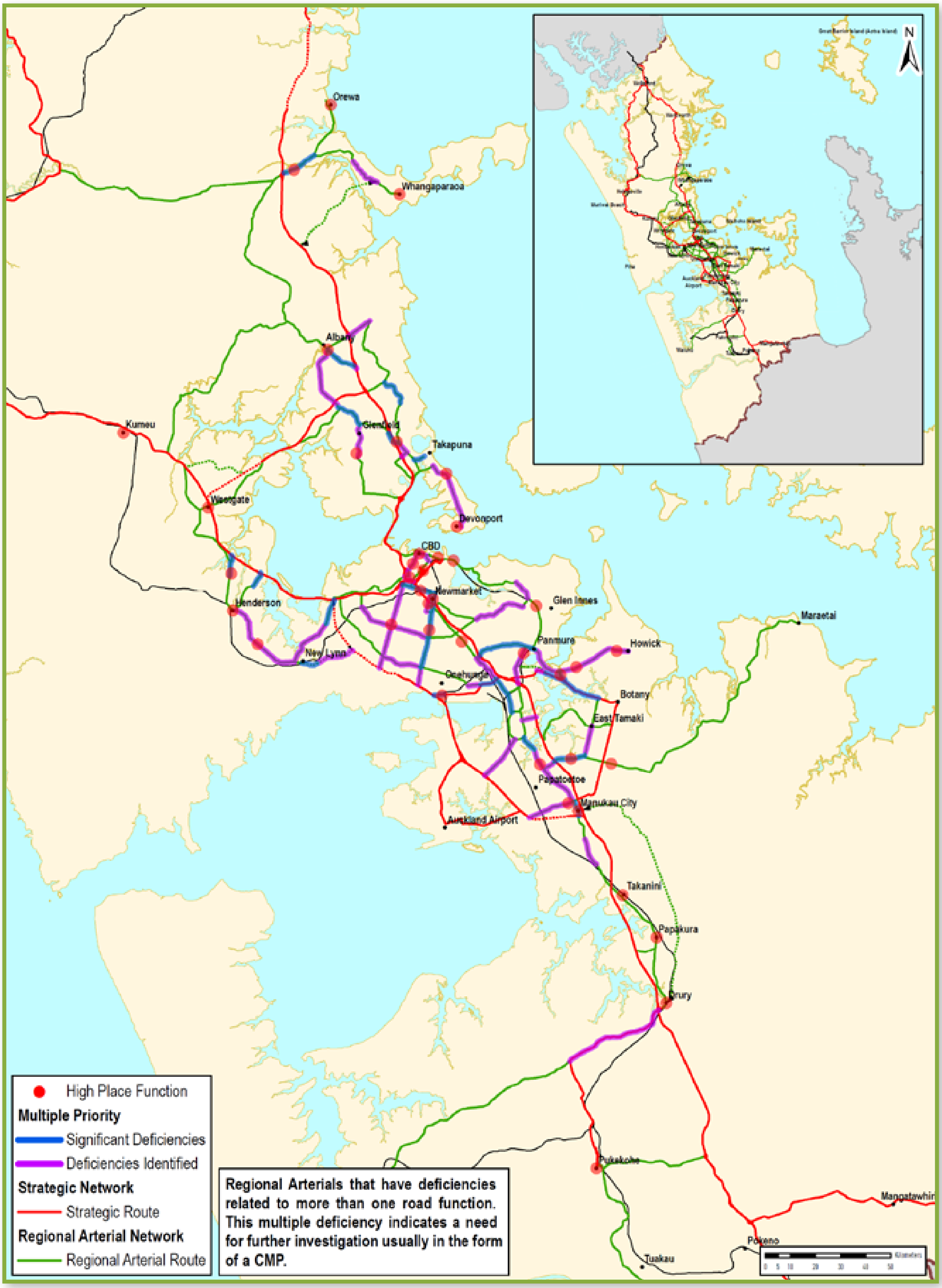


Table 3.2-3 Travel time variation
Source: Auckland Transport's Annual Report (2011)

Strategically important commuter routes	Current (Nov 2010) 85% of trips within travel times (minutes) during the morning peak (7am-9am)
Airport to CBD via Manukau Road	41
CBD to Airport via Manukau Road	41
St Lukes to St Johns via St Lukes Road / Greenlane / Remuera Road	41
St Johns to St Lukes via St Lukes Rd / Greenlane / Remuera Road	58
Albany to Birkenhead via Glenfield Road	38
Birkenhead to Albany via Glenfield Road	26
Henderson to CBD via Great North Road	50
CBD to Henderson via Great North Road	38

Transport distribution

Our arterials, along with the motorway network, carry significant volumes of general and goods traffic. There are distribution patterns at certain locations and times as a result of missing strategic and arterial links as well as uneven assets across the network. Sometimes traffic that should be on motorways and arterials is using local roads. This uneven transport distribution affects travel times in an unpredictable fashion.

The travel times across the network are shown in Table 3.2-3. The travel times (minutes) along these strategically important vehicle routes during the morning peak (7am-9am) were measured as baseline data for Auckland Transport as a new organisation. This shows the challenge of providing a connected arterial road and state highway network that moves people and goods efficiently and safely.

Public transport, cycling and walking

Ongoing increases in travel demand cannot be sustainably met by just increasing road capacity for private vehicles throughout the network. Public transport, cycling and walking are alternative modes to the private vehicles that can reduce the rate of growth in demand for road use. These modes can help reduce congestion on road corridors and motorways.

Auckland Council is committed to helping reduce the emission of greenhouse gases by moving away from being fossil fuel dependent. Auckland Transport plays a part in meeting this challenge with the promotion of public transport, walking and cycling. Traditionally, public transport has not played as significant a role in the Auckland region as say in the Wellington region. This is changing with the recognition that quality infrastructure and services are needed in order to encourage motorists to switch modes. There has been sustained public transport growth in the last decade with a 40 per cent increase in patronage. Annual public transport patronage is almost 70 million passengers (to January 2012). This is a 9.7 per cent increase in boardings from 2011.

Walking school buses are children walking together to and from school under the supervision of adult volunteers or conductors. Walking school buses are an iconic part of the city. Over 5,400 children regularly use walking school buses which reduces the traffic around schools and improves safety. (Refer to Section 4.15 Community Transport Service Plan.)

Transport pricing

Currently the price users pay for roads is the fuel excise duty paid by petrol vehicles, the road user charge paid by diesel vehicles, and the vehicle registration charge paid by all registered vehicles. This price is tax and charge based and not directly related to the use of transport corridor infrastructure. The Government has identified transport pricing as a way of managing demand in the longer term.

Government policy is likely to involve changes to the ways in which users pay for their use of the network in the long term. There may be a more direct linkage established between the price paid and the costs imposed by users on others. Users of heavily congested networks where the marginal cost of increasing capacity is significant can be expected to pay more per kilometre than users of low volume roads.

Transport safety

Road safety is a high priority for Auckland Transport and is closely monitored. Although road deaths in the region have declined by 21 per cent between 2000 and 2008 along with a 12 per cent decrease in serious injuries, the number of minor injuries increased by 35 per cent in the same period. The highest road casualties per 100 million vehicle kilometres travelled (VKT) by legacy council and urban and rural networks were located in the former Waitakere area followed by Auckland and Manukau areas.

The capital programmes to address these safety issues are mainly through corridor upgrades and targeted community transport programmes (refer to Sections 3.4.3 and 4.15 respectively).

In addition to addressing serious road injuries and casualties, it is important that all transport users have a high degree of personal security, both real and perceived. The transport system should provide an environment where personal security is assured, whether the individual chooses to travel by private vehicle, public transport, walking or cycling. Safety issues need to be addressed with walking and cycling modes through improvement programmes or capital works.

Public health

The regional transport network provides vital links and connections for communities. The development and operation of the transport network can influence community health in terms of risk from air pollution, noise and vibration.

Vehicles produce toxic air pollutants particularly carbon monoxide (CO), nitrogen oxides (NO2) and fine particles (PM10).The 2001 Ministry of Transport study Health Effects of Vehicle Emissions estimated that air pollution causes 436 premature deaths each year in the region with 58 per cent due to motor vehicles. Auckland Council monitors the air quality and reports any concentration of a pollutant that exceeds the national air quality standards to the public.

The majority of current transport-related activities are energy intensive and rely on consuming non-renewable resources in terms of fuel, materials and land use. These activities contribute to greenhouse gases and climate change. These are discussed separately in Section 5, Sustainability. Vehicles account for 35 per cent of greenhouse gas emissions in the region. High reliance on private cars for short trips instead of active modes such as walking and cycling may lead to poorer regional health outcomes in future.

Environmental sustainability at the local level

The transport system can impact on the loss or degradation of waterways due to the discharge of stormwater contaminants. These include sediment, stormwater flows being increased and/or diverted, leading to flooding and erosion. This is discussed further in Section 4.12, Drainage Lifecycle Management Plan.

3.2.4 Knowing the demand

Traffic monitoring has evolved over many years and provides the base information for making decisions about the transport network. Traffic monitoring assesses traffic volumes including vehicle speed and class, and heavy vehicle class. There are many permanent traffic counting sites regionally, with continuous and seven-day counters are scheduled quarterly. There are also counters available for problem areas as needed.

Legacy councils had different methodologies and historic site locations for traffic monitoring. Traffic counts were used for slightly different purposes, such as transport modelling versus road rehabilitation. Internal and external enquiries since Auckland Transport was set up confirm that these sites are located in the right places. Papakura District Council's traffic monitoring programme was ad hoc and this will be aligned to the regional approach. End-user requirements are currently being consulted on and one programme will be developed that is best used to understand the demand going forward. There is no formal documentation of the traffic monitoring approach regionally and this is recognised as an area for future improvement.

Traffic volumes of all heavily trafficked rural roads have not yet been accurately and consistently counted. This is discussed further in Section 4.2, Road Pavements Lifecycle Management Plan. A key improvement initiative has been identified to address this problem.

There is a vast amount of data collected from traffic counting sites and it is stored in Auckland Transport's RAMM system. It is used for specific projects and for asset management analysis. Traffic count information is available on Auckland Transport's website.

Other modes of travel such as cycling, walking and ride sharing are measured annually through the TravelWise programme, the regional cycle count, and walking and cycle trips into the CBD. These monitor the reduction in car use to measure programme successes in encouraging alternatives to using the private car.

Infrastructure to automatically count cyclists has been installed at key locations across the cycle network. A Regional Cycle Monitoring Plan is being developed and will guide the future approach to monitoring. It is expected that the automatic monitoring programme will increase as the network expands with a corresponding reduction in the manual count programme.

3.2.5 Changes in technology

Technological advancement will have an impact on the operations and maintenance of transport services and infrastructure. Changes in technology are also expected to affect travel demand by removing the need to travel, making a particular mode of transport more or less attractive, or affecting the impacts of travel. Technological changes may also affect assets such as stormwater, solid waste and other road assets. The main changes in technology to manage demand on the transport networks are summarised in Table 3.2-4.

Table 3.2-4 Changes in technology summary

Technological change	Description and possible future impact
Electronic parking ticketing	Developments in electronic ticketing for parking will enable quick transactions for parking. The likely impact of this is consolidated administration of ticketing and revenue collection, ease of use and faster dispersion of vehicles off the road
Real-time information signage	Developments here will enable our parking customers to see where parking is currently available. This will also affect our parking customers by saving time and fuel costs in searching for parking Real-time information will enable people to understand estimated travel times at peak periods for the busy arterial routes. Ramp signalling has been introduced by NZTA on motorways interchanges to control and manage the feeding of traffic into motorways during peak times to make the motorways flow better. Auckland Transport is working with NZTA as part of the One System approach to make this initiative successful. This may reduce congestion on our arterial roads, which feed into these interchanges
Closed-circuit television surveillance (CCTV)	Development of CCTV will support increased personal and property safety and emergency response. This will encourage public transport patronage and support the reduction in congestion
Transport modelling technology	Developments in this area will better support our region's transport planners in their assessment and definition of where new / improved transport facilities should be provided. The likely impact is better responses to the needs of transport customers
Condition and performance monitoring of facilities and infrastructure	Developments in condition and performance assessments will enable quicker analysis and better understanding of requirements ensuring a facility or infrastructure is meeting those requirements. The likely impact is that Auckland Transport will be better able to ensure that the performance and condition of facilities and infrastructure are maintained at the appropriate levels. This maintenance will reduce the possibility of asset and service level failures and subsequent risk
Street light and traffic signal bulbs	This relatively new technology will increase illumination at night along with decreased maintenance costs due to longer bulb life. The installation cost is currently higher than existing bulbs. Power saving by using LED lights could be as high as 40 per cent to maintain similar light levels on streets. LED lights have other advantages such as longer life (20 years), better light distribution, lower light pollution and white light
Cleaner and more efficient cars	As vehicle technology improves in the long term, air pollution should reduce. This has not been formally assessed and further investigations and studies are required to quantify this change. This is a central government issue but Auckland Council may take the lead
Adoption of telecommunications	Development of telecommunications technology (e.g. installation of ICT ducting) has been made compulsory by the council as part of any new development or project. This may encourage more people to work at home during peak times and may reduce the need for trip-making
Urban design innovations	Urban streets are being designed as people-friendly places to encourage local walking and cycling trips instead of vehicle-based trips. New subdivisions are being developed to encourage walking and cycling as well
Pavement construction technology	Advancements in road construction technology include: · Surface sealing products with improvements in polymers which may result in longer lasting seals · Stabilising agents for road construction and maintenance. Effective for maintenance where there is sufficient pavement depth. The choice of pavement materials also has an impact on the quality of stormwater runoff. Roads are an impermeable surface so when it rains the stormwater runoff puts pressure on the stormwater system and degrades the water quality. A permeable paving project was trialled on a 200m² section of Birkdale Road under North Shore City Council (refer to Section 5.4 Implementing Sustainability). The economic and environmental benefits of permeable paving are financial savings due to less pressure on stormwater reticulation systems and reduced environmental impacts. The true benefits are still to be measured including the impact on the road base
Reuse and recycling of road materials	There are now many areas where road materials are reused or recycled, including: · Overlay and stabilising of existing pavements, rather than removal to tip of worn out pavements, and replacing with imported new road materials · Recycling of concrete footpaths · Recycling of existing road construction and maintenance materials has a double positive effect of reducing waste and reducing the cost of new work. Recent examples include the cold milling of existing reseal layers to produce a composite overlay material for area-wide pavement treatment and the recycling of milled asphalt concrete to produce lower quality but adequate asphalt products. Auckland City Council and Fulton Hogan collaborated to reconstruct a section of Church Street in Otahuhu using recycled materials. (Refer to Section 5.4 Implementing Sustainability). Recycled crushed concrete and millings from existing pavements were recycled and therefore diverted from landfill. As a consequence the need for new materials (aggregate and bitumen) was reduced and there was less impact on the landfill
Low impact design	Low impact design includes the concept of designing stormwater systems to have less impact on surrounding ecosystems, and designing new subdivisions to reduce earthworks where possible. There may be cost implications with the on-going operation and maintenance of non-traditional stormwater assets such as rain gardens and swales. Sustainable developments with water sensitive designs provide opportunity to improve stormwater quality in new developments but also to reduce existing adverse effects through redevelopment. The Albany Lakes Precinct comprises two complex developments where low impact design features heavily in the asset base (refer to Section 5.4 Implementing Sustainability). An innovative approach was also developed to manage and maintain the green engineered assets. This project demonstrated less impact on the environment and with careful management there were operational efficiencies and an associated reduction in operating costs
Contract renewal process	Sustainability and technology innovation is valued in the contract renewal process within road corridor maintenance. This awards points to contractors for work / achievements in these areas

3.3 Demand forecast

3.3.1 Regional demand forecast

Regional growth

The demand forecast of our transport network is influenced by multiple factors: population growth, economics including employment, commercial and industrial development, and town centres. The Auckland Plan is supported by a high-level Development Strategy which sets out how Auckland will change and grow over the next 30 years. Growth is focused on existing and more compact urban areas which are serviced by public transport. The Development Strategy has adopted a place-based approach by aligning investment in areas where the majority of growth will occur. The integration between land use and infrastructure is important for determining how Auckland evolves in the long term. Of all infrastructure types, transport has the strongest influence on the location, patterns, and quality of place.

The Development Strategy consists of four key elements:

- Key shapers and enablers
- Two big initiatives (City Centre and Southern Initiative)
- Moving to a quality, compact Auckland
- Working and delivering with others (through a coordinated and collaborative approach).

The Development Strategy has sequenced priority growth areas for three, 10 and 30-year planning horizons. Figure 3.3-1 shows the detailed Development Strategy for the next 30 years. The figure shows the CBD as the City Centre area, with metropolitan centres (such as Takapuna and Manukau), town centres (such as Panmure and Browns Bay), and local centres. Two satellite towns, Warkworth and Pukekohe, have been identified to function semi-independently of the main metropolitan area. The future form consists of a network of centre-connected through-transport corridors.

Two big initiatives are intended to make a step change in Auckland's performance:

City Centre area	**To become a leading commercial and cultural centre internationally. Public transport will be enhanced to improve access to the city centre's opportunities. The City Rail Link is a significant project identified to improve access to the city centres and future growth opportunities at other centres. A City Centre Masterplan has been developed to support the Auckland Plan and provides a 20-year transformation direction.**
Southern Initiative area	**This is an area of high social need and economic opportunity and includes Auckland International Airport. It will be transformed from a gateway to a manufacturing hub with housing provision to accommodate residential growth.**

Nine areas have been identified for further planning and implementation over the first three years. These nine locations will be the focus in the short term and include:

- City Centre
- Southern Initiative
- Hobsonville / Westgate, Massey North
- Tamaki
- New Lynn Metropolitan Centre
- Onehunga Town Centre and suburban area
- Takapuna Metropolitan Centre
- Warkworth satellite town
- Pukekohe satellite town.

The quality approach is based on the following measures:

- A new rural urban boundary
- Provision for new development areas for residential and business growth with a commitment to best practice in urban design
- A network of inter-connected towns and villages
- Opportunities for employment growth
- A less-is-more approach which prioritises eight growth areas for investment in the first three years
- A clear direction as to how growth and development will be sequenced over 30 years.

The Development Strategy intends to achieve a compact urban form as well as allowing for flexibility:

- Provide for 60 to 70 per cent of total new dwellings inside the existing core urban area as defined by the 2010 Metropolitan Urban Limit (MUL)
- Between 30 to 40 per cent of new dwellings outside of the baseline 2010 MUL in new greenfields, satellite towns, and rural and coastal towns
- Provide for at least 1,400 hectares of business land in new greenfields
- Provide for a Rural Urban Boundary (RUB) to define the maximum extent of urban development to 2040.

Figure 3.3-1 Detailed Development Strategy
Source: Auckland Plan (April 2012)

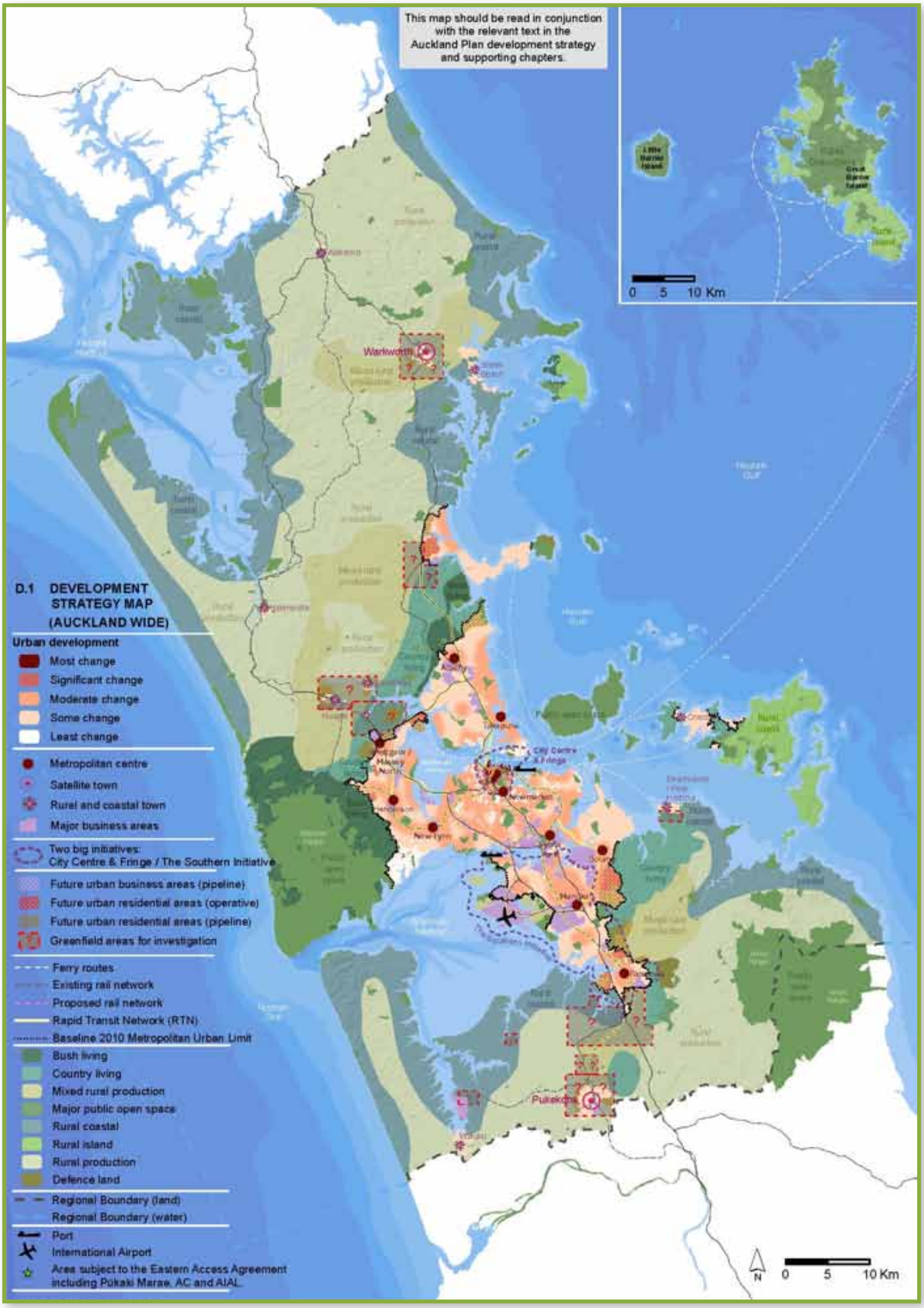
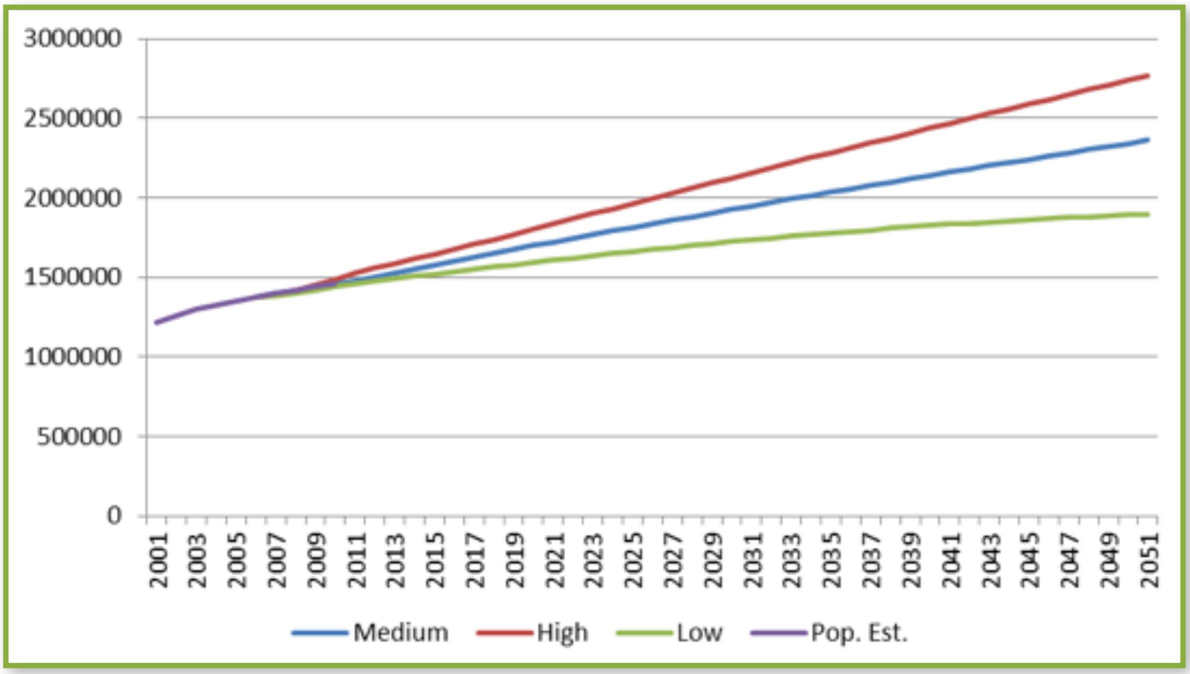


Figure 3.3-2 Auckland region population projections
Source: Auckland Council, Market Economics and Statistics New Zealand (4 April 2012)



Auckland region population projections

The Auckland Plan has identified growth as a significant issue for the region to accommodate an increase of some 235,800 people under a medium-growth projection between 2012 and 2022. Auckland is expected to grow to a population of between 1.9 and 2.8 million people (low and high scenarios) depending on the rates of natural increase and migration, by 2051. The regional population growth forecast is presented in Figure 3.3-2. Population is expected to grow in future due to natural increase and migration (internal and international).

The regional demand forecast for this AMP has been developed using Auckland Council's growth model developed for the Auckland Plan. It provides high-level numbers for population, households, dwellings and employment. It is important to acknowledge that projections are subject to uncertainty. They are best used as an overall guideline and an indication of the overall trend rather than as exact forecasts.

The growth model uses broad information based on the following assumptions:

- Medium growth projections
- Statistics New Zealand population projections
- Employment projections provided by Market Economics using a proprietary model.

Asset management planning for the 2012 – 22 LTP uses the medium population growth scenario, which at the time of writing was considered to be the most likely future growth scenario. Close monitoring of actual population growth and change will need to occur to ensure use of this scenario remains valid over time.

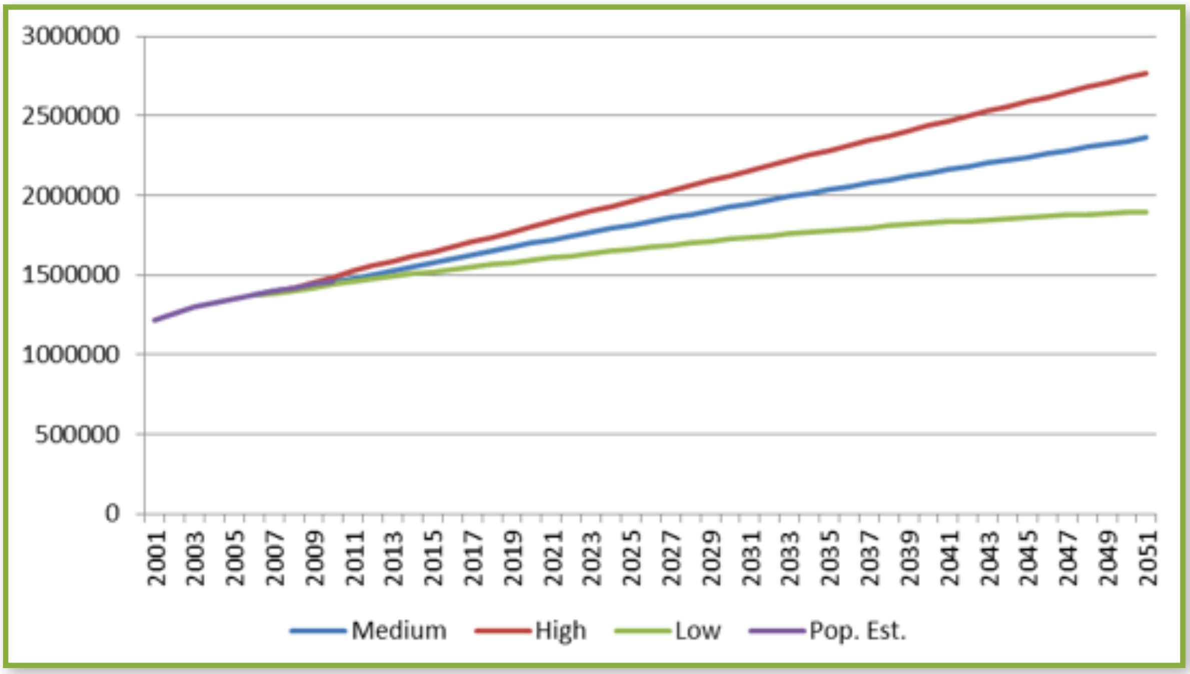
As a 30-year plan, the Auckland Plan has chosen to use both a medium and a high-growth scenario so as not to constrain growth potential unnecessarily over the planning timeframe. This is also appropriate given the relative unpredictability of long-term growth trends.

Dwelling projections have been developed from Auckland Council's growth model at Local Board level. Auckland's largest population growth is located in Franklin, Hibiscus and Bays, and Rodney Local Boards.

There are also expected changes in the demographic structure, which will influence urban form and consequently the transport network. As with most developed countries, New Zealand's general trend is an increase in the ageing population. The number of persons of retirement age in Auckland is expected to grow from about 164,000 to 237,000 between 2012 and 2022. By 2051, the proportion of residents aged over 65 will be around 20 per cent.

The projected population growth will create demands for residential dwellings. The 2006 census recorded a total of 476,046 dwellings. Most of these were private occupied dwellings and included

Figure 3.3-3 Daily trips by population
Source: Auckland Plan transport modelling (15 March 2012)



33,000 unoccupied dwellings. Population-driven demand for private dwellings could see the region with between 755,000 (low) and around one million (high) dwellings at 2051.

The rate of residential construction has declined significantly since the global financial crisis began around 2008. This is evident in a range of data sets, in particular the number of residential dwelling authorisations for Auckland as presented in Table 3.2-1.

There are uncertainties in all forecasts and ongoing monitoring of the timing, location, form and quantity of growth is necessary to judge alignment of the growth model outputs with actual development trends. The Development Strategy will be monitored and reviewed through the following Auckland Council mechanisms:

- Ongoing analysis of growth capacity (including land supply, vertical space and commercial factors)
- Every three years capacity may be adjusted in response to the above information and analysis
- Input into six yearly reviews of the Auckland Plan.

Inter-regional growth context

The Auckland region should be considered with the Waikato and Bay of Plenty regions in relation to growth and economic activities. Auckland, Tauranga and Hamilton are frequently called the golden triangle. Inter-regional connectivity is an important element of the urban growth strategy, focused on business land and the impact of freight movements, with the Port of Tauranga drawing business from Auckland.

Auckland Plan demand forecasts

Transport demand forecasts have been modelled on Auckland Plan aspirations. These forecasts have been based on two new scenarios as follows:

- Medium growth projection with a new population projection of 2.1 million people by 2041 (called Scenario E) and based on intensive containment
- High growth projection with a new population projection of 2.4 million people by 2041 (called Scenario F) and based on intensive expansion.

Auckland Transport is in the process of understanding the consequential funding needed to achieve these aspirations. Alternative scenarios are being modelling that have a more realistic view to supporting regional growth with appropriate funding. This is an iterative process that will continue into 2012 and beyond.

Figure 3.3-4 on page 54 shows that the number of daily trips by population decreases over time for four scenarios (including scenarios A and B that are now superseded) as the population increases (except for A in 2021).

Figure 3.3-4 Daily trips by population
Source: Auckland Plan transport modelling (15 March 2012)

Figure 3.3-5 and Figure 3.3-6 present the VKT forecasts for the morning (AM) peak, the two-hour average inter-peak (IP) periods, and the daily VKT per capita respectively. VKT is expected to increase over time, with the growth in the inter-peak VKT being greater than in the morning peak, so that by 2041 they are similar. The growth in Scenario F is greater than for the other scenarios. Daily VKT per capita remains relatively static over time from 2006 except for a small decrease for Scenario F.

Figure 3.3-5 VKT forecasts for morning (AM) peak
Source: Auckland Plan transport modelling (15 March 2012)

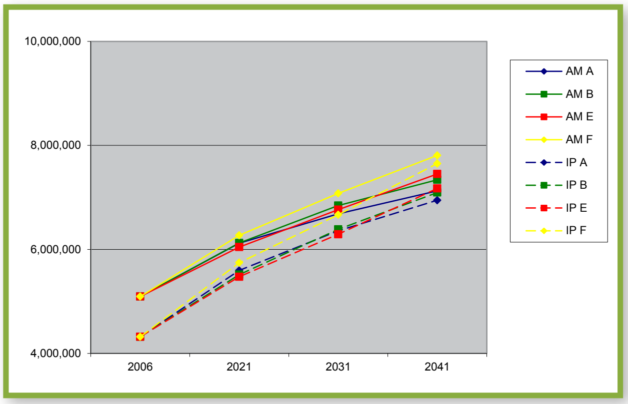
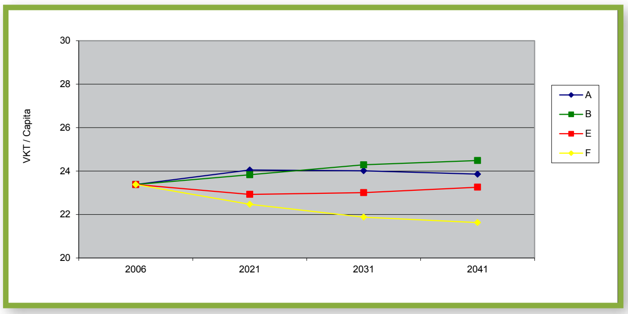


Figure 3.3-6 VKT forecasts for daily per capita
Source: Auckland Plan transport modelling (15 March 2012)



Walking and cycling demand forecasts

Walking and cycling are becoming more important as journeys frequently involve more than one transport mode. It is expected that there will be longer walking and cycling trips to fewer bus routes with more frequent services. The linking of pedestrian routes with other transport modes, particularly public transport interchanges, is important for increasing public transport demand.

The demand forecasts for walking and cycling are summarised in Table 3.3-1.

The key initiative for increasing cycling demand is to complete the Regional Cycle Network for development rather than demand-led growth. The Regional Cycle Network is presented in Section 4.8 Cycling LCMP and shows the existing and proposed network. The current focus for managing cycling growth is to complete the network gaps.

3.3.2 Impact of demand

The region's population is growing rapidly. The impact of this demand has been assessed at a high level with the development of the ITP and RLTP. A One System approach has been adopted to improve congestion, increase reliability and safety, and to manage the impact of demand.

The One System approach requires the integration of its network elements: physical, functional and operational. As well as the traditional physical

Table 3.3-1 Walking and cycling demand forecasts
Source: Draft Active Transport Technical Paper 2012 (December 2011)

Transport mode	Demand measure	Medium target	Long-term target
Walking	Increase daily walking trips into the City Centre in the morning peak	6,100 by 2016 (4,476 in 2009/10)	8,750 by 2026
Walking and cycling	Mode share	23% by 2020	37% by 2040
Cycling	Completion of the Regional Cycle Network (as set out in 2009)	50% by 2016	100% by 2026

infrastructure there are functional elements of freight, business traffic, school and university students, and commuters, recreational and social users. These contribute to a local sense of place and community. Overlaying the physical and functional networks is operational networks traffic management, public transport services and systems such as integrated ticketing, fares and information.

A One System approach is used when making changes in an area with a focus on a suite of options by the different partners, i.e. Auckland Transport, NZTA and KiwiRail. For example, the Auckland Manukau Eastern Transport Initiative (AMETI) project is using the One System approach and this will result in a higher level of integration between the different transport modes.

Demand drivers

Transport demand is influenced by a number of factors other than population growth. It is necessary to understand how these demand factors interplay in order to provide an effective and reliable transport network. This is critical to sustain Auckland's quality of life and to support Auckland's growing contribution to New Zealand's economic productivity.

These demand trends are described in Sections 3.2.1 to 3.2.3. The main effects of demand drivers on roading demand are summarised in Table 3.3-2. Increased traffic congestion is the primary effect of population and economic growth and this causes an increased public transport demand. Environmental pollution is the secondary effect of increased traffic congestion. The results, shown in arrows, illustrate increasing, decreasing or no change in the effect on demand.

Current strategies

The impact of demand on the transport network is managed through current adopted strategic plans. The primary planning documents for the Auckland transport network are:

- 2010 Auckland Regional Land Transport Strategy (RLTS)
- 2009 Regional Arterial Road Plan (RARP).

The 2010 RLTS was adopted in March 2010. It provides the regional strategic context for the development and operation of the land transport system in Auckland over the next 30 years. The Land Transport Management Act requires that the Auckland RLTP is consistent with the RLTS.

The 2010 RLTS developed a "policy hierarchy" approach to improving transport in Auckland. This consists of first considering region-wide activities that can affect the demand for transport before considering increases to the capacity of the transport system.

The 2009 RARP was developed as an outcome of the 2005 RLTS as it recognised the importance that the region's arterial roads play in the transport network. The RARP defines the existing and future role and function of regional arterial roads, provides a framework for integrated management of regional arterial roads, and provides a basis for prioritising projects. The plan identified the regional arterial roads that have been assessed as deficient

Table 3.3-2 Demand impact summary

Growth / demand effects	Impact on transport corridors	Demand effect
Service levels		
Asset condition	Increased traffic growth impacts on the road network include increased deterioration of roading assets from additional traffic loads, particularly in the case of heavy commercial vehicles	▼
Asset performance	Asset performance is reduced as the spare capacity across the network is filled up and arterial roads become more congested	▼
Public safety	As other modes of transport are encouraged such as cycling and walking, there will be conflicts with different user requirements such as pedestrian difficulties in crossing roads and vehicle conflicts with cyclists	▼
Population and demographics		
Congestion	Higher population leads to traffic growth which causes increased congestion, particularly at peak periods	▲
Residential growth – compact form	The location of residential growth within the region will influence the way that residents access jobs, education and other daily needs. An increasing number of inner city residents increases public transport patronage, which reduces congestion	▼
Economic growth		
Local employment	The location of employment within the region is a major determinant of where peak hour traffic will try to go. This places pressure on the transport network to support large-scale movement	▲
Environmental and social sustainability		
Environmental awareness	Increased willingness to use public transport and other modes of travel	▲
Pollution	The most significant environmental impacts are noise, community severance, land take, intensification of water run-off due to road construction, water run-off pollution from road traffic, particulates from heavy road vehicles, air emissions from road transport and health from air pollution	▲

and prioritised for the development of corridor management plans (CMP). (Refer to Section 3.2.3, Movement including a deficiency map Figure 3.2-6).

3.4 Demand Management Plan

The One System approach is improving congestion and increasing reliability and safety. This includes using the existing assets and reducing demand (Section 3.4.2) before building new capacity through future strategies (Section 3.4.1) and capital works programmes (Section 3.4.3).

3.4.1 Future transport strategy

Long-term plans are vital for managing future capacity. Transport and land use planning determine the efficiency, effectiveness, resilience, affordability and environmental sustainability of a transport system. By shaping the pattern of development and influencing the location, scale, density, urban design and mix of land uses, planning can help to facilitate an efficient transport and land use system.

Long-term investment to improve the system to cope with increasing traffic is driven by the Auckland Plan.

Auckland Transport's plan hierarchy is presented in Figure 3.4-1 in response to Auckland Council's planning framework. Auckland Transport's main linkages with Auckland Council are through:

- Integrated Transport Plan (ITP) – to achieve the outcomes sought by the Auckland Plan
- Statement of Intent – to publicly state and measure the activities and intentions of Auckland Transport as a council-controlled organisation.

Auckland Plan

A single system approach is a key feature of the Development Strategy. The three elements to address current congestion problems and accommodate future business and population growth are:

- Improve and complete the existing road and rail network
- Encourage a shift toward public transport
- Support environmental and health objectives through walking and cycling.

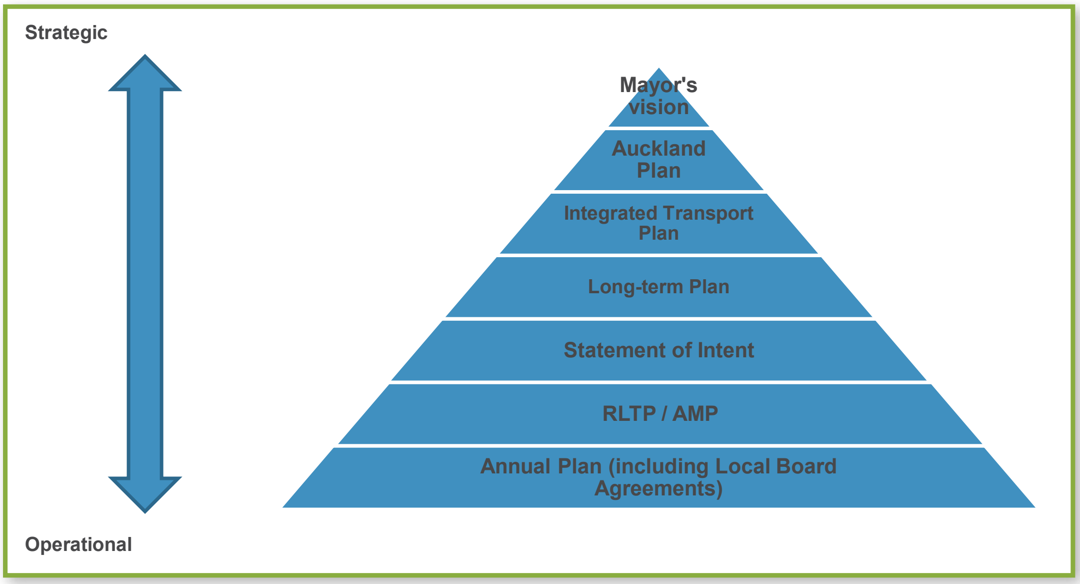
Providing only for road capacity will not cater for future growth nor is it sustainable. A transformational shift is required to invest in all transport modes. The impact of demand requires a combination of measures to manage congestion. This includes investing in public transport and walking and cycling networks, using traffic management techniques, intensification of land to encourage mode shift to walking, cycling and public transport and providing demand management programmes.

The Auckland Plan aims to manage population growth and integrate the provision and development of transport with identified growth areas. Provision of transport infrastructure and services is a key enabler and shaper of future growth. Commercial and residential developments need to be designed with all transport modes in mind.

There is a dedicated transport chapter in the Auckland Plan supported by a technical paper Transport Framework for the Auckland Plan. The four strategic priorities for Auckland are:

- Manage Auckland's transport as a single system

Figure 3.4-1 Auckland Transport's plan hierarchy



- Integrate transport planning and investment with land use development
- Prioritise and optimise investment across transport modes
- Implement new transport funding mechanisms.

The Government has indicated that the development of the Auckland Plan will ultimately replace the RLTS as the key strategic document for transport in Auckland.

Integrated Transport Plan

Auckland Transport is preparing an ITP in conjunction with the RLTP development. It integrates key strategies, tactical plans, programmes and project packages developed by Auckland Transport, NZTA, Auckland Council and KiwiRail to deliver an integrated one system approach to the development and operation of Auckland's transport system. At the strategic level, the ITP 2012-42 has a 30-year horizon to reflect the Auckland Plan and RLTS. While not a statutory document, it is an important delivery mechanism for transport in the Auckland region. The ITP will reflect the One System approach with a focus on developing an indicative 30-year funding plan. It will reflect the strategic directions of the Auckland Plan and the new GPS on transport.

Its key purpose is to:

- Provide the strategic context and framework for prioritising and integration of transport activities from different agencies
- Bridge the gap between long-term outcomes sought by the Auckland Plan and RLTS and provide practical, achievable solutions within the 30-year timeframe
- Bridge the gap between the long term strategic approach of the Auckland Plan, and the short-to-medium term tactical focus of the RLTP.
- Indicate how the key actions and activities can be implemented together, the affordability of them and how risks can be managed
- Provide Auckland Council, NZTA and other key stakeholders with a clear picture of the preferred approach for implementing the Auckland Plan (and RLTS) and create confidence for funding the RLTP based on their support for the ITP.

Corridor Management Plans

CMPs are the tools for addressing network deficiencies including general traffic service level at peak periods. There is a move away from addressing congestion through building additional capacity to looking more holistically through CMP development where multiple factors are considered such as movement, providing choices with other travel modes and integrated land use. The detailed CMP for each arterial corridor considers the potential use of supporting cycleway and walking networks, local bus services, and/or local traffic.

Parking strategy

Parking has a key demand management function on the transport network. A parking strategy has been developed for Auckland Transport's parking activities over the next three years. It highlights the strategic drivers that influence parking in Auckland, identifies the issues, challenges and opportunities facing the parking business, and summarises the key initiatives that are proposed to enable Auckland Transport to meet its objectives in relation to parking, enforcement and demand management. The parking activities cover on-street parking, off-street parking, park and ride, and enforcement.

The key growth and demand strategic initiatives for parking areas are summarised in Table 3.4-1 with further details in Section 4.6 Parking LCMP.

Table 3.4-1 Summary of parking strategic initiatives
Source: Parking Strategy (21 June 2011)

Parking area	Objectives	Initiative
On-street parking	**Reasonable balance between supply and demand**	• **Shift from reactive and ad hoc responses to local area and residential parking problems. This will enable proactive assessment of parking needs** • **Develop and implement Comprehensive Parking Management Plans in town centres** • **Review pricing strategies for on-street parking in City Centre. This will more closely align price with demand variations between different locations and time periods**
Off-street parking	• **Pricing and supply to reflect wider transport objectives** • **Balance between on and off-street supply**	• **Review existing off-street parking assets and determine basis for future management (hold, upgrade, dispose)** • **Review tariffs for off-street parking in City Centre to better align with strategic objectives, and on-street pricing**
Park-and-ride	• **Support for regional goals, including reducing pressure on congested corridors and increasing public transport patronage** • **Cost effectiveness, including appropriate pricing**	• **Develop a coherent strategy to guide the location, supply and pricing / funding of park-and-ride facilities. Take account of land availability, facility cost, short and long-term development plans for the area, potential for patronage gains, and effect on the road network** • **Prioritise investment in new park-and-ride facilities according to their economic value and contribution to transport objectives**
Enforcement	**Consistent approach to enforcement across the region**	• **Re-balance enforcement staffing to direct resources to areas of highest demand**

3.4.2 Travel Demand Management Plan

Demand is managed through the long-term plans detailed in Section 3.4.1 as well as operating the existing asset to its maximum capacity. This is a shift away from the traditional engineering approach of providing additional capacity to meet all demands through building new roads. Maximising use of the existing network capacity by managing demand is known as travel demand management (TDM).

TDM measures are designed primarily to address traffic congestion in ways other than building new roads and increasing the capacity of roads and car parks. TDM measures are typically more cost effective than increasing road capacity and are often achieved in a shorter time frame.

There are significant benefits other than capital investment deferral, which include:

- Improving public health by encouraging greater use of physically active travel modes such as walking and cycling
- Reducing greenhouse gas emissions by increased use of public transport and carpooling.

A successful TDM programme will increase public transport patronage and enable a sustainable transport network and therefore support economic growth in the region. Integrated land use and transport planning is the main TDM tool as this provides multiple benefits. Current TDM programmes that help manage peak period congestion in the Auckland region also include:

- Providing information about travel choices
- Encouraging public transport through pricing and supply of on- and off-street parking
- Developing area parking plans for priority centres and surrounding residential areas
- Developing a comprehensive region-wide approach to park-and-ride provision
- Looking at opportunities to price parking and public transport as a package
- Providing regionally consistent definitions and enforcement on arterials for clearways, priority lanes and no-stopping areas
- Travel plans and TravelWise programme for schools, businesses and institutions (such as universities and Auckland International Airport)
- Carpooling programme for businesses including setting up a scheme in individual workplaces and an online carpool system, Ride Share
- Personal journey planning for infrastructure projects to provide people with travel options to encourage people out of private vehicles
- Offering choice through providing existing cycling and walking facilities and as part of new significant projects such as AMETI and corridor upgrade projects
- Bus priority measures and transit lanes, or high-occupancy vehicle (HOV) lanes such as Onewa Road and Khyber Pass Road
- Traffic bylaws including restricting traffic use and speed restrictions
- Geometrics to restrict speed and access by large vehicles
- Commercial area redevelopment to promote pedestrian access ways, and relocating parking areas. This has been successfully completed with Orewa and Warkworth street upgrades
- Providing slow streets treatment in local roads to improve safety and discourage use of those roads by through traffic.

Refer to Section 4.15 Community Transport Services for travel plans, walking and school safety in more detail.

Intelligent Transport Systems (ITS) provides real-time network and services information that may encourage road users to alter their travel plans. These are commonly used on NZTA's state highways with predicted travel time in real-time or closed sections due to accidents or flooding. Auckland Transport uses ITS techniques most commonly with actual parking demand in the CBD area.

Although our current TDM programme is comprehensive, we recognise that there are future approaches we need to consider. These may include:

- Adopting design, construction and maintenance approaches that discourage vehicle demand where safety and the environment are more important
- Leaving some roads unsealed in recognition that an improved road surface would encourage increased visitor numbers and pressures on a fragile eco-system
- Transport pricing to directly relate transport use with infrastructure cost. As technology improves and becomes more cost effective, transport pricing may become a more realistic TDM tool in the medium term.

Integrated network design

The ITP supports a transformational increase in public transport use and more viable travel options for people. This will result in freeing up limited road capacity and potentially avoiding some additional spend on road infrastructure due to less demand. These measures will also improve travel times for public transport users, private car users and road freight.

A review of public transport duplications is under way to operate the existing asset to its maximum capacity. Many public transport services were historical. These networks could be operated more effectively, especially between rail and bus services. The review is looking at the whole network with operational input to ensure that the network is working as an integrated system. More interchanges will be introduced to create more efficiency between rail and bus routes. This will result in value for money, which is a GPS priority.

3.4.3 Capital plan – growth and demand

Capital summary

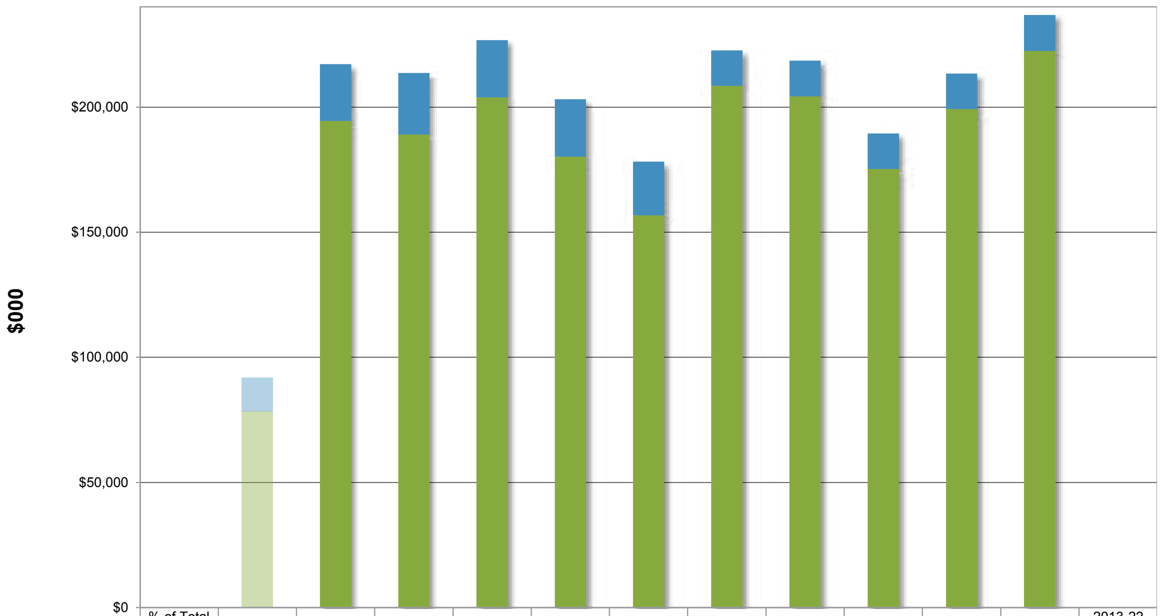
The overall capital programme for upgrading infrastructure over the next 10 years to meet growth is summarised in Figure 3.4-2. The total amount of expenditure for growth over the next ten years is $2.1 billion. The financial forecasts are mainly based on the Auckland Plan, project readiness and benefits, coordination with other programmes, and mayoral proposals. The capital programme is subject to LTP changes and these will be finalised later in 2012.

The capital plan for new growth and levels of service driven projects is combined. It has been based on the existing capital plans from the legacy councils, which did not split the capital categories of growth and levels of service consistently. This limitation is recognised as a high priority for future improvement to the AMP. Figure 3.4-2 summarises the comprehensive $2.1 billion capital investment programme by the two investment areas. Corridor management has the highest level of expenditure at $1.9 billion over 10 years.

Note: These forecasts are indicative and subject to LTP approval in June 2012

The council normally uses development contributions and financial contributions to fund part of its growth-related capital expenditure. A series of guideline documents sets out how the growth-related part of the capital programme can be identified. These have been applied against projects and programmes in the council's capital works programme.

Figure 3.4-2 Summary of growth capital programme
Source: LTP budget model 12 April 2012 after refresh for AMP



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total
TOTAL	100%	91,836	217,172	213,638	226,764	203,103	178,172	222,620	218,507	189,453	213,412	236,696	2,119,538
TDM	9%	13,389	22,715	24,605	22,862	22,959	21,479	14,182	14,250	14,200	14,250	14,300	185,802
Corridor management	91%	78,447	194,457	189,033	203,902	180,144	156,693	208,438	204,257	175,253	199,162	222,396	1,933,736

Corridor management

There is a move away from addressing congestion through building additional capacity to looking more holistically through CMP development at multiple factors such as movement, providing choices with other travel modes and integrated land use. CMPs reflect the different issues relevant to each arterial road or groups of arterial roads and the places located on them. They consider the potential use of supporting cycle and walking networks, local bus services, and/or local traffic.

There has been a step change with corridor upgrade projects focused also on changing people's travel behaviour from the start of planning stages. Personal journey planning is initiated for these projects to provide people with travel options through a range of media. This approach has been used successfully for the Lake Road upgrade with Devonport and Takapuna communities. The linkage of personal journey planning with corridor upgrade projects is discussed in Section 4.15 Community Transport Services Plan.

The corridor management programme is summarised in Table 3.4-2.

The planned expenditure for these programmes is shown in Figure 3.4-3. This shows that corridor upgrades has the highest level of expenditure at 96 per cent.

Note that these forecasts are indicative and subject to LTP approval in June 2012.

Travel demand management

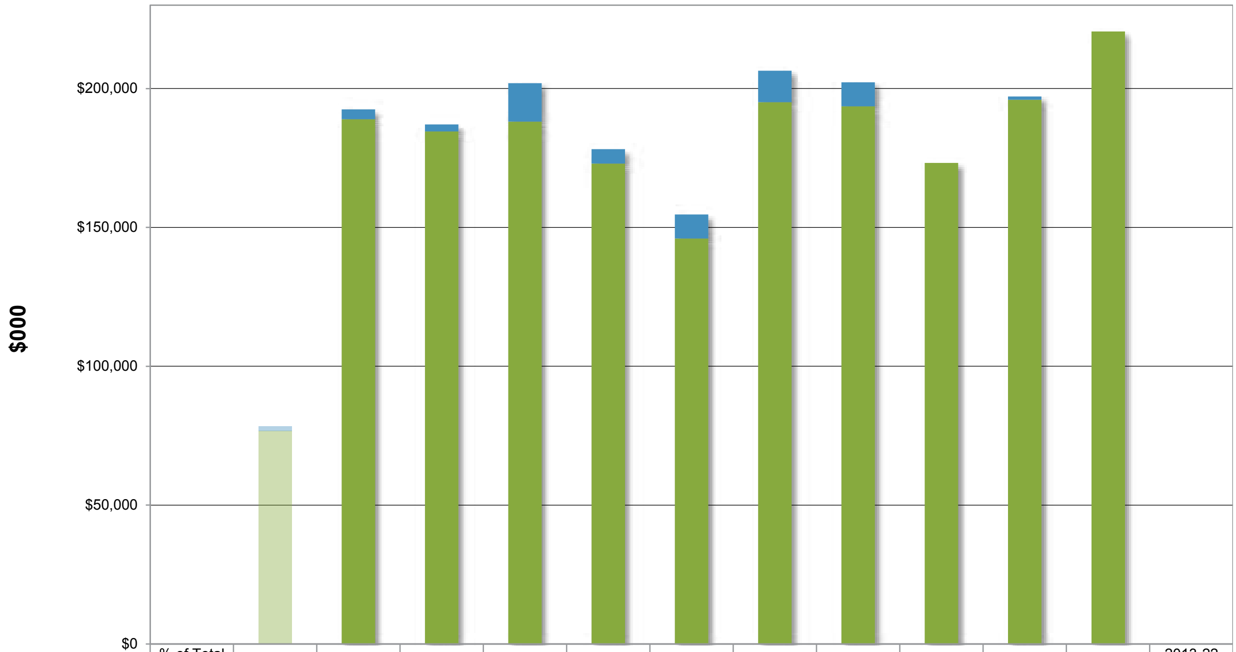
The TDM programme is summarised in Table 3.4-3. Further details on school safety programmes are provided in Section 4.15 Community Transport Services Plan.

Table 3.4-2 Corridor management capital plan

Programme	Description
Corridor upgrades	Corridor upgrade projects include road widening and improving traffic flows, new link roads and other road improvements. Corridor upgrades include road upgrades, isolated intersections, new roads and bridges. The capital programmes consist of multiple projects. This is the largest CAPEX area at $1.86 billion for the next 10 years including $169 million for new works for bridges, drainage, network management and planning and traffic systems The significant corridor consists of the following corridor new works: • $200 million planned for regional road reconstruction • $92 million planned for AMETI including Panmure corridor package at $72 million • $76 million planned for Mill Road corridor upgrade • $64 million planned for Takapuna Lake Road upgrade (Hauraki to Bayswater) • $66 million planned for Albany Highway North upgrade (Schnapper Rock to SH17) • $54 million for Northern Strategic Growth Area (NorSGA) growth projects, including $51 million for Plan Change 15 Massey North Westgate and $3 million for Plan Change 13 Hobsonville village. Plan Change 14 Hobsonville Town Centre Industrial Precinct is covered below under commercial development • $52 million planned for Penlink projects • $40 million planned for Neilsen Street upgrade (part of Multi Modal East West Study) • $40 million for Long Bay growth projects • $39 million planned for corridor and intersection improvements • $37 million planned for the Warkworth growth improvements, including $21 million for the Warkworth Western Collector to serve the western suburbs of Warkworth. Auckland Transport is committed to improving transport safety. We work closely with the Police, the NZTA and other organisations to strive for the best practicable safety outcomes for the region. Auckland Transport supports the Government's Safer Journeys strategy Corridor upgrades also include safety improvements. There are many minor safety improvements identified regionally and these are mainly LOS driven projects. There is $135 million for safety improvements for the next 10 years, $8.6 million for HPMV routes, and $300,000 for red light cameras. Safety around schools is covered under TDM below This programme provides the ability to respond quickly to secure small lots of land for transport purposes. Sometimes these are required for our significant projects such as the AMETI corridor upgrade project at $135 million
Street lighting	Street lighting improvements have been identified regionally. These are mainly LOS-driven projects totalling $20 million
Commercial development	The Auckland Plan focuses urban growth around town centres, with less emphasis on general in-fill throughout suburban areas. There is recognition that greater investment needs to be focused on the quality of urban streetscapes, open spaces and urban design if centres are going to accommodate the levels of growth needed to reduce pressures on in-fill, greenfield expansion and congestion There is $55 million for commercial development for the next 10 years, with $47 million for the Hobsonville village and $5 million from Albany Centre Improvements. Town centre improvements are also planned for Matakana, Kumeu, Browns Bay, and Papakura

Figure 3.4-3 Planned corridor management expenditure

Source: LTP budget model 12 April 2012 after refresh for AMP



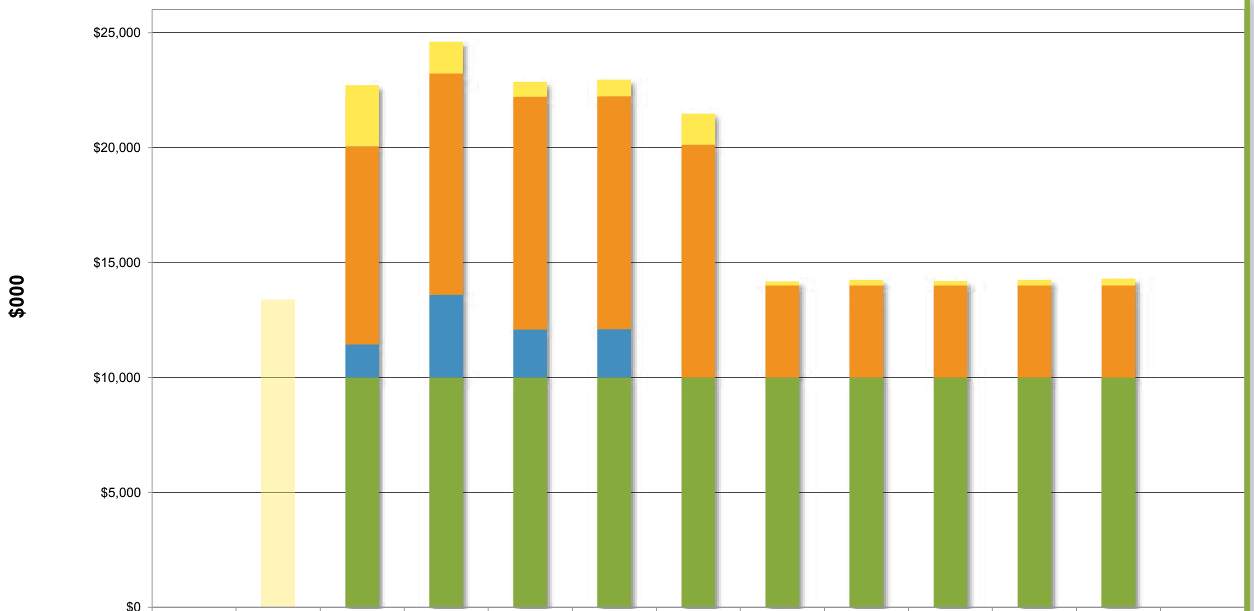
	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total
Commercial	3%	1,769	3,522	2,514	13,779	5,131	8,708	11,369	8,660	000	1,200	000	54,881
Corridor upgrades	96%	76,678	188,935	184,520	188,123	173,014	145,986	195,069	193,597	173,253	195,962	220,396	1,858,855
Street lighting	1%	000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	20,000
TOTAL	100%	78,447	194,457	189,033	203,902	180,144	156,693	208,438	204,257	175,253	199,162	222,396	1,933,736

Table 3.4-3 TDM capital plan

Programme	Description
Cycle improvements	Cycleway improvements include the planning and implementation of cycle facilities, education and promotion projects. The proposed improvements have a focus on planning for the central area for the first three years however projects are proposed in all areas within the region. The current focus for cycling growth is to complete the network gaps There is $100 million for cycleway development and construction for the next 10 years
Walking improvements	Walking is becoming more important as journeys frequently involve more than one transport mode. The linking of pedestrian routes with other transport modes, particularly public transport interchanges, is important for increasing public transport demand New footpaths have a specific budget at $9 million over 10 years, including Auckland Harbour Bridge pathway and Tamaki Drive boardwalk. However, much of the expenditure resulting in walking improvements will be through larger road projects, town centre upgrades and maintenance and renewals programmes
School safety	School safety programmes include infrastructure works to improve safety for school children. This programme is undertaken regionally and integrated with the school TravelWise programme There is $68.8 million for school safety for the next 10 years. These projects are school-based engineering interventions to improve road safety and operational deficiencies within the transport network and include pedestrian refuges, signage and road markings
Parking management	Parking management is a key TDM tool as supply of parking and its cost is a key influencer on Aucklanders' trips. Auckland Transport's Parking Strategy has been developed to ensure that the limited supply of parking is managed and that there is balance with the availability of public transport and accessibility to goods and services. There is $8 million for parking improvements for the next 10 years

Figure 3.4-4 Planned TDM expenditure

Source: LTP budget model 12 April 2012 after refresh for AMP



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total
Parking management	4%	13,389	2,655	1,382	652	732	1,355	182	250	200	250	300	7,958
School safety	37%	000	8,624	9,624	10,124	10,124	10,124	4,000	4,000	4,000	4,000	4,000	68,620
Walking	5%	000	1,436	3,599	2,086	2,103	000	000	000	000	000	000	9,224
Cycle improvements	54%	000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	100,000
TOTAL	100%	13,389	22,715	24,605	22,862	22,959	21,479	14,182	14,250	14,200	14,250	14,300	185,802

The planned expenditure for these TDM programmes is detailed in Section 4.15 with summary in Figure 3.4-4. This shows that the cycling improvements have the highest level of expenditure at 54 per cent.

Note: These forecasts are indicative and subject to LTP approval in June 2012.

Development contributions

Long-term strategic intentions for service or asset provision are an important consideration when developing a capital programme, and making decisions about individual capital projects. This includes identifying where a project or part of a programme is intended to deliver increased capacity to meet increased demand, arising from growth. The council has a number of methodology documents that outline how this capital expenditure for growth can be identified.

Development contributions are a method for collecting revenue from those who are building additional dwellings and work capacity that contribute subsequent increases in demand and additional council infrastructure costs that relate to growth. They are not able to be used for renewal of existing facilities or for improvements to levels of services or assets. Development contributions must be applied to, or used towards, the capital expenditure for which the contribution was required.

Development contributions are therefore based on a capital programme (in the LTP); raised from developments as they are consented; and then applied against the original capital programme, alongside other funding sources such as rates. This loop creates an opportunity for a high level of transparency about the use of this and other funding sources. The council's website includes detailed information supporting the use of development contributions to fund part of the capital programme.

In practice, given the number and range of projects included in the LTP and this AMP, there will be some variation in the project list from year to year. In general, these changes are accommodated through the three-yearly LTP updates (and the update of the development contributions policy as part of that). Changes to planning for various large projects may require earlier amendments to the development contributions policy.

The council can also use financial contributions (under the Resource Management Act 1991) to provide for the mitigation of effects connected with developments. Several of the former councils used financial contributions rather than development contributions as the main way of addressing growth-related effects for particular asset areas.

At the time of writing this AMP, Auckland Council is reviewing its development contribution policy and the use of financial contributions. A new policy will be adopted in June 2012, alongside the LTP, and based on the capital programme outlined in this AMP.

Significant projects

The significant road projects planned for the next three years are detailed by the main investment areas. The location, timing and value of these significant projects are presented in Figure 3.4-5.

Corridor management improvements

The larger corridor improvement projects are detailed as follows:

AMETI

Auckland-Manukau Eastern Transport Initiative (AMETI) will provide key infrastructure that will support growth of the region by unlocking network constraints East and South. AMETI is a package of integrated transport improvements for the Tamaki Edge area, which will be a catalyst for significant change and growth. AMETI involves a package of infrastructural improvements for public transport, the street network, walking and cycling, freight and business. In particular, it will support the business and residential growth for Glen Innes, Panmure, Mt Wellington and Sylvia Park over the next nine years.

The key elements for AMETI under the One System approach are:

- New Urban Busway – a high-quality separated busway is proposed linking Panmure and Botany via Pakuranga along Lagoon Drive, Pakuranga Road, and Ti Rakau Drive
- Panmure Bridge – development of a new bridge for buses, pedestrians and cyclists alongside the existing three-lane vehicle bridge. The new bridge will ensure continuous connectivity of the proposed busway
- Panmure Bus / Rail Interchange – a new interchange between the busway and rail station at Panmure will enable passengers to interchange between bus and rail much more efficiently than currently and will provide a landmark station for Panmure
- Panmure Roundabout – replacement of the Panmure Roundabout with a new signalised intersection will improve the functionality of the intersection for all road users including pedestrians
- AMETI Link Road – this road will connect Mt Wellington Highway with Morrin Road passing under the Ellerslie-Panmure Highway and Mountain Road. This will reduce vehicle numbers using the roundabout, allowing the roundabout to be replaced with a signalised intersection
- Cycling and Walking – cycling and walking improvements feature in most parts of the AMETI project.

Construction has started on the AMETI Link Road and is expected to be completed in 2015. The timing of the other phases is being developed with NZTA.

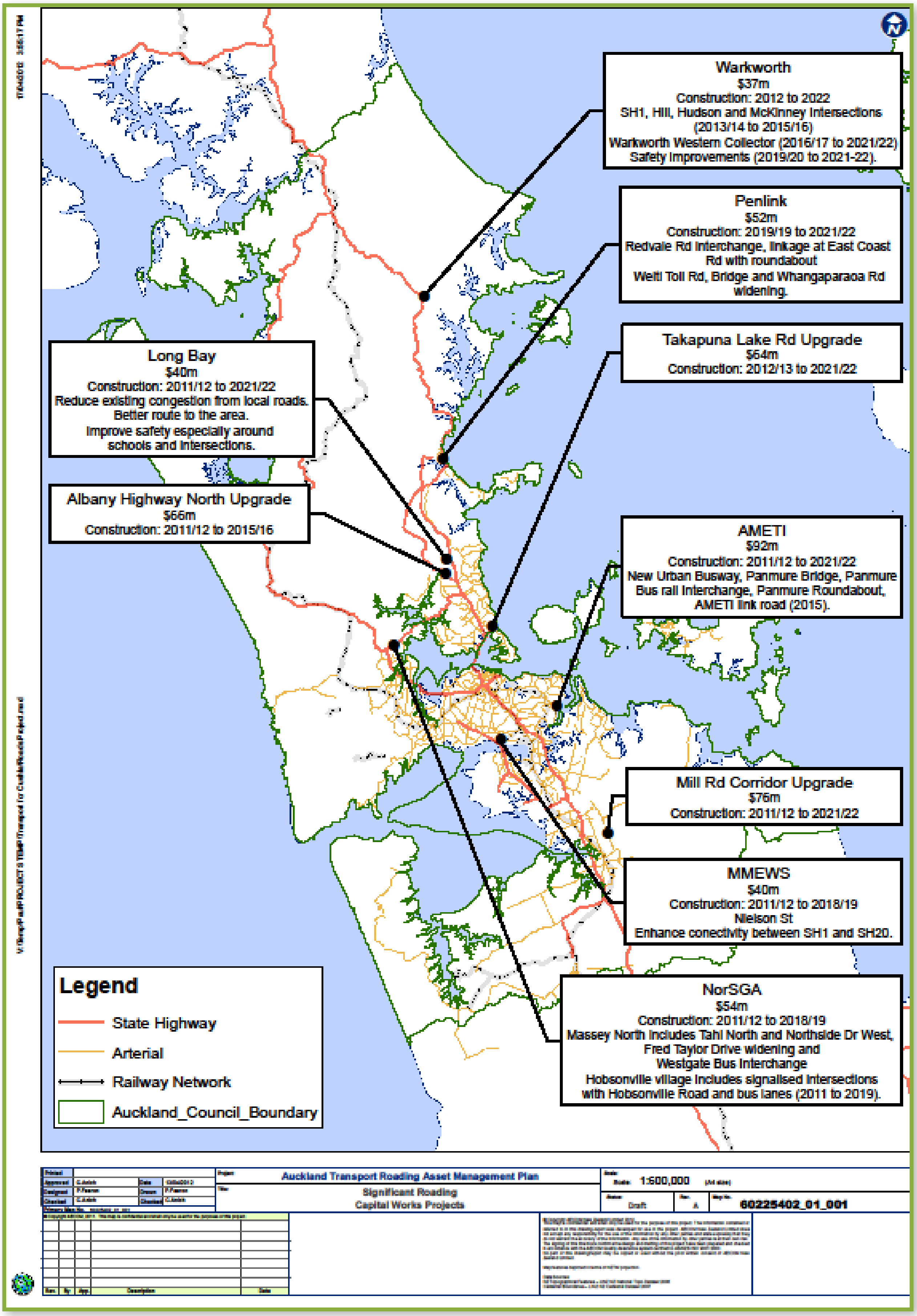
NorSGA

The Northern Strategic Growth Area (NorSGA) is the strategic growth area located north-west. The Regional Growth Strategy identified it as an intense growth area including Hobsonville Peninsula, Westgate, and Hobsonville corridor. It has also been identified in the Auckland Plan as an innovation area for Auckland, including marine and film industries. This development area is using sustainable practices such as low impact design for stormwater management with streams having amenity value as well as their traditional function.

The three main areas are summarised as follows:

Massey North / Westgate area (PC 15)	**This is located at the end of the SH16 North Western and is the most advanced of the three development areas** **The two main roads, Tahi North and Northside Drive West are designed as pedestrian-friendly shared spaces (expected to be completed in 2013). This area consists of industrial, retail and high-density residential apartments.** **Fred Taylor Drive will be widened and includes signalised intersections with cycleways and bus lanes and will be completed by 2014. Auckland Transport-driven local roads will connect with the arterials in this area (to be completed in 2013).** **The Westgate Bus Interchange will provide interchange between bus services (to be completed by 2013). The site has been moved to Rua Road for better transport connections.**
Hobsonville village (PC 14)	**This is located along Hobsonville Road and will consist of industrial only development west of Brigham Creek Road, and industrial and retail east of Brigham Creek Road. The retail centre is called Hobsonville village.** **There will be signalised intersections for local roads with Hobsonville Road. There will be extra lanes at the intersections for bus lanes as part of the Quality Transit Network. There will be a new footpath on the greenfield side of Hobsonville Road and dedicated cycleways on both sides of the road. There will be extra lanes for Brigham Creek Road to help with the State Highway interchange to reduce congestion.**
Hobsonville Point **(PC 13)**	**This is located at the Hobsonville airbase and will consist of mainly residential development of all three densities (low, medium and high), marine industries, and yard-based retail (or bulk retail). The Hobsonville Land Company (set up by Housing New Zealand) is undertaking the development. The new roads will be vested to Auckland Transport.** **Auckland Transport is constructing a new ferry terminal, bus interchange, and park-and-ride facilities as part of the land development agreement. The Landing ferry terminal will be completed in late 2012.**

Figure 3.4-5 Significant road new works projects



Penlink

Penlink will provide a second access to Whangaparaoa Peninsula as Whangaparaoa Road is currently the only access. It will be a direct link from Stanmore Bay on the peninsula and the Northern Motorway at Redvale. It is will provide a critical element to manage traffic growth in the Hibiscus Coast. The Penlink project will reduce travel time from Auckland's city centre and the eastern portion of the peninsula from Stanmore Bay. It will also relieve pressure on the Silverdale Interchange, Hibiscus Coast Highway and Whangaparaoa Road west of Stanmore Bay.

The Penlink project consists of package of works that is interdependent:

- Redvale Road interchange
- Linkage at East Coast Road with a roundabout
- Seven-kilometre Penlink Toll Road to Weiti River
- Bridge (about 500m in length) and a roundabout with Whangaparaoa Road
- Whangaparaoa Road widening to four lanes to cope with the additional traffic (about 1km in length).

The Penlink Toll Road makes up most of the project. It is a major new arterial to provide access to Whangaparaoa Peninsula and enable development in the Silverdale and Orewa areas. Land purchases and designations for the project have been completed and resource consents approved (although now lapsed). Preliminary work for the Penlink Toll Road is expected to start in 2018/19.

Warkworth

Warkworth has been identified as one of nine growth priority areas for the first three years in the Auckland Plan. NZTA has also planned the RoNS project Puhoi to Wellsford (State Highway 1) which will also drive growth for the Warkworth area. There are various projects providing strategic linkages for Warkworth to cater for growth, driven by NZTA, Auckland Transport or developers.

Three signalised intersections are planned by NZTA on the state highway through Warkworth including Hill Street, Hudson Road, and McKinney Road. NZTA is constructing these intersections with contributions from Auckland Transport.

The Warkworth projects for improving strategic linkages for this growth area include:

- Warkworth Matakana Link (SH1 to Matakana with timing expected after 2022)
- Hauiti McKinney Link Road (development driven and expected to start after 2015)
- Warkworth Western Collector.

The Warkworth Western Collector is a new road serving the western suburbs of Warkworth. The first stage is a link between Mansell Drive and Falls Road, including a bridge over the Mahurangi River. Stage one will start construction in 2012/13. Subsequent stages include a link between Woodcocks Road and the McKinney Road intersection with SH1, and a link between Falls Road and SH1 near or at the Hudson Road intersection. This last link will service a commercial and industrial area and is longer term (expected after 2022).

Stage 1 of the Warkworth town centre upgrade programme has been completed to support growth. Stages 2 to 4 still remain and are likely to start after 2022.

There are three safety improvement projects for the Warkworth and surrounding areas. These are likely to start after 2012 and include:

- Warkworth Mahurangi East Road / Sharp Road intersection
- Matakana Centre improvements
- Matakana Leigh Road / Takatu Road intersection.

Long Bay

The Long Bay area is an identified growth area within the northern fringe of North Shore urban area. There will be over 2,800 lots created in this Greenfield development over the next 10 to 15 years. The Long Bay Structure Plan was approved in March 2012. Higher density development is planned behind the Long Bay Regional Park with about 2,300 units by 2020. Another 300 units are planned in the upper catchment in larger size lots (from 2,500 to 5,000 m2).

There are three entry points planned to the Long Bay Structure Plan and in particular the Long Bay Regional Park. It is important to protect the park and plans are to divert and treat road stormwater run-off, and divert away from known areas of instability. A recreational track for walkers and cyclists is planned from the park to Albany village and will generally follow the stream. This project is being led by the council's Stormwater Unit and Parks, Sports and Recreation Group with Auckland Transport as support.

There are already existing capacity issues with the road network so connectivity and alternative routing is important. An additional access route is proposed with a new future road, Glenvar Ridge Road. This alternative route will give multiple benefits:

- Reduce existing congestion from local roads, particularly Ashlee Avenue with two schools
- Provide a better route to the area including the regional park with a new entrance
- Improve safety, especially around schools and intersections.

MMEWS

This is a multi-modal project to enhance the connectivity in the area between SH1 and SH20 corridors north of the Mangere inlet. This project is now referred to as MMEWS (Multi Modal East West Study) but was known as East-West link. This link is strategically important regionally as:

- Road freight is expected to increase and will impact this industrial area
- Neilson Street is heavily congested
- Onehunga is poorly connected for efficient freight movements to SH1 south, SH20 south and East Tamaki.

The initial project phase is the sub regional strategy development (to be completed in 2012/13). The full extent of the project will be refined on completion of the strategy. It is expected that there will be a package of MMEWS projects and that the improvements will be implemented by multi agencies.

3.5 Growth and demand assumptions

The assumptions for developing the growth and demand forecast are mainly associated with the development of the Auckland Plan. Four scenarios for land use were evaluated for the preferred growth scenarios for the Auckland region.

The key demand assumptions of the Auckland Plan are:

- Growth will occur in accordance with Development Strategy as indicated in the Auckland Plan (March 2012)
- Population projections are based on medium growth.

The key demand assumptions with developing this AMP are:

- Demand for transport needs will increase as predicted in this section
- Projected land use is based on the quality compact city model as indicated in the Auckland Plan (March 2012).

3.6 Key improvement initiatives

Key improvements have been identified that will contribute to the robustness of the growth and demand forecasting and management processes as follows:

Table 3.6-1 Key improvement initiatives

Improvement initiative number	Description	AMP Section	Priority
Growth 1	Formally document the traffic monitoring programme to reflect the regional approach and end user requirements, particularly for the Papakura area	3.2.4	Medium
Growth 2	Identify the main driver for each capital project by growth or levels of service	3.4.3	High
Growth 3	Finalise the HPMV routes with NZTA and industry groups and understand the potential impact on the pavement	3.2.3	High

4 Lifecycle Management Plan

4 LIFECYCLE MANAGEMENT PLAN

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Overview. Lifecycle Management Plan
4.1 Contents

4.1 Overview

4.1.1 Section overview

Auckland Transport manages transport assets to deliver the levels of service defined in Section 2 in a sustainable manner over the long term. The transport network (excluding state highways) is maintained and developed in a way that is fit for purpose and is sustainable over time and consistent across the region. Auckland Transport operates and manages local and arterial roads, traffic control systems and signalling, street lighting, footpaths, cycleways and other assets.

Auckland Transport's organisational approach to lifecycle management includes:

- Meeting the service levels at least cost over time
- Lifecycle management plans (LCMP) providing good guidance of how the network is to be managed; and providing a clear link between service levels, lifecycle management needs and cost.

The lifecycle sections cover operations, maintenance, renewal, new works, disposal strategies and standards that are generic for all transport assets at a network level. They describe the asset management lifecycle practices and key issues for 13 road asset groups including pavements, bridges and structures, footpaths, street lighting and drainage.

4.1.2 Transport network

Auckland's transport network is one of the largest in the country and is complex in space and scale. Auckland Transport manages 7,227km of roads, made up of 6,375km sealed roads and 852km unsealed roads. To manage these assets effectively we prepare lifecycle management plans for the individual assets that make up the transport network.

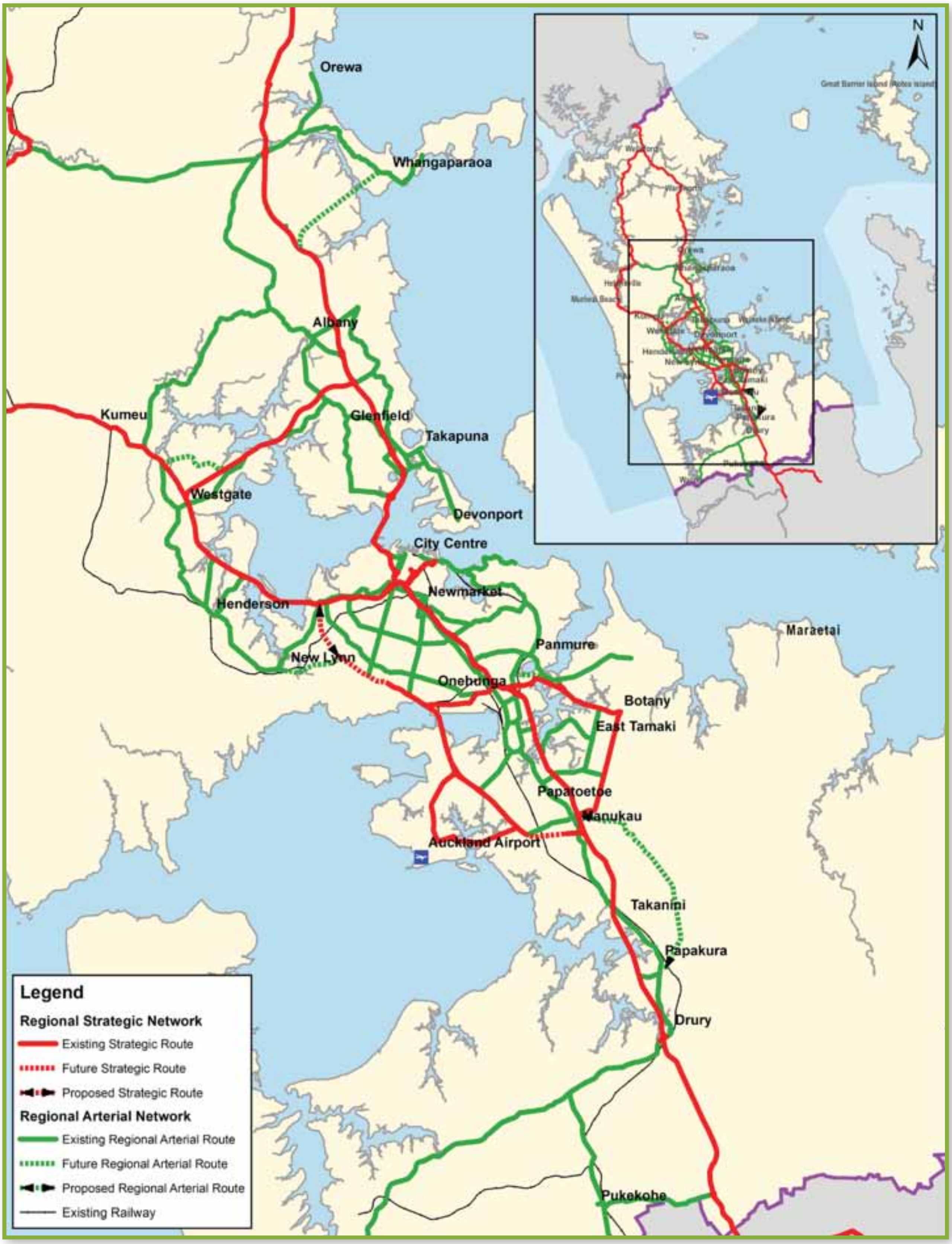
The physical parameters of the different asset types are shown regionally in Table 4.1-1. The LCMPs also include two service activities, Community Transport and network management and planning activities.

Table 4.1-1 Transport asset data
Source: Auckland Transport asset valuation (30 June 2011) and RAMM database (March and April 2012)

AMP Section number	Asset group	Sub-asset group	Asset quantity	Unit	Optimised Replacement cost ($000s)
4.2	Road pavements	Total	7,227	km	
		Sealed road	6,375	km	
		Unsealed road	852	km	
		Pavement formation	70,237,634	m^2	1,743,203
		Pavement surface	53,889,917	m^2	680,203
		Pavement base	53,886,845	m^2	2,900,961
4.3	Bridges and structures	Road bridges	592	number	537,191
		Major culverts	356	number	
		Foot bridges	46	number	
4.4	Retaining walls		105	km	177,599
4.5	Road corridor structures	Road barriers	55	km	47,460
		Gantries	10	number	
4.6	Parking	Parking buildings	12	number	
		Pay-and-display units	933	number	9,233
		On-street facilities	2,000	km	
		Off-street facilities	254	number	32,665
		Lighting	522	number	299
		VMS and equipment	11	number	172
4.7	Footpaths	Footpaths	6,879	km	666,253
4.8	Cycleways	Off-road	114	km	33,683
		On-road	100	km	
4.9	Street lighting	Luminaires	100,677	number	37,385
		Columns	59,769	number	103,193
		Brackets and outreach arms	97,850	number	24,468
4.10	Traffic systems and operations	Signal-controlled intersections	536	number	80,526
		Signalised pedestrian crossing	135	number	
4.11	Street signs	Regulatory and warning	94,935	number	21,600
		Advanced destination		number	7,753
	Road marking	High-performance / long life road marking	170 (Asset consolidation February 2011)	km	1,305
4.12	Drainage	Road drainage kerb and channel	7,409	km	1,918,932
		Road drainage catchpits (based on Auckland Council's GIS in 2011)	86,107	number	
4.13	Street vegetation	Trees	163,945	material	
		Gardens	68,900	material	
4.14	Corridor fixtures	Litter bins	1,420	number	1,191
		Street benches and seats	1.909	number	3,318
4.15	Community Transport	Road safety education and promotion			
		School safety			
		Travel plans and travel planning			
		Cycling and walking			
4.16	Network management and planning activities	Activity management planning			
		Asset management systems			
		Transport planning			
		Corridor access management			

The Auckland transport network is shown in Figure 4.1-1 including the current and proposed strategic routes, regional arterials, and arterial networks. It also shows the current and proposed rail, ferry, bus and cycle networks. There are currently eight billion vehicle kilometres travelled each year on the Auckland transport system.

Figure 4.1-1 Auckland's strategic and regional arterial road networks
Source: Draft Regional Land Transport Programme (April 2012)



The network is also divided into four areas to facilitate operations and reflect the different physical, engineering and other needs of the region and its communities. These areas are northern, western, central and southern.

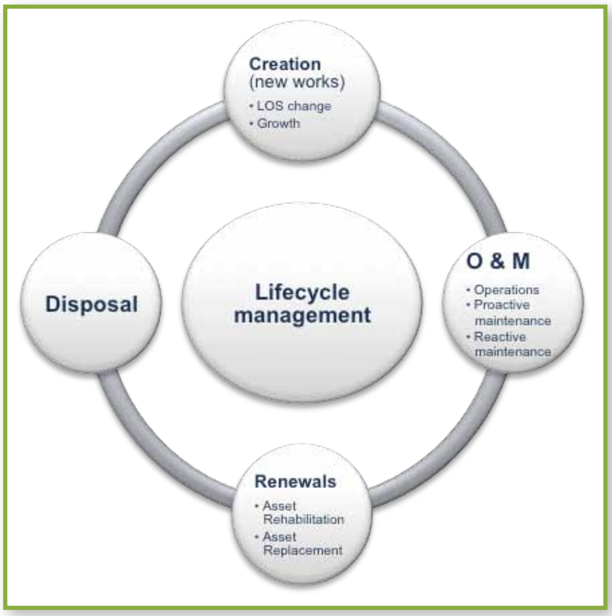
4.1.3 Work categories

The main work categories are:

- Operations and maintenance – operations is the running costs; maintenance can be proactive or reactive
- Capital renewals – replacement and rehabilitation
- Capital new works – new capital (Auckland Transport provided), land development (growth driven and developer provided), vested assets and levels of service (improvements), and regulatory improvements
- Asset disposals.

Figure 4.1-2 shows the lifecycle management categories.

Figure 4.1-2 Transport lifecycle management categories

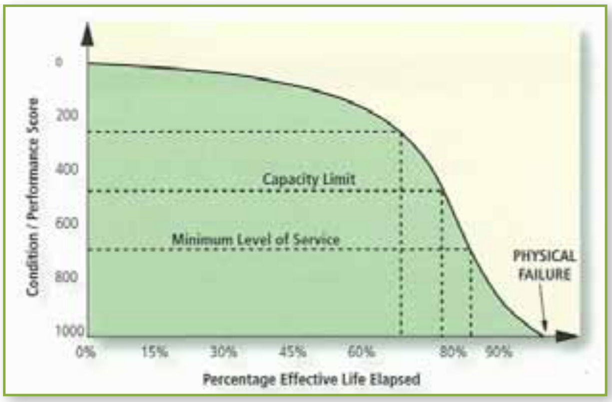


4.1.4 Asset condition

In this plan the term condition is used in its asset management context and refers to the degree of deterioration of an asset or asset element. All assets deteriorate at different rates to eventual failure. Asset condition is a measured assessment of an asset's current position or place on the asset decay curve, an example of which is illustrated in Figure 4.1-3.

Figure 4.1-3 Typical condition curves

Source: 2011 International Infrastructure Management Manual (Figure 2.5.4)



Transport condition assessments typically use an advanced asset management approach with a condition/performance scoring index of between 0 and 1000. This is banded to a base score index of 1 to 5 which is a commonly understood condition rating scale. This condition grading approach is used to assess an asset's condition with a ranking from 1 (very good) through to 5 (very poor). A grading of zero is assigned where an asset has been abandoned or no longer exists. This condition grading system, summarised in Table 4.1-2, is based on the 2011 International Infrastructure Management Manual (IIMM) and is used for all transport asset groups.

The decision-making process considers levels of service, condition and risk. It may use sophisticated optimised decision-making strategies, detailed in Section 4.1.7, or may be practical and relatively straightforward.

Auckland Transport measures a large number of condition indicators for its transport network, most of which are used to inform technical decision making at a relatively detailed level or to support other processes such as deterioration modelling and renewal programming. These are discussed in each LCMP relative to the levels of service to be provided and risk appetite.

Table 4.1-2: Condition grading system
Source: 2011 International Infrastructure Management Manual

Condition grade rating	Condition score range	Description of condition	Condition criteria
1	0-200	Very good condition	Only cyclical maintenance required
2	200-400	Good condition	Minor maintenance required plus cyclical maintenance
3	400-600	Moderate condition	Significant maintenance required
4	600-800	Poor condition	Significant renewal / upgrade required
5	800-1000	Very poor condition	Unserviceable

Each LCMP details how Auckland Transport monitors the condition for a specific asset group. Monitoring provides an understanding of the distribution of the current condition to ensure an acceptable level of service at least lifecycle cost. Auckland Transport aims to spend the least amount of funds to keep road networks in condition grades 1 to 3. Renewal or maintenance works provides additional service life, otherwise the asset deteriorates to the bottom part of the curve, condition grade 1.

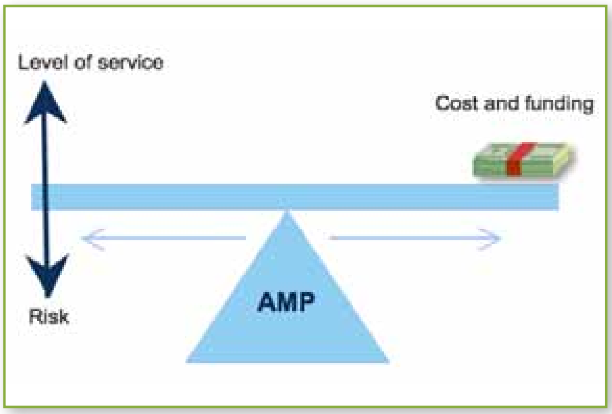
Each asset group requires different maintenance and renewal strategies to manage the risk of future service failure resulting from poor asset condition. Assets fail to deliver their target level of service below a certain condition or will not meet acceptable performance levels. This is known as the intervention point to trigger planned works which may be maintenance or renewals.

A formal condition assessment programme is being developed for all asset groups that will start in July 2012. A higher priority has been given for critical assets including bridges, retaining walls, and public transport, including ferry facilities, bus shelters and rail assets. Detailed inspections will be undertaken for these critical assets. They will assign condition rating and confidence and risk factors, and will determine residual life and replacement cost and confidence. Routine condition assessments will be undertaken for the non-critical assets at an appropriate frequency for the asset group.

4.1.5 Lifecycle management strategies

Auckland Transport's key asset management principle is meeting the service levels and managing risk while minimising whole-of-life costs. It is important that asset lifecycle costs are considered in decision making as they are typically several times greater than the initial development costs. Asset management is required to deliver an appropriate balance between asset cost, levels of service and risk as presented in Figure 4.1-4.

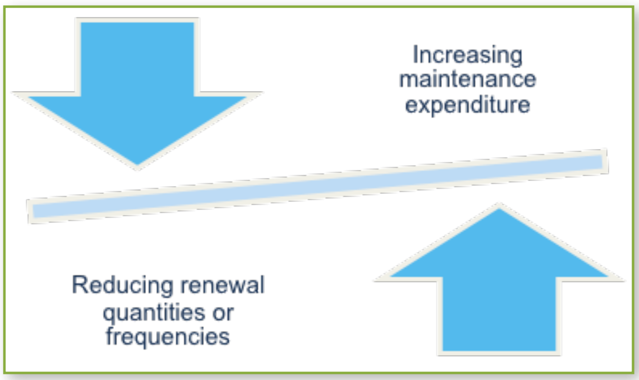
Figure 4.1-4 Balancing LOS, risk and cost



If an asset is allowed to deteriorate into poor condition, it will require more maintenance and present increased risk to the network. Maintenance costs resulting from deferred renewals can be significant.

Renewal investment is used to maintain levels of service, manage the cost of maintenance and manage risk. Optimised decision making (ODM) is used to minimise the whole cost of asset ownership by providing an optimal balance between renewal and maintenance investment levels. It is important to identify the most cost-effective time to renew the assets to maintain service levels. Deferred or reduced renewal works programmes can trigger increased maintenance requirements on deteriorating assets, as shown in Figure 4.1-5.

Figure 4.1-5 Impact of reduced renewals



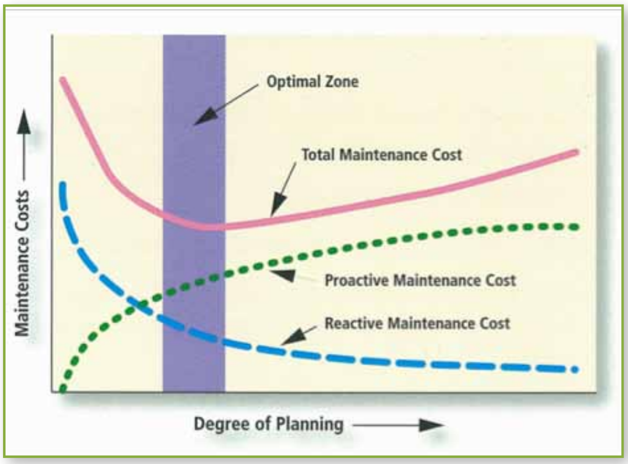
Auckland Transport wishes to manage the assets with a consistent regional approach but it is recognised that this will take time. Quite different approaches to lifecycle management strategies were taken by the legacy councils. It is expected that regional consistency will be enabled as the new maintenance contracts are progressively implemented.

Current lifecycle management strategies are summarised in the following sections.

Operations and maintenance strategy

Auckland Transport wishes to optimise its maintenance activities to minimise the total maintenance cost. The optimal maintenance mix is a balance of planned and reactive maintenance, as shown in Figure 4.1-6. The initial focus will on the major asset groups; these high value and high demand assets will give the best benefits for the effort undertaken.

Figure 4.1-6 Maintenance optimisation
Source: 2011 IIMM (Figure 3.3.4)



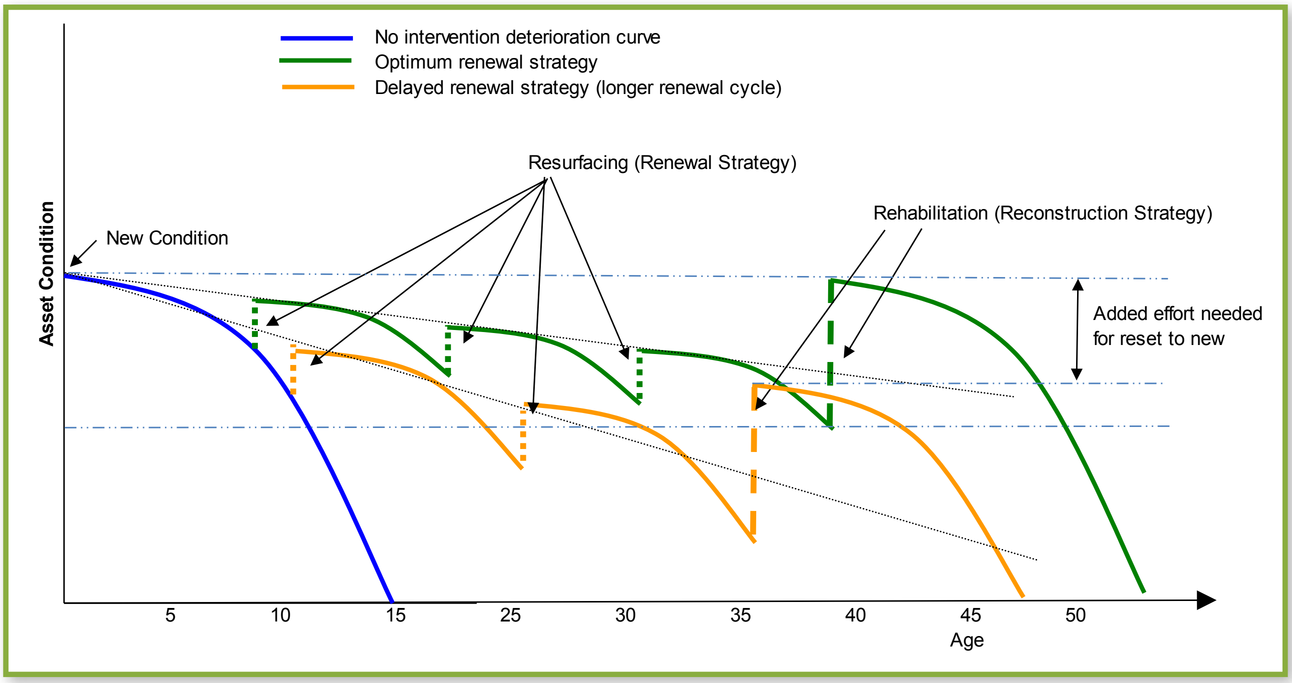
Maintenance definitions are as follows:

- Proactive – proactive inspection and maintenance works planned to prevent asset failure
- Reactive – reactive action to correct asset malfunctions and failures on an as-required basis (i.e. emergency repairs).

Typical operational activities include graffiti removal, weed control, customer service response, road opening procedures, inspections, reporting, traffic management, intelligent transport systems, asset management database and systems operations such as RAMM and SPM.

Maintenance includes minor repairs that cannot be capitalised, consistent with Auckland Transport's capitalisation policy.

Figure 4.1-7 Asset deterioration and timing of work required



Renewal strategy

Asset renewal is the process of restoring the level of service delivered by an asset to its original design level, or close to it, by repairing or replacing the worn components. The purpose of the renewal strategy is to maintain the levels of service by identifying the most cost-effective time to renew the asset as presented in Figure 4.1-7. This shows that the asset age can be extended from 15 years with no interventions to between 47 and 54 years with different renewal strategies.

As the purpose of renewals is to restore levels of service close to design levels, the driver for their initiation is decline (or failure) of the ability to deliver the required level of service. This failure may be assessed in two ways:

- Level of service – asset does not achieve the required condition or performance such as road safety
- Economic criteria – more cost effective to provide the required level of service by replacing the asset rather than by repairing it.

There are four ways assets might fail that are used in assessing whether a renewal is necessary and all of them must be considered:

- Condition failure
- Capacity failure – such as insufficient space, not enough assets to deliver the service
- Reliability failure – such as road casualties, cannot consistently achieve the required performance
- Obsolescence and changes in technology.

New capital strategy

New assets are created or upgraded to cater for growth, additional levels of service or legislative requirements. These works are either Auckland Transport or developer initiated. New assets that are growth and levels of service driven are covered in more detail in Section 3, Growth and Demand.

New assets are built to meet the needs of growth. In addition to the need to build new roads, growth can also drive the widening of existing pavements and, as in the case of the increased heavy vehicle loadings for example, the strength of pavements and the suitability of their surfaces.

New works are generally developed through long-term plans and strategies such as the Integrated Transport Plan and Corridor Management Plans. Auckland Transport's new works strategy is to manage the impact of growth through focusing on maximising the use of the existing assets and by increasing patronage of public transport to the delay the construction of new roads.

4.1.6 Renewal approach

There are four approaches for renewal planning with increasing maturity as shown in Figure 4.1-8 Some renewal approaches are more appropriate for certain asset groups due to their value, size and inherent risk. Auckland Transport wishes to move towards the proactive renewal approach over time for the major asset groups.

Renewals were analysed by age and condition-based methods for each LCMP where there was sufficient information available. Each method

Figure 4.1-8 Renewal approach

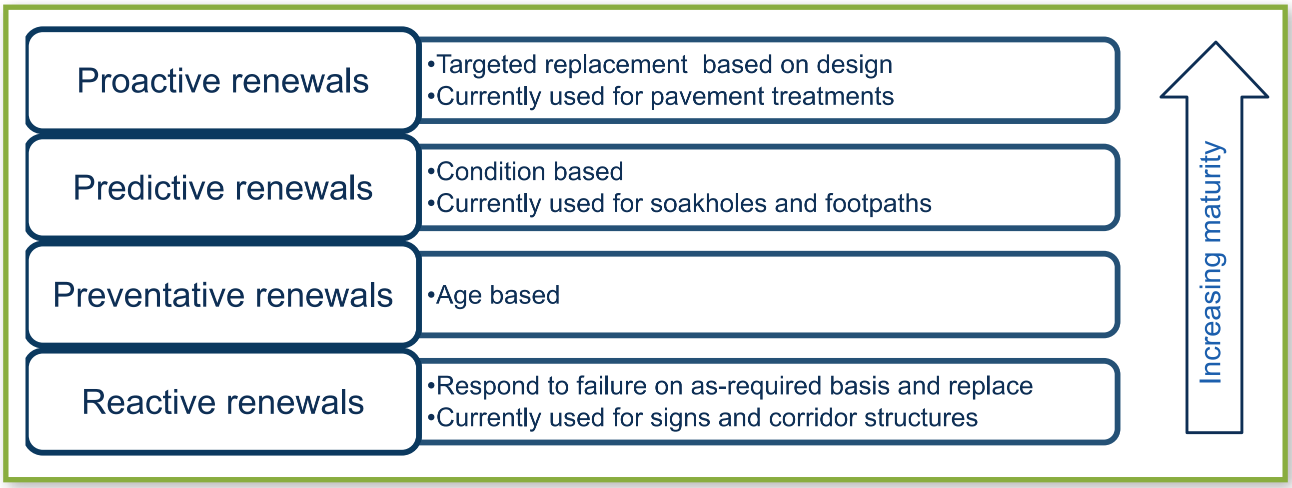


Figure 4.1-9 ODM process

becomes less effective where there are significant amounts of unknown information. The resulting renewal profiles are detailed in each LCMP

4.1.7 Optimised decision making strategy

ODM approach

Auckland Transport's ODM frameworks generally follow the New Zealand Asset Management Support's (NAMS) ODM Guidelines. These frameworks provide the platform for decision making for the maintenance, renewal and development of new assets, based on economic principles and multi-criteria objectives reflecting community well-being. They represent best practice, advanced asset management.

The ODM process involves considering different options for solving a particular problem, allowing for different trade-offs and financial outcomes. The ODM process is a multi-step process as shown in Figure 4.1-9 with a mix of ODM tools and judgement resulting in the final output. Financial projections for the AMP are developed in close coordination with Auckland Council's LTP process, thus reinforcing the link to community outcomes.

These ODM frameworks are used in different asset management processes. Although the existing frameworks from the legacy councils are still being used in many cases, it is recognised that their future status will need to be rationalised. A key asset management improvement programme is the development of robust ODM processes including the introduction of appropriate tools (refer to Section 10, Improvement Plan and Monitoring).

ODM tools

dTIMs and NODEM are specialised transport modelling frameworks currently being used at Auckland Transport. dTIMs predictive modelling is a process that uses several stages to provide the asset manager with guidance on an optimised programme of work needed to maintain and renew the road carriageway pavement network.

The model aims to maximise the Pavement Condition Index (PCI) for a given set of budgets. Changes to budget levels are modelled to arrive at the best budget to address the level of improvement required by the network.

NODEM (NIS Optimised Decision Making System) is another specialised modelling framework being used for footpath and street lighting asset networks. Condition information is used from the RAMM database and analysed in NODEMS. It is used in developing financial options to address catch-up footpath renewal work required.

Table 4.1-3 Summary of new maintenance contract timing

Phase	Area	Start dates
1	Southern area	Two RCM contracts commenced July 2012
2	Central / West area	Four RCM contracts commencing July 2013
3	Northern area	Two RCM contracts commencing July 2014
	Region wide	Three Preferred Supplier Panels, commenced early 2012

4.1.8 Service delivery

Our maintenance contractors help us deliver services to our customers 24/7, and help respond and provide resources in times of emergencies such as extreme flooding, storm events, accidents and landslips. All physical works for our transport network including maintenance, renewal and new works are contracted out. This is a NZTA requirement for any subsided works. Management of these contracts is undertaken by a mix of in-house resources and consultants.

The current physical works contracts are inherited from the legacy councils. Most are long-term contracts and packaged to provide city-wide coverage but also use different procurement models including partnership and alliance contracting. There were 25 term contracts in place for maintenance and renewal of the road network.

The philosophy for Road Corridor Maintenance (RCM) and renewals is integrated, collaborative contracts to ensure Auckland Transport's service providers are on the same page. It is based on a collaborative, best-for-network delivery model with a new customer-centric focus. A boundary-to-boundary management structure is planned to empower staff and suppliers to take real ownership of all activities within the road corridor.

There will be nine road maintenance contracts (geographic based), two street lighting maintenance contracts (geographic based), and three technical support service panels. The timing for the new contracts is summarised in Table 4.1-3.

4.1.9 Section layout

The LCMPs describe the assets that are used in the delivery of transport services to customers, how the transport network is performing and the condition trends of key asset groups; and provides input into developing the operations and maintenance, renewal work and new works programmes.

Detailed LCMPs are provided for each asset group including the following key sections:

The service we provide	Outline of relevant levels of service
Network overview	Key LCMP issues and the strategies to manage these issues
	Description of the assets in physical and financial terms
	Detailed asset condition, performance and capacity
10-year plan	Detailed operations, maintenance, and renewal and new works needs
	A summary of the predicted expenditure forecast for the 10-year network needs at the end of each LCMP
Approved Long Term Plan	Comparison of AMP needs and approved LTP and any long term consequences
Improvement plan	Key improvement initiatives

4.2 Contents

4.2 Road Pavements

4.2.1 The service Auckland Transport provides

The road pavement or carriageway is the part of the roadway that is designed for vehicle travel; in common terms it is the road itself. It can be considered a core transport asset in providing for the movement of vehicles. It is therefore critical that it be of good quality and have adequate capacity to provide the required level of service (LOS) for present and future customers. The design, condition and performance of the pavement can also impact significantly on road safety in general. Road pavement helps deliver an effective and efficient transport system.

The road pavement levels of service most relevant to that delivery are:

- **Accessibility** – the degree to which people, goods and services have opportunities to conveniently travel within the region
- **Capacity** – the degree to which the network can accommodate demand
- **Quality** – the suitability of the built design and the standard of the maintained condition
- **Reliability** – the degree to which the network can maintain routes and consistent travel times
- **Safety** – the degree to which the network maintains a safe vehicle environment.

Table 4.2-1 Road pavements levels of service

Service value	Level of service	Service measure	Current performance	Target performance (indicative/to be developed and agreed)
Accessible	Improve distribution of the freight network	Percentage of satisfaction with level of freight vehicle accessibility across the network	TBC	TBC
	Increase availability of travel options for convenient travel across the Auckland region	Percentage user satisfaction with the availability of travel options within the transport network	39%	70-80%
Capacity	Improve capacity and efficiency of freight routes	% of inter peak travel times maintained on arterial routes	85%	85%
	Reduce road peak congestion so that there is sufficient capacity in the network to accommodate demand	Percentage of user satisfaction with peak travel times	TBC	TBC
		Primary arterial roads - Ratio of peak hour traffic volume to road capacity (V/C Ratio)	TBC	No greater than 25% of LOS E (V/C=0.82)
		Degree of saturation at key intersections	TBC	TBD
	Increase availability of travel options for convenient travel across the Auckland region	Vehicle Kilometres Travelled (VKT)	8 billion	TBD
Quality	Assets are maintained in good condition	Percentage of residents very satisfied, satisfied or neutral about the quality of roads in the Auckland region	79%	Not less than 75%
		Rural Smooth Travel Exposure Index	64-98%	Maintain or improve on baseline
		Urban Smooth Travel Exposure Index	79-95%	Maintain or improve on baseline
	Assets are maintained in good condition	Percentage of arterial routes that score 3 or better on AMEM Traffic Environment Survey	95%	95%
Reliability	Improve or maintain timelines for clearance of network blockages	Compliance with response and resolution times for network blockages	85-95%	TBD
Vehicle safety	Eliminate road black spots	Number of improvements at black spot locations implemented	20	Improve on baseline
	Minimise fatal and serious injuries	Crash reductions on local roads associated with crash reduction programme	27%	20%
		Percentage speed reduction in areas where speed projects have been implemented	TBC	5%
		Percentage of vehicle users consider the network to be safe	88%	TBC
		Number of fatal and serious injuries per 100 million VKT	5.1 (year to 31 Dec 2010)	Average annual reduction of 2% per year
		Number of fatal and serious injuries per 100 million VKT on local road network	410 (year to 31 Dec 2010)	Average annual reduction of 2% per year

The details of the carriageway LOS being measured are provided in Section 2, Levels of Service. The measures detailed in Table 4.2-1 against carriageway key levels of service are shown for indicative purposes.

Several of the above measures and targets are yet to be confirmed (TBC) and will be included in the improvement plan.

These LOS are diverse, as are the aspects of the carriageway that affect them; for example, ride comfort (smooth travel exposure) is affected by the structural integrity of the total pavement, its state of repair, and where it is in its lifecycle. Network congestion, the ability of traffic to flow freely, is more affected by the width and number of available traffic lanes and the traffic systems on the network.

4.2.2 Network overview

Auckland Transport owns and maintains 7,227km of road pavement. This includes 6,375km of sealed roads and 852km unsealed roads. The Auckland Transport road network is very diverse, ranging from busy arterials to low volume local roads. The network is split into four maintenance areas: north, central, west and south. The road length distribution for the maintenance areas, urban / rural, pavement type and surface type are shown in Figure 4.2-1.

Further details on length distribution for the geographical areas are shown in the appendices.

Figure 4.2-1 Network length distribution
Source: RAMM Database (October 2011)

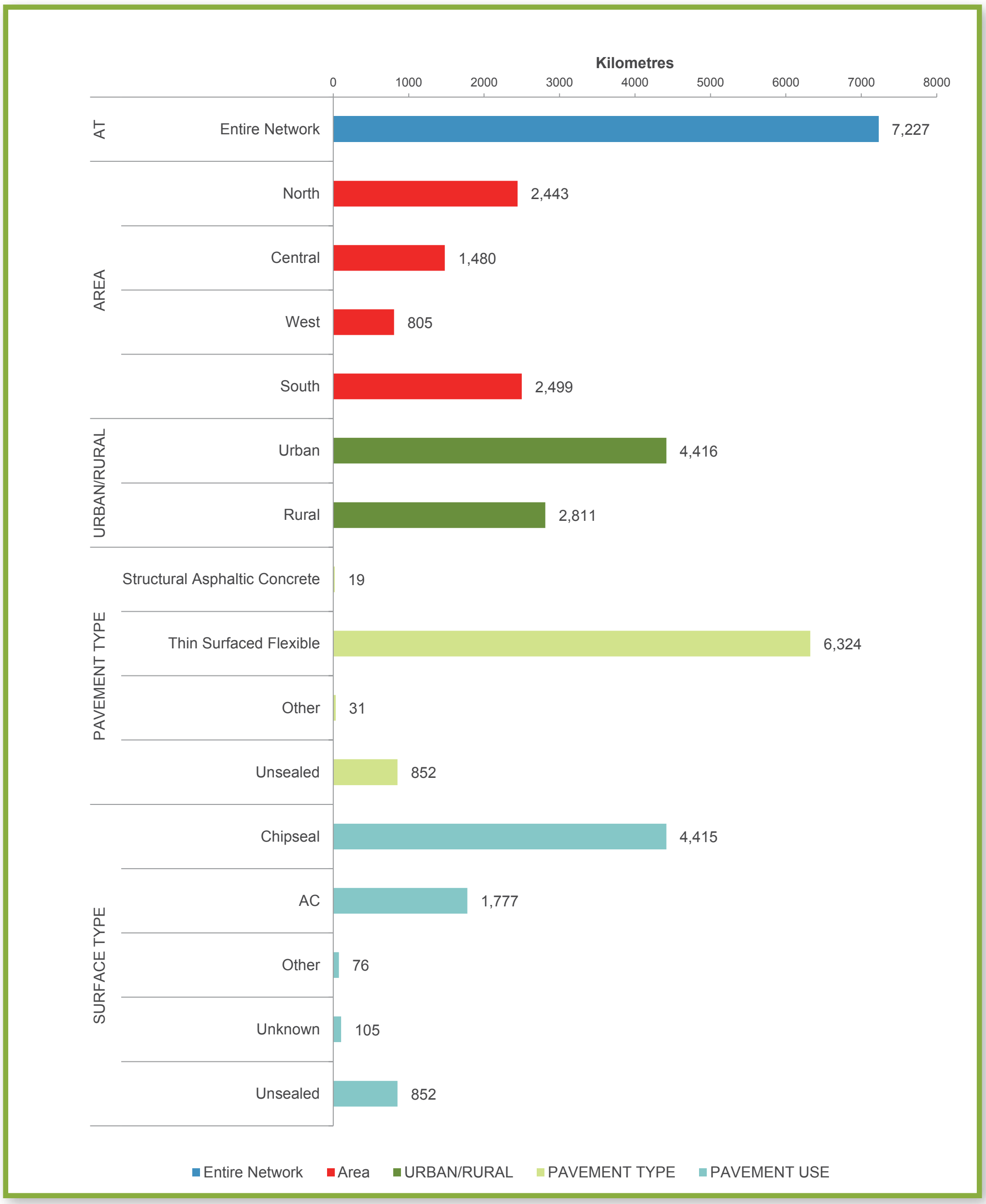
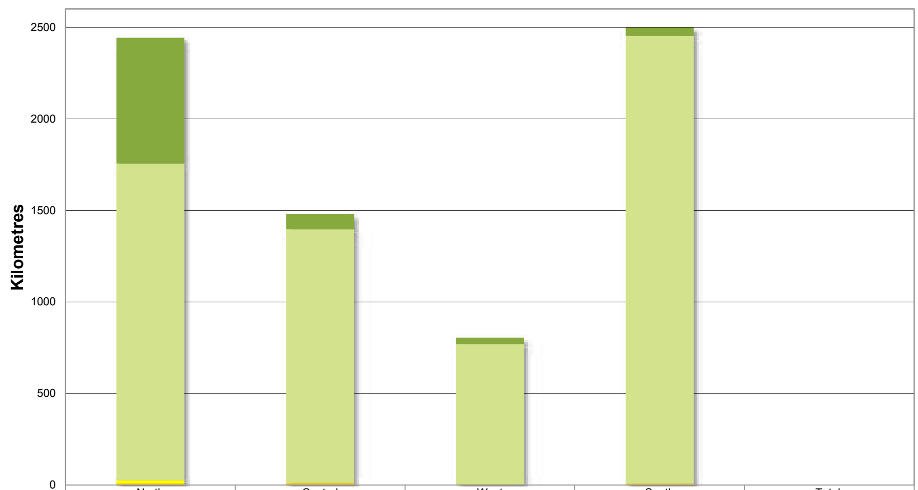


Table 4.2-2 Road pavements valuation
Source: Auckland Transport asset revaluation (30 June 2011)

Asset	Optimised replacement cost (ORC) $000s	Optimised depreciated replacement cost (ODRC) $000s	Annual depreciation (ADR) $000s
Top surface	680,203	334,838	57,738
Pavement base	2,900,961	2,005,998	42,691
Road formation	1,743,203	1,743,203	Nil

Figure 4.2-2 Pavement types by area
Source: RAMM Database (October 2011)



	North	Central	West	South	Total
Unsealed	687	84	35	46	852
Flexible Pavements	1729	1385	765	2445	6,324
Structural Asphaltic Concrete	18	1	0	0	19
Other	8	11	4	8	31
% of total	34%	20%	11%	35%	100%
Total	2,443	1,480	805	2,499	7,227

4.2.3 Network valuation

The key value indicators from the asset valuation completed in June 2011 are shown in Table 4.2-2.

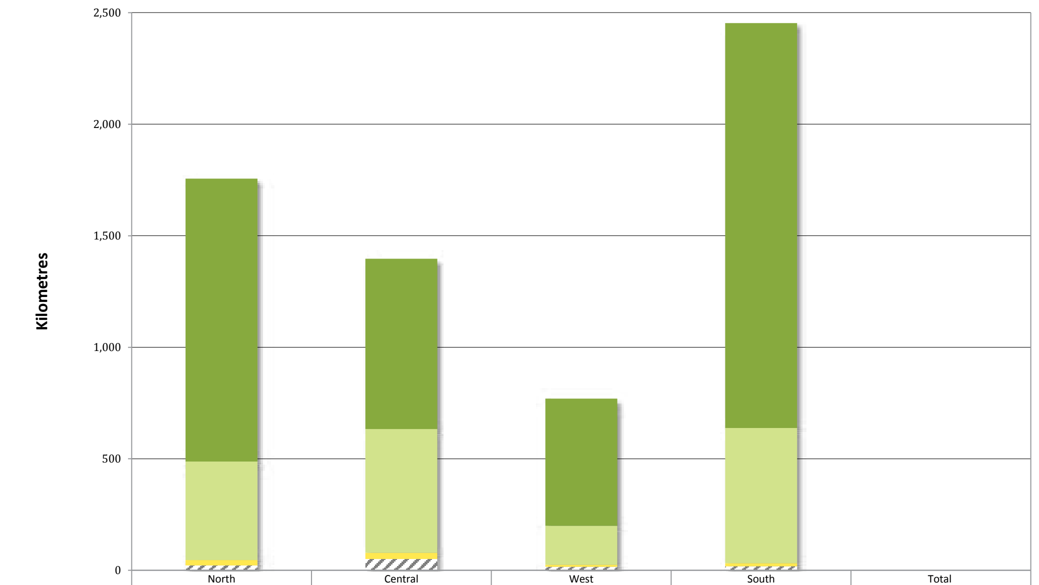
4.2.4 Network asset details

The two major components of the road pavements are the top surface (surface) and the base layers (pavement base). The function of pavement base is similar to a foundation: it receives the load and distributes it to the underlying formation. The function of the surface is to provide a smooth riding surface and to act as a waterproof layer that prevents water getting into the pavement. The current distribution of pavement base types by area is summarised in the Figure 4.2-2.

The majority of the network consists of flexible (granular) pavements. There is a small proportion of structural asphaltic concrete and other pavements. These are used in heavily trafficked roads and their initial capital cost is high.

Figure 4.2-3 shows the distribution of surface types by area. Chipseal and asphaltic concrete make up the majority of surfaces. Asphaltic concrete surfaces are suitable for heavy traffic roads and last longer than chip seal surfaces. The initial capital cost of asphaltic concrete surfaces is high, but requires less frequent maintenance. Hence it is mostly preferred on high volume roads where disruption has to be minimal. Traffic management costs on such roads are high and frequent maintenance is not viable. Chipseal surface is a cost effective solution for relatively low traffic volume roads. It has a shorter lifespan and requires more frequent maintenance compared to asphaltic concrete.

Figure 4.2-3 Surface material distribution by area
Source: RAMM Database (October 2011)



	North	Central	West	South	Total
CHIP	1,268	763	570	1,815	4,415
ASPHALTIC CONCRETE	442	555	174	606	1,777
Other	24	28	10	14	76
UNKNOWN	22	51	16	18	107
Total	1,756	1,397	770	2,453	6,375

4.2.5 Network data confidence

The RAMM database holds asset information for the road network, including condition rating information. The assessment of data confidence is based on the data confidence grading system and methodology described in Section 2.4.5 of the International Infrastructure Management Manual 2011. Table 4.2-3 illustrates Auckland Transport's confidence in the data currently held in the asset database:

The current overall confidence level of asset data in terms of road pavements is considered reliable except for pavement base age. Table 4.2-4 shows that the data for top surface is mostly complete. However, 36 per cent of the age data for pavement bases is unknown. Pavement bases have a long lifespan and their construction dates back almost to a century. However, the RAMM database has been actively managed only in the last 10-20 years and historical data prior to that is not complete.

Table 4.2-3 Data confidence – road pavements

Data attribute	Very uncertain	Uncertain	Reliable	Highly reliable
Asset description			■	
Asset quantity			■	
Asset age		■		
Condition			■	
Performance			■	

Table 4.2-4 Completeness of data

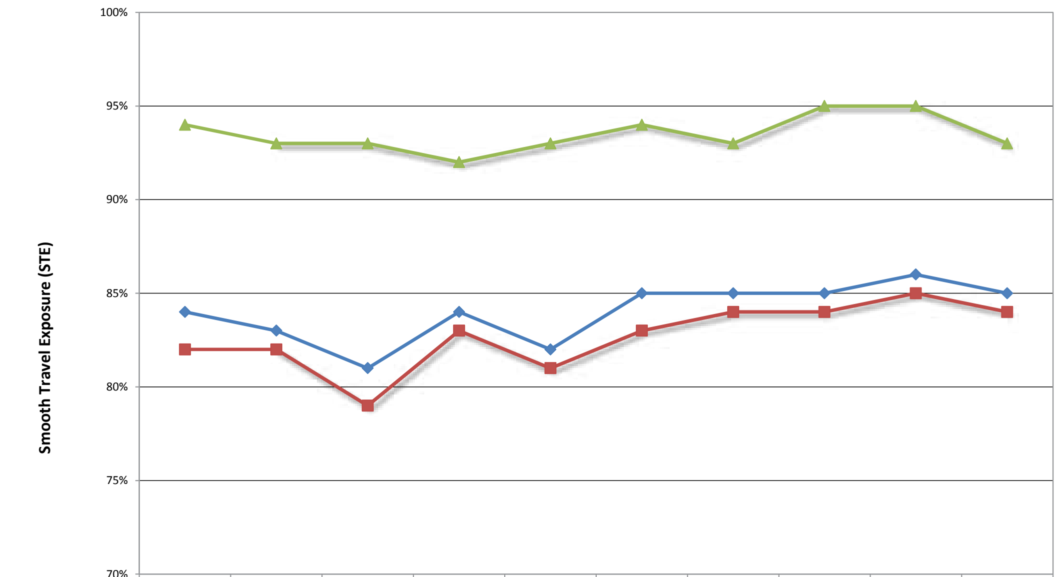
Asset	Completeness of data		
	Measure	Age	Condition
Top surface	98%	98%	97%
Pavement base	100%	64%	64%

4.2.6 Asset condition

Condition rating

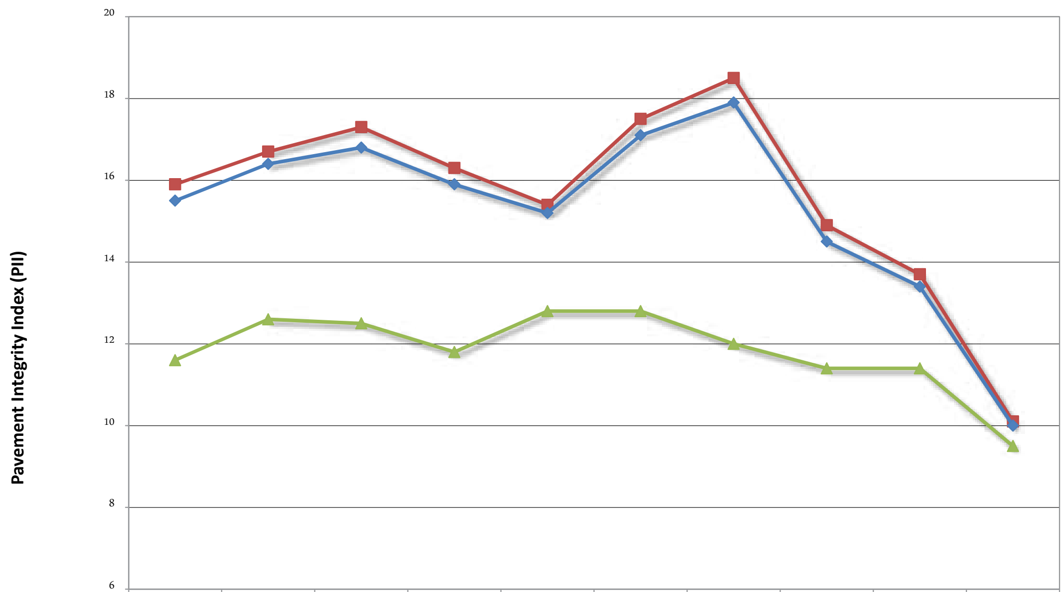
Road condition rating is undertaken every year. The information collected is pertinent to both surface and pavement base. This includes high speed data collection and visual condition rating. The high speed data collection records the pavement distress modes which includes roughness, rutting and surface texture. Defects such as rutting, shoving, scabbing, cracking, potholes, patches and edge breaks are recorded by visual condition rating. Other condition measurements include Falling Weight Deflectometer (FWD) and Benkelmen Beam tests which measure the strength of pavement base layers.

Figure 4.2-4 Sealed road STE trends
Source: RAMM Database (March 2012)



	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
Urban	82%	82%	79%	83%	81%	83%	84%	84%	85%	84%
Rural	94%	93%	93%	92%	93%	94%	93%	95%	95%	93%
AT Entire Network	84%	83%	81%	84%	82%	85%	85%	85%	86%	85%

Figure 4.2-5 Sealed road PII trends
Source: RAMM Database (March 2012)



	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
Urban	15.9	16.7	17.3	16.3	15.4	17.5	18.5	14.9	13.7	10.1
Rural	11.6	12.6	12.5	11.8	12.8	12.8	12	11.4	11.4	9.5
AT Entire Network	15.5	16.4	16.8	15.9	15.2	17.1	17.9	14.5	13.4	10

Condition data is not collected for unsealed roads as the condition of these roads is very dynamic, changing continuously because of traffic movement, weather and routine maintenance activities.

Condition measures

The asset condition measures used for reporting to key stakeholders (mainly NZTA, Auckland Transport management and the Auckland Council) are:

• Smooth travel exposure (STE)	• Roughness
• Pavement integrity index (PII)	• Age
• Surface condition index (SCI)	• Remaining useful life

The indicators used to report the overall condition of the road network include smooth travel exposure, PII and SCI.

STE is a measurement of road roughness scaled by traffic volume to reflect usage for sealed rural and urban roads. The travel is considered smooth if the roughness is within the limits. The roughness limits vary depending on traffic volumes and urban or rural location.

Roughness has a close relation to riding comfort experienced by road users. Hence, it is widely accepted as a key measure that indicates the health of the network. Figure 4.2-4 illustrates the STE trends for the Auckland Transport network. It shows a steadily increasing trend in STE since 2006 and slight decrease in the last year. It also infers that 85 per cent of the travel on Auckland Transport network happens on smooth roads.

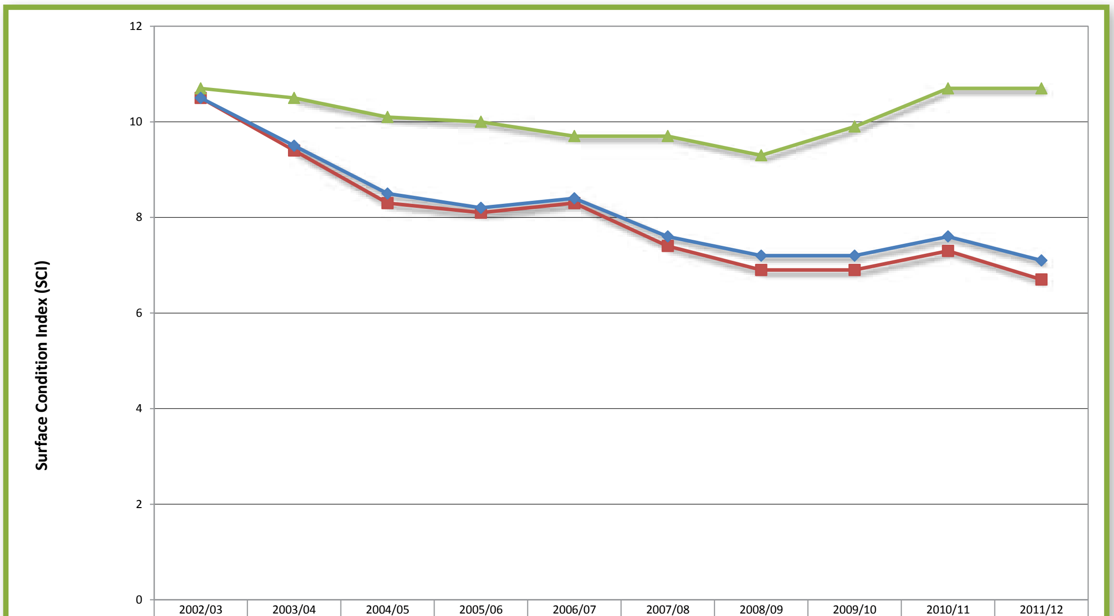
PII is a performance indicator for the structural condition of a pavement calculated by combining certain condition measures and defects. The lower the value, the better the condition. Figure 4.2-5 shows the historical trends of PII for the Auckland Transport network. The PII shows a downward trend in recent years, indicative of an improvement in condition since 2008. The sharp decrease in PII value in the recent years suggests an improvement in condition, however this may be due to an error in data, which needs further verification.

SCI is a composite index that represents the network surface condition. SCI has two key components:

- The condition index (CI) – based on RAMM condition rating data
- The age factor index (AI) of the surface using remaining surface life (RSL) from RAMM.

The lower the SCI value, the better the condition of the road network. The historical trend of SCI for the Auckland Transport network is shown in Figure 4.2-6. There is a steadily declining trend in the urban roads SCI, which indicates an improving condition. Rural roads show a deteriorating condition from 2008 onwards.

Figure 4.2-6 Sealed road SCI trends
Source: RAMM Database (March 2012)



	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
Urban	10.5	9.4	8.3	8.1	8.3	7.4	6.9	6.9	7.3	6.7
Rural	10.7	10.5	10.1	10	9.7	9.7	9.3	9.9	10.7	10.7
AT Entire Network	10.5	9.5	8.5	8.2	8.4	7.6	7.2	7.2	7.6	7.1

Table 4.2-5 NZTA road groups for maintenance guidelines

Group name	Urban environment	Rural environment
	Average annual daily traffic	Average annual daily traffic
A	>10,000	Available for future use
B	5,000–10,000	>5,000
C	1,000–5,000	1,000–5,000
D	200–1,000	200–1,000
E	<200	50–200
F	Available if required	<50

Roughness

Roughness is chosen as a key performance measure as it is closely related to road user satisfaction. NZTA maintenance guidelines for local roads provide performance measures and target values which are considered appropriate for asset managers to aim for when setting the level of maintenance on local roads. The guidelines use a total of 12 road groups; five urban and five rural groups are used currently as shown in Table 4.2-5.

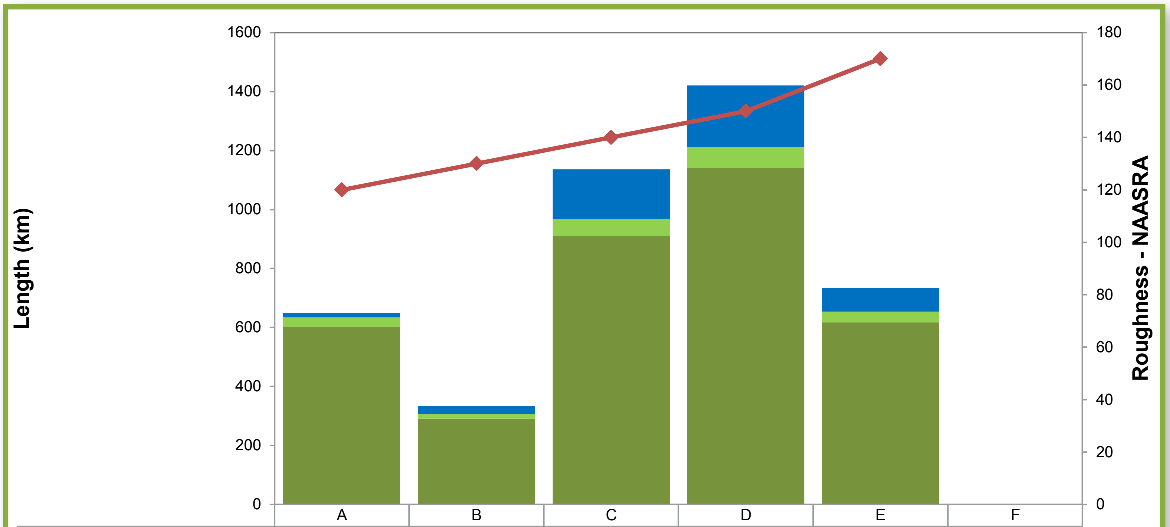
Target values for maximum average roughness are set to each road group. No more than five per cent by length of roads in any group may exceed the maximum roughness limits.

Figure 4.2-7 shows the comparison of roughness of Auckland Transport roads versus NZTA guidelines for urban roads. The length of road exceeding the limits is higher for roads carrying less than 5,000 vehicles per day. The high volume roads are relatively smoother.

Figure 4.2-8 shows the comparison of the roughness of Auckland Transport roads versus NZTA guidelines for rural roads. It shows a pattern similar to urban roads where low volume roads exceed the roughness limits. However, surfaces and bases on these low volume roads often last longer than the design life. Renewal of these low volume roads is not a high priority as long as the surface retains water tightness and skid resistance.

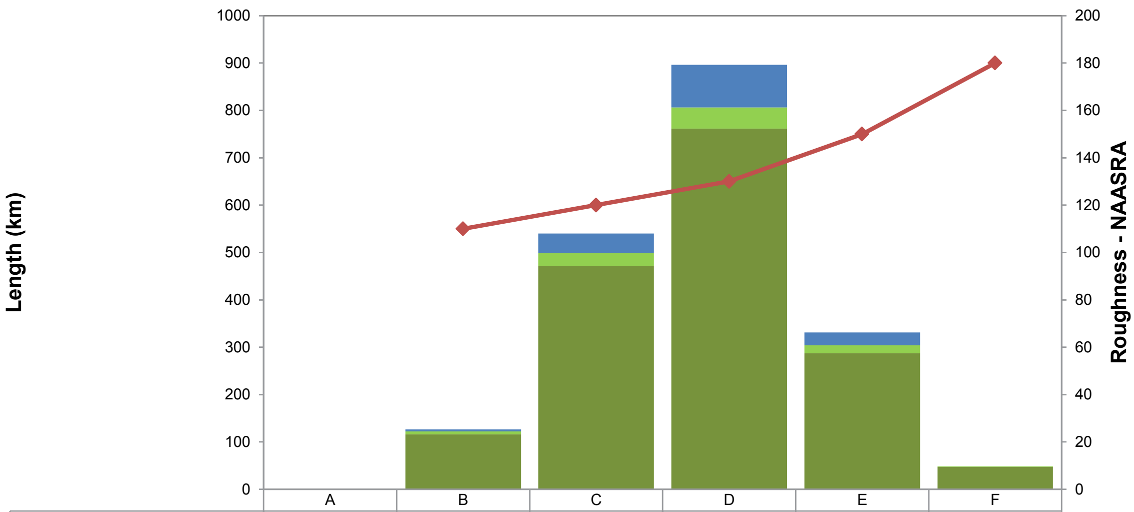
Further details on roughness for the maintenance areas are provided in the appendices.

Figure 4.2-7 Auckland Transport urban roads – roughness performance comparison
Source: RAMM Database (March 2012)



	A	B	C	D	E	F
Length exceeding beyond 5%	15.82	25.17	168.36	208.44	79.10	
Length exceeding within 5%	32.51	16.63	56.81	71.05	36.66	
Length within limits	601.89	290.85	911.06	1141.48	617.36	
NZTA NAASRA Limit	120	130	140	150	170	

Figure 4.2-8 Auckland Transport rural roads – roughness performance
Source: RAMM Database (March 2012)

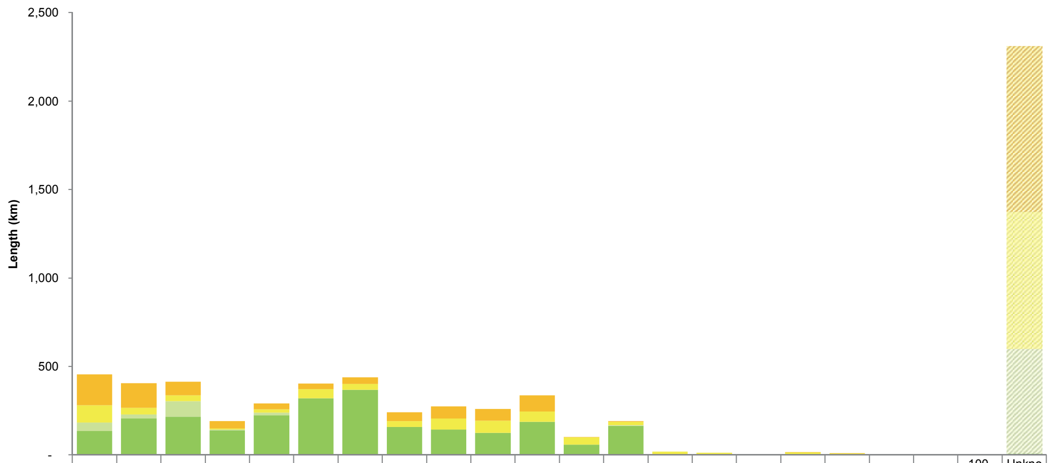


	A	B	C	D	E	F
Length exceeding beyond 5%		4.45	40.82	89.73	26.87	0.00
Length exceeding within 5%		6.34	26.99	44.81	16.55	1.31
Length within limits		116.01	472.08	761.71	287.61	47.50
NZTA NAASRA Limit		110	120	130	150	180

Age

Age is one of the main factors influencing the renewal needs of pavement bases and surfaces. Figure 4.2-9 illustrates pavement base age distribution by area. The pavement base age is unknown for 36 per cent of the network. The majority of pavement bases were constructed in the last 65 years.

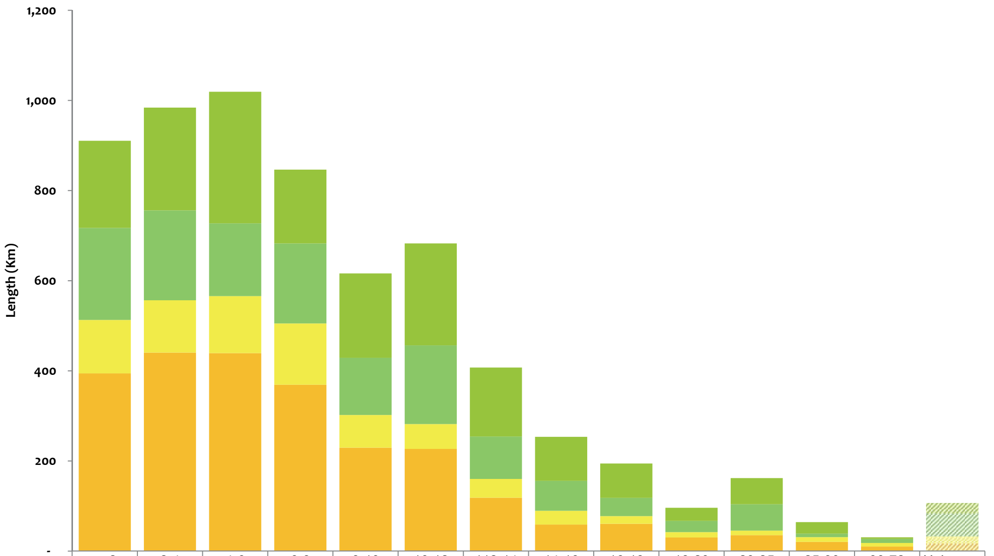
Figure 4.2-9 Pavement age distribution
Source: RAMM Database (March 2012)



	<=5	5-10	10-15	15-20	20-25	25-30	30-35	35-40	40-45	45-50	50-55	55-60	60-65	65-70	70-75	75-80	80-85	85-90	90-95	95-100	100-105	Unknown
North	174	140	76	43	33	31	37	50	68	68	92	1	3	-	-	-	3	1	-	-	-	936
Central	99	39	33	5	18	51	32	34	64	68	58	42	20	19	11	2	14	8	4	2	1	774
West	47	22	87	5	15	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	590
South	135	205	217	138	225	321	368	157	142	124	187	58	164	-	-	-	-	-	-	-	-	11

Pavement Age (Years)

Figure 4.2-10 Sealed-surface age distribution
Source: RAMM Database (March 2012)



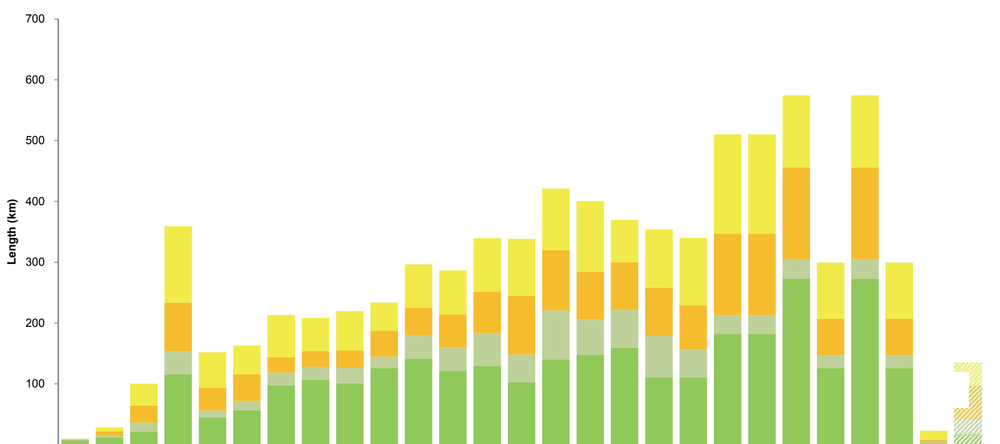
	<=2	2-4	4-6	6-8	8-10	10-12	112-14	14-16	16-18	18-20	20-25	25-30	30-72	Unknown
North	193	228	292	164	187	226	153	98	76	29	58	26	4	22
Central	204	199	162	178	127	175	94	67	40	25	58	8	9	51
West	118	116	126	136	72	55	42	30	17	12	10	11	8	16
South	394	440	439	369	230	227	119	59	61	30	36	21	10	18

Figure 4.2-10 illustrates surface age distribution. The average design life of surfaces is about 12 years. It can be seen that the age of the majority of surfaces is under 12 years. Older surfaces which have lasted longer are likely to be surface types with longer design life, such as asphaltic concrete. Roads which carry low traffic volumes also tend to last longer than the design life.

Remaining surface life

The remaining surface life data is recorded for all sealed surfaces in RAMM. This is calculated using age and RAMM design life of the surface. Figure 4.2-11 shows the remaining life of surfaces by area. Surfaces with zero or negative seal life imply that the surfaces are expired and require renewals. Surfaces are known to last beyond their design life. However, expired surfaces older than minus-five years will have a high likelihood of data errors either in surface date / age or the design life. These will be checked and updated in RAMM. Similarly, remaining life data greater than 15 years is also likely to be error-prone.

Figure 4.2-11 Remaining surface life distribution
Source: RAMM Database (March 2012)



	-45 to -20	-20 to -15	-15 to -10	-10 to -5	-5 to -4	-4 to -3	-3 to -2	-2 to -1	-1 to 0	0 - 1	1 - 2	2 - 3	3 - 4	4 - 5	5 - 6	6 - 7	7 - 8	8 - 9	9 - 10	10-11	11-12	12-13	13-14	14-15	15 - 20	20 - 60	Unknown
North	1	7	36	126	58	47	70	54	65	47	71	72	88	94	101	116	70	96	111	163	163	119	92	119	92	15	38
Central	1	7	28	80	38	44	25	26	29	42	45	55	68	96	99	78	78	79	73	134	134	150	60	150	60	4	55
West	1	2	15	38	11	15	21	21	25	19	38	38	54	46	81	58	62	68	45	31	31	33	21	33	21	2	24
South	7	12	22	116	45	56	97	107	101	126	142	121	129	103	140	148	159	111	111	182	182	273	126	273	126	2	18

Remaining Seal Life (Years)

Figure 4.2-12 Comparison of average age and surface life
Source: RAMM Database (March 2012)

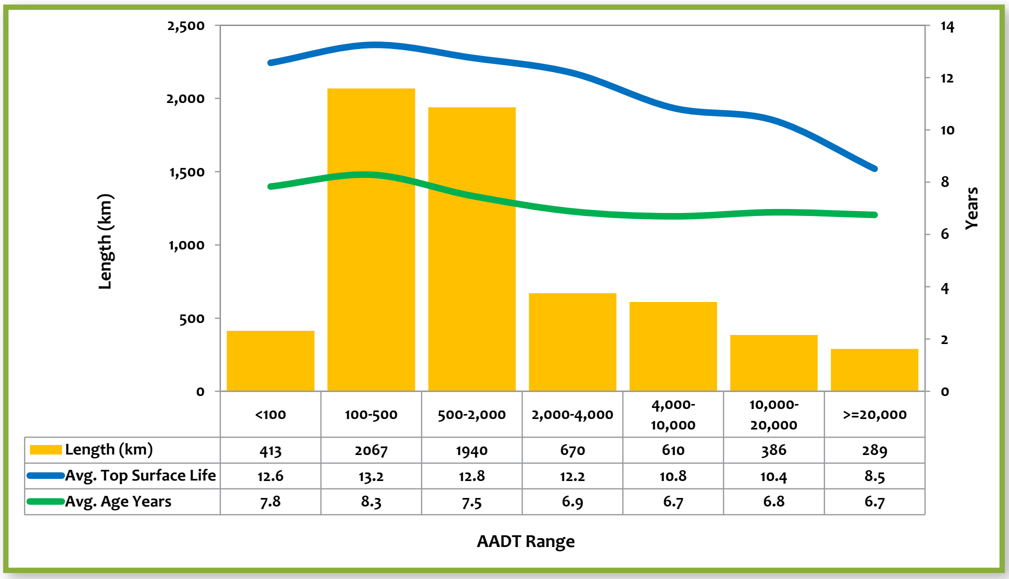


Figure 4.2-12 shows the comparison of average age and average surface life for roads with different traffic volumes. For roads with AADT above 4,000 vehicles per day, the difference between top surface life and average age (which represents the remaining seal life), is lower compared to low traffic volume roads. This suggests a need for increased surface renewals on high traffic volume roads.

The measures used for management reporting on the carriageway asset condition are:

- Seal age and remaining seal life – year-by-year totals
- Length of unsealed roads > 100 vehicles per day (km)
- Vehicle kilometres travelled (VKT) on unsealed roads carrying > 100 vehicles per day
- Average maintenance cost per VKT for the network.

Management reporting measures are also required for the following aspects of carriageways, but are yet to be developed:

- Proportions of the carriageway by surface area and length in each condition grade
- Proportion and length of carriageway surface providing poor friction characteristics.

4.2.7 Asset performance and capacity

Safety of road users and efficiency of traffic movement are the two key elements of road network performance. Travel time is the performance measure used to measure the operational efficiency of the network. Road safety is of high importance to Auckland Transport, and safety performance of the network is constantly monitored. Performance is measured by data obtained from measurement of network parameters and opinions from customer surveys.

The capacity of the road network has an impact on the performance. Increased traffic volumes and reduced capacity lead to congestion and longer journey times. Ample capacity allows free flow of traffic and reduced travel times. The asset performance measures used for reporting key stakeholders are:

Network performance	Peak hour traffic volume to road capacity ratio [v/c ratio]
	Consistency of strategic route, origin to destination vehicle travel times
	Consistency of freight route, origin to destination vehicle travel times
Safety performance	Total number of fatal and serious injury crashes annually
	The number of fatal and serious injury crashes per vehicle-kilometres travelled
	Total pedestrian crashes and total cyclist vs. motor vehicle crashes

Table 4.2-6 Road risk analysis

Risk	Net risk factor	Management options
Safety – high crash rates attributed to reduced surface friction or deficient alignments or speed controls	High risk	Ensure continual monitoring of all crashes. Prioritisation intervention to address deficiencies using risk-based techniques
Safety – fatal and serious injury crashes attributed to crashes of the "left road hit obstacle" type	High risk	Auckland Transport road safety engineers investigate the site of each fatal crash to determine whether any road improvements would reduce the severity or likelihood of future crashes Data from these investigations is used in the intervention ranking process
Inadequate road design – substandard geometry, surfaces, marking resulting in inefficient or unsafe operating conditions (contributing to risk of loss of control accidents), road pavement not adequately designed for average daily traffic.	High risk	Seek continuous improvement in design standards
Insufficient traffic demand management – increased congestion leads to higher loading time and reduced life, inability to provide balance between commuters and local short-trip users	High risk	Continue to monitor and improve current practices Continue to communicate with external agencies – the Auckland Council, NZTA etc
Availability and cost of road materials and quality aggregate – economic viability and sustainability of the region	High risk	Monitor availability and cost Strategies to use different aggregates and modified materials Review use of concrete roads
Unsatisfactory working relationships with utilities –causing delays to projects and damage to service levels, coordinating work programmes e.g. Vector, Watercare, Telecom etc.	High risk	Monitor changes in management of utilities to predict organisational shift Alliance initiatives Integrate asset data into spatial system (GIS) for asset transparency

4.2.8 Asset risks and criticality

Asset risks

Asset risks across the transport network are identified through a formal risk assessment process and the risk register is presented in Section 8, Risk Management. Significant risks for the road network are summarised in Table 4.2-6.

Additional risks identified through the development of this AMP are summarised in Table 4.2-7. These risk ratings are indicative only and require more detailed consideration as part of the risk management process.

Critical assets

Roads are one of the fundamental assets that are critical to emergency response operations. It is generally agreed that the road hierarchy and traffic volume broadly define the relative importance of roads. Table 4.2-8 shows the length of strategic and arterial roads in the Auckland Transport network which are of high importance.

Table 4.2-7 Additional roads risk summary

Risk	Risk rating	Management options
Different standards used for decision-making and condition and performance measurement in the legacy councils are still being used to rank projects within Auckland Transport	Moderate risk	Early adoption of standardised prioritisation and rating procedures and nomenclature, followed by staff training
Widespread incapacitation of network — for example, due to volcanic ash, sea inundation during a storm event, bushfire, or widespread slips)	High risk	Coordinate and be guided by Auckland Council's Civil Defence Unit
Incorrect data or attributes in databases leading to incorrect decisions on maintenance or renewal requirements	High risk	Review all asset database information from basis of a single set of agreed parameters and descriptions

Table 4.2-8 Critical roads (km)
Source: RAMM Database (March 2012)

Road classification	North	Central	West	South	Total
Strategic	0	26	0	0	26
Arterial	218	240	166	293	917

When assessing the criticality of roads, it is also important to consider resilience – the ability of the network to sustain serviceability during adverse events. Sole route accesses (which by definition do not have alternate routes) are considered critical; these are included in the Auckland Engineering Lifelines critical sites map as shown in Figure 4.2-13. This map is the best assessment of asset criticality available currently.

Figure 4.2-13 Auckland Engineering Lifelines – critical sites
Source: Auckland Council (March 2012)

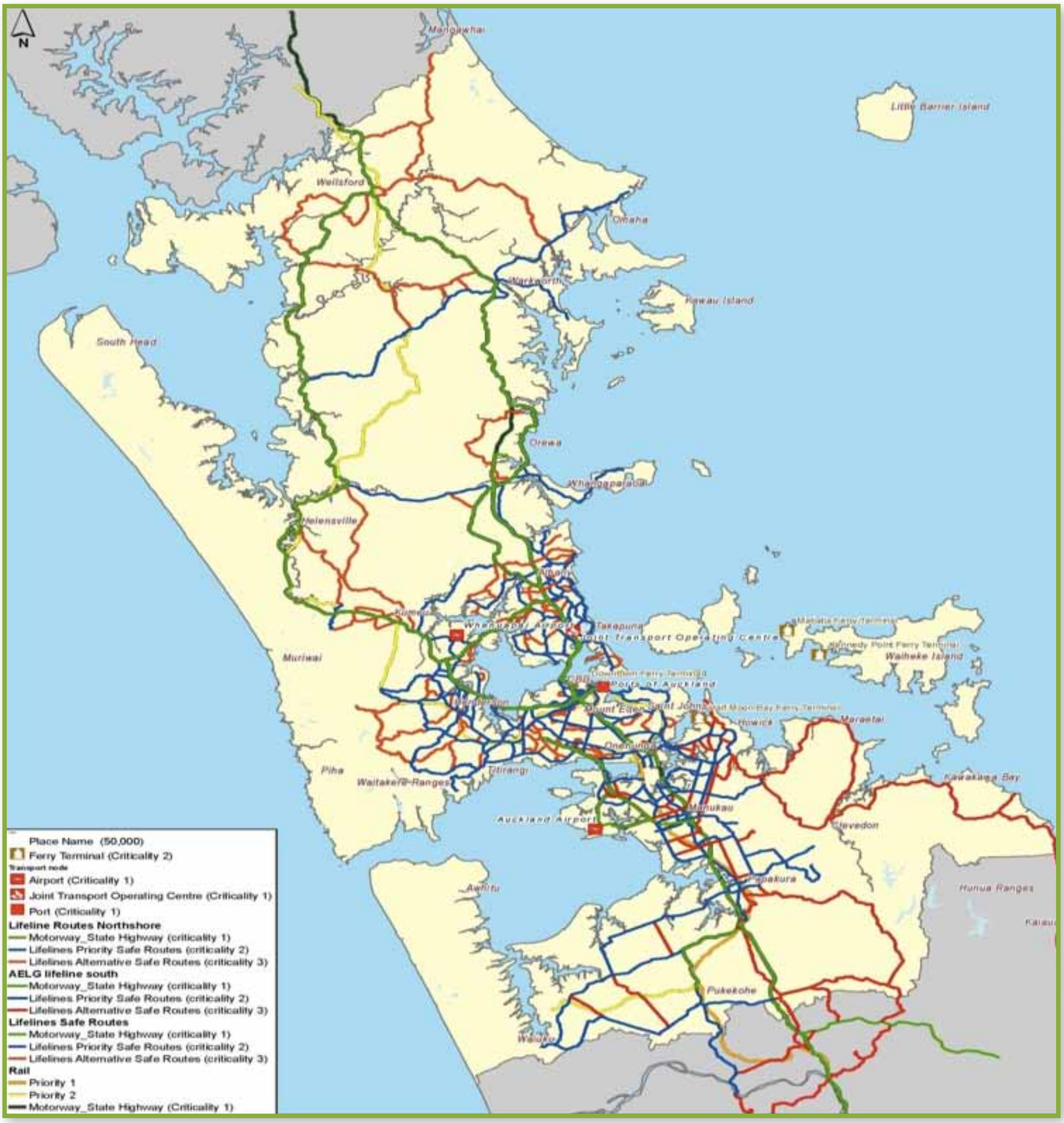


Table 4.2-9 Road pavements key issues

No	Description	Action Plan	Outcomes
1	Legacy councils had different levels of service. There is a lack of unified levels of service for Auckland Transport	Adopting a single levels of service for Auckland Transport will mean reducing or increasing existing levels of service for some customers. Auckland Transport will work with the Auckland Council to ensure that an appropriate consultation plan is prepared and implemented before changes are made to road levels of service	Development of a single, affordable set of levels of service targets across the entire city
2	Different maintenance, renewal and development practices of the legacy councils have to be integrated in a manner that provides the agreed levels of service to current and future customers at the least lifecycle cost, without significant fluctuations and anomalies during the transition period	Give careful consideration to the timing of the rollout of new contracts and the specifications for these contracts. Incorporate 'transition provisions' where appropriate	Unified policies and standards are developed and implemented across the entire network
3	The effects of recent changes of the land transport rule: vehicle mass and dimensions for high productivity motor vehicles (HPMVs) on specific routes	Careful review of all applications for use of local roads by HPMVs Continual monitoring of potential HPMV routes for unauthorised use by HPMVs A 'no-exception' approach to prosecution of unauthorised use of local roads by HPMVs	The effect of new vehicle loading on pavement and structures on HPMV routes is assessed Appropriate actions are taken to prevent adverse effects on road pavements
4	Development in formerly rural and semi-rural areas is leading to traffic loadings unsuitable for some road pavements	Liaise closely with Auckland Council RMA planning and administration staff to ensure that effects of developments outside their property boundaries are fully considered in all RMA decisions	Auckland Transport receives contributions/subsidies to upgrade road pavements affected by developments
5	The nature of the soils, terrain and groundwater levels are highly variable throughout the region caused by the volcanic and marine origins of the land. These factors create the need to control groundwater levels through specific design, building retaining walls to support deeper cut and fill slopes, and extensive use of stabilisation in the building and maintenance of the roads	Continue to exercise care when using standard designs Liaise closely with Auckland Council's staff issuing engineering consents for work by developers to ensure that those approvals reflect the best current standards of Auckland Transport	Assets are designed appropriately to withstand local conditions and prevent premature deterioration or failure

4.2.9 Key issues

The six most significant key lifecycle issues that affect road carriageway assets are summarised in Table 4.2-9.

4.2.10 Operations and maintenance needs

Scope of operations and maintenance

Pavement maintenance provides for the care and attention required to maintain the structural integrity and serviceability of the asset. It addresses the maintenance needs of both the top surface and pavement base. The nature of maintenance activities for sealed and unsealed roads is different.

The maintenance of sealed roads includes the following activities:

- Pothole repairs
- Digouts
- Surface defects repairs
- Edge break repairs
- Emergency works (slips, fallen trees etc.)
- Reporting
- Quality assurance
- Temporary traffic management
- Preseal repairs work

The maintenance of unsealed roads includes the following activities:

- Maintenance grading
- Surface and shape restoration.

Further details on sealed and unsealed road maintenance activities are provided in the appendices.

There are three main inputs into the maintenance needs assessment as summarised in Table 4.2-10.

Operations and maintenance plan

Routine maintenance is the day-to-day activity required to keep assets serviceable and prevent premature deterioration or failure. The operations and maintenance plan comprises planned and reactive maintenance. Physical works necessary to deliver the scope of works listed above are procured through contracts awarded on a competitive basis. A new procurement plan will be implemented by Auckland Transport which will include nine physical works contracts. Refer to Section 4.1.8 LCMP Overview for further details.

Table 4.2-10 Maintenace needs assessment

Maintenance activity	Description
Reactive maintenance	Fixing assets that have deteriorated to a LOS below the acceptable limit
Planned maintenance	Ensuring the smooth functioning of the road network
Renewal programme	There is interdependency between maintenance and renewal needs. Deferring renewals increases maintenance costs and total lifecycle costs

The contractors delivering the maintenance services have the ability to programme works on a priority basis and are required to comply with the contract specifications and recognised guidelines for maintenance activities.

Contractor performance on delivering the maintenance works and related outputs are linked to the operational LOS of the transport network.

Historical levels of operations and maintenance expenditure provided the current LOS of the network. It is expected that this current LOS will be maintained in the future and is the basis of the long-term lifecycle management strategies of this AMP. This position may change in the future as a result of Auckland Council and Auckland Transport adopting a different LOS in view of the funding and budgetary constraints.

The maintenance intervention strategy describes the asset condition or extent of defects that warrants maintenance work. The strategy also advices whether the condition/defect should be addressed through maintenance or renewals. As well, the strategy includes the performance measures and the maintenance practices that will achieve them. The objectives of the strategy include minimising lifecycle costs, ensuring a consistent and rational approach to road maintenance, and communicating relevant maintenance data to other parties. Maintenance intervention criteria are currently detailed in the separate road-maintenance contracts. Legacy councils had differing practices in this area and these are still being refined and harmonised.

Below are some of the common principles of the maintenance intervention strategy:

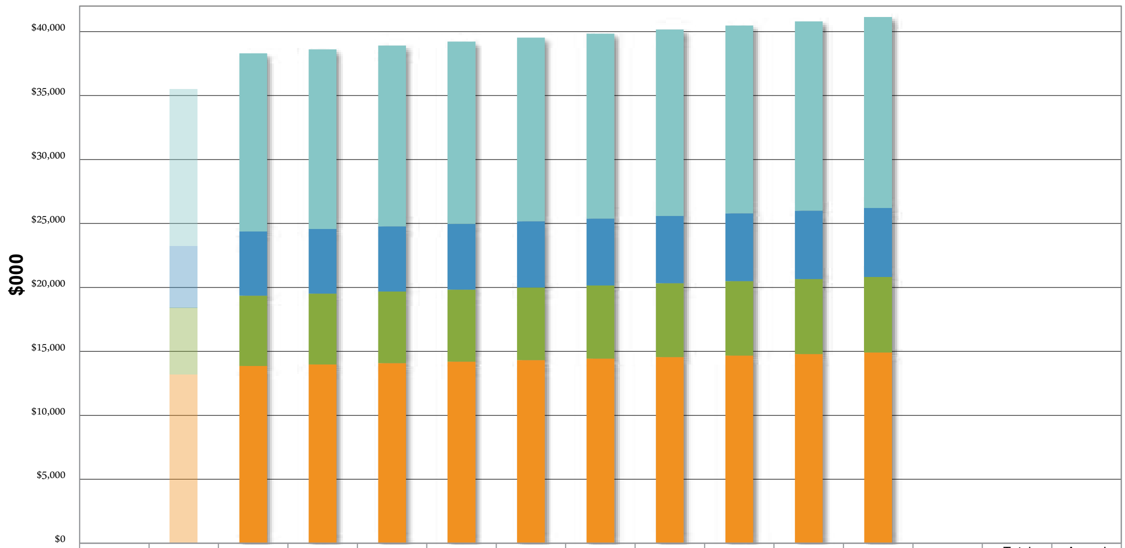
- Defer minor maintenance work if road pavements are due for rehabilitation
- Ensure all defects are rectified before roads are re-sealed
- Ensure the network is maintained to deliver the desired LOS.

The significant road operations and maintenance issues affecting the Auckland Transport network are shown in the Table 4.2-11.

Table 4.2-11 Significant road operations and maintenance issues

Issue	North	West	Central	South
Land development resulting in:				
Increasing traffic volumes on rural roads on urban fringe	✓			✓
Need for additional capacity on key corridors	✓	✓	✓	✓
High traffic volumes of metal roads	✓			
High heavy commercial vehicle (HCV) volumes, accelerating pavement deterioration and increasing maintenance needs, with additional potential issues from the introduction of High Productivity Motor Vehicles (HPMVs)	✓		✓	✓
Additional maintenance funding required to maintain the state highways that will be revoked to Auckland Transport	✓		✓	✓
Maintenance of vehicle crossings, especially those that do not comply with current standards and specifications	✓	✓		✓
Service covers not level with surrounding road surface resulting in poor riding quality, increased roughness and noise to surrounding residents and potential public safety problem. This issue affects collector and local roads in particular	✓		✓	✓
Development and use of sustainable pavement maintenance practices that deliver the required LOS at the lowest lifecycle costs	✓	✓	✓	✓
Weed control in urban areas is not providing sufficient protection to pavement and shoulder, impairing function of water channels	✓	✓		✓
Road works on high volume roads as high traffic management costs			✓	
Poor condition of roads on the Hauraki Gulf islands			✓	
Accelerated pavement wear due to increasing HCV traffic including quarry traffic	✓			✓
Growing evidence of poor performance of interlocking concrete block pavement surfaces			✓	

Figure 4.2-14 Road pavements operations and maintenance expenditure
Source: LTP Budget Model 12 April 2012 after Refresh for AMP



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	Total Length (Km)	Annual average $/Km
North	37%	12,260	13,935	14,040	14,146	14,253	14,360	14,469	14,579	14,689	14,801	14,913	145,754	2,443	$5,966
Central	13%	4,822	5,017	5,058	5,098	5,140	5,181	5,223	5,265	5,308	5,351	5,394	52,286	1,480	$3,532
West	14%	5,232	5,496	5,541	5,586	5,632	5,678	5,724	5,771	5,818	5,866	5,914	57,244	805	$7,112
South	36%	13,185	13,857	13,970	14,084	14,199	14,315	14,432	14,550	14,668	14,788	14,909	144,332	2,499	$5,776
Total	100%	35,498	38,305	38,608	38,914	39,223	39,534	39,848	40,165	40,484	40,806	41,131	397,017	7,227	$5,494

Operations and maintenance 10-year expenditure forecast

The recommended 10-year operational expenditure forecast is shown in Figure 4.2-14. It is based primarily on historical trends but also includes the revised activities detailed above, and recognises the LOS to be achieved to some extent. This recommendation has also taken into account current funding constraints being experienced by Auckland Transport and the Auckland Council. Note however that the actual plan approved by Auckland Transport and Auckland Council may differ from these network needs because of the impact of funding constraints.

State highway revocations

There are about 54km of state highways which will be revoked by NZTA. These state highways will become local roads owned by Auckland Transport. All of these roads, with the possible exception of SH18A, will remain arterial roads. These roads will be part of designated over-dimension bypass routes.

The maintenance and renewal of these roads will require additional funding. The current maintenance expenditure of the roads to be revoked is shown in Table 4.2-12.

Note: Expenditure includes structural maintenance and renewals of bridges, and structural maintenance of retaining walls.

4.2.11 Renewal needs

Renewal strategy

Asset renewal is the process of restoring the LOS delivered by an asset to its original design level, or a level close to that, by replacing the worn components.

The two criteria that trigger asset renewals are the failure to deliver LOS and economics. It may be more cost effective to provide the required LOS by replacing the asset rather than repairing it.

The renewal of road pavements includes three activities as follows:

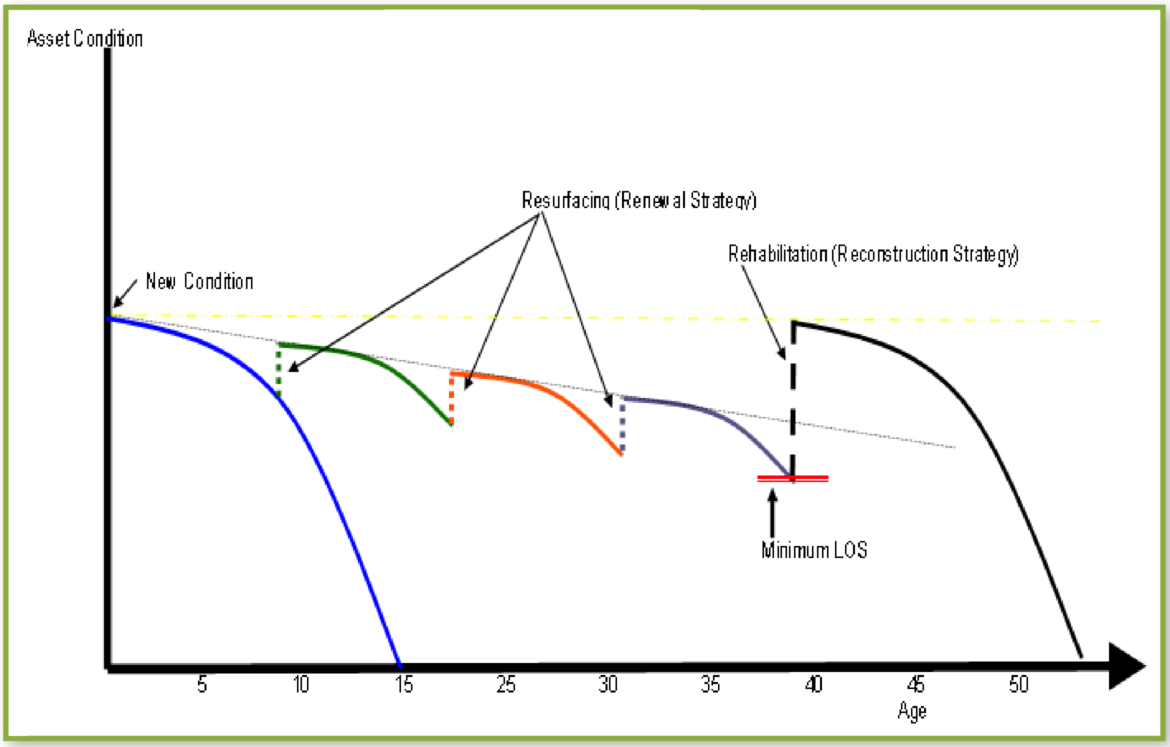
- Resurfacing or surface renewals – involves replacing top surfaces. The two main surface types that make up the majority of surface renewals are chipseal and asphaltic concrete (AC)
- Rehabilitation or pavement base renewals – involves replacing the base and/or sub-base.
- Unsealed road renewals – remetalling.

Table 4.2-12 State highway revocation roads annual maintenance expenditure

State highway revocation sites	Length (km)	Annual maintenance expenditure ($000)	Comments
SH16 at Parnell (Shipwright Lane and part Parnell Rise)	3.92	250	Includes professional services
SH16 at Westgate (NW Motorway – Hobsonville Road Underpass to old Brigham Creek Road intersection)	0.19	–	Does not include professional services
SH17 from Puhoi to Albany (Fowler Access Road to Bush Road – Albany)	31.5	1,350	Includes professional services
SH18 at Hobsonville (Squadron Drive Underpass to Hobsonville Road Underpass)	5.6	218	Does not include professional services
SH18A at Upper Harbour Drive (Albany Highway interchange to William Pitcher Place)	4.27	194	Does not include professional services
SH20 at Manukau (Redoubt Road, Great South Road, Manukau Station Road, Wiri Station Road, Roscommon Road from Redoubt Road to Puhinui Road Interchange)	5.75	555	Does not include professional services
Total	51.23	2,567	

The pavement renewal programme takes up a significant portion of the overall renewals expenditure. Optimised decision making (ODM) is a key methodology used to develop the renewal programme. ODM seeks to ensure the right work is done at the right time, and that this work delivers the agreed LOS in the most economical way for present and future customers. ODM does not exclude the lowest cost solution, but helps to ensure that all relevant factors are considered before any solution is adopted. By undertaking renewals at the right times, the pavements will last longer, as shown in Figure 4.2-15.

Figure 4.2-15 Effects of renewals on asset condition



The following considerations drive the decision making for establishing renewal needs of pavement base and surfacing:

- Pavement condition
- Levels of service (LOS)
- Historical needs
- Optimisation of lifecycle costs
- Growth – traffic and size of network.

There are two approaches to decision making on renewals. The first approach utilises Treatment Selection Algorithm (TSA) outputs to prioritise resurfacing and rehabilitation. This approach mostly ensures preservation of asset condition and delivery of LOS. The prioritisation is based on remaining useful life, condition and traffic volume. The outputs are validated on site to produce a three-year programme. The final programme is checked against other road or utility projects for conflicts and opportunities.

The second approach involves long term predictive modelling using dTIMS. This approach focuses on optimisation of lifecycle benefits for a given funding level and also predicts the asset performance for different funding scenarios.

Renewal plan

The current renewal plan includes consolidation of analyses from seven legacy councils. Going forward, the renewal programming will be undertaken separately for each of the new maintenance areas. The new asset management contracts cover the data collection, analysis and development of renewal programmes.

The resurfacing programme is based on an analysis of the current condition, remaining useful life and historical needs. The two main aspects that influence resurfacing are surface integrity and skid resistance. Surface defects such as cracking compromise the waterproofing of pavement layers. Moisture has a detrimental effect on the whole pavement structure. Neglecting surface defects affects the pavement base, which will eventually require rehabilitation. Loss of skid resistance is a significant safety concern that requires quick action. Hence the focus is to ensure that surface integrity and skid resistance are maintained through timely renewal of surfaces.

The analysis of the remaining useful life suggests that the high volume roads have lesser remaining life compared to low volume roads. This includes arterials and collectors greater than 10,000 vehicles per day. The catch up of renewals of these roads will be the priority in the interim. Surfaces on low volume local roads can last longer than the design life. The average roughness is high on low volume roads. However, this is tolerable as long as the surface holds its integrity and retains skid resistance.

The pavement bases have a long life span and are, on average, expected to last 70 years. Pavements have been constructed in the Auckland region for almost a century. The age information for 36 per cent of the pavement bases is not available in RAMM. The older pavements on arterial roads in the central area were originally designed for lower traffic volumes. These roads are carrying in excess of 20,000 vehicles per day. There is also an increase in traffic volumes across the network and an increase in vehicle mass and dimensions. The increased traffic loading will increase the rate of deterioration. The pavement base renewals are prioritised based on condition and age.

In addition to ensuring preservation of asset condition and delivery of LOS, dTIMS modelling facilitates the optimisation of the surface and pavement base lifecycle. Implementation of the optimised programme in the long term depends on the availability of funding. The short-term focus will be to address renewals of high priority sites.

The issues affecting renewal of pavement bases and surfaces are listed in Table 4.2-13.

Table 4.2-13 Significant road renewal issues

Issue	North	West	Central	South
Ageing asphaltic concrete surfaces and chipseal surfaces on relatively high volume roads	✓	✓	✓	✓
High and/or increasing roughness across the network, some accompanied by declining trends in pavement and surface integrity		✓	✓	✓
Backlogs in sealing/resurfacing and in second-coat seals	✓	✓	✓	✓
Funding of renewals is insufficient to meet the known need	✓	✓	✓	✓
Management of:				
Pavement failure at high-volume intersections		✓		
The poor performance of interlocking concrete block surfaces			✓	
Road surfaces to ensure adequate skid resistance			✓	✓

Table 4.2-14 dTIMS recommended resurfacing quantities for 10 years

Area	dTIMS recommended quantities – based on 10-year average (km)			
	Asphaltic concrete	Chipseal	Annual average	10-year total
North	20	104	124	1,238
Central	50	65	115	1,150
South	40	187	227	2,270
West	19	37	56	562
Total	129	393	522	5,220

Sealed roads – surface renewal analysis

The various analyses undertaken to establish the renewal needs of pavement surfaces are described in the sections below.

Condition-based method

This condition-based analysis uses current condition and whole-of-life optimisation to identify indicative renewal needs. Condition is the key attribute that affects the renewal of pavement surfaces. dTIMS pavement performance modelling is used to predict the future condition of road pavements and generate optimum renewal strategies for a given level of funding. The dTIMS condition-based analysis provides an optimum renewal programme to achieve the desired LOS at the lowest lifecycle cost.

Recommended resurfacing quantities from the latest dTIMS analyses are summarised in Table 4.2-14.

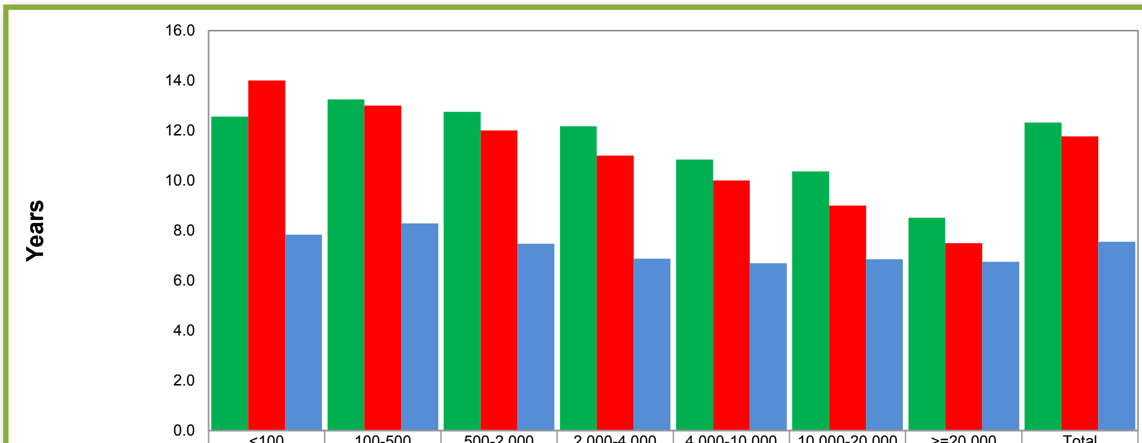
Age-based method

This analysis of renewals is based on the age and design life of the top surfaces, described in RAMM. Age-based analysis is undertaken as follows:

- RAMM provides the design life for each pavement use group. The quantity of resurfacing required to renew the surfaces at the end of their design life is calculated
- Suggested design lives may be different from RAMM design lives and these "suggested" lives are based on experience and engineering judgement. The quantity of resurfacing required to renew the surfaces at the end of their suggested design life is calculated.

Figure 4.2-16 shows the network average RAMM design life, suggested design life and the current average age for the different traffic use groups. The figure indicates that suggested design lives tend to be longer on the low volume roads and shorter on the higher volume roads compared to RAMM design lives.

Figure 4.2-16 Sealed roads surfacing – average RAMM design life, average suggested life and average age by pavement use



	<100	100-500	500-2,000	2,000-4,000	4,000-10,000	10,000-20,000	>=20,000	Total
RAMM Design Life	12.6	13.2	12.8	12.2	10.8	10.4	8.5	12.3
Suggested Design Life	14	13	12	11	10	9	7.5	11.8
Avg. Age	7.8	8.3	7.5	6.9	6.7	6.8	6.7	7.6

Table 4.2-15 Sealed roads surfacing – annual resurfacing requirement based on RAMM design life and surface age

Area	RAMM design life quantities – based on current surface data			
	Asphaltic concrete	Chipseal	Annual average	10-year total
North	31	130	160	1,604
Central	47	68	115	1,149
West	12	58	70	702
South	46	221	267	2,666
Total	136	477	612	6,121

Table 4.2-16 Sealed roads surfacing – annual resurfacing requirement based on suggested design life and surface age

Area	Suggested design life quantities – assuming reseal as a surface function			
	Asphaltic concrete	Chipseal	Annual average	10-year total
North	40	106	146	1,459
Central	57	66	123	1,229
West	15	50	66	657
South	55	152	207	2,065
Total	167	374	542	5,410

The resurfacing quantities based on RAMM design life and suggested design life are shown in Table 4.2-15 and Table 4.2-16. The first table shows the renewal quantities based on RAMM design life and surface age. The second table shows the renewal quantities based on suggested design life and surface age.

It can be seen that the resurfacing needs based on RAMM design life are higher than resurfacing needs based on suggested design life. This is because of the presence of first coat seals in RAMM. First coat seals are done on new pavements and have a very short life and are regarded as a priming seal. The large number of first coats is attributed to both data error and backlog. The presence of these first coats results in over estimation of the amount of renewals required in the long term. The first coat seals in RAMM need to be verified and updated.

The quantities based on suggested design life present a more realistic view of future need as they assume all surfaces to be reseals. This may slightly underestimate the renewal needs in the near future. However, first coat seals at any time are only a small portion of the network and should not have significant effect on the analysis.

Suggested design life takes into account the effect of traffic on the life of surfaces. Hence the resurfacing quantities based on suggested design life for asphaltic concrete surfaces, which is mostly used on high traffic volume roads, is higher than the quantities based on RAMM design life. In contrast, the resurfacing quantities based on suggested design life for chipseal surfaces, used on relatively low traffic volume roads, is lower than the quantities based on RAMM design life.

Historical trends

The quantity of resurfacing completed each year has been recorded in RAMM. These represent the historical trend of renewals and are summarised in Table 4.2-17.

This shows a decrease in the renewal quantities in the north and south areas. It has to be noted that the historical renewal programmes were subject

Table 4.2-17 Resurfacing achievements
Source: RAMM Database March 2012

Area	2010/11	Last three-year average	Last five-year average	Last 10-year average	Last 15-year average
North	108	116	129	134	154
Central	96	106	105	97	106
South	201	224	238	240	241
West	59	63	65	64	62
Total	463	509	537	534	563

Table 4.2-18 Road pavements depreciation profile (surfaces and pavement bases)
Source: Auckland Transport asset depreciation profiles

	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total
Depreciation ($ million)	100	102	106	109	113	115	118	121	125	128	132	1,270

to funding constraints and may not represent the optimum level of renewals required.

Depreciation profile

The total depreciation for road pavements including surfaces and pavement bases ranges from $100 million to $132 million over the 10 years. The total depreciation of road pavements over 10 years is $1,270 million. This includes both surfaces and pavement bases. The total renewal expenditure for road pavements including resurfacing and rehabilitation for 10 years is $1,088 million. Therefore the proposed renewal programme is lower than the depreciation. The 10-year depreciation profile is shown in Table 4.2-18.

Table 4.2-19 dTIMS recommended rehabilitation quantities for 10 years

AREA	dTIMS recommended quantities – based on 10-year average (km)	
	Annual average	10-year total
North	27	270
Central	12	120
West	13	130
South	26	260
Total	78	780

Sealed roads – pavement base renewal analysis

The various analyses undertaken to establish the rehabilitation needs of pavement bases are described in the sections below.

Condition-based method

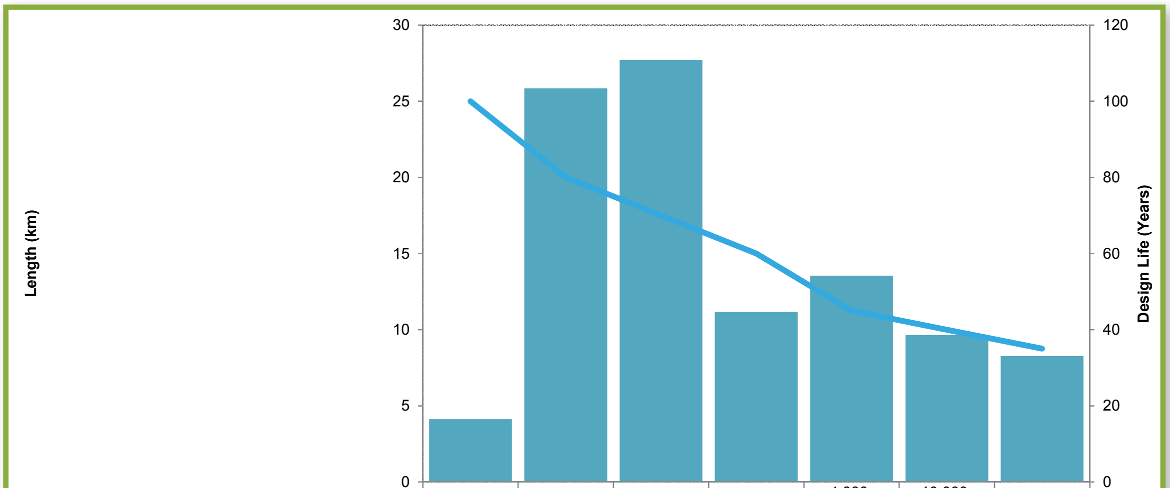
The following analysis of renewals is based on the current condition of the assets and uses whole-of-life deterioration to identify indicative renewal needs. Condition is the key attribute that affects the renewal of pavement bases. dTIMS predictive modelling is used to analyse the condition of the pavement base. The renewal quantities recommended are shown in Table 4.2-19.

Age-based method

The age of the pavement base is unknown for 36 per cent of the network. The condition data available for the pavement base is inadequate to calculate the remaining life from age. Current valuation assumes an average pavement design life of 68 years. On this basis, to maintain the current average age will require 94km of pavement base renewals per year.

The design life for pavements has been suggested based on experience and engineering judgement. Figure 4.2-17 below shows the suggested design life for the traffic use groups, as well as annual rehabilitation quantities based on those design lives.

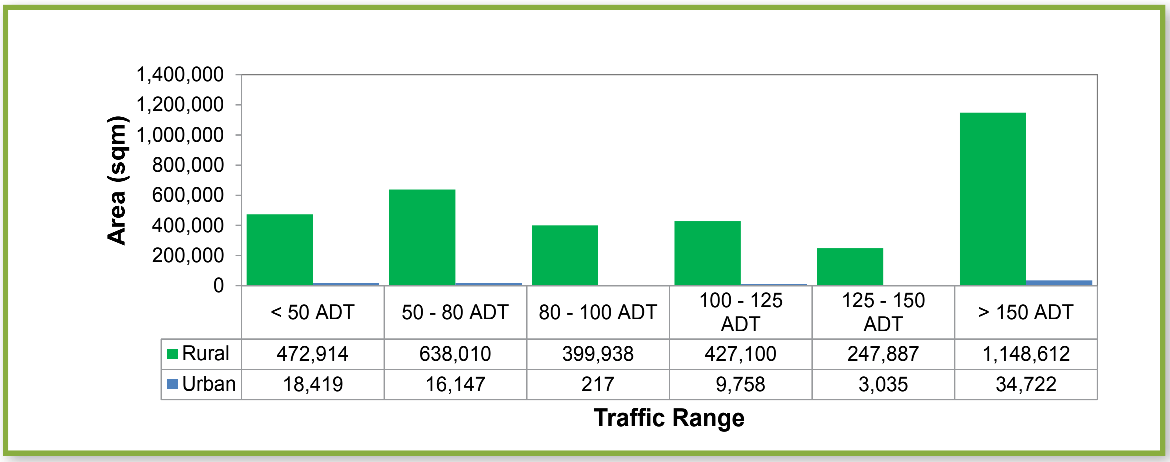
Figure 4.2-17 Sealed road pavement base renewals – based on suggested lives and current practice



	<100	100-500	500-2,000	2,000-4,000	4,000-10,000	10,000-20,000	>=20,000
Annual Rehabilitation based on Suggested Design Lives	4	26	28	11	14	10	8
Suggested Design Life (Years)	100	80	70	60	45	40	35

Annual Average Daily Traffic range

Figure 4.2-18 Unsealed roads by traffic volume



The renewal quantities recommended by this analysis are about 100km per year, while the renewals currently being implemented are less than this. This is because:

- Pavement bases are renewed in pavement reconstruction projects as part of capital new works
- Localised pavement base repair or digouts effectively extend the life of pavement bases by replacing the worst parts
- Pavement bases on low volume roads can last longer than the design lives.

Depreciation profile

The combined depreciation profile for surfaces and pavement bases is shown in section 4.2.11, sealed roads – surface renewal analysis.

Unsealed roads – renewal analysis

Unsealed resurfacing

Metal road resurfacing or remetalling has the primary aim of restoring the wearing surface of metal roads, which is lost or consumed by displacement due to traffic and weather. Remetalling occurs on different cycles, based on the needs of individual roads. Heavily trafficked roads (>125 vehicles per day) may require six-monthly or annual remetalling, but most low volume roads require a seven-year cycle.

The distribution of metal roads carrying different traffic volumes is presented in Figure 4.2-18. The length of unsealed roads carrying >125 vehicles per day is considered unreliable due to errors in traffic data recorded in RAMM. An improved traffic counting regime for these roads, coupled with updates of average annual daily traffic (AADT) in RAMM, will address this issue.

Table 4.2-20 Remetalling frequencies

Traffic volume (average daily traffic)	Indicative remetalling cycle (years)
< 50	15
50-80	10
80-100	7
100-125	3
125-150	½
> 150 ADT	1/4

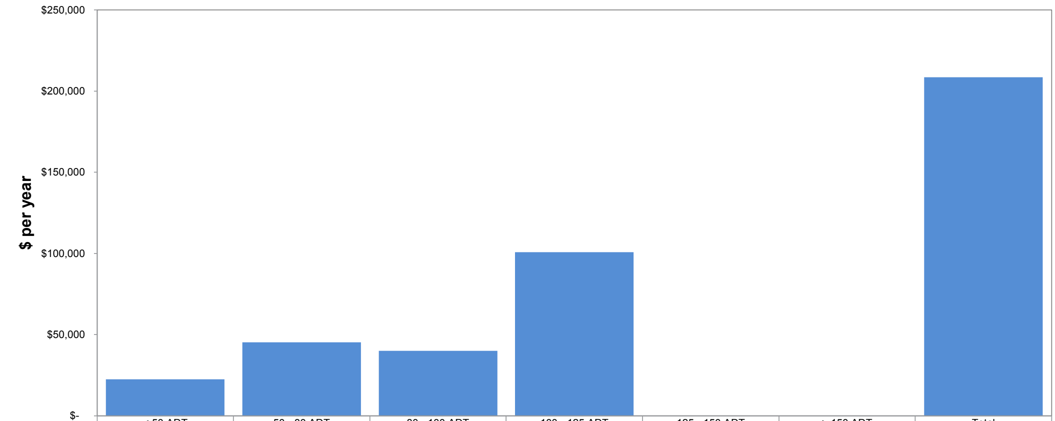
Resurfacing or remetalling needs of metal roads are highly dependent on traffic volume, as outlined in the Table 4.2-20. Other factors such as the availability and quality of the resurfacing metal and local weather also have significant influences.

Remetalling programmes are prepared annually by Auckland Transport asset managers in conjunction with the contractors' staff. Auckland Transport metal roads have been analysed using the indicative remetalling cycle to identify the remetalling needs. Due to the high likelihood of errors in that data, the length of high traffic volume roads have been estimated. The expected costs of annual remetalling are summarised in Figure 4.2-19.

Unsealed pavement renewals

It is relatively rare that unsealed pavements require reconstruction. When this occurs, it is usually because remetalling has been delayed and the pavement structure has been eroded by traffic. The other principal causes of unsealed pavement failure are loss of material due to flooding, or periodic heavy rain coupled with inadequate drainage. There is therefore no programme of unsealed pavement renewals. These needs are met from the remetalling programme and emergency works programme.

Figure 4.2-19 Annual remetalling needs (total costs)



	< 50 ADT	50 - 80 ADT	80 - 100 ADT	100 - 125 ADT	125 - 150 ADT	> 150 ADT	Total
Remetalling needs	$22,499	$45,226	$40,005	$100,795			$208,525

Any short lengths of soft, unsealed pavement are repaired under maintenance.

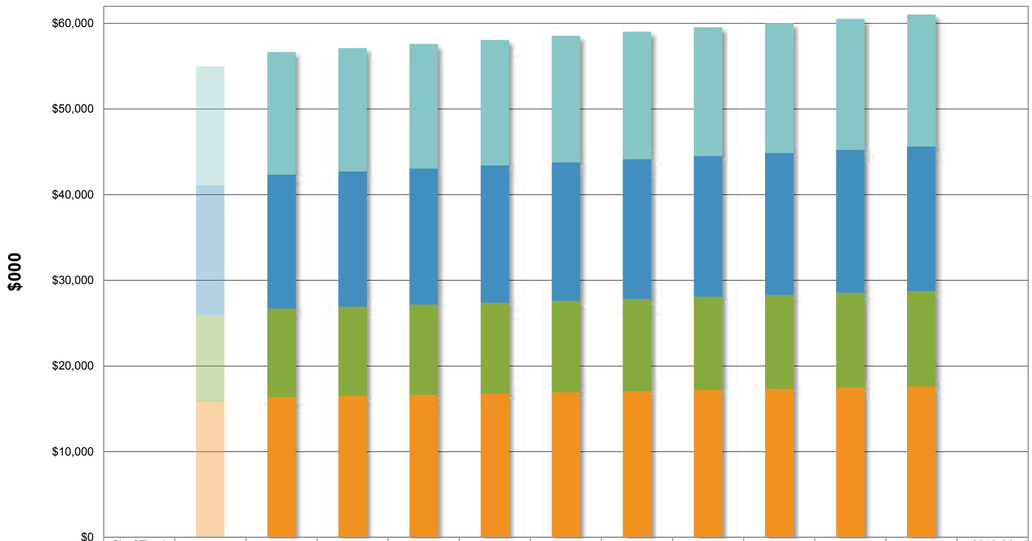
Renewals 10-year work and expenditure forecast

Resurfacing

The analyses given above provide varying levels of indicative renewal work for the future. This demonstrates the current difficulty of forecasting future renewal needs.

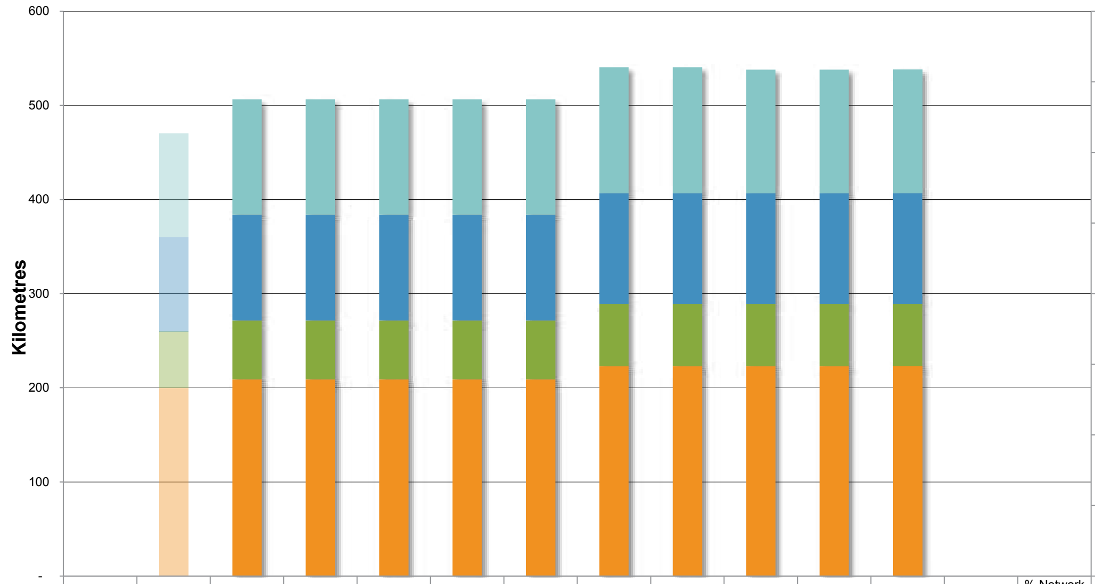
Considering the above renewal analyses and the current funding constraints being experienced by Auckland Transport and the Auckland Council, the recommended 10-year renewals needs are shown below. Note, however, that the actual renewals plan approved by Auckland Transport and the Auckland Council may differ from these network needs because of the impact of funding constraints. The 10-year resurfacing expenditure forecast is shown in Figure 4.2-20.

Figure 4.2-20 10-year resurfacing expenditure
Source: LTP budget model 12 April 2012 after refresh for AMP



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total
North	25%	13,927	14,303	14,422	14,542	14,664	14,786	14,910	15,034	15,160	15,286	15,414	148,521
Central	28%	15,108	15,637	15,766	15,897	16,029	16,161	16,295	16,430	16,567	16,704	16,843	162,329
West	18%	10,057	10,343	10,429	10,516	10,604	10,692	10,781	10,871	10,962	11,053	11,146	107,397
South	29%	15,888	16,366	16,502	16,639	16,778	16,918	17,058	17,201	17,344	17,488	17,634	169,928
Renewals (km)		0	507	507	507	507	507	541	541	538	538	538	5,228
TOTAL	100%	54,980	56,648	57,119	57,594	58,074	58,557	59,045	59,536	60,032	60,532	61,037	588,175

Figure 4.2-21 Resurfacing needs – quantity (km)



	Network Length	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	% Network renewed 2013-22
North	2,443	110	123	123	123	123	123	134	134	132	132	132	1,275	52%
Central	1,480	100	113	113	113	113	113	118	118	118	118	118	1,150	78%
West	805	60	63	63	63	63	63	66	66	66	66	66	643	80%
South	2,499	200	209	209	209	209	209	223	223	223	223	223	2,160	86%
TOTAL	7,227	470	507	507	507	507	507	541	541	538	538	538	5,228	72%

Table 4.2-21 Resurfacing needs – chipseal (km)

Area	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22
North	88-97	88-97	88-97	88-97	88-97	95-100	95-100	90-100	90-100	90-100
Central	55-60	55-60	55-60	55-60	55-60	55-60	55-60	55-60	55-60	55-60
West	50-50	50-50	50-50	50-50	50-50	50-55	50-55	50-55	50-55	50-55
South	164-176	164-176	164-176	164-176	164-176	170-183	170-183	170-183	170-183	170-183
Auckland Transport	357-383	357-383	357-383	357-383	357-383	370-398	370-398	365-398	365-398	365-398

Table 4.2-22 Resurfacing needs – asphaltic concrete (km)

Area	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22
North	27-33	27-33	27-33	27-33	27-33	33-40	33-40	33-40	33-40	33-40
Central	50-60	50-60	50-60	50-60	50-60	55-65	55-65	55-65	55-65	55-65
West	10-15	10-15	10-15	10-15	10-15	12-15	12-15	12-15	12-15	12-15
South	35-43	35-43	35-43	35-43	35-43	42-51	42-51	42-51	42-51	42-51
Auckland Transport	122-151	122-151	122-151	122-151	122-151	142-171	142-171	142-171	142-171	142-171

Figure 4.2-21 shows the recommended resurfacing quantities for 10 years. Renewal quantities for 2011-12 are estimated as actual resurfacing achievements are not yet available.

Table 4.2-23 Resurfacing – unit rates

Treatment	$/sqm
Chipseal	6-7
Asphaltic concrete	20-25

This shows an annual resurfacing need of 507km until 2016-17. It increases to 541km for the next two years and drops to 538km for the last three years of the programme.

Table 4.2-21 and Table 4.2-22 show the resurfacing needs split between chipseal and asphaltic concrete surface types.

An analysis of resurfacing costs has indicated that the unit rates applicable for above surfacing types are within the ranges identified in the Table 4.2-23.

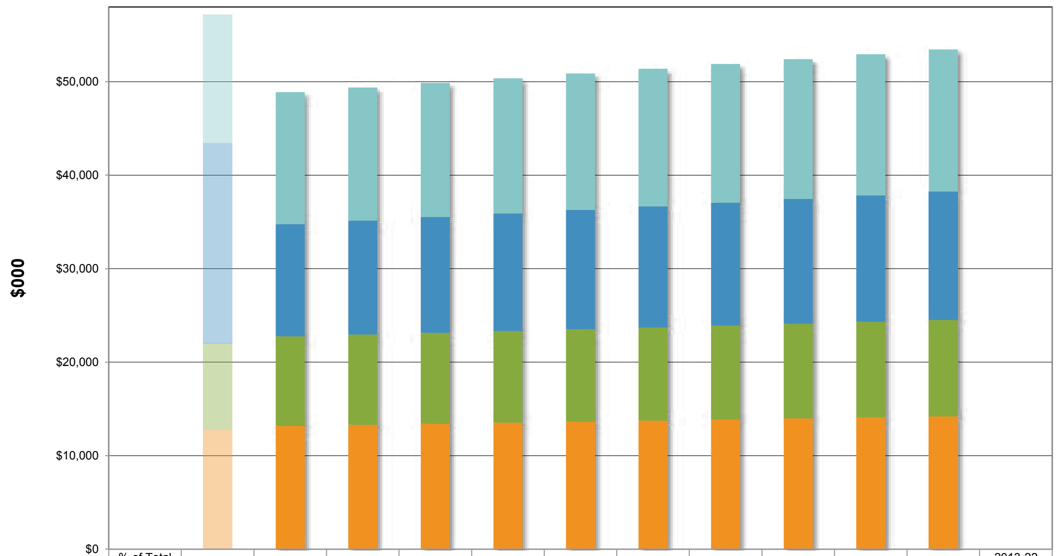
Rehabilitation

The analyses given above provide varying levels of indicative renewal work for the future. This demonstrates the current difficulty of forecasting future renewal needs.

Considering the above renewal analyses and the current funding constraints being experienced by Auckland Transport and the Auckland Council, the recommended 10-year renewals needs are shown below. Note however that the actual renewals plan approved by Auckland Transport and the Auckland Council may differ from these network needs because of the impact of funding constraints. Current annual rehabilitation length is less than one per cent of the total sealed network length.

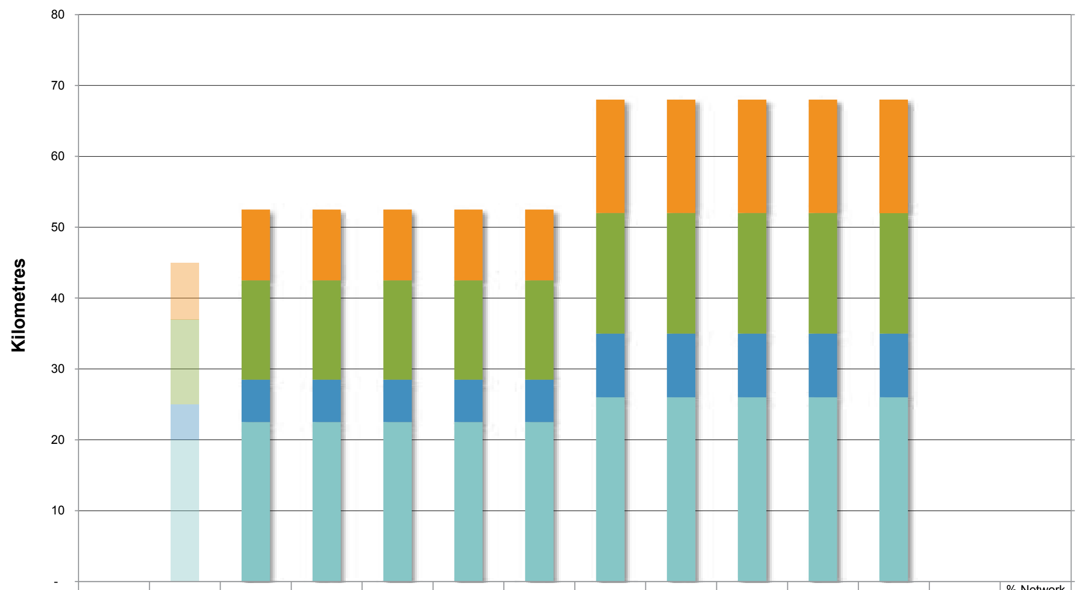
The 10-year rehabilitation expenditure forecast is shown in Figure 4.2-22.

Figure 4.2-22 10-year rehabilitation expenditure
Source: LTP Budget Model 12 April 2012 after refresh for AMP



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total
North	29%	13,744	14,118	14,236	14,355	14,475	14,596	14,718	14,841	14,964	15,089	15,216	146,608
Central	25%	21,434	12,016	12,200	12,385	12,572	12,760	12,950	13,142	13,335	13,530	13,727	128,618
West	19%	9,284	9,563	9,642	9,722	9,803	9,885	9,967	10,050	10,134	10,218	10,304	99,289
South	27%	12,741	13,191	13,301	13,411	13,522	13,634	13,747	13,861	13,976	14,091	14,208	136,941
Renewals (km)		0	53	53	53	53	53	68	68	68	68	68	603
TOTAL	100%	57,202	48,888	49,379	49,873	50,372	50,875	51,382	51,894	52,410	52,930	53,455	511,457

Figure 4.2-23 Rehabilitation – quantity (km)



	Network Length	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	% Network renewed 2013-22
North	2,499	8	10	10	10	10	10	16	16	16	16	16	130	5%
Central	805	12	14	14	14	14	14	17	17	17	17	17	155	19%
West	1,480	5	6	6	6	6	6	9	9	9	9	9	75	5%
South	2,443	20	23	23	23	23	23	26	26	26	26	26	243	10%
TOTAL (km)	7,227	45	53	53	53	53	53	68	68	68	68	68	603	8%

Table 4.2-24 Rehabilitation needs (km)

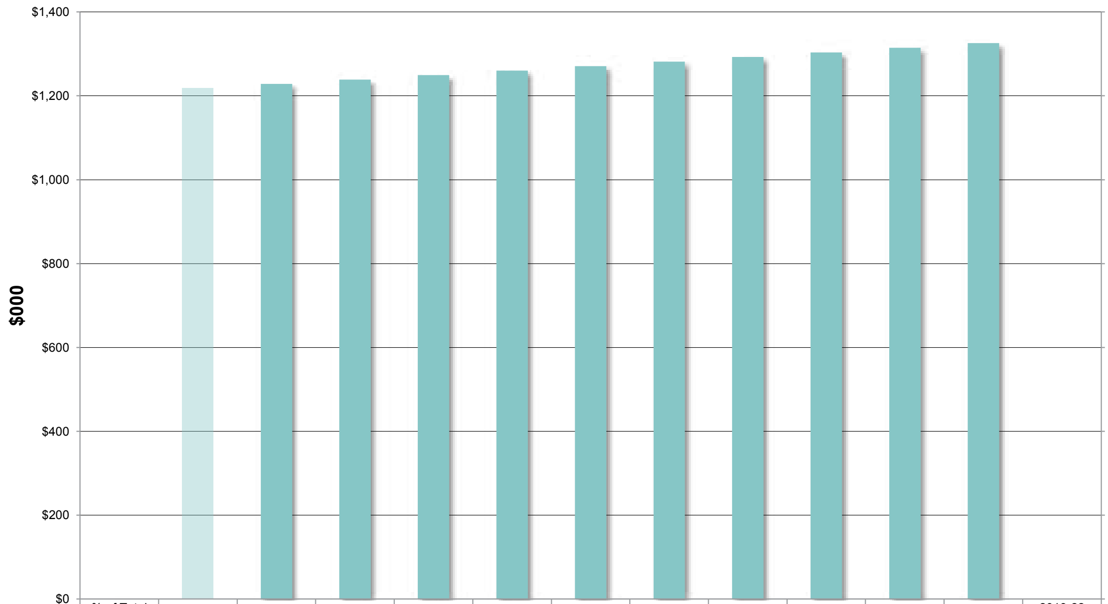
Area	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22
North	8-12	8-12	8-12	8-12	8-12	14-18	14-18	14-18	14-18	14-18
Central	13-15	13-15	13-15	13-15	13-15	16-18	16-18	16-18	16-18	16-18
West	5-7	5-7	5-7	5-7	5-7	8-10	8-10	8-10	8-10	8-10
South	20-25	20-25	20-25	20-25	20-25	23-29	23-29	23-29	23-29	23-29
Auckland Transport	**46-59**	**46-59**	**46-59**	**46-59**	**46-59**	**61-75**	**61-75**	**61-75**	**61-75**	**61-75**

Figure 4.2-23 shows the recommended rehabilitation quantities for next 10 years. The recommended annual average rehabilitation quantity is 53km until 2016-17, increasing to 68km per year for the last five years of the programme. Rehabilitation quantities for 2011-12 are estimated as actual rehabilitation achievements are not yet available.

The rehabilitation quantity beyond year one is tentative and quantities are finalised in the respective year subsequent to field validation. The recommended range of rehabilitation quantities is shown in Table 4.2-24.

The unit rates applicable to pavement rehabilitation are shown in Table 4.2-25.

Figure 4.2-24 10-year unsealed roads remetalling expenditure
Source: LTP Budget Model 12 April 2012 after refresh for AMP



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total
North	100%	1,218	1,229	1,239	1,250	1,260	1,271	1,282	1,293	1,304	1,315	1,326	12,768
Central	0%												
West	0%												
South	0%												
TOTAL	100%	1,218	1,229	1,239	1,250	1,260	1,271	1,282	1,293	1,304	1,315	1,326	12,768

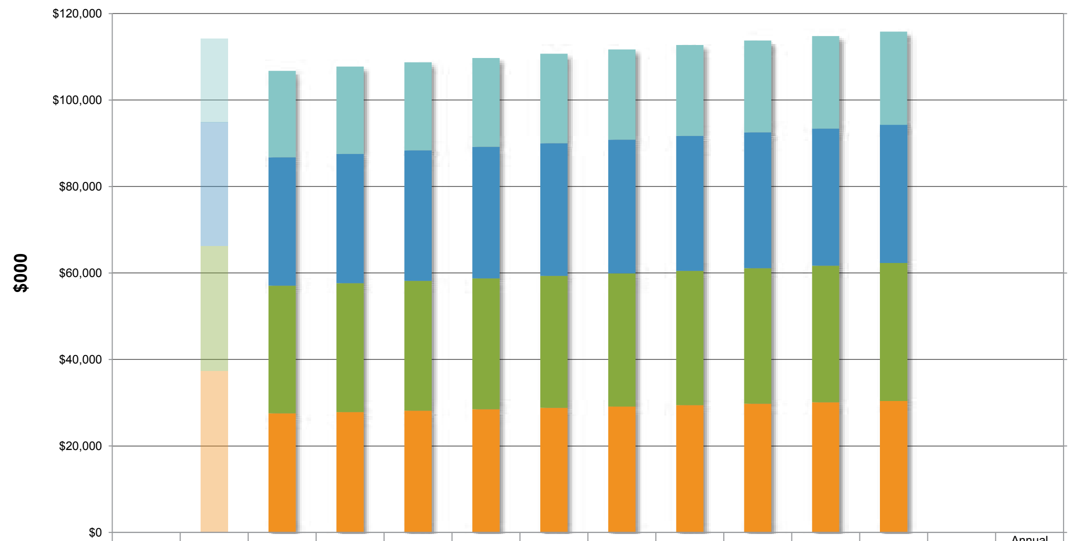
Table 4.2-25 Rehabilitation unit rates

Treatment	Urban range $/m²		Average	Rural range $/m²		Average
Structural asphaltic concrete rehabilitation	182	296	239	-	-	-
Foam bitumen stabilisation	95	108	101	78	91	84
Lime / cement stabilisation	48	89	69	32	72	52
Granular rehabilitation	54	102	78	38	84	61

Unsealed road renewals

The expected annual costs shown in Figure 4.2-24 include the general provision of 0.85 per cent for growth-driven additional costs applied throughout this plan. While it could be argued that the length of the unsealed network is unlikely to grow by this amount, the increases are believed justified because of Auckland Council's reduction in funding of seal extension. Seal extensions are unlikely to be funded even when they are economically viable. Not all legacy councils budgeted remetalling costs separately from other pavement maintenance costs. The 10-year expenditure forecast of unsealed road remetalling is shown in Figure 4.2-24 .

Figure 4.2-25 Road pavements 10-year renewal expenditure by area
Source: LTP Budget Model 12 April 2012 after refresh for AMP



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	Annual Average $ / area network
North	19%	19,341	20,020	20,186	20,353	20,522	20,692	20,864	21,037	21,211	21,387	21,564	207,836	$8,508
Central	28%	28,629	29,672	29,918	30,165	30,415	30,666	30,920	31,176	31,434	31,695	31,957	308,019	$20,809
West	28%	28,889	29,535	29,782	30,032	30,284	30,538	30,794	31,053	31,313	31,576	31,841	306,747	$38,110
South	26%	37,338	27,538	27,851	28,167	28,485	28,807	29,131	29,458	29,787	30,120	30,455	289,798	$11,597
Renewals (km)		0	559	559	559	559	559	609	609	606	606	606	5,830	
TOTAL	100%	114,197	106,765	107,737	108,717	109,706	110,703	111,709	112,723	113,746	114,777	115,817	1,112,400	$15,393

Total road pavements renewals expenditure summary

The 10-year expenditure forecast of road pavement renewals for the maintenance areas is shown in Figure 4.2-25.

The 10-year expenditure forecast for the three main types of road pavement renewals is shown in Figure 4.2-26.

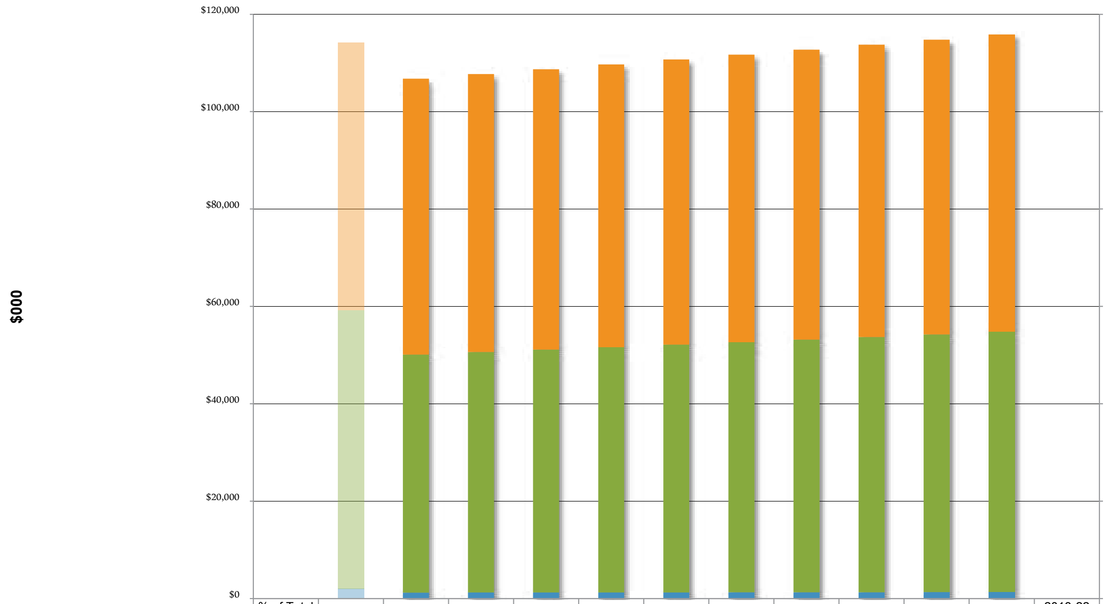
State highway revocations

There are about 54km of roads which the NZTA intends to revoke of the state highway designation. These roads will be under the ownership of Auckland Transport. All of these roads, with the possible exception of SH18A, will remain arterial roads. These will all be part of designated over-dimension bypass routes. The maintenance and renewal of these roads will require additional funding. The current annual renewal expenditure of the roads to be revoked is shown in Table 4.2-26.

Table 4.2-26 State highway revocation roads – annual renewal expenditure

State highway revocation sites	Length (km)	Annual renewals expenditure ($ million)	Comments
SH16 at Parnell (Shipwright Lane and part of Parnell Rise)	3.92	–	Includes professional services
SH16 at Westgate (NW Motorway – Hobsonville Road Underpass to old Brigham Creek Road intersection)	0.19	–	Does not include professional services
SH17 from Puhoi to Albany (Fowler Access Road to Bush Road – Albany)	31.5	0.8	Includes professional services
SH18 at Hobsonville (Squadron Drive Underpass to Hobsonville Road Underpass)	5.6	0.515	Does not include professional services
SH18A at Upper Harbour Drive (Albany Highway interchange to William Pitcher Place)	4.27	0.4	Does not include professional services
SH20 at Manukau (Redoubt Road, Great South Road, Manukau Station Road, Wiri Station Road, Roscommon Road from Redoubt Road to Puhinui Road Interchange)	5.75	0.682	Does not include professional services
Total	**51.23**	**2.397**	

Figure 4.2-26 Road pavements 10-year renewal expenditure by activity
Source: LTP Budget Model 12 April 2012 after refresh for AMP



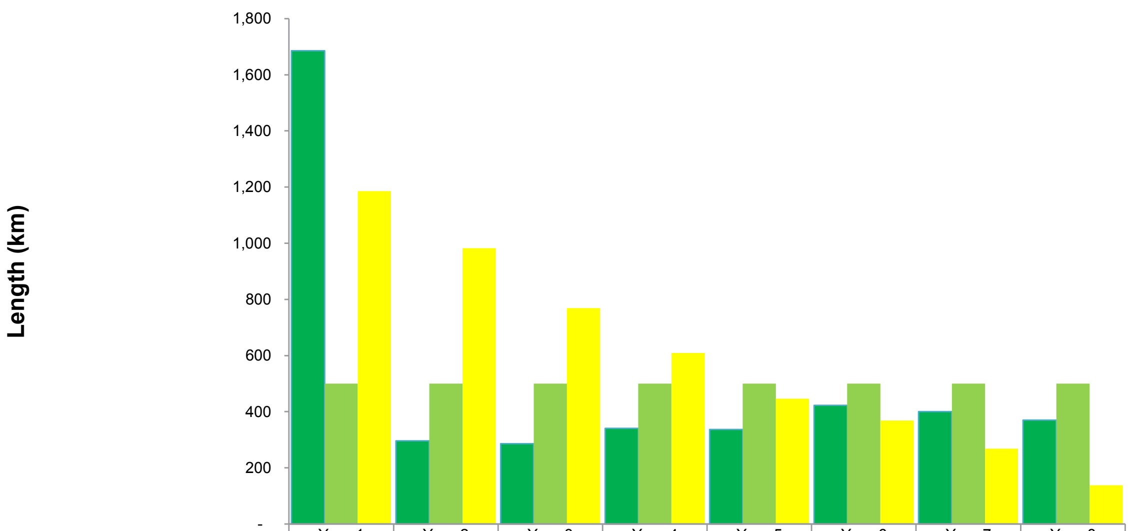
	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total
Sealed road -surface Renewals	53%	54,980	56,648	57,119	57,594	58,074	58,557	59,045	59,536	60,032	60,532	61,037	588,175
Sealed road - Pavement Base Renewals	46%	57,202	48,888	49,379	49,873	50,372	50,875	51,382	51,894	52,410	52,930	53,455	511,457
Unsealed Road Renewals	1%	2,014	1,229	1,239	1,250	1,260	1,271	1,282	1,293	1,304	1,315	1,326	12,768
Renewals (Km)		0	559	559	559	559	559	609	609	606	606	606	5,830
TOTAL	100%	114,197	106,765	107,737	108,717	109,706	110,703	111,709	112,723	113,746	114,777	115,817	1,112,400

Backlog of renewals

Figure 4.2-27 shows an arithmetic analysis of pavement backlog. Any surface that has exceeded its design life is considered to be a backlog.

This is compared against the proposed rate of renewal over the analysis period, and the corresponding backlog is calculated. As per the analysis above, at the proposed rate of renewal, the backlog should be cleared by year eight.

Figure 4.2-27 Theoretical resurfacing backlog based on surface life



	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
Length becoming Backlog Each Year	1,685	297	286	341	337	422	400	370
Annual Renewals	500	500	500	500	500	500	500	500
Backlog (km)	1185	982	768	609	446	369	269	138

This is a very basic analysis and gives an indication of resurfacing backlog based on expected life. However, it does not account for:

- Increased rate of deterioration due to over-weight and over-dimension vehicles in urban areas and logging routes in rural areas
- Impact of trenching and other utility works
- Holding seals and other underlying pavement issues which can result in early surface renewal
- Other factors including traffic growth and soil condition, that affect renewal needs.

Hence, the backlog shown here is only indicative. The data is inadequate to perform a similar analysis for pavement base renewals. Comprehensive asset data and more robust analysis is required to fill these gaps.

4.2.12 New works

New works plan

New pavements are built to meet the needs of growth and LOS. Growth and demand is discussed in Section 3 of this plan. In addition to the need to build "new roads", growth can drive the widening of existing pavements. Growth can also require the strengthening of pavements, as in the case of road pavements subject to increased heavy vehicle loadings.

Auckland Transport manages a significant network of unsealed roads. Seal extension has to be prioritised based on the costs of remetalling and grading, and the cost of operating vehicles on metalled roads. Seal extension is uneconomical for roads carrying traffic volumes under 150 vehicles per day.

The development of new works and major improvements is a multi-disciplinary and multi-faceted process. It requires a holistic view and considers multiple factors such as social benefits and costs to the wider communities that are served by the road networks. These factors provide the blue print for many capital improvement projects.

Capital new works – growth projects

The Local Government Act 2002 requires Auckland Council to identify the projects it is carrying out to meet the demands of growth. The growth and demand section of this plan includes this work in its recommendations for improvement. Distinguishing between growth-driven and LOS-driven improvements is difficult. Additional traffic resulting from growth can result in LOS below agreed levels. The work to address this problem can be identified as either growth-driven or LOS driven. It is easier to make the distinction when a LOS is deliberately changed, such as through the provision of cycleways or the introduction of smoother surfaces.

Capital new works – LOS projects

In addition to identifying growth-related capital improvements, the LGA 2002 also requires the council to identify those capital improvements required to enable it to meet its agreed LOS. Safety improvements can generally be regarded as LOS projects. Exceptions occur when they are the consequence of new safety strategies, government direction or statutes, e.g. in the Government's Road Safety 2020 Strategy and the Road Safety Action Plan.

Vested assets

Roads, because of their fundamental role of providing access to and from, and often within properties, are directly affected by most changes in land use and by all subdivisions. Some of these effects may be very minor, but some can be significant – either locally or at a network level. Developers pay the full cost of road development within new subdivisions, with new assets being vested to Auckland Council upon completion and the grant of subdivision titles.

Auckland Transport specifies minimum design criteria and checks construction at critical stages. Where a development fronts an existing legal road, improvements will often need to be made to that road, and sometimes to other parts of the network; for example, new seal, footpaths, kerb and channel, access improvements, increased seal width, and improved sight lines.

For each development's resource consent process, the Council considers the need for consequential road improvements directly associated with the development. This applies whether the proposal is for residential, industrial, commercial, or rural use. Where improvements are justified, engineering staff seek to have appropriate conditions inserted into consents and an agreement is made on cost sharing.

The issues relating to new works and improvements affecting road pavements and surfaces are shown in Table. 4.2-27.

Table 4.2-27 Significant road improvement issues

Issue	North	West	Central	South
Insufficient and/or inconsistent carriageway widths and/or shoulder widths to meet current LOS	✓			✓
The need for funding to allow the most cost-efficient resolution of issues				✓
Provision of sealed surfaces as the lowest lifecycle cost option for heavily trafficked metal roads	✓			✓
Demand-driven growth creating the need for existing capacity on existing routes	✓			✓

New works programmes

New works and improvement projects include all phases of those works that follow the investigation and scoping phases. Investigation and scoping are regarded as separate overhead costs. A significant feature of many new works projects is the need to acquire additional land for the project. Land acquisition is rarely simple and is often a very protracted process; it can reasonably be expected to be the longest part of a major project.

Auckland Transport manages property centrally through its property team.

Capital new works forecast

The capital new works expenditures contained in this section are those of the Auckland Transport financial system (SAP) as at April 2012.

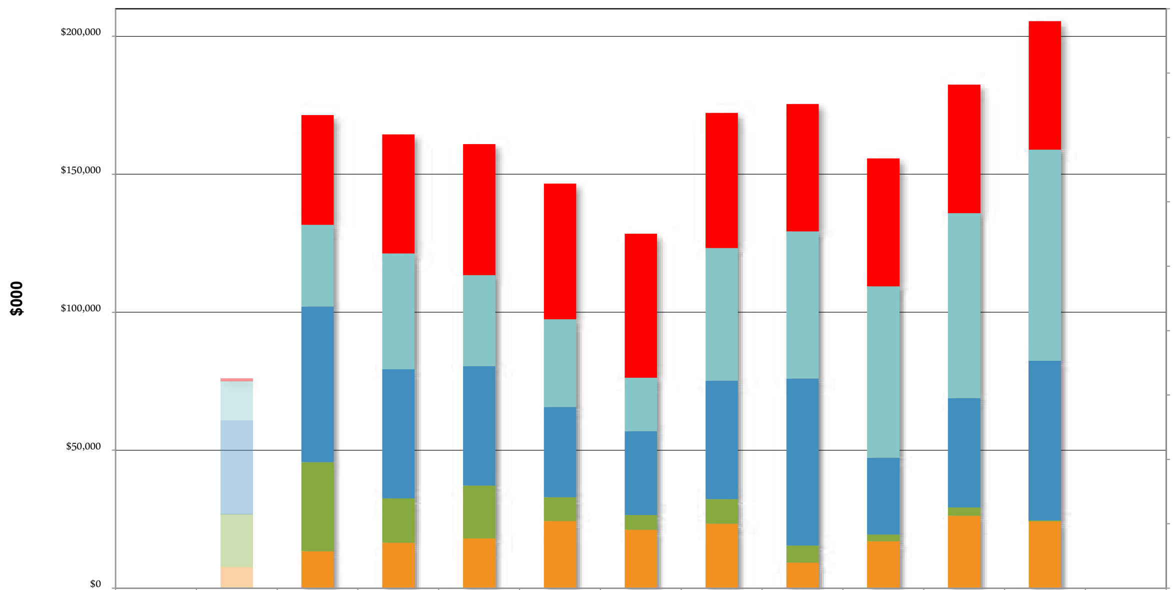
The 10-year capital new works expenditure for road pavements is $1,663 million, which is 53 per cent of the total road pavements expenditure.

The 10-year expenditure forecast for capital new works is shown in the Figure 4.2-28.

4.2.13 Disposal plan

The carriageway disposal plan is concerned with the removal of carriageway assets from the network. It is important to distinguish its function from the management plans for the reuse of debris. The latter are generated from carriageway maintenance operations, such as materials dugout, failed base course, milled pavement and recyclable asphaltic concrete.

Figure 4.2-28 Road pavement 10-year capital new works expenditure
Source: LTP Budget Model 12 April 2012 after refresh for AMP



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total
Region Wide	28%	1,067	39,765	43,105	47,480	49,180	52,180	48,930	46,180	46,380	46,580	46,580	466,356
North	28%	14,233	29,590	42,002	32,947	31,771	19,347	48,079	53,274	62,073	66,990	76,428	462,501
Central	26%	33,923	56,400	46,754	43,329	32,689	30,399	42,892	60,589	27,852	39,635	57,973	438,512
West	6%	19,127	32,276	16,074	19,129	8,656	5,351	8,923	6,164	2,500	3,000	200	102,274
South	12%	7,747	13,411	16,496	18,022	24,325	21,160	23,382	9,243	16,958	26,239	24,333	193,569
Total	100%	76,097	171,442	164,431	160,905	146,621	128,436	172,207	175,450	155,763	182,444	205,513	1,663,211

The carriageway disposal plan involves the permanent removal of the services provided by the carriageway in that location. Assets may become surplus to requirements for any of the following reasons:

- Under-utilisation
- Obsolescence
- Provision exceeds required LOS
- Assets are replaced before their predicted economic life expires
- Upgrading or operating is uneconomic
- Policy changes
- Service is provided by other means (e.g. private sector involvement).

In summary, the Auckland Council cannot determine in advance whether any road, even a paper road, will be stopped.

If a road is diverted or realigned rather than removed from the network, the particular provisions around road stopping may not apply.

Private property is often purchased for specific road improvements. Where there is land surplus to requirements this will be subdivided off and offered for sale. There are specific provisions within the Local Government Act that must be followed when land is sold.

Table 4.2-28 Road pavements disposal needs

Road disposal need	Description
Stop a section of road to allow a new limited access arterial link or motorway to be built	Currently most projects requiring these disposals are managed by the NZTA state highway division. Auckland Transport has not compiled a schedule or programme for these disposals. All consultation with respect to them is carried out as part of the planning processes for each new road construction by NZTA
Unformed legal road (often referred to as paper roads)	As the roads are owned by Auckland Council, Auckland Transport has only an advisory role during the disposal process. The principal controls around road disposal are:
	Section 342 of the Local Government Act 1974
	The necessity for Minister of Lands' prior consent to the stopping of any rural road
	Part 6 (Sect 75) of the Local Government Act 2002, which stipulates how the council must make decisions
	The requirement that every land title must have a legal access to it
	The Public Works Act 1981, which contains provisions relating to the sale of land and the offer of surplus land back to the original owners

4.2.14 Summary of 10-year network needs

The 10-year expenditure summary for road pavements is shown in Figure 4.2-29.

Notes on expenditures in Figure 4.2-29:

- The proposed 10-year capital new works expenditures contained in this section are those of the Auckland Transport financial system (SAP) as at April 2012
- The proposed 10-year base expenditure for operations, maintenance and renewals includes an annual growth factor of +0.85 per cent to allow for consequential OPEX and consequential renewals from growth in the network and growth in demand for services.

State highway revocations

NZTA intends to revoke the state highway designation on about 54km of roads. These roads will be under the ownership of Auckland Transport. All of these roads, with the possible exception of SH18A, will remain arterial roads. These will be part of designated over-dimension bypass routes. The maintenance and renewal of these roads will require additional maintenance funding of $2.5 million and renewal funding of 2.4 million per year.

4.2.15 Approved Long Term Plan Envelope

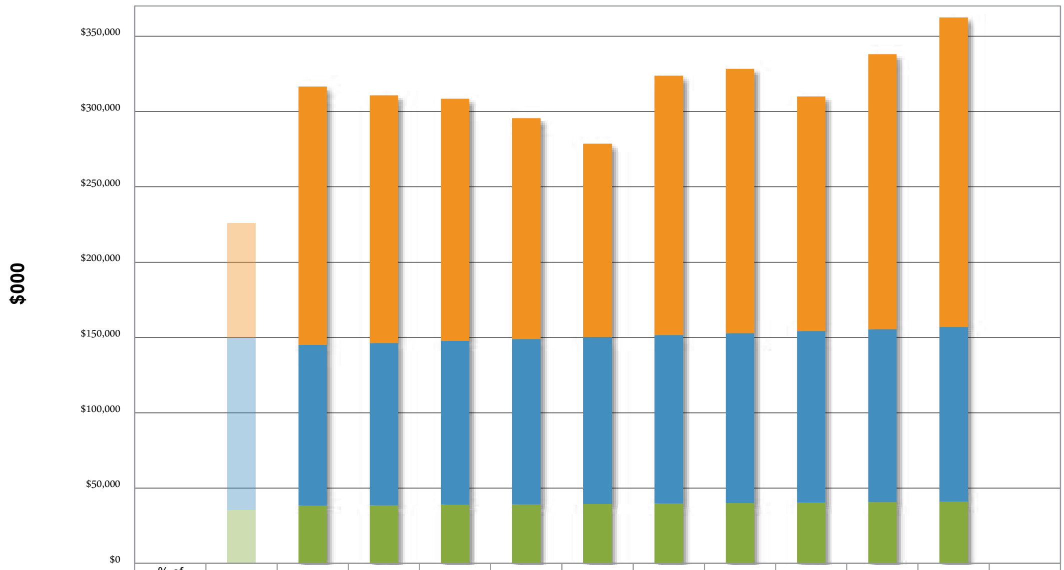
This section compares the approved LTP envelope for OPEX and renewals with the road pavements network needs as determined by this AMP at a regional level and identifies the likely impacts of any variances. Revenue and funding incomes to Auckland Transport (from Auckland Council ratepayers and NZTA government subsidies and the like) are allocated through the approved Long Term Plan budgets. The LTP was adopted on 28 June 2012.

OPEX impacts

Based on the information in Table 4.2-29, road pavements operational expenditure shows variance between the LTP allocated budgets and the AMP needs. The LTP allocated budget for road pavements OPEX has a 10-year shortfall of $65.5 million (16 per cent reduction) compared to the network needs determined by this AMP.

However it is anticipated that the LTP will require further efficiency savings and as a result, this funding gap may be increased.

Figure 4.2-29 Road pavements 10-year expenditure summary



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total
CAPEX New Works	52%	76,097	171,442	164,431	160,905	146,621	128,436	172,207	175,450	155,763	182,444	205,513	1,663,211
Renewals	35%	114,197	106,765	107,737	108,717	109,706	110,703	111,709	112,723	113,746	114,777	115,817	1,112,400
Operations & Maintenance	13%	35,498	38,305	38,608	38,914	39,223	39,534	39,848	40,165	40,484	40,806	41,131	397,017
TOTAL	100%	225,792	316,511	310,776	308,537	295,550	278,673	323,763	328,338	309,992	338,027	362,461	3,172,628

Table 4.2-29 Variance between LTP approved budget and AMP network needs for road pavements (all un-inflated)
Source: LTP Budget Model 12 April 2012 after refresh for AMP and revised LTP Budget Model 28 June 2012

Road pavements	10-year total LTP approved budget ($000s un-inflated)	10-year total AMP network needs ($000s un-inflated)	Variance 10-year total ($000s un-inflated)
Operations and maintenance	**331,521**	**397,017**	**-65,496**
Renewals	**1,081,250**	**1,112,400**	**-31,150**
Road pavements total	**1,412,770**	**1,509,417**	**-96,646**

Renewals impacts

The LTP allocated budget for road pavements capital renewals has a 10-year shortfall of $31.5 million (3 per cent reduction) compared to the network needs determined by this AMP. The approved LTP budget envelope appears to be insufficient to reduce the current levels of deferred renewals. The shortfall of $31.2 million equates to a reduction of approximately 148km of resurfacing and 17km of rehabilitation of road pavements over the 10 years of the plan.

Further efficiency savings

As required by the approved LTP, a further reduction in OPEX of $18.6 million per year, reducing to nil by 2016/17, will need to be allocated against asset related operational budgets. The impact of this further reduction on road pavements operational budgets is yet to be assessed and finalised.

Monitoring and management of Long Term Plan consequences

The consequences resulting from these variances will be monitored and reported as appropriate.

CAPEX new works

CAPEX new works contained in this AMP are derived from draft LTP listings as at April 2012 and are produced in section 4.2.12.

The capital new works programme has been further refined and adopted in late June 2012. Details of this adopted programme are contained in the LTP.

AMP inflation effects

Un-inflated and inflated road pavements needs for the AMP are shown in Table 4.2.30.

LTP inflation effects

Un-inflated and inflated road pavements budgets from the LTP are shown in Table 4.2-31.

Table 4.2-30 Un-inflated and inflated road pavements AMP needs

Source: LTP Budget Model 12 April 2012 after refresh for AMP and revised LTP Budget Model 28 June 2012

UN-INFLATED expenditure ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M		38,305	38,608	38,914	39,223	39,534	39,848	40,165	40,484	40,806	41,131	397,017
Renewal road base		55,702	56,240	56,783	57,330	57,882	58,438	59,000	59,566	60,137	60,712	581,789
Renewal AC		30,183	30,439	30,698	30,959	31,222	31,488	31,755	32,025	32,297	32,572	313,640
Renewal Chip		20,880	21,058	21,237	21,417	21,599	21,783	21,968	22,155	22,343	22,533	216,971
Road pavements total		145,070	146,345	147,631	148,929	150,237	151,557	152,888	154,230	155,583	156,948	1,509,417
AC Inflator	OPEX	3.30%	3.30%	3.30%	3.30%	3.50%	3.60%	3.10%	3.10%	3.30%	3.60%	n/a
AC Inflator	CAPEX	3.90%	3.40%	2.80%	2.90%	3.10%	3.30%	3.50%	3.70%	4.00%	4.00%	n/a
INFLATED expenditure ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M		39,569	41,198	42,895	44,749	46,727	48,559	50,462	52,541	54,866	57,293	478,859
Renewal road base		57,874	60,420	62,711	65,152	67,818	70,730	73,908	77,378	81,245	85,304	702,540
Renewal AC		31,360	32,702	33,903	35,183	36,582	38,110	39,780	41,602	43,634	45,765	378,622
Renewal Chip		21,694	22,623	23,454	24,339	25,307	26,364	27,519	28,780	30,185	31,660	261,924
Road pavements total		150,497	156,943	162,963	169,423	176,434	183,763	191,669	200,301	209,930	220,022	1,821,945

Table 4.2-31 Un-inflated and inflated road pavements LTP budgets

Source: LTP Budget Model 12 April 2012 after refresh for AMP and revised LTP Budget Model 28 June 2012

UN-INFLATED expenditure ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M		31,732	32,040	32,351	32,665	32,982	33,301	33,623	33,947	34,275	34,605	331,521
Renewal road base		52,614	53,146	53,683	54,224	54,770	55,321	55,876	56,436	57,000	57,570	550,639
Renewal AC		30,756	31,018	31,281	31,547	31,815	32,086	32,359	32,634	32,911	33,191	319,599
Renewal Chip		20,307	20,479	20,653	20,829	21,006	21,184	21,365	21,546	21,729	21,914	211,012
Road pavements total		135,409	136,683	137,969	139,265	140,573	141,892	143,222	144,563	145,915	147,279	1,412,771
AC Inflator	OPEX	3.30%	3.30%	3.30%	3.30%	3.50%	3.60%	3.10%	3.10%	3.30%	3.60%	n/a
AC Inflator	CAPEX	3.90%	3.40%	2.80%	2.90%	3.10%	3.30%	3.50%	3.70%	4.00%	4.00%	n/a
INFLATED expenditure ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M		32,779	34,190	35,661	37,267	38,983	40,580	42,243	44,058	46,084	48,203	400,048
Renewal Road base		54,666	57,096	59,288	61,622	64,172	66,956	69,995	73,312	77,008	80,888	665,003
Renewal AC		31,956	33,323	34,547	35,851	37,277	38,835	40,535	42,392	44,463	46,634	385,815
Renewal Chip		21,099	22,001	22,810	23,671	24,612	25,640	26,763	27,989	29,356	30,790	254,731
Road pavements total		140,499	146,610	152,306	158,411	165,044	172,011	179,536	187,752	196,911	206,515	1,705,597

4.2.16 Revenue plan

Revenue and funding incomes to Auckland Transport are contained in Auckland Council's SAP financial management system. The transparency and completeness of allocations requires review and confirmation. NZTA's financial contributions, revenue from the Auckland Council and development contributions are budgeted separately from the works they relate to.

The NZTA provides financial assistance for all maintenance, renewal and new pavement works on behalf of the Government. The procedures associated with this financial assistance, commonly called 'subsidy', are detailed in the NZTA Programme and Funding Manual. In summary:

Maintenance	Subsidised at the base rate (43 per cent from July 2012)
Approved renewals	Subsidised at the base rate (43 per cent from July 2012)
Approved new works and improvements	Subsidised at the base rate plus 10 per cent (53 per cent; but 58 per cent for new works from July 2012)

Operations and maintenance revenue

Roads operations and maintenance are normally financially assisted (subsidised) by NZTA. The rules around NZTA subsidies are contained in the organisation's Programme and Funding Manual. The rate for maintenance, known as the base rate, is 43 per cent from July 2012.

Capital renewals revenue

Road renewals are normally subsidised by NZTA. Renewals are funded at the base rate detailed above.

Capital new works revenue

New carriageway works are normally subsidised at the base rate plus 10 per cent; but at 15 per cent for new works from July 2012, provided that NZTA's criteria are met.

4.2.17 Key improvement initiatives

Key improvement initiatives relating to the road pavements section of this asset management plan are shown in Table 4.2-32.

Table 4.2-32 Key improvement initiatives

Improvement Initiative number	Description	Priority/ importance
Carriageway 1	Review and update road hierarchy descriptors and definitions, providing and using a single set of understood names regionally	High
Carriageway 2	Establish / determine the criticalities and vulnerabilities of the network for key events, and use these to inform maintenance, renewal, improvement and disposal programmes	High
Carriageway 3	Develop and populate the performance measures and condition targets and achievements tables	High
Carriageway 4	Assess and record pavement growth characteristics and allow for the effects of growth in budget forecasts	Medium
Carriageway 5	Compare historical expenditure with changes in asset performance and condition year by year	Medium
Carriageway 6	Review and correct as appropriate the sealing dates for all very old sealed surfaces	High
Carriageway 7	Review AADTs on all heavily trafficked metal roads	URGENT
Carriageway 8	Institute programme to annually collect and review traffic data for heavily trafficked metal roads	High
Carriageway 9	When Auckland Transport models the whole of its network, consider whether it will be more beneficial to model the network in sub-areas and combine those results, or to carry out the analysis based on broader groupings, such as all sealed rural roads	High
Carriageway 10	Incorporate detailed considerations of asset risk, criticality, and network resilience in future updates of this plan	Medium
Carriageway 11	Develop and maintain a schedule of disposals	Low
Carriageway 12	Prepare a schedule of uneconomic road facilities	Low
Carriageway 13	Produce a rough forecast of the pavements renewal programme similar to that produced for reseals	Very high
Carriageway 14	Review the future use and performance of OGPA on Auckland Transport's road network	Medium
Carriageway 15	As this AMP is developed and Auckland Transport practices evolve, it is expected that the basis for the unsealed road grading schedules, and possibly the schedules themselves, will be included in the AMP	Medium
Carriageway 17	Develop a unified "Sealed resurfacing decision tree" that is applicable across the whole Auckland Transport network	High
Carriageway 18	Form an Auckland Transport view on the determination, maintenance and renewal of "uneconomic" road assets	Low
Carriageway 19	Consolidate separate measurements of pavement layers and pavement surface condition in RAMM. Assign an overall summary of condition, based on a score of 1-5. This process has not yet been carried out in RAMM for the Auckland Transport network, and it requires consideration of and agreement on the weighting given to the factors and their combination	High

4.3 Contents

4.3 Bridges and structures

4.3.1 The service Auckland Transport provides

Bridges and structures enable people and freight to move safely, reliably and efficiently across physical barriers on the road network. An Auckland Transport objective is that they are appropriate to carry the volumes and weights of traffic that wish to use the surrounding road, footpath and cycleway networks.

Details of the levels of service (LOS) being measured are provided in Section 2, Levels of Service. Several of the measures and targets in Table 4.3-1 are yet to be confirmed (TBC) or developed (TBD) and will be included in the improvement plan. The following measures represent operations performance for bridges.

4.3.2 Network overview

Auckland Transport manages and owns the region's 994 bridges and structures, comprised of 592 bridges, 356 major culverts, and 46 footbridges.

The term bridge is used to refer to all of the following structures:

Bridges	Structures commonly understood to be bridges by the general public. They provide a pathway over an obstacle with minimal interference to the obstacle – bridges do not have 'floors' as such
Major culverts	Fully enclosed pipes, of any cross-sectional shape placed in an obstacle (such as a waterway) to carry that obstacle under a road, path or railway. Major culverts are defined as cross-sectional area of 3.4 m^2 or more
Underpasses	Structures that convey people, stock or vehicles

Small and large culverts are covered separately in Section 4.12, Drainage.

The RAMM database does not identify any bridges as being shared with neighbouring authorities.

A preliminary review of map data shows that boundary road sections do not have bridges.

Bridges that carry railways and state highways across Auckland Council roads are the property of KiwiRail and NZTA respectively. Those that carry Auckland Transport roads across state highways or railways are owned by Auckland Transport and are included in this plan. In broad terms, the cost of constructing new bridges over other assets is generally the responsibility of the party requiring the work to be done.

The responsibility for pedestrian bridges across motorways and railway lines is as follows:

- NZTA for the structure over motorways
- Auckland Transport for the structure over railways (unless footbridge includes ramp access to station platform)
- Auckland Transport for the deck surface and above.

4.3.3 Network valuation

The value of the bridge network is shown in Table 4.3-2. (Refer to the appendices for the full valuation).

4.3.4 Network asset details

Auckland Transport has stewardship responsibilities for the bridge network. The type, number of assets and geographical spread is summarised in Table 4.3-3.

Legacy councils included 121 culverts that required special inspection in their major culverts lists, even though they did not quite reach the required size threshold. This is a sound asset management practice as the services these culverts provide have been reviewed and determined to be 'major'.

Table 4.3-1 Bridges levels of service

Level of service	Measure	Current performance	Target performance (indicative/ to be developed and agreed)
Assets are maintained in good condition	Percentage of bridges and major culverts in moderate or better (condition grade 3)	70% (96% of known assets)	TBC
	Percentage compliance with maintenance and cleaning schedules for bridges, traffic control structures and major culverts	TBC	100%
	No. of weight- and/or speed-restricted bridges reviewed annually	TBC	TBC
Increase the resilience of the network	Number of 'high risk' locations left unprotected	None – Compliance 100%	None – Compliance 100%

Table 4.3-2 Bridge valuation summary (as at 30 June 2011)

Source: Auckland Transport asset revaluation (30 June 2011)

Asset	Optimised replacement cost (ORC) $000s	Optimised depreciated replacement cost (ODRC) $000s	Annual depreciation (ADR) $000s
Road bridges	537,191	280,502	6,632

Table 4.3-3 Bridging summary

Source: Auckland Transport RAMM database (12 March 2012)

Asset	North	Central	West	South	Total	%
Bridge	279	83	66	164	592	60
Major culverts	154	54	24	124	356	36
Footbridge	16	10	7	13	46	5
Total	449	147	97	301	994	100

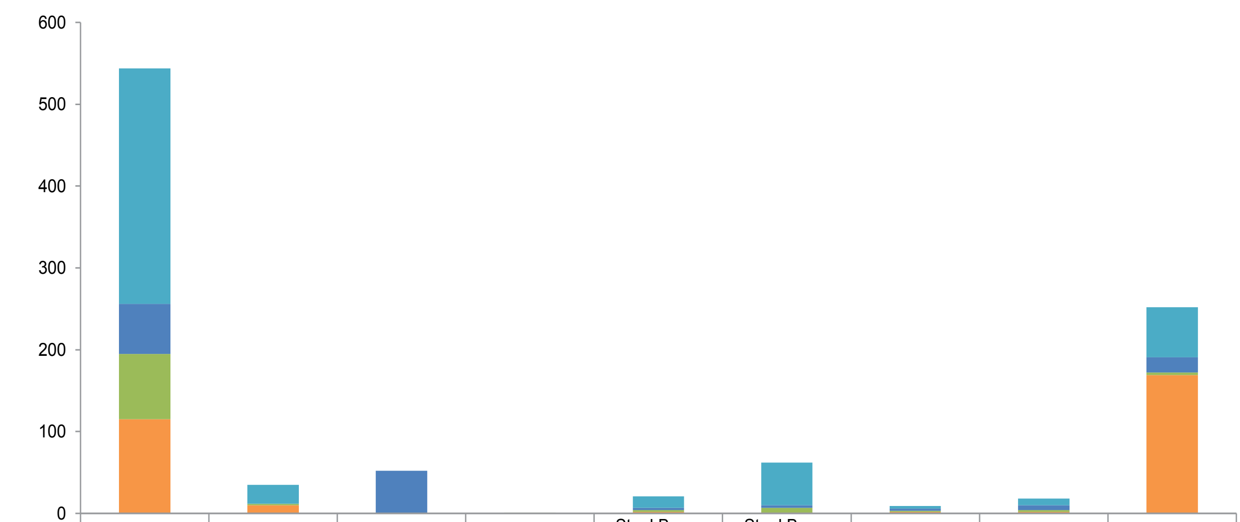
The bridges and structures database lists some bridges and culverts with incorrect centre-line lengths of greater than 1km. This data will be checked and updated.

There are some footbridges currently in RAMM that are owned by Auckland Council's Parks Sports and Recreation Group. These will be removed from the RAMM database and the council notified accordingly.

Figure 4.3-1 shows the material for bridges, major culverts and footbridges. The predominant bridge structure material is concrete. This includes the older reinforced concrete structures and modern pre-stressed and post-tensioned types. About 25 per cent of all bridges have unknown material types, particularly majority in the South area. There are also 18 timber bridges with eight located in the North, mainly in the rural areas.

Figure 4.3-1 Bridge material type by number

Source: Auckland Transport RAMM database (12 March 2012)



	Concrete	Culvert - Armco	Culvert - Major	Masonary Arch	Steel Beam Concrete Deck	Steel Beam Timber Deck	Steel	Timber	Unknown
North	288	23			14	52	3	8	61
Central	61		52		3	3	3	6	19
West	80	2		1	2	6	1	2	3
South	115	10			2	1	2	2	169

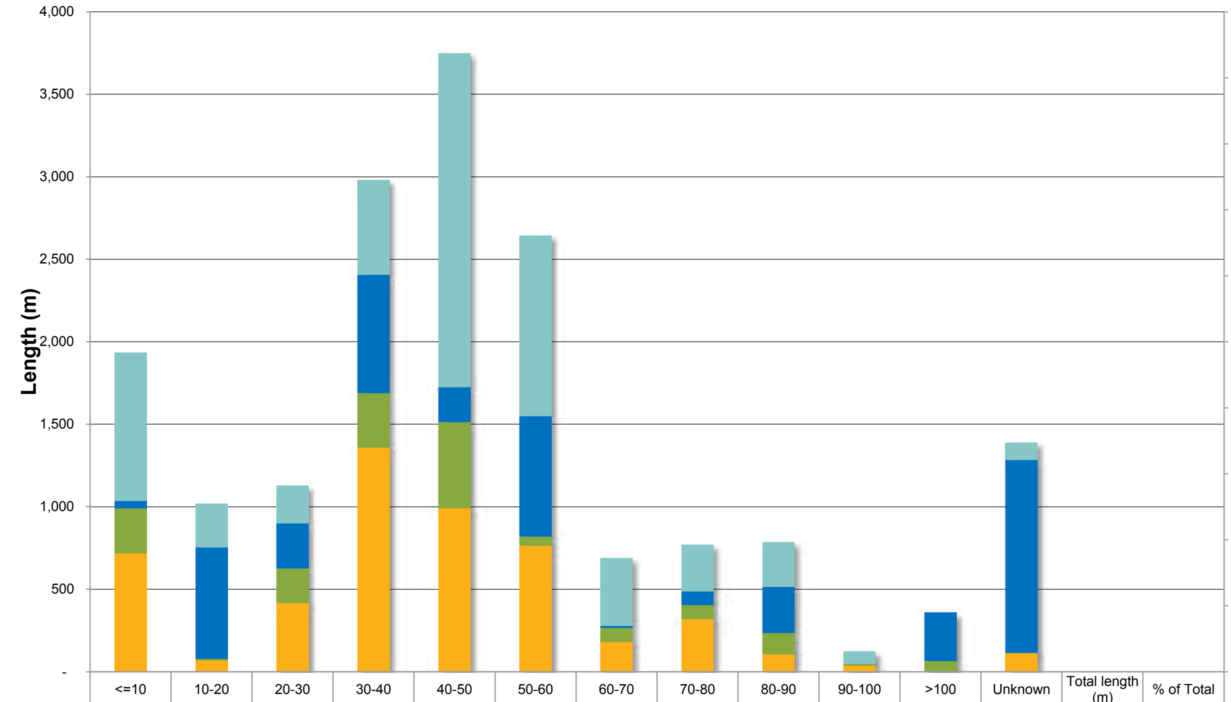
There is over 17km in bridges and structures, as shown in Figure 4.3-2, with the most assets located in the North and South areas. 53 per cent of bridge structures are between 30 to 60 years old. Eight per cent of the network by length has an unknown age.

Note that dummy dates may have been used for age data such as 1963 for many Rodney bridges. This will be corrected as part of a key improvement programme to improve the asset data quality in RAMM.

The expected useful asset lives for bridges and major culverts is shown in Table 4.3-4.

These are the normal expected useful lives and are used as default values when no better information is available. The current valuation alters the expected remaining useful lives on the basis of condition, which is assessed during the periodic technical inspection of each bridge.

Figure 4.3-2 Bridge age distribution by length
Source: Auckland Transport RAMM database (12 March 2012)



	<=10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100	>100	Unknown	Total length (m)	% of Total
North	900	265	230	575	2,026	1,096	413	284	271	77	0	106	6,243	36%
Central	43	674	273	718	211	730	12	84	281	0	296	1,170	4,492	26%
West	273	11	210	330	523	55	85	84	128	11	64	0	1,774	10%
South	719	68	416	1,358	990	764	180	319	106	36	0	113	5,069	29%
TOTAL (m)	1,935	1,018	1,129	2,981	3,750	2,645	690	771	786	124	360	1,389	17,578	100%

Table 4.3-4 Expected useful lives of bridges and major culverts (as at 30 June 2011)
Source: Auckland Transport asset revaluation (30 June 2011)

Bridge type (short title)	Description	Expected useful life
Concrete	Reinforced concrete bridge	} 60 to 110
	Pre-cast, pre-stressed concrete or post-tensioned concrete bridge	
Timber	Timber traffic bridges of all types	50 to 100
Steel	Steel bridges (steel beams or steel trough-truss)	60 to 100
ARMCO®	Corrugated galvanised steel (including multi-plate) culverts of all makes	40 to 100
Aluflo®	Corrugated and non-corrugated aluminium (including multi-plate) culverts of all makes	60 to 60
Timber walkway bridges	Lightweight timber walkway bridges, (including raised walkways over boggy or environmentally sensitive areas)	50 to 100

4.3.5 Asset data confidence

The RAMM database holds asset information for the bridging network, including condition rating information. The assessment of data confidence is based on the data confidence grading system and methodology described in Section 2.4.5 of the International Infrastructure Management Manual 2011.

Data confidence relates to both the accuracy and completeness of data. Table 4.3-5 illustrates Auckland Transport's confidence in the accuracy and completeness of its asset data.

The current overall confidence level of the bridge asset data is uncertain. The main issues are:

- Inconsistent methods of recording / describing data, including bridge materials
- Some incorrect data, such as bridge lengths and local descriptors
- Lack of construction dates
- Need for integration of the data management methods and practices of the legacy councils into one consistent and useable approach to data management.

Table 4.3-6 shows how complete the inventory data is for each sub-asset type. Condition information is relatively complete, whereas age-related data is only about 50 per cent complete for major culverts and footbridges. Auckland Transport intends to improve the data completeness through the planned condition assessment programme (refer to Section 4.3.6, condition assessment programme) and the planned improvement initiatives.

4.3.6 Asset condition

Condition rating

Condition rating surveys are carried out in conjunction with the periodic formal bridge inspections. Assessment of bridge condition and performance uses a condition grade rating system that includes structural defects and condition, corrosion and decay, element criticality, health and safety factors, and aesthetics / visual amenity of each structure and principal structural element. The assessment follows the guidelines contained in Transit NZ's (now NZTA) Bridge Inspection Manual.

Bridges are currently condition surveyed every two years with general inspections and every six years for detailed inspections. Rural culverts greater than 1m in diameter are condition surveyed along with road bridges. The RCM group manages the culverts of less than 1m diameter.

Bridge inspections have been completed for all bridges and condition rating is available but not updated in RAMM immediately following inspection.

Table 4.3-5 Bridge data confidence (as at 19 April 2012)

Data attribute	Very uncertain	Uncertain	Reliable	Highly reliable
Asset quantity				
Asset age				
Condition				
Performance				

Table 4.3-6 Inventory data completeness
Source: Auckland Transport RAMM database (12 March 2012)

Asset group	Inventory data completeness (%)		
	Measure	Age	Condition
Bridges	100	94	81
Major culverts	100	60	67
Footbridges	100	46	70

Overall condition grade

The overall condition for bridge structures is presented in Figure 4.3-3. This shows that 70 per cent are in moderate to very good condition, and that in 27 per cent of cases, conditions are unknown.

Bridges

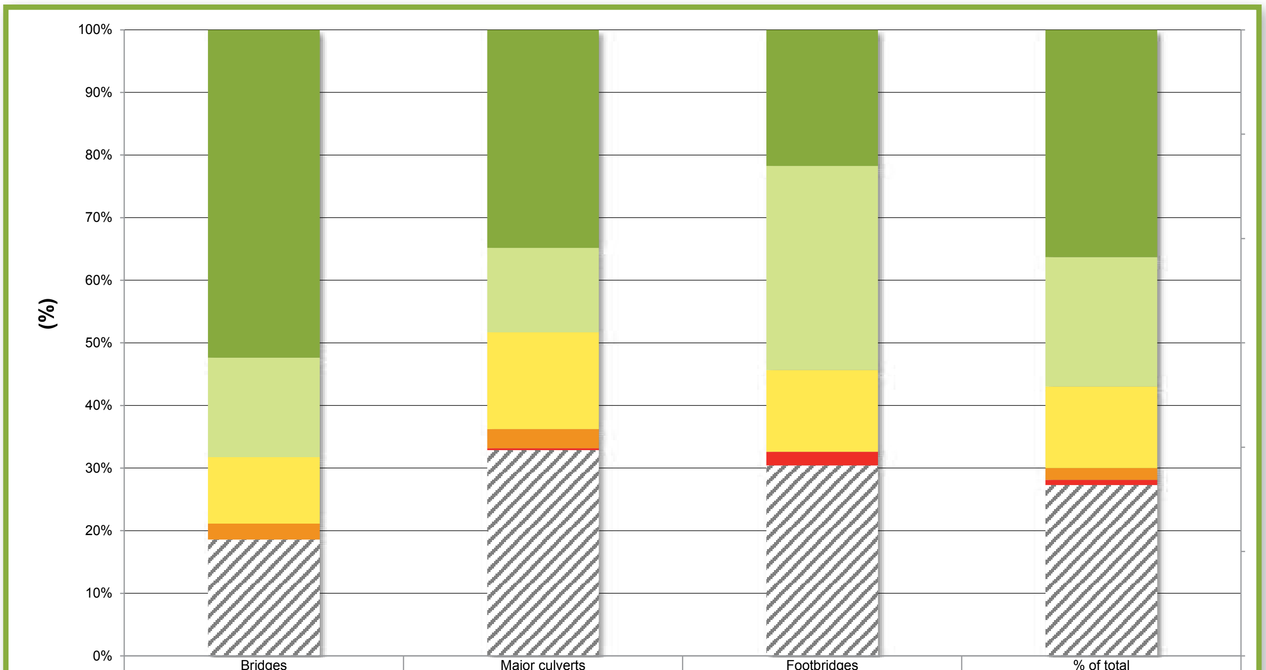
Of the 592 bridges, 79 per cent are in moderate to very good condition as shown in Figure 4.3-4. 19 per cent have unknown condition information, in large part because the latest data has not been uploaded into RAMM. As a form of support information, the uploading of previous structural assessment reports into RAMM has been identified as a future improvement initiative.

The bridge condition is affected by traffic volumes and loading, maintenance practices, bridge materials, age, bridge design, the nature of the approach (sealed or unsealed), and the frequency of flooding and the amount of debris carried by the waterway during floods.

Major culverts

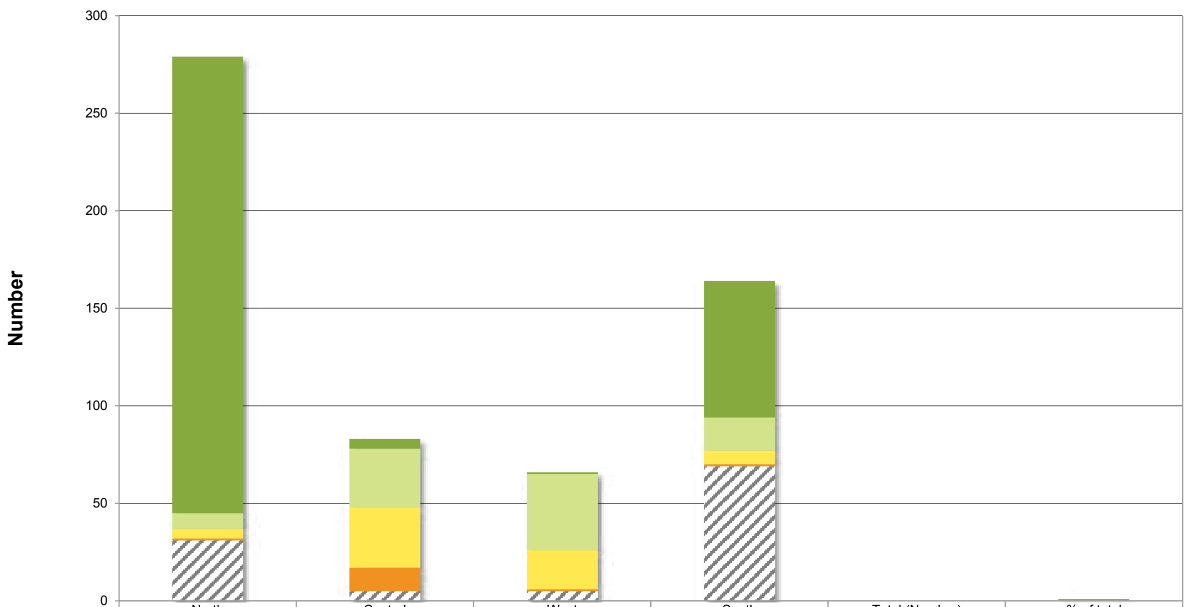
There are 356 major culverts and 64 per cent are in moderate to very good condition as shown in Figure 4.3-5. 33 per cent of major culverts, many in the South area, are in an unknown condition.

Figure 4.3-3 Overall condition of bridges
Source: Auckland Transport RAMM database (12 March 2012)



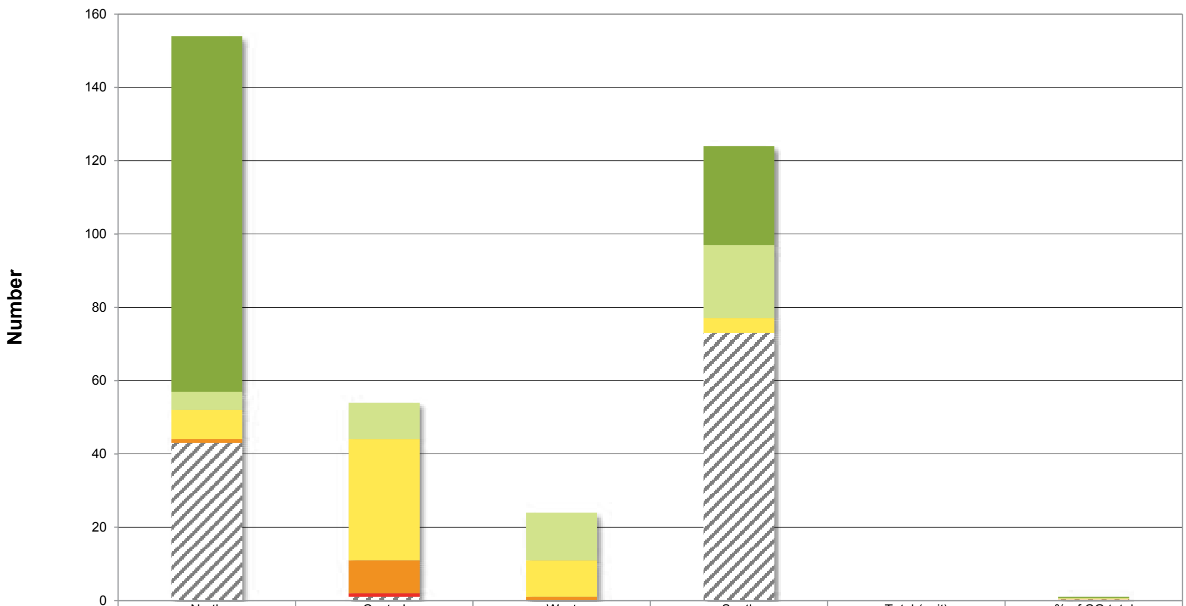
	Bridges	Major culverts	Footbridges	% of total
Very Good	52%	35%	22%	36%
Good	16%	13%	33%	21%
Moderate	11%	15%	13%	13%
Poor	3%	3%	0%	2%
Very Poor	0%	0%	2%	1%
Unknown	19%	33%	30%	27%
Total	100%	100%	100%	100%

Figure 4.3-4 Bridge condition
Source: Auckland Transport RAMM database (12 March 2012)



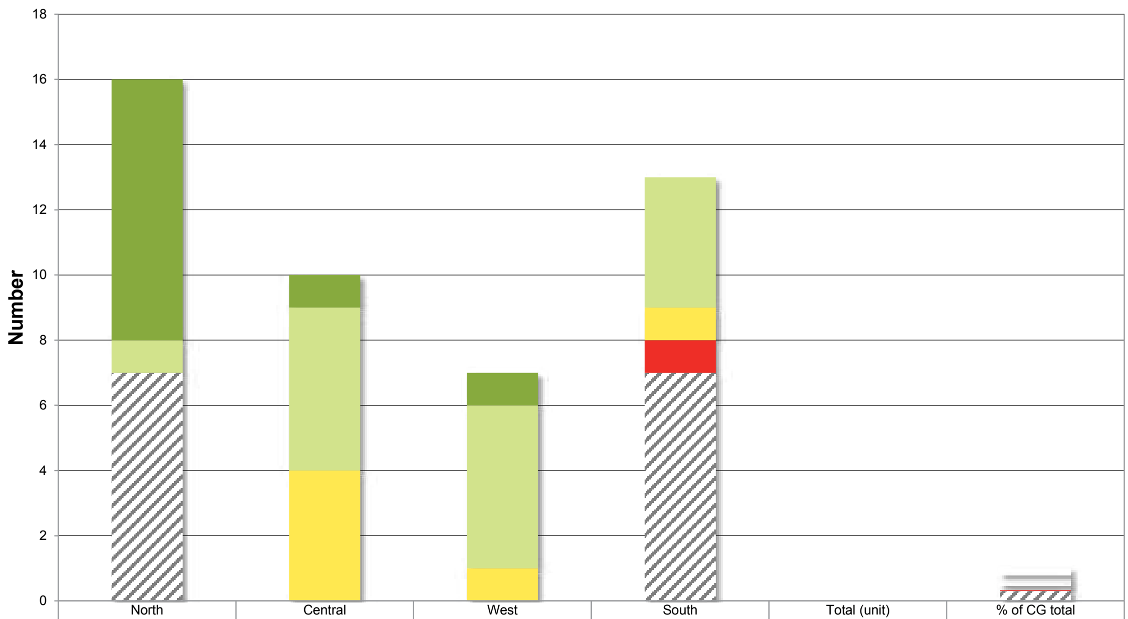
	North	Central	West	South	Total (Number)	% of total
Very Good	234	5	1	70	310	52%
Good	8	30	39	17	94	16%
Moderate	5	31	20	7	63	11%
Poor	1	12	1	1	15	3%
Very Poor	0	0	0	0	0	0%
Unknown	31	5	5	69	110	19%
% of total	47%	14%	11%	28%	100%	
Total (Number)	279	83	66	164	592	100%

Figure 4.3-5 Major culvert condition
Source: Auckland Transport RAMM database (12 March 2012)



	North	Central	West	South	Total (unit)	% of CG total
Very Good	97			27	124	35%
Good	5	10	13	20	48	13%
Moderate	8	33	10	4	55	15%
Poor	1	9	1	0	11	3%
Very Poor	0	1	0	0	1	0%
Unknown	43	1	0	73	117	33%
% of total	43%	15%	7%	35%	100%	
Total (Number)	154	54	24	124	356	100%

Figure 4.3-6 Footbridge condition
Source: Auckland Transport RAMM database (12 March 2012)



	North	Central	West	South	Total (unit)	% of CG total
Very Good	8	1	1		10	22%
Good	1	5	5	4	15	33%
Moderate	0	4	1	1	6	13%
Poor	0	0	0		0	0%
Very Poor	0	0	0	1	1	2%
Unknown	7	0	0	7	14	30%
% of total	35%	22%	15%	28%	100%	
Total (Number)	16	10	7	13	46	100%

Footbridges

Of the 46 footbridges, 67 per cent are in moderate to very good condition as shown in Figure 4.3-6. 30 per cent are in an unknown condition, particularly in the North and South areas.

Condition assessment programme

A formal condition assessment programme is being developed for bridges along with other structures. The overall programme started in July 2012. Detailed inspections will be undertaken on a six-year rotation with general inspections every two years.

The detailed inspections will assess condition rating and confidence, residual life (physical life left) and replacement cost.

Inspection frequency and detail can be increased for structures that are in, or showing signs of, distress, i.e. special inspections as one-offs, or monitoring inspections (which normally range from once a month to every six months).

As the planned condition assessments get under way, there will be more robust and complete condition information for bridges. Going forward, the intention is to report bridge condition by material type. This will help refine the inspection and renewal programmes.

4.3.7 Asset performance and capacity

Performance

The performance of bridges is principally affected by their trafficable widths but is also affected by the clearance (shy-line) between the outside traffic lane and the structural elements of the bridge, including its safety railings.

Bridges are categorised by their carrying capacities in terms of traffic lanes:

Not trafficable	Narrower than 3m	Use by vehicle traffic is marginal or impossible. These do not include footbridges or cycleway bridges
Single lane bridges	3 to 4.2m wide and suitable only for use by single-lane traffic	Upper limit is wider than the commonly used NZTA (state highway) dimension of 3.5m but that is too small for much agricultural traffic, which is a significant user of single lane bridges in rural areas. It also puts too many bridges that have good single lane width into the next category
Ambiguous width bridges	Between 4.2 and 6.4m trafficable width. Too wide to be obviously single lane and too narrow to carry two-lane traffic safely and regularly	These bridges are risky sites on the network in terms of unexpected demands on drivers. These should be reviewed to determine whether they should be artificially narrowed to make their single lane nature more obvious or widened to make them truly two lane
Two-lane bridges	Trafficable widths 6.5m and less than 15.5m, which is a reasonable lower limit for four lane bridges	There are 318 bridges with trafficable widths between 9 and 15.5m. These may be two-lane bridges with on-road cycleways, have painted median, have three lanes (e.g. an extra turning lane) or be very narrow multi-lane bridges. More work is required to identify their lane capacities more accurately
Multi-lane bridges	Trafficable widths of 15.5m or more	This dimension allows for four (narrow) traffic lanes of 3.5m and a 750mm shy-line on each outside lane
Footbridges and cycleway bridges	Various widths	These bridges have their purpose defined by their name recorded in the database

The adequacy of bridge widths will be reviewed once all bridge data has been reviewed and verified.

Capacity

Load masses (weights) that bridges can carry safely and the heights of these loads affect bridge capacity performance. While the RAMM data records the restrictions on bridge capacity in terms of these parameters, there is currently no reliable way of determining which of these is current or should be current. Bridge restrictions must be publicly notified annually.

There are currently 10 bridge restrictions in the Rodney area. These are reviewed and monitored annually to ensure they are structurally sound. These bridges may be replaced due to significant structural issues or other reasons, such as increased traffic due to growth in area.

The load capacity of existing bridges varies depending on the design standards at that time. Bridges constructed from the 1980s are generally designed for seismic loading. Today's design standard is against Class 1 (44 tonnes) and considers seismic loading.

Bridges before 1950 were not designed to modern standards for capacity. The bridges in the South area were assessed against age to understand their capacity issues. 25 bridges were found to have potential capacity issues based on age only. The bridges in the Manukau area were analysed further with site inspections and structural analysis. A similar approach is intended to be taken regionally and this has been identified as a future improvement, as part of the planned asset criticality review (refer to Section 4.3.8, critical assets).

4.3.8 Asset risks and criticality

Asset risks

Asset risks across the transport network, identified through a formal risk analysis review, appear in the Section 8, Risk Management. Risks for the bridging network are shown in Table 4.3-7.

Table 4.3-7 Bridging network risk summary
Source: Auckland City Council Transport Risk Analysis 2008

Risk	Net risk factor	Management options
Lack of certainty around ownership of structures, e.g. Auckland Transport owned bridges on private property or vice versa, unknown ownership and reliance on private structures	Moderate risk – address via new procedures and/or modification of existing practices and training	• Continue to monitor and review current practices • Review process around ownership to incorporate private ownership • Establish wall ownership redefinition policy
Bridge collapse / damage / deterioration /erosion / blockage – Accessibility, safety (excluding catastrophic events)	Moderate risk – address via new procedures and/or modification of existing practices and training	• Undertake review of bridges requiring seismic measuring • Review, assess and monitor current practices • Undertake risk assessment of critical bridges • Review and monitor Lifeline project outcomes
Damage to services on structures – causing loss of water, electricity, phone etc.	Moderate risk – address via new procedures and/or modification of existing practices and training	• Review, assess and monitor current practices • Undertake risk assessment of critical structures • Review and monitor Lifeline project outcomes • Improve coordination with utilities e.g. Telecom, Vector, Watercare
Structural damage from overloading or vehicle impact causing faster deterioration of bridges, culverts and structures	High risk – requires remedial planning and action via the AMP	• Review and improve enforcement of weight restrictions according to bylaws • Formalise communication with transport industry regarding routes and loadings • Review current capacity of bridges, overweight permit process and communication of requirements • Improve supervision of service providers • Install weigh-in-motion sites (similar to NZTA at certain motorway sites including the Harbour Bridge) • Improve relationship with NZTA – provide regulatory documentation • CCTV monitoring of critical structures
Vehicles, pedestrians, or objects fall or are thrown from bridge	Moderate risk – address via new procedures and/or modification of existing practices and training	• Security measures – CCTV and barriers • Review and monitor maintenance and renewal programme • Review renewals programme with compliance requirements • Monitor and plan changes to current standards

Table 4.3-8 Additional bridging risks

Risk	Management options
Inadequate or inconsistent data leading to incorrect or inappropriate decisions	• Collect data using standard descriptions and methodologies • Update all data to the new data standard
User safety	• Collect and monitor data for crashes and injuries on all bridges • Prioritise interventions to address causes of crashes and injuries on bridges using risk-based and programme remedial measures each year
Single lane bridges on busy roads	• Ensure appropriate signage and delineation • Consider for upgrade if structural, safety or capacity issues • Improve approaches to provide adequate stopping sight distances
The 112 ambiguous width bridges with increased crash potential and possible confusion among road users	• Ensure appropriate signage and delineation • Prioritise for narrowing or widening as appropriate

Additional risks identified through the development of this AMP are shown in Table 4.3-8.

Critical assets

Bridge criticality is determined by:

Location on major arterial and Lifeline routes	Some structures also carry power and communications cables and other equipment and their failure could cause serious disruption
Location on overweight and over dimension routes	Any failure of these structures could cause major disruption to the transport industry, as heavy transport may not be able to access ports or industrial areas
Lack of local network resilience	Availability of alternative crossing points is important to maintaining the ability of the network to deliver an acceptable LOS when a bridge is out of service for any reason

Some of the legacy councils identified critical bridging assets, as shown in Table 4.3-9.

The council assessments had different drivers and are therefore not consistent as a group. A formal criticality review of the regional transport network needs to be undertaken and this has been recognised as a future improvement initiative. This review should include assessment against location on Lifeline routes, age, seismic screening, overweight routes, HPMV routes, and load capacity of existing bridges (refer to Section 4.3.7).

Potential hazards and safety issues are identified in Table 4.3-10 including mitigation measures.

Table 4.3-9 Summary of existing critical bridge assets

Legacy council	Approach	Findings
Auckland City Council	Assessed structures for major arterials and Lifeline route structures, overweight and over-dimension route structures, and local boundary structures	• 9 bridges on major arterials and Lifeline route structures • 11 bridges overweight and over dimension route structures • 9 local boundary structures
Manukau City Council, Franklin District Council and Papakura District Council	Assessed all bridge and culverts against age. The Manukau area was analysed further with site inspections and structural analysis	• 11 bridges in Franklin area • 4 bridges in Manukau area • 8 in Papakura area
Rodney District Council	Identified resilient routes which are high priorities for being able to function during or after an extreme rainfall and/or flood event	• Rodney's resilient routes identified, including known deficiencies associated with them (10 in total) • 16 flood susceptible roads

Table 4.3-10 Bridge safety hazards

Potential hazard	Mitigation measures
Collisions between vehicles travelling in opposite directions across the structures	• Adequate and appropriate signage/warning of narrow structures • Addressing the causes of confusion around bridges of ambiguous width • Consideration of use of safety rail on centre lines of very busy multi-lane bridges
Collisions between vehicles and other road users	• Adequate and appropriate signage/warning of narrow structures • Appropriate use of safety barriers and vertical separation (e.g. footpaths behind a raised kerb) • Adequate lighting at night
Collapse of structures under excessive loads	• Regular inspection of critical and vulnerable structures and prompt posting of bridges where there is a change in their load-carrying capacity • Maintenance of bridge restrictions current and sign-posted in accordance with heavy vehicle regulations • Identification of appropriate routes for overweight, over-height and high-capacity vehicles (HCVs) • Strict policing of bridge restrictions • Institution of process and surveillance methods that will lead to increased certainty of infringing vehicles being caught • Renewal programmes that address the risks and vulnerabilities around low-capacity bridges and heavy vehicles
Inundation and scouring of structures, compounded by the potential for loss while inundated and a 'missing structure' being used without knowledge of its condition	• Regular inspection for and clearance of debris around bridge piles and in waterways • Driver education • Appropriate emergency responses including closure of structures • Structures on lifeline routes being able to pass larger than normal flood

Table 4.3-11 Key bridging network issues

No.	Key issues with bridges	Action plans for managing these issues	Outcomes
1	Ongoing operations and maintenance issues when working in heavily trafficked environments including night work	Coordinated and planned traffic management plans that consider peak-traffic needs, adequate signage and clear indication of the timings of alternate routes	Bridge operations and maintenance completed in all working environments
2	Upgrading of bridges to cater for growth and loading	Base budget requests on sound lifecycle cost information; explain the implications of not providing the increased capacities Where possible implement innovative solutions for bridge management, upgrading and creation	Bridges are upgraded to meet the expected growth and loadings
3	The condition and integrity of structures on Lifeline routes is essential for public safety and civil defence, as noted by Auckland Engineering Lifelines Group (AELG) (refer to Section 8, Risk Management)	Develop a risk register in alignment with NZ/ AS4360 to include risks associated with asset groups, such as pavements, bridges, footpaths Programme of seismic screening and risk assessment is in place for structures on the Lifeline routes Continue to undertake corrosion management studies along critical coastal routes Review earthquake risk associated with bridge assets	Bridges on Lifeline routes are structurally sound
4	Need for regular inspections to minimise risk of materials failure Hollow core beam bridges – longitudinal cracks Incomplete or inconsistent bridge inventory data including a significant number of bridges with unknown construction dates	Implement a bridge inspection policy and programme maintained and regularly inspected that includes annual monitoring of crack development in hollow core beams Improve bridge data including accuracy of estimated construction dates (consider appropriate use of local knowledge)	No unexpected material failures for the bridging network
5	Limited functionality in the bridges sections of RAMM restricting ability to do some analyses, store condition information, to clearly define the function (e.g. "footbridge") of a structure or to determine the material type of a bridge (steel / concrete / timber etc) especially for multi-span bridges	Liaise with RAMM Software Ltd to improve functionality of the software	Adequate RAMM functionality to support asset management requirements
6	High productivity motor vehicle operation may lead to greater loadings and higher risks on bridges on the specific routes	Identify permitted HCV routes. A list of possible HCV routes is being considered for inclusion in the overweight / over-dimension permit system Request for policing of HCV not on these routes and the weights they are carrying on permitted routes	Permitted HCV routes identified

4.3.9 Key issues

Key lifecycle issues that affect the bridging network are shown on Table 4.3-11.

4.3.10 Operations and maintenance needs

Operations and maintenance plan

Auckland Transport keeps the bridging network suitable, accessible, safe and well maintained by carrying out planned and responsive maintenance. It also addresses progressive deterioration, corrosion, decay, crash damage, public complaints and defects resulting from normal use of the structures or arising from health and safety issues.

The principal driver of bridge maintenance work is inspection of the assets by contractors, Auckland Transport technical staff and specialist bridge engineers. Approximately 85 per cent of bridge maintenance is planned works identified by network inspections and the balance is reactive works. Work programmes are prioritised on the basis of safety and need.

Auckland Transport's operations work includes three levels of inspections as follows:

Superficial inspections	These inspections are undertaken monthly. Checks of each bridge for damage and deterioration and waterway blockages, both on the bridge deck and in the waterway / obstacle being crossed
General inspections	These inspections are undertaken three monthly. They provide the condition rating data for the bridges and identify defects. The maintenance / renewal programme is then produced from the defects list, working within the available budget (unless urgent safety works in excess of budget are required). Bridges with posted restrictions on their load or speed capacities are checked during this inspection to ascertain whether the restrictions require amending
Full structural assessments carried out every six years	These inspections contribute to preparing the renewals and maintenance programmes, and help improve financial forecasting for structural assets. They also update bridge condition ratings

Auckland Transport's maintenance work includes commitments to:

- Clean the bridges' waterways and clear obstructions that may cause damage to the bridge or major culvert from the obstacle waterways
- Maintain the signage and protective railings associated with each bridge
- Maintain bridge components including bearings, expansion joints, piers, approach slabs and abutments
- Maintain the road / path surface
- Ensure paint and corrosion protection of the structures as required.

Table 4.3-12 Physical maintenance works' response times

Source: Draft Technical Specifications Volume 5, RCM South Contract (8 February 2012)

Maintenance activity	Response times
Urgent / essential	Four weeks
Routine	As required

The response times for physical maintenance works are summarised in Table 4.3-12. Routine maintenance repairs are identified by routine operation inspections. The frequencies are the same for all road hierarchies.

Physical works necessary to deliver the scope listed above are procured through competitive tender. These contracts are normally for five years or longer for road-related works.

Contractors delivering the maintenance services are able to programme works on a priority basis. Contractors must comply with the contract specifications and with the recognised guidelines for maintenance activities.

The contractors' performance on delivering the maintenance works and related outputs is linked in to the operational LOS of the transport network.

Historical levels of operations and maintenance expenditure have provided the current LOS of the network. Auckland Transport expects these current LOS will be maintained in the future; this expectation provides the basis of long-term lifecycle management strategies of this AMP. This position may change in the future as a result of Auckland Council and Auckland Transport adopting a different LOS in view of funding and budgetary constraints.

Operations and maintenance 10-year expenditure forecast

The recommended 10-year operational expenditure forecast is shown in Figure 4.3-7 with $23.7 million forecast over the next 10 years. The forecast is based primarily on historical trends but also includes the revised activities detailed above and LOS to be achieved to some extent. This recommendation has also taken into account current funding constraints being experienced by Auckland Transport and Auckland Council. Note, however, that the actual plan that will be approved by both organisations may yet differ from these network needs because of the impact of funding constraints.

The average annual expenditure for the operations and maintenance on bridges and structures over the next 10 years is approximately $2.4 million which is approximately 21 per cent of the total expenditure. Overall, there is an increase from $2.3 million to $2.5 million over the next 10 years, resulting from growth of the road network and bridge assets. About half of the planned operational expenditure is for the Central area.

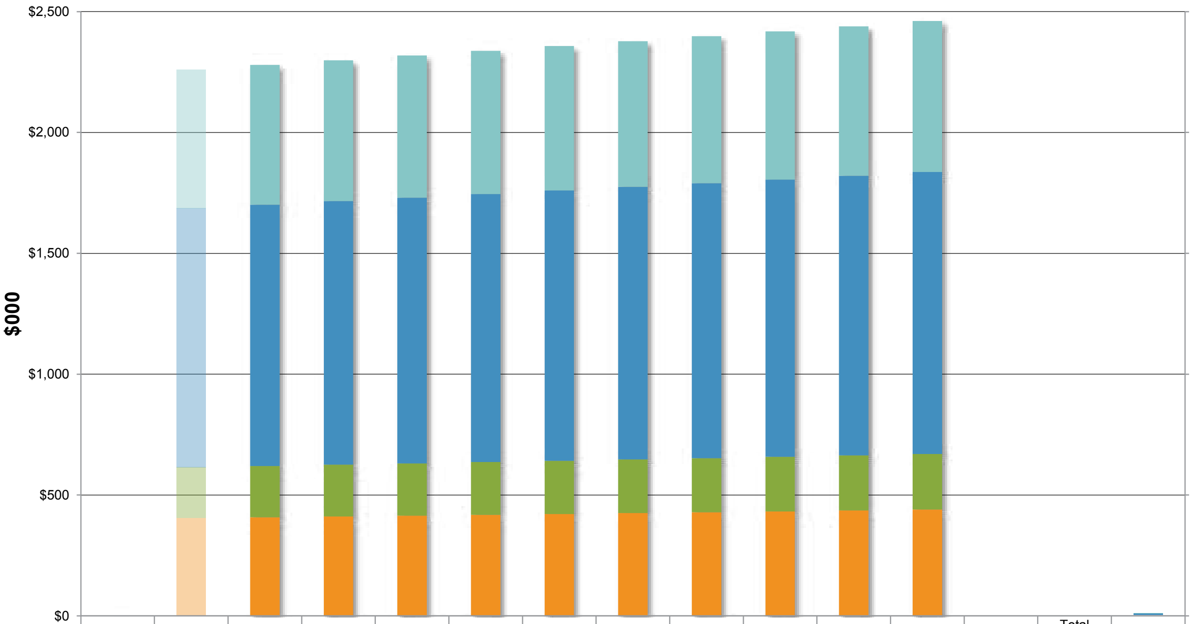
4.3.11 Renewal needs

Renewal strategy

The objective of renewals is to restore existing assets to the original design capacity within the constraints imposed by modern statutory and engineering regulations. Such restorations can fully utilise modern engineering practice and materials. The renewal strategy follows like-for-like (in terms of the number of traffic lanes), but with construction set to Class 1 loadings using materials such as steel or concrete (for bridges) and concrete,

Figure 4.3-7 Planned bridges operations and maintenance expenditure

Source: LTP Budget Model 12 April 2012 after refresh for AMP



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	Total (bridge structures) (number)	Annual average $/(unit)
North	25%	573	578	583	588	593	598	603	608	613	619	624	6,007	449	$1,338
Central	47%	1,072	1,081	1,090	1,099	1,109	1,118	1,128	1,137	1,147	1,157	1,166	11,231	147	$7,640
West	9%	211	213	214	216	218	220	222	224	226	228	229	2,210	97	$2,278
South	18%	404	408	411	415	418	422	425	429	433	436	440	4,237	301	$1,408
Total		2,260	2,279	2,299	2,318	2,338	2,358	2,378	2,398	2,418	2,439	2,460	23,685	994	$2,383

aluminium, steel or plastics (for culverts). Bridge renewals can include replacement of complete structures and refurbishment of major components such as decks.

Bridge condition is the principal driver for bridge renewals. Performance can also be a driver, especially for older bridges that are too narrow for the traffic they need to carry. Where bridges are subject to renewal, and also require an increased capacity, the cost of the improvement works is met from the capital new works budget.

Renewal plan

10-year renewal plan

Long-term renewal analysis is based on data extracted from the RAMM database. Renewals are developed using age and condition-based analysis. A simple tool is used to model the 10-year renewal profiles for both methods. Some validation is undertaken with the Road Corridor Maintenance Group to support the analysis. Currently, criticality is not considered in the renewal analysis. The resulting 10-year renewal profiles are used for asset management purposes.

Linkages between LOS and renewal forecasts cannot be clearly and readily established. The specific bridging LOS currently have little relationship to bridge renewals and do not provide robust support for the future expenditures. Auckland Transport will develop LOS that relate to load capacities, trafficable widths or peak traffic volumes, bridge availability and waterway capacities.

Annual and three-year renewals plan

Auckland Transport also prepares a short-term renewal programme for delivering the forward works programme for the next three years. This programme development also includes site walkovers, confirmation of asset ownership and coordination with other work programmes.

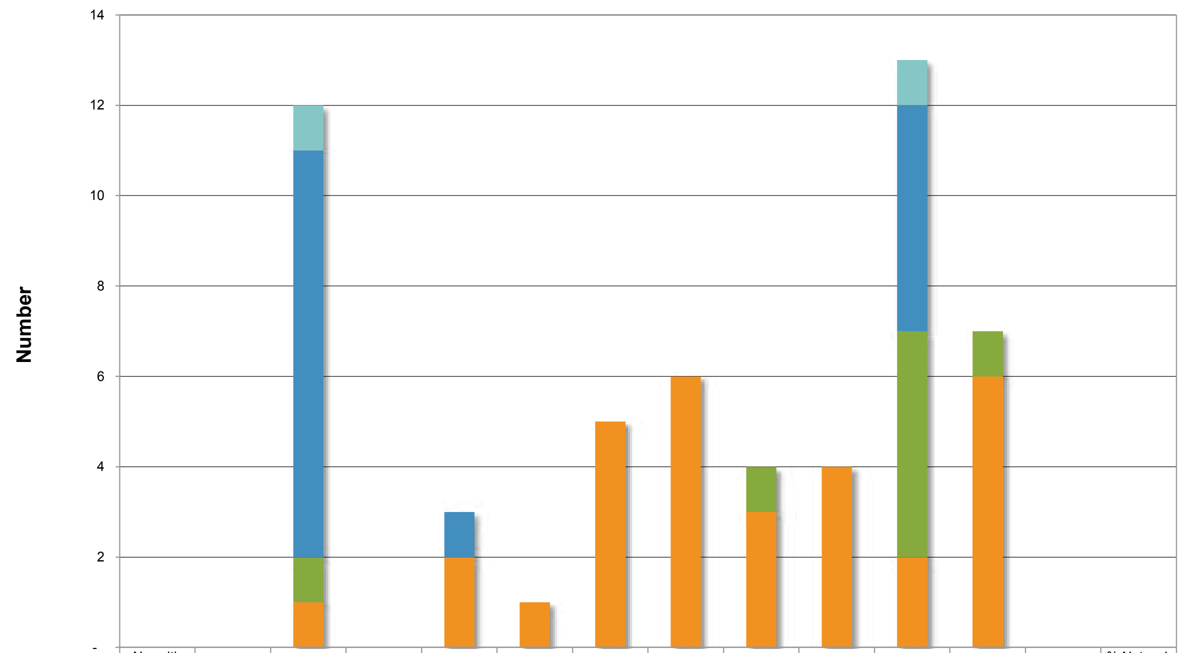
Renewal analysis

The bridge renewals have been analysed by the following four methods (in decreasing maturity). Each method is less effective when there is a significant amount of unknown information.

Condition-based method – bridges

The following analysis of renewals is based on the current condition of the assets and uses whole-of-life deterioration to identify indicative renewal needs. Overall, 27 per cent of bridges and structures have an unknown condition grade.

Figure 4.3-8 Bridge condition-based renewal results
Source: Auckland Transport RAMM database (5 March 2012)



	No. with Condition Data		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	% Network renewed 2013-22
North	248		1	0	0	0	0	0	0	0	1	0	2	1%
Central	55		9	0	1	0	0	0	0	0	5	0	15	27%
West	61		1	0	0	0	0	0	1	0	5	1	8	13%
South	93		1	0	2	1	5	6	3	4	2	6	30	32%
TOTAL (Number)	457		12	0	3	1	5	6	4	4	13	7	55	12%

79 per cent of bridges are in moderate to very good condition (refer to Section 4.3.6). The condition based analysis has significant amounts of unknown information. This analysis will improve over time as more robust condition information becomes available as an input into the renewal analysis.

The 10-year condition-based renewal profile for bridges is shown in Figure 4.3-8. This shows that renewals are expected mainly in South and Central areas in the first 10 years. There is an initial peak in 2012/13 with addressing condition grades 4 and 5, then another peak in 2020/21.

Note that unknowns have been excluded from this analysis.

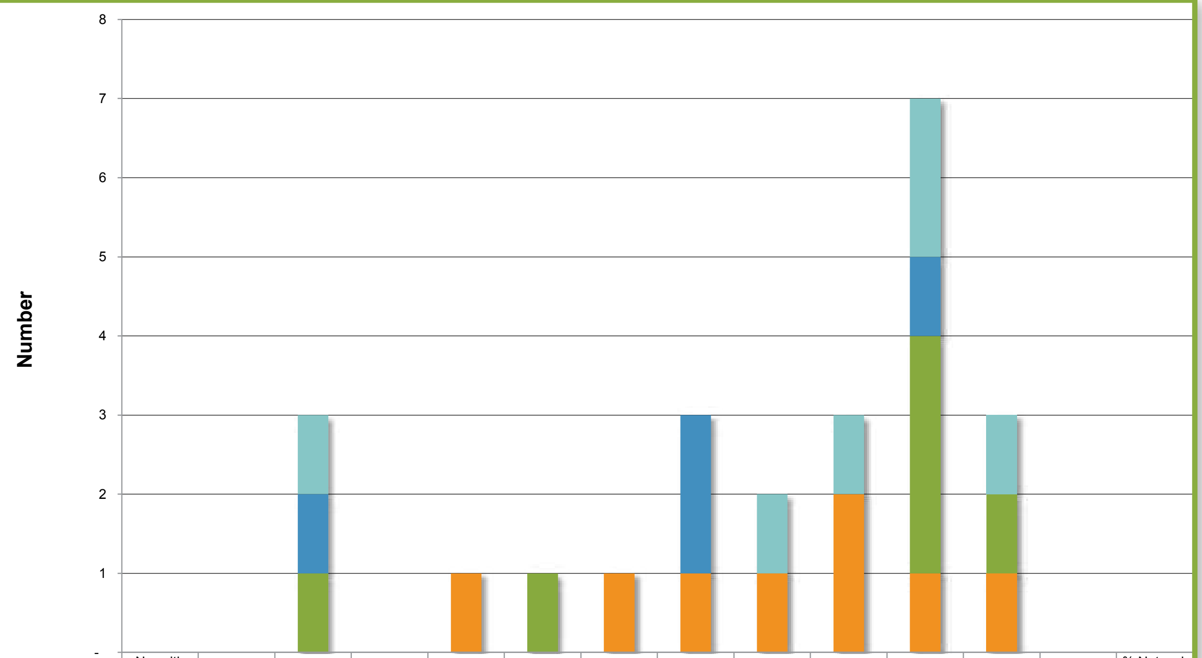
Condition-based method – major culverts

64 per cent of major culverts are in moderate to very good condition. The 10-year condition based renewal profile for major culverts is given in Figure 4.3-9. This shows that there is a relatively even spread of renewals in all areas with a peak in 2020/21.

Condition-based method – footbridges

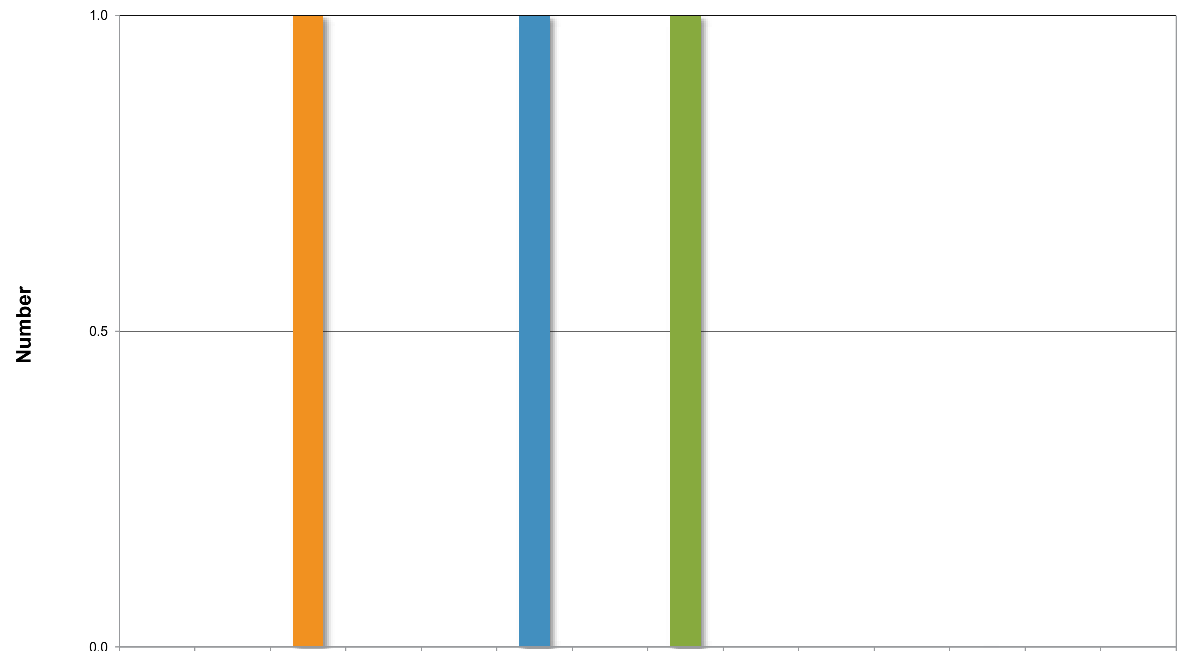
67 per cent of footbridges are in moderate to very good condition. The 10-year condition-based renewal profile for footbridges is given in Figure 4.3-10. This shows that there are only three renewals planned in this 10-year period.

Figure 4.3-9 Major culvert condition-based renewal results
Source: Auckland Transport RAMM database (5 March 2012)



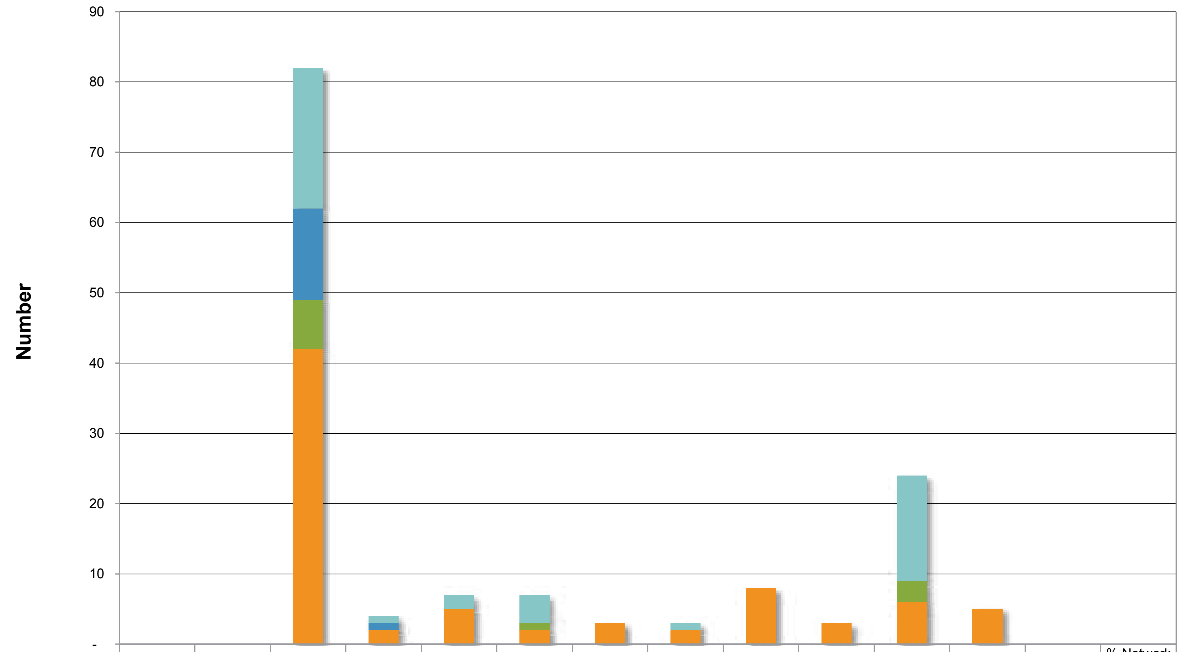
	No. with Condition Data		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	% Network renewed 2013-22
North	110		1	0	0	0	0	0	1	1	2	1	6	5%
Central	6		1	0	0	0	0	2	0	0	1	0	4	67%
West	24		1	0	0	1	0	0	0	0	3	1	6	25%
South	40		0	0	1	0	1	1	1	2	1	1	8	20%
TOTAL (Number)	180		3	0	1	1	1	3	2	3	7	3	24	13%

Figure 4.3-10 Footbridge condition-based renewal results
Source: Auckland Transport RAMM database (5 March 2012)



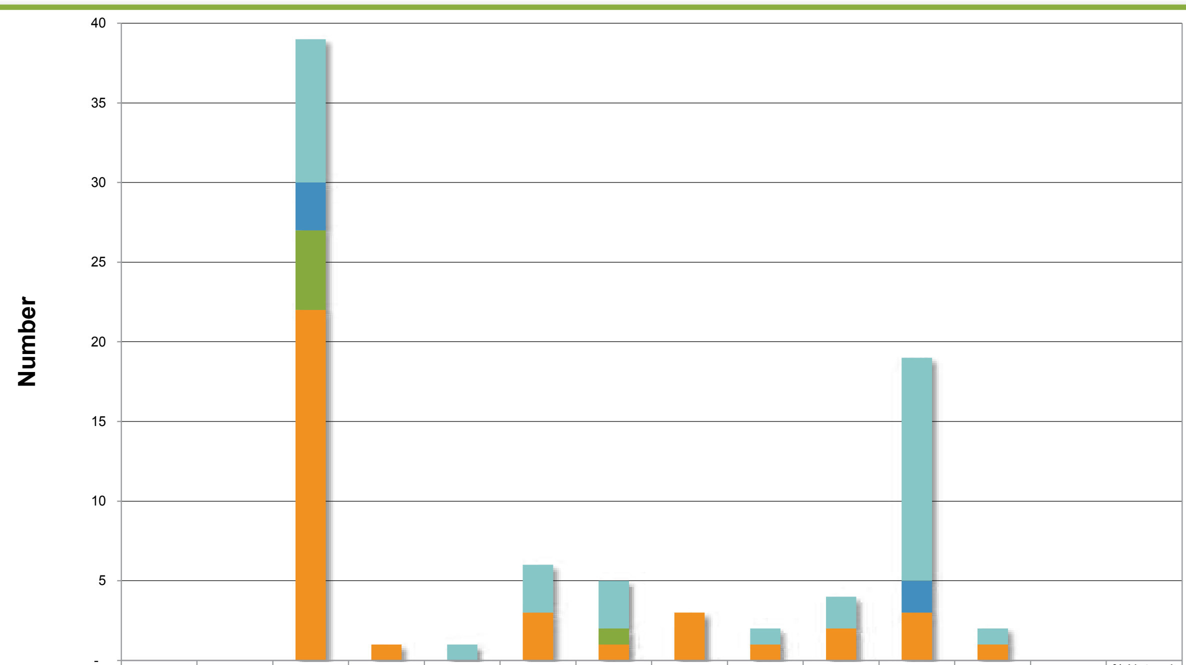
	No. with Condition Data		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	% Network renewed 2013-22
North	9		0	0	0	0	0	0	0	0	0	0	0	0%
Central	6		0	0	0	1	0	0	0	0	0	0	1	17%
West	7		0	0	0	0	0	1	0	0	0	0	1	14%
South	6		1	0	0	0	0	0	0	0	0	0	1	17%
TOTAL (Number)	28		1	0	0	1	0	1	0	0	0	0	3	11%

Figure 4.3-11 Bridge age-based renewal results
Source: Auckland Transport RAMM database (5 March 2012)



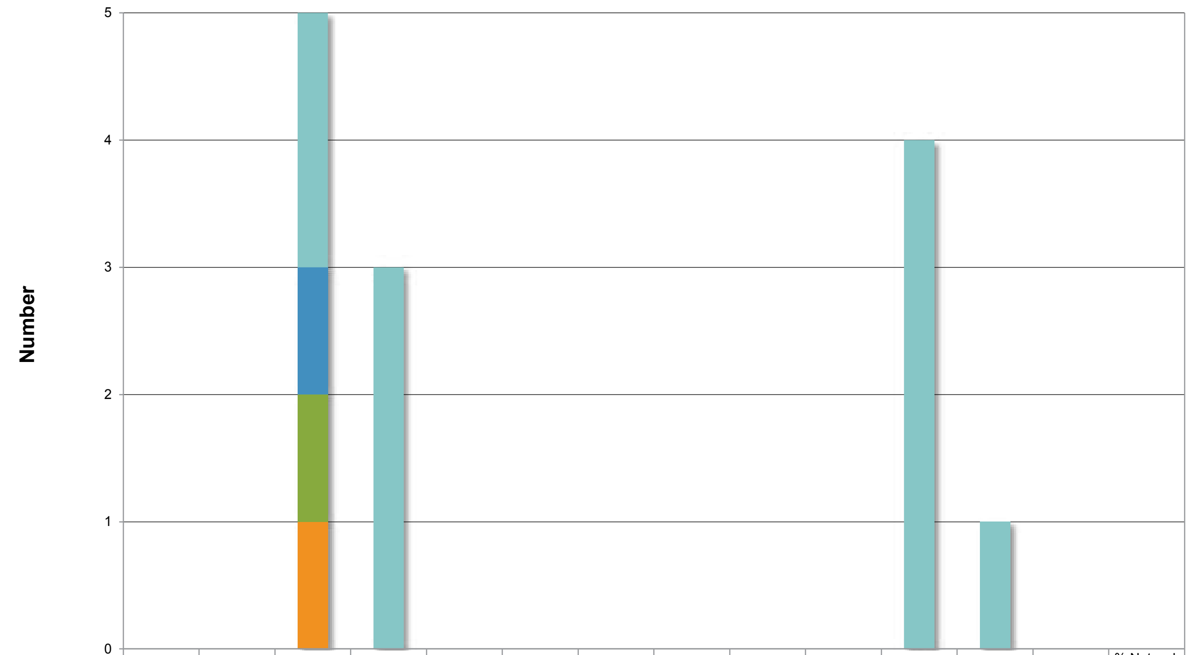
	No. with Age Data	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	% Network renewed 2013-22
North	278	20	1	2	4	0	1	0	0	15	0	43	15%
Central	57	13	1	0	0	0	0	0	0	0	0	14	25%
West	66	7	0	0	1	0	0	0	0	3	0	11	17%
South	162	42	2	5	2	3	2	8	3	6	5	78	48%
TOTAL (Number)	563	82	4	7	7	3	3	8	3	24	5	146	26%

Figure 4.3-12 Major culvert age-based renewal results
Source: Auckland Transport RAMM database (5 March 2012)



	No. with Age Data	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	% Network renewed 2013-22
North	149	9	0	1	3	3	0	1	2	14	1	34	23%
Central	6	3	0	0	0	0	0	0	0	2	0	5	83%
West	24	5	0	0	0	1	0	0	0	0	0	6	25%
South	96	22	1	0	3	1	3	1	2	3	1	37	39%
TOTAL (Number)	275	39	1	1	6	5	3	2	4	19	2	82	30%

Figure 4.3-13 Footbridge age-based renewal results
Source: Auckland Transport RAMM database (5 March 2012)



	No. with Age Data		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	% Network renewed 2013-22
North	16		2	3	0	0	0	0	0	0	4	1	10	63%
Central	6		1	0	0	0	0	0	0	0	0	0	1	17%
West	7		1	0	0	0	0	0	0	0	0	0	1	14%
South	13		1	0	0	0	0	0	0	0	0	0	1	8%
TOTAL (Number)	42		5	3	0	0	0	0	0	0	4	1	13	31%

Age-based method – bridges

The 10-year age-based renewal profile for bridges is given in Figure 4.3-11. This shows that there is a significant level of bridge renewals in the first year due to the high numbers of bridges reaching the end of their useful lives. Historically, bridges are typically renewed based on condition rather than age. There is another peak in 2020-21 at 24.

Age data is less complete for bridge structures and particularly major culverts. This makes the age-based renewal analysis less effective. This will improve over time as more robust age information becomes available as an input into the renewal analysis.

Age-based method – major culverts

The 10-year age-based renewal profile for major culverts is shown in Figure 4.3-12. This shows that there are 39 major culverts to be renewed in the first year. There is another peak in 2020-21 at 19. Historically, culverts are typically renewed based on condition rather than age.

Age-based method – footbridges

The 10-year age-based renewal profile for footbridges is shown in Figure 4.3-13. This shows that there are five footbridges to be renewed in the first year. There is another peak in 2020-21 at four. Historically, footbridges are typically renewed based on condition rather than age. Most renewals are located in the North area.

Bridging sub-asset groups nearing the end of their lives include:

- Timber bridges built through to the early 1960s
- Early steel culverts (before 1980)
- Concrete bridges built in the early years of the 20th century.

These structures will be subject to early inspections to determine their expected remaining useful lives and appropriate on-going inspection regimes.

Operational priorities

Based on past bridge renewals, it has been estimated that about eight bridges need to be replaced each year for the next 10 years. This is based on operational knowledge of bridge age, condition, safety issues and seismic design requirements. This compares closely with the condition-based analysis detailed.

Road Corridor Maintenance have indicated that regionally, the equivalent of about five bridges needs to be replaced each year for the next 10 years. This also compares with the above condition-based analysis.

Historical trends

There is currently insufficient commonality between legacy data sets to provide a reliable regional view of historical expenditure trends. A future asset management improvement is to implement consistent tracking of expenditure by asset type and expenditure type over time. This will enable robust expenditure trends analysis in future.

Depreciation profile

The annual depreciation for road bridges and structures (includes retaining walls and corridor structures) is constant at $12 million over the next 10 years as indicated in Table 4.3-13.

Renewals, 10-year work and expenditure forecast

The analyses given above provide varying levels of indicative renewal work for the future. This demonstrates the current difficulty of forecasting future renewal needs.

Considering the above renewal analyses and the current funding constraints being experienced by Auckland Transport and Auckland Council, the recommended 10-year renewals needs is shown in Figure 4.3-14. Note, however, that the actual renewal plan that will be approved by Auckland Transport and the Auckland Council may yet differ from these network needs because of the impact of funding constraints

Figure 4.3-14 shows that renewals increase slightly from $8.4 million to $9.1 million per year. There is a total of $87.5 million for bridge renewals for the next 10 years with most of this located in the Central area at $35 million, followed by $28.9 million for the North area. These forecasts will be better refined over time through improved regional data and analysis.

Note that the quantity of renewal work is an indicative programme based on theoretical complete bridge replacement. In practice, bridging structures are refurbished on a component basis as noted earlier or total replacement for smaller bridges in rural areas such as Rodney.

Separate renewal projects are not listed in this AMP as they are prepared as a one-year detailed work programme within multiple small projects. There are no significant bridge renewal projects identified in this AMP.

4.3.12 New works needs

New works plan

New bridging structures includes new bridges and major culverts and improvements and upgrades to existing ones, which may or may not be carried out in conjunction with asset renewal works.

Some new bridges and culverts are built in new subdivisions and industrial developments as part of those developments. The developer is required to vest in Auckland Council all assets that will be publicly owned. Auckland Council passes management responsibility for the new road assets, including bridging, to Auckland Transport.

Drivers to upgrade or construct bridges and major culverts are to:

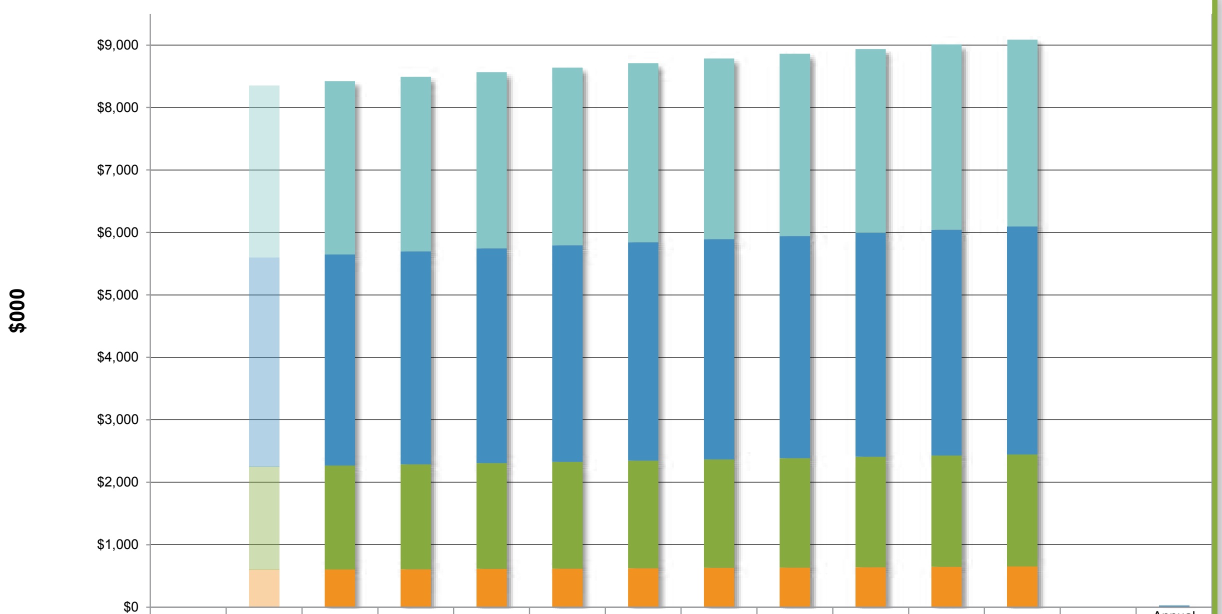
- Improve LOS, including width, load capacity, resilience and capacity
- Improve LOS when they are part of new works or improvement projects that focus on the wider network
- Respond to requirements for additional load capacities (gross-mass of loads) and similar demands generated from industry sectors and supported by regulatory change.

Table 4.3-13 Bridging structures depreciation forecasts

Source: Auckland Transport infrastructure depreciation profiles (25 April 2012)

Profile	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Depreciation ($ millions)	12	12	12	12	12	12	12	12	12	12	12	134

Figure 4.3-14 Planned bridges renewal expenditure
Source: LTP Budget Model 12 April 2012 after refresh for AMP



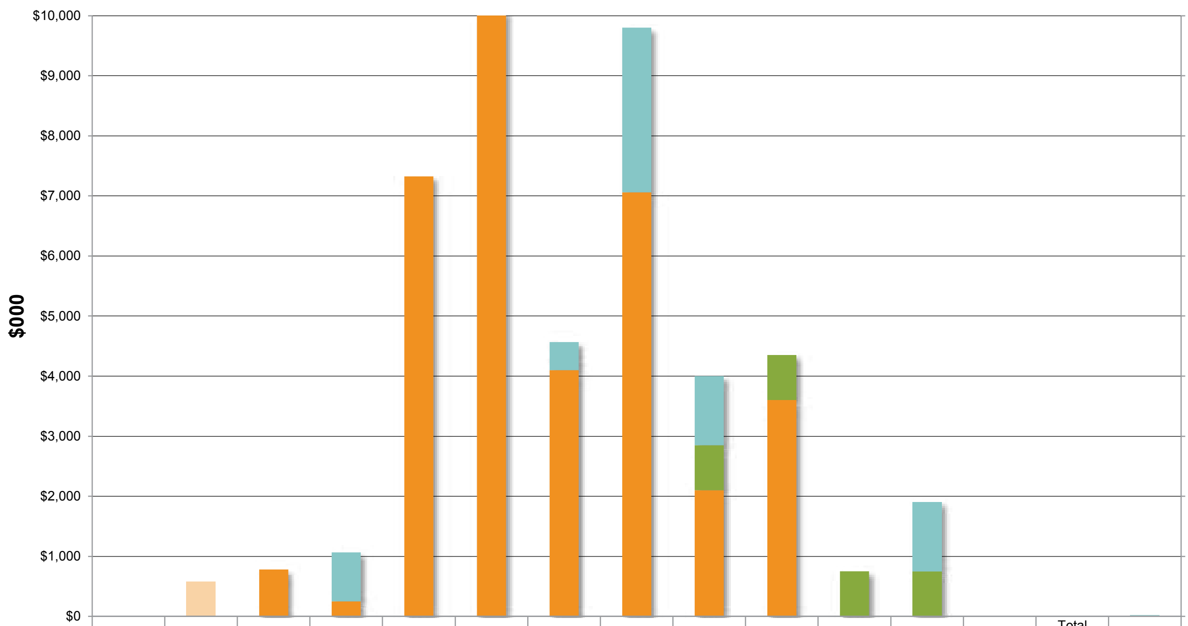
	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	Annual Average $ / area network
North	33%	2,750	2,773	2,797	2,821	2,845	2,869	2,893	2,918	2,943	2,968	2,993	28,819	$10,713
Central	40%	3,352	3,381	3,409	3,438	3,467	3,497	3,527	3,557	3,587	3,617	3,648	35,128	$13,059
West	20%	1,651	1,665	1,680	1,694	1,708	1,723	1,737	1,752	1,767	1,782	1,797	17,306	$6,433
South	7%	597	603	608	613	618	623	629	634	639	645	650	6,261	$2,328
Renewals (number)		5	5	5	5	5	5	5	5	5	5	5	50	
TOTAL	100%	8,351	8,422	8,493	8,566	8,638	8,712	8,786	8,861	8,936	9,012	9,089	87,514	$8,133

As examples, Auckland Transport will undertake new bridging works and improvements to:

- Install crash attenuators at the ends of bridge safety railing
- Widen bridges to provide greater vehicle, pedestrian and/or cyclist capacity
- Undertake major strengthening to allow routine passage of HCVs of up to 60 tonnes
- Construct a new bridge or culvert where there was not one previously or where the LOS provided by a bridge was not previously available
- Cross new 'gaps' in the transport network, such as a new motorway or railway line that severs an existing road.

It is currently difficult to associate bridge improvements with adopted LOS. Levels of service will be developed that relate to load capacities, trafficable widths or peak traffic volumes, bridge availability and waterway capacities and other drivers of bridge upgrading and bridge provision programmes, including both vehicular and pedestrian bridges.

Figure 4.3-15 Bridges and structures capital new works forecast by area
Source: LTP Budget Model 12 April 2012 after refresh for AMP



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	Total (bridge structures) (number)	Annual average $/(unit)
North	14%	00	00	816	00	00	465	2,740	1,150	00	00	1,150	6,321	449	$1,408
Central	0%	00	00	00	00	00	00	00	00	00	00	00	00	147	$-
West	7%	00	00	00	00	00	00	00	750	750	750	750	3,000	97	$3,093
South	79%	581	780	250	7,325	10,078	4,100	7,060	2,100	3,600	00	00	35,293	301	$11,725
Total		581	780	1,066	7,325	10,078	4,565	9,800	4,000	4,350	750	1,900	44,614	994	$4,488

Based on the analysis above, the regional summary of new works expenditure for bridges across the region is presented in Figure 4.3-15. This shows that new works varies from $1 million to $10 million per year. There is a total of $45 million for bridge new works for the next 10 years with most of this work located in the South area at $36 million, followed by $7 million in the North area.

The annual fluctuations projected will be difficult to manage financially and are also likely to create issues with workloads and costs in both the design and construction sectors. Review of the projects scheduled for 2012-13 and beyond suggests that there are some works that could be rescheduled to address these issues.

Capital new works projects

Table 4.3-14 details the indicative bridge new works projects for the next 10 years in descending order based on total value.

Growth-related new works

New bridging structures in new subdivisions are taken over by Auckland Transport after the subdivision is vested with Auckland Council. In some cases, such as when the work is on an existing road outside the boundary of the development, the council programmes and manages the improvement through Auckland Transport. In these circumstances, the council is generally required to contribute towards the cost of the work in proportion to that increase in traffic post development.

NZTA has advised Auckland Transport that it intends to seek revocation of about 54km of state highways in Auckland to reflect the recent and pending completion of motorway extensions. All of these roads with the possible exception of SH18A will remain arterial roads. They will all be part of the designated over-dimension bypass routes. From an initial assessment, there are nine bridges and two large culverts that will be added to the Auckland Transport network. There are also some retaining walls, but the initial assessment did not include the asset number.

The effects of this potential additional road network and associated assets has not yet been fully assessed or incorporated into the forward programmes or estimates. The full effects of these changes, along with the ages and conditions of the assets, need to be investigated and understood.

Table 4.3-14 Bridges and structures capital new works projects
Source: LTP Budget Model 12 April 2012 after refresh for AMP

Project Name	Total ($000)	Area
Murphys Road Bridge improvements (Manukau)	12,331	South
Chapel Road realignment and new bridge	12,062	South
Flat Bush Collector stream crossings	9,900	South
Road drainage extensions – West	3,000	West
Rodney Leathers Bridge (Matakana Road)	1,200	North
Rodney Peak No 2 Bridge (Peak Road)	1,100	North
East Coast Road overbridge and view site	1,000	North
Thomas Road Culvert replacement	1,000	South
The Strand – Gabion Walls (WAI)	765	North
Rodney Taylors Bridge (Coatsville Riverhead Highway)	566	North
Rodney Glennies Bridge (West Coast Road)	465	North
Rodney Tramcar Bridge (Leigh Road)	464	North
Rodney McPhersons Bridge (Wellsford Valley Road)	361	North
Rodney Oldfield Bridge upgrade	250	North
Bridge upgrade – View Road	150	North
Total	44,614	

Levels of service related new works

The introduction of the high-capacity vehicle classification for heavy trucks is, in effect, an increase in the LOS provided by state highways. Nine specific routes that will require upgrading to this new LOS have been identified. There are 29 bridges and major culverts on these routes. An initial assessment based on age and bridge design loadings indicates that 13 of them require improvements to carry these increased loads. An initial estimate for these improvements is as follows and it is expected that these will be developed into capital projects over time.

2011/12	$1.034 million
2012/13	$ 2.006 million
2013/14	$1.000 million
Total	$4.040 million

Note that $8.63 million is planned for HPMV routes in Section 4.16 Network Management and Planning Activities. This includes some bridge strengthening.

4.3.13 Disposal plan

Disposal is the process of retiring an asset from service. It is not the process of disposing of the waste from material generated by the renewal process.

Disposal programme

Asset disposal requires making the site safe, removing surplus structures, and covering the costs of any environmental remediation. These costs are generally included as part of the capital project. There are currently no bridging assets identified for disposal.

4.3.14 Summary of 10-year network needs

The total budget for operations and maintenance, renewals and new works for bridging structures over the next 10 years is $156 million. Average annual budgets for operations and maintenance, renewals and new works on bridging structures over the next 10 years stand at approximately $16 million, of which 15 per cent is for operations and maintenance, 56 per cent is for renewals, and 29 per cent for new works.

The operations, renewal and new works forecasts are summarised in Figure 4.3-16. This shows that total annual costs vary from about $12 million to $22 million per annum.

Notes on the expenditures in Figure 4.3-16.

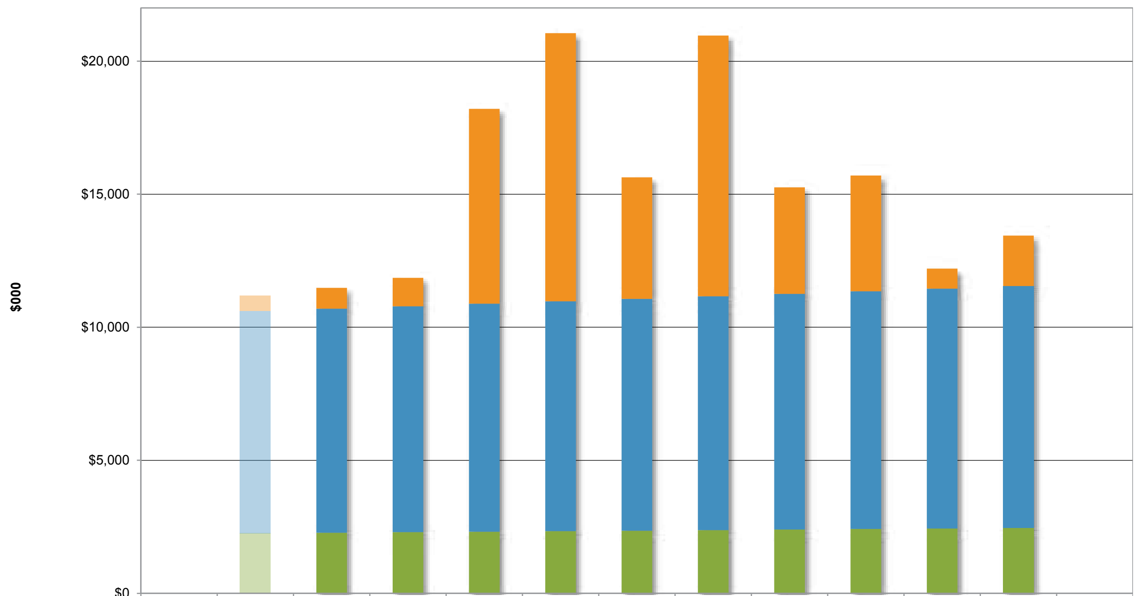
- The proposed 10-year expenditures for OPEX and renewals include an annual growth factor of +0.85 per cent to allow for consequential OPEX and consequential renewals from growth in the network and growth in demand for services
- Professional costs are included in renewal total costs.

Historically there were mixed approaches to funding structures by the legacy councils and in particular there were different indicators for renewals. This has been recognised by Auckland Transport as an area for improvement. Over time the planned operations and renewals budgets will better reflect the asset needs based on better information regionally, such as complete inventories, condition and risk assessments, and agreed service levels. A key improvement programme is to develop robust 10-year renewals programmes (refer to Section 9, Asset Management Practice).

One particular consequence of the varied legacy council approach is that the budgeted items for asset renewal include a significant list of bridges but few retaining walls or sea walls and no corridor structures. As all three of these asset classes are funded from the same high-level budget (Bridging Structures), Auckland Transport has decided that the budget allocations recommended by the legacy councils will be altered. Until the improvements outlined above can provide more robust input to the forward programmes, the altered budget allocations will reflect an overall distribution of renewal expenditure assuming that:

- Bridges and structures comprise 85 per cent of the structures operations budget (and retaining walls 10 per cent and corridor structures 5 per cent)
- Bridges and structures comprise 70 per cent of the structures renewals budget (and retaining walls 25 per cent and corridor structures 5 per cent).

Figure 4.3-16 Summary of bridges and structures operations, renewals and new works forecast
Source: LTP Budget Model 12 April 2012 after Refresh for AMP



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total
CAPEX New Works	29%	581	780	1,066	7,325	10,078	4,565	9,800	4,000	4,350	750	1,900	44,614
Renewals	56%	8,351	8,422	8,493	8,566	8,638	8,712	8,786	8,861	8,936	9,012	9,089	87,514
Operations & Maintenance	15%	2,260	2,279	2,299	2,318	2,338	2,358	2,378	2,398	2,418	2,439	2,460	23,685
TOTAL	100%	11,192	11,481	11,858	18,209	21,054	15,635	20,964	15,259	15,704	12,201	13,448	155,814

4.3.15 Approved Long Term Plan envelope

The approved Long Term Plan

This section compares the approved LTP envelope for OPEX and renewals with the bridges and structures network needs as determined by this AMP at a regional level and identifies the likely impacts of any variances. Revenue and funding incomes to Auckland Transport (from Auckland Council ratepayers and NZTA government subsidies and the like) are allocated through the approved Long Term Plan budgets. The LTP was adopted on 28 June 2012.

OPEX impacts

Based on the information in Table 4.3-15, bridges and structures operational expenditure shows no variance between the LTP allocated budgets and the AMP needs. However, it is anticipated that the LTP will require further efficiency savings and therefore a funding gap for bridges and structures operational expenditure may eventuate.

Renewals impacts

The LTP allocated budget for bridges and structures capital renewals has a 10-year shortfall of $30.3 million (35 per cent reduction) compared to the network needs determined by this AMP. The approved LTP budget envelope appears to be insufficient to reduce the current levels of deferred renewals. The shortfall of $30.3 million, which is part of a $43 million reduction to central area structure renewals, equates to a reduction of approximately 17 bridge renewals over the 10 years of the plan.

Further efficiency savings

As required by the approved LTP, a further reduction in OPEX of $18.6 million per year, reducing to nil by 2016/17, will need to be allocated against asset related operational budgets. The impact of this reduction on bridges and structures operational budgets is yet to be assessed and finalised.

Monitoring and management of Long Term Plan consequences

The consequences resulting from these variances will be monitored and reported as appropriate.

CAPEX new works

CAPEX new works contained in this AMP are derived from draft LTP listings as at April 2012 and are produced in section 4.3.12.

The capital new works programme has been further refined and adopted in late June 2012. Details of this adopted programme are contained in the LTP.

Table 4.3-15 Variance between LTP approved budget and AMP network needs for bridges and structures (all un-inflated)

Source: LTP Budget Model 12 April 2012 after refresh for AMP and revised LTP Budget Model 28 June 2012

Bridges and structures	10-year total LTP approved budget ($000s un-inflated)	10-year total AMP network needs ($000s un-inflated)	Variance 10-year total ($000s un-inflated)
Operations and maintenance	23,685	23,685	0
Renewals	57,143	87,514	-30,371
Bridges and structures total	80,829	111,200	-30,371

AMP inflation effects

Un-inflated and inflated bridges and structures needs for the AMP are shown in Table 4.3-16.

LTP inflation effects

Un-inflated and inflated bridges and structures budgets from the LTP are shown in Table 4.3-17.

Table 4.3-16 Un-inflated and inflated bridges & structures AMP needs

Source: LTP Budget Model 12 April 2012 after refresh for AMP and revised LTP Budget Model 28 June 2012

UN-INFLATED expenditure ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M		2,279	2,299	2,318	2,338	2,358	2,378	2,398	2,418	2,439	2,460	23,685
Renewal		8,422	8,493	8,566	8,638	8,712	8,786	8,861	8,936	9,012	9,089	87,514
Bridges & structures total		10,701	10,792	10,884	10,976	11,070	11,164	11,259	11,354	11,451	11,549	111,200
AC Inflator	OPEX	3.30%	3.30%	3.30%	3.30%	3.50%	3.60%	3.10%	3.10%	3.30%	3.60%	n/a
AC Inflator	CAPEX	3.90%	3.40%	2.80%	2.90%	3.10%	3.30%	3.50%	3.70%	4.00%	4.00%	n/a
INFLATED expenditure ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M		2,355	2,453	2,555	2,667	2,787	2,898	3,013	3,139	3,279	3,426	28,572
Renewal		8,750	9,125	9,460	9,817	10,207	10,634	11,100	11,608	12,175	12,770	105,646
Bridges & structures total		11,105	11,578	12,015	12,484	12,994	13,532	14,113	14,747	15,454	16,196	134,218

Table 4.3-17 Un-inflated and inflated bridges & structures LTP budgets

Source: LTP Budget Model 12 April 2012 after refresh for AMP and revised LTP Budget Model 28 June 2012

UN-INFLATED expenditure ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M		2,279	2,299	2,318	2,338	2,358	2,378	2,398	2,418	2,439	2,460	23,685
Renewal		7,962	5,122	4,381	4,593	5,568	5,868	5,801	5,800	6,009	6,039	57,143
Bridges & structures total		10,241	7,421	6,700	6,931	7,925	8,246	8,199	8,219	8,448	8,499	80,829
AC Inflator	OPEX	3.30%	3.30%	3.30%	3.30%	3.50%	3.60%	3.10%	3.10%	3.30%	3.60%	n/a
AC Inflator	CAPEX	3.90%	3.40%	2.80%	2.90%	3.10%	3.30%	3.50%	3.70%	4.00%	4.00%	n/a
INFLATED expenditure ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M		2,355	2,453	2,555	2,667	2,787	2,898	3,013	3,139	3,279	3,426	28,572
Renewal		8,272	5,503	4,839	5,219	6,523	7,103	7,267	7,535	8,119	8,485	68,864
Bridges & structures total		10,627	7,956	7,394	7,887	9,310	10,000	10,279	10,674	11,398	11,912	97,437

4.3.16 Revenue sources

Revenue and funding incomes to Auckland Transport are recorded in Auckland Transport's SAP financial management system although the transparency and completeness of allocations require review and confirmation.

Operations and maintenance revenue

Bridge operations and maintenance are normally subsidised by NZTA but not footbridges.

Capital renewals revenue

Bridge component renewals are normally subsidised by NZTA. The function of the renewal budget is to maintain a LOS of an asset by intervening prior to the end of the useful life of the asset, or by preventing the condition of the asset falling below an agreed level. Renewal of complete bridges is subsidised by NZTA at the base rate plus 10 per cent.

Capital new works revenue

New bridges is subsidised by NZTA at the base rate plus 10 per cent.

4.3.17 Key improvement initiatives

Key bridging improvement initiatives are shown in Table 4.30-18.

Table 4.3-18 Key bridging improvement initiatives

Improvement area	Description	AMP section	Priority / importance
Bridges 1	Ensure there is trafficable width data in RAMM for all bridges and review the widths shown for very narrow bridges (2m or less). This should include identification of the function of the bridges (e.g. footbridge, shared cycleway etc.)	4.3.4 4.3.7	High
Bridges 2	Identify and remove from RAMM database the council's park footbridges and notify the council accordingly	4.3.4	Medium
Bridges 3	Check the bridge database for accuracy, as it lists some bridges and culverts with centre-line lengths of greater than 1km	4.3.4	Medium
Bridges 4	Review the range in bridging expected useful lives used for asset valuations into one Auckland Transport set	4.3.4	Medium
Bridges 5	Update and complete the inventory records for bridges, which include materials not recorded in RAMM. This will ensure that aspects of their management are not inadvertently overlooked. Address inaccuracies and inconsistencies in database bridge descriptions	4.3.5	High
Bridges 6	Upload previous structural assessment reports as supporting information in RAMM	4.3.6	Very high / on occurrence
Bridges 7	Work with RAMM Software Ltd to: • Improve how posted weight and speed limits are represented in RAMM and how the information can be retrieved • Recommend improvements to how condition data is represented in RAMM	4.3.7 4.3.6	High
Bridges 8	Complete a formal criticality review of the regional transport network. This review should include assessment against location on Lifeline routes, age, seismic screening, overweight routes, HPMV routes, and load capacity of existing bridges	4.3.8	High
Bridges 9	Develop LOS that relate to the drivers of bridge renewals, improvements and new bridge construction and include both vehicular and pedestrian bridges	4.3.11	Medium
Bridges 10	Review or reschedule the projected annual fluctuations in the Capital New Works budget for bridging in order to address the issues caused by very 'lumpy' forecast expenditures	4.3.12	High
Bridges 11	Identify bridging assets to be vested by approved developments and identify new works partly funded by developers as conditions for resource consents	4.3.12	High
Bridges 12	Include costs from LOS changes to provide HCV routes and to reflect revocation of state highways in forward programmes and estimates	4.3.12	High

4.4 Contents

4.4 Retaining Walls

4.4.1 The service Auckland Transport provides

An Auckland Transport objective is that the retaining walls, sea walls and noise walls on the network are well maintained to provide safe and continuous access for vehicles and road corridor users.

Retaining walls, sea walls and other structures are designed and maintained to ensure the structural stability, safety and protection of the road corridor from adjacent ground and water risk. Noise walls provide a level of sound protection for adjacent land users from vehicle noise on the network. The retaining walls levels of service relate primarily to network reliability and resilience and the ability to provide safe access across the network in all weathers.

Details of the levels of service being measured are provided in Section 2. Several of these measures and targets are yet to be confirmed and will be included in the improvement plan. The measures representative for retaining wall operational performance are shown in Table 4.4-1.

4.4.2 Network overview

Retaining walls and sea walls support the road structure and protect transport assets from adjacent slip risks. Road-related sea walls generally support the roadway at the edge of the harbour or sea. Auckland Transport has ownership and management responsibilities for the region's 2,584 retaining walls.

Sea walls associated with parks and landfills are contained in separate Auckland Council AMPs. In future, it is expected that noise and sight walls, typically used on bigger roading systems, will be added to the retaining wall portfolio.

4.4.3 Network valuation

The approximate replacement value of the retaining wall network is $239 million, shown in Table 4.4-2. (Refer to the appendices for the full valuation).

4.4.4 Network asset details

Auckland Transport has ownership responsibilities for road-related retaining walls and sea walls as summarised in Table 4.4-3.

Table 4.4-1 Levels of service for retaining walls

Service value	Level of service	Service measure	Current performance	Target performance (indicative / to be developed and agreed)
Reliability	Increase the resilience of the network	Number of slips classified as low, medium, high risk	20	20
		Percentage of drainage openings not functioning in retaining walls	<= 5% defects total on all walls	<= 5% defects total on all walls

Table 4.4-2 Retaining wall valuation
Source: Auckland Transport asset revaluation (30 June 2011)

Asset	Optimised replacement cost $000s	Optimised depreciated replacement cost $000s	Annual depreciation $000s
Retaining and sea walls	239,309	163,161	3,064

Table 4.4-3 Road retaining wall asset data
Source: Auckland Transport RAMM database (12 April 2012)

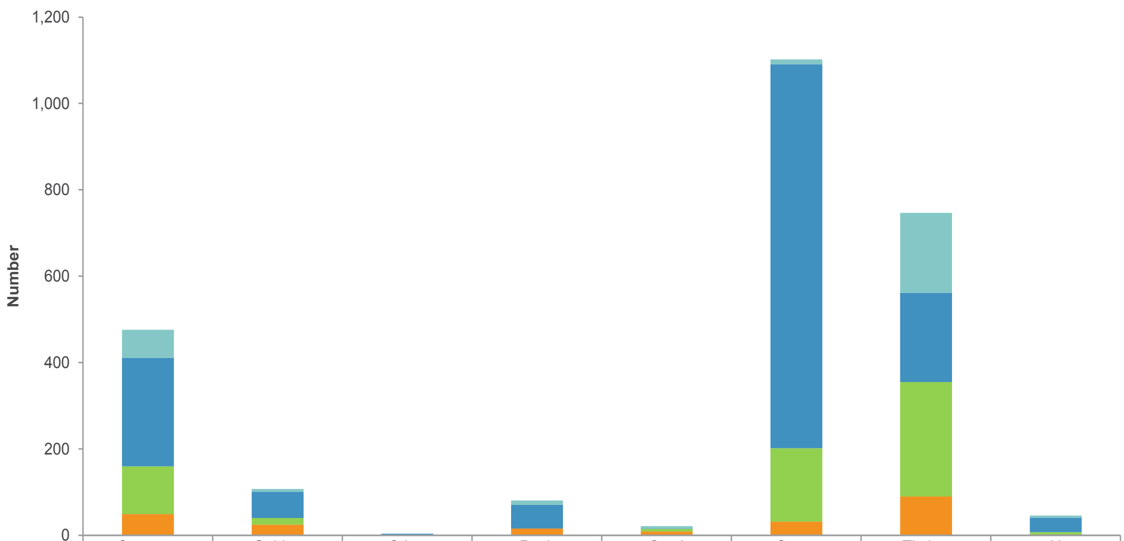
Asset	Unit	North	Central	West	South	Total
Retaining walls	no	289	1,499	574	222	2,584
	km	13	63	17	12	105

As there is incomplete inventory of retaining walls and sea walls regionally, a programme to identify these assets has been identified as a future improvement initiative. The failure of unknown retaining walls may impact the road network causing a vulnerable community. Some legacy councils treated sea walls as coastal reserve assets rather than road assets. This needs to be reviewed in all areas to identify any sea walls which support the road but are not shown in RAMM.

A function of retaining walls is often also to protect land within and adjoining the road corridor, and sometimes buildings or other structures (e.g. pylons) on the land.

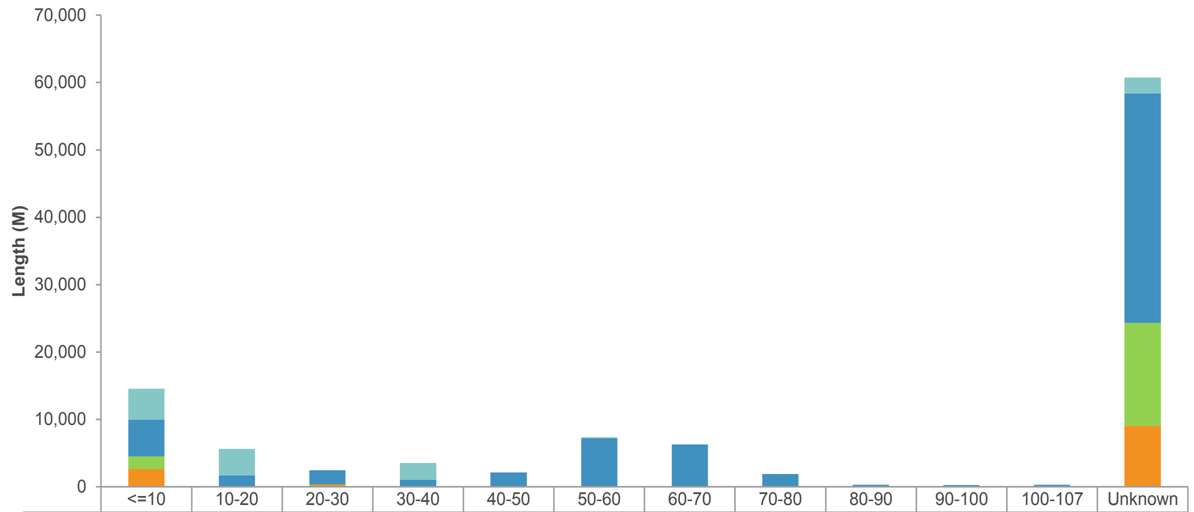
Figure 4.4-1 shows that the main material type for retaining walls, based on quantity, is stone followed by timber.

Figure 4.4-1 Retaining wall material type by number
Source: Auckland Transport RAMM database (12 April 2012)



	Concrete	Gabion	Other	Rock	Steel	Stone	Timber	U
North	65	6		11	5	11	186	5
Central	251	61	3	54	1	889	206	34
West	111	15			6	170	265	7
South	49	25	1	16	9	32	90	

Figure 4.4-2 Retaining wall age distribution by length
Source: Auckland Transport RAMM database (12 April 2012)



	<=10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100	100-107	Unknown
North	4,565	3,884	-	2,458	-	154	-	-	-	-	-	2,353
Central	5,445	1,655	2,059	1,053	2,134	7,229	6,273	1,887	295	280	290	34,049
West	1,869	43	-	-	-	-	-	-	-	-	-	15,259
South	2,658	30	379	-	-	-	-	-	-	-	-	9,065

Years

The extent to which retaining walls are engineered ranges from timber pole walls and reinforced concrete walls to unbound rock constructed using bulk placement of material. The form of assets is described inconsistently in the RAMM database. Some describe only materials, others only the design, and some neither. There needs to be a distinction between rock gabions (can have a limited life due to corrosion) and unbound rock walls (rely on gravity for structural integrity). This is will be part of the programme to improve the inventory.

The useful asset life for retaining walls and noise walls is assumed to be 75 years for concrete, 40 years for timber, and 75 years for sea walls. The age of 58 per cent of Auckland's retaining walls is unknown, as shown in Figure 4.4-2.

4.4.5 Asset data confidence

The RAMM database holds asset information, including condition rating, for the retaining wall network. The assessment is based on the data confidence grading system and methodology described in Section 2.4.5 of the International Infrastructure Management Manual 2011.

Table 4.4-4 illustrates Auckland Transport's confidence (in the accuracy and completeness) in the asset data.

The current overall confidence level of asset data in terms of condition and performance of the retaining wall network is 'very uncertain'. Asset description and/or condition data sets are not complete for Rodney, North Shore, Papakura, Franklin and Waitakere areas. This is discussed further in Section 4.4.6. The current confidence level of asset data in terms of asset quantity of the retaining wall network is 'uncertain'.

Table 4.4-5 shows the completeness of inventory data by asset quantity. This shows that age information is relatively incomplete, at 14 per cent. Auckland Transport intends to improve the data completeness with the planned condition assessment programme (refer to Section 4.4.6 condition assessment programme) and with planned improvement initiatives. Note that it is assumed that the RAMM database has only recorded about 40 per cent of retaining walls.

Table 4.4-4 Retaining wall data confidence

Data attribute	Very uncertain	Uncertain	Reliable	Highly reliable
Asset descriptors and quantity		■		
Asset age		■		
Condition			■	
Performance	■			

4.4.6 Asset condition

Condition rating

The frequency of the current retaining wall condition surveys is summarised in Table 4.4-6.

The scope of condition rating surveys will be updated to reflect improvements in inventory identified in Section 4.4.4.

Retaining walls

70 per cent of retaining walls are in moderate to very good condition as shown in Figure 4.4-3. 25 per cent have an unknown condition, particularly in the Central area.

Condition assessment programme

A formal condition assessment programme is being developed for retaining wall assets that will start in July 2012. Small walls will be surveyed as part of general inspections every three years. Large engineered walls will be subject to detailed inspections every two years.

The detailed inspections will include visually inspecting all components of the retaining walls and identifying areas of deteriorated concrete such as cracking, spalling and/or delamination as well as

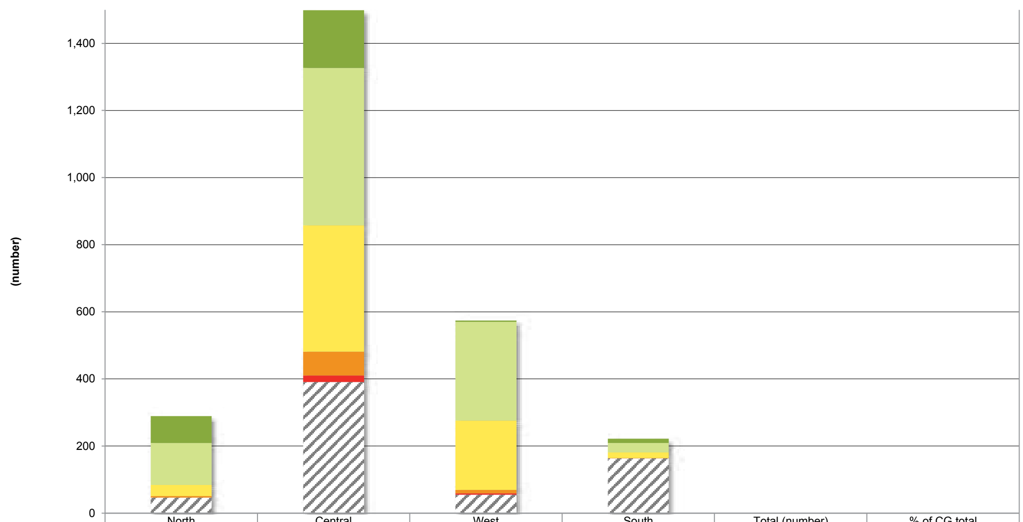
Table 4.4-5 Inventory data completeness
Source: Auckland Transport RAMM database (12 April 2012)

Asset group	Inventory data completeness (%)		
	Measure	Age	Condition
Retaining walls	40	37	77

Table 4.4-6 Retaining wall and sea walls condition surveys
Source: Auckland Transport's Asset Systems and Monitoring (28 February 2012)

Asset group	Current condition survey frequency	Future condition survey frequency
Retaining walls and sea walls	Every two years	Every three years for general survey for small walls Every two years for large, engineered walls
Retaining walls on key routes	Increased frequency	Increased frequency

Figure 4.4-3 Retaining wall condition
Source: Auckland Transport RAMM database (12 April 2012)



	North	Central	West	South	Total (number)	% of CG total
Very Good	80	172	4	13	269	10%
Good	125	469	294	28	916	35%
Moderate	33	377	207	17	634	25%
Poor	5	71	10	1	87	3%
Very Poor	0	19	4	0	23	1%
Unknown	46	391	55	163	655	25%
% of total	11%	58%	22%	9%	100%	
Total (number)	289	1,499	574	222	2584	100%

the extent of corroded reinforcement. A condition rating and confidence will be assigned, as well as a risk factor in terms of public safety and confidence, residual life (physical life left), and a replacement cost and confidence.

4.4.7 Asset performance and capacity

Performance

Retaining wall and sea wall performance is generally defined as performing well (i.e. supports the road or adjacent land) until the moment it fails. Failure may be due to asset condition or other parameters, as discussed below.

Retaining wall and sea wall asset performance was generally not assessed on a formal basis by the legacy councils, except for Auckland City Council. Future asset performance defects will now be identified through general and detailed inspections.

Asset performance of retaining walls and sea walls may also be affected by natural hazards which are considered as part of the risk assessment process. Natural hazard effects on road structures may mean specific retaining walls and sea walls will need to meet a more stringent standard in the future.

Performance parameters for retaining walls, noise walls and sea walls are generally established at the design stage and are not easy to change. If the design information is unavailable, a structural engineer needs to make a structure capacity assessment using available data and measurements.

4.4.8 Asset risks and criticality

Asset risks

Asset risks across the transport network, identified through a formal risk analysis review, appear in Section 8, Risk Management. Risks for the retaining wall network are summarised in Table 4.4-7.

Additional risks identified through the development of this AMP are summarised in Table 4.4-8.

Critical assets

Parts of the retaining wall network are classified as critical assets because they are vital to providing service continuity. Retaining walls and sea walls are very important to support the roadway and their failure may have a major impact. Critical retaining wall assets are likely to be:

- Those located on major arterial and Lifeline link routes
- Those located on overweight and over-dimension routes. Any failure of these structures could cause major disruption to the transport industry as heavy transport may not be able to access ports or industrial areas.

Auckland Transport's action plans for managing these critical assets are:

- Complete a risk analysis of all walls and a route-risk analysis to determine if there are any Auckland Transport or privately owned walls that affect Auckland Transport critical routes

Table 4.4-7 Retaining wall risk analysis
Source: Auckland City Council Transport Risk Analysis 2008

Risk	Net risk factor	Management options
Wall failure caused by natural hazard (e.g. landslide, undermining), vehicle impact and/or accessibility	High risk – requires remedial planning and action via the AMP	Ongoing review of engineering codes Improve accuracy of RAMM data Continue general wall inspection programme Monitor and improve existing processes
Asset ownership – Auckland Transport owned walls on private property, and unknown ownership and reliance on private structures	Moderate risk – address via new procedures and/ or modification of existing practices and training	Continue to monitor and review current practices

Table 4.4-8 Additional retaining wall risk summary

Risk	Management options
Asset failure due to condition and performance of retaining wall assets	Renew and upgrade poor and very poor condition retaining wall facilities across the region
Public safety due to asset failure	Regular general and detailed inspections for all retaining walls and sea walls regionally to assess performance
Lifelines failure	Continue with regional Lifeline coordination Continue general wall inspection programme
Damage to property and underground services (such as water, wastewater, electricity, fibre optic, gas) where they are buried in the road pavement supported by a wall.	Regular general and detailed inspections for all retaining walls regionally to assess performance and potential impact

Table 4.4-9 Key retaining wall issues

No.	Key issues with walls	Action plans for managing these issues	Outcomes
1	Incomplete data and asset knowledge of retaining walls and sea walls	Develop programme for detailed inspections of known and unknown retaining walls and sea walls	Complete inventory of retaining walls and sea walls
2	Ownership of retaining walls on private properties	Risk analysis: Develop ownership guidelines, investigate and reconcile ownership using data from annual condition survey (found assets)	Retaining wall ownership on private properties recorded
3	Condition integrity of structures on Lifeline routes is essential for public safety and civil defence, as required by Auckland Engineering Lifeline Group	Develop programme of seismic screening and risk assessment for structures on the Lifeline routes. A corrosion management study along critical coastal routes should also being undertaken	All retaining walls and sea walls on Lifeline routes assessed seismically
4	Limited knowledge about future renewal needs	Develop planned renewal programme based on detailed inspections once completed	Planned renewal programme completed
5	Incomplete knowledge of retaining wall and sea wall inventory in some rural areas	Develop programme for identifying retaining walls in rural areas associated with road network	Complete inventory of retaining walls in rural areas associated with road network

- Complete condition assessments of retaining wall and sea wall assets on a regular basis, detailed in Section 4.4.6
- Respond to asset failures in a timely manner as detailed in Section 2 Levels of Service
- Regular inspection and maintenance of critical retaining wall and sea wall assets to minimise the impact of poor maintenance.

4.4.9 Key issues

Key lifecycle issues that affect retaining wall assets are summarised in Table 4.4-9.

4.4.10 Operations and maintenance needs

Operations and maintenance plan

Auckland Transport keeps the retaining wall network suitable, accessible, safe and well maintained through an ongoing maintenance programme of either planned maintenance or responsive maintenance work.

Auckland Transport operations work includes the following actions:

Reactive response	Responding to customer faults	General customer complaints
Emergency response	Responding within minimum response times	Events that may affect network safety and integrity, and/or public safety. This can fluctuate depending on adverse weather conditions and traffic accidents / incidents
Routine operations	Superficial inspection	Ensures effective operations service of wall assets. These inspections are undertaken monthly. Visual check of each wall for damage, deterioration, and drainage issues
	General inspections	These inspections are undertaken three monthly. These inspections identify defects and assign condition rating. The maintenance / renewal programme is then produced from the defects list, working within the available budget (unless urgent safety works in excess of budget are required) These detailed inspections assess assets against established performance criteria such as compliance to regulations and current engineering standards

Auckland Transport maintenance work includes the following actions:

Reactive maintenance	**Responding to faults to complete repairs to damaged assets. A low (15 per cent) level of customer-initiated reactive maintenance exists for retaining wall assets**
Planned maintenance	**Most maintenance consists of planned works though network inspection. This includes cleaning, weeding and debris removal, making safe and minor (expensed) repairs to the wall networks**
Reporting	**Reporting on maintenance activities to enable asset analysis**

The response times of the physical maintenance works are summarised in Table 4.4-10. Routine is the maintenance required to repair a fault identified by the routine operation inspections. The response times are the same for all road hierarchies.

Table 4.4-10 Physical maintenance works' response times
Source: Draft Technical Specifications Volume 5, RCM South Contract (8 February 2012)

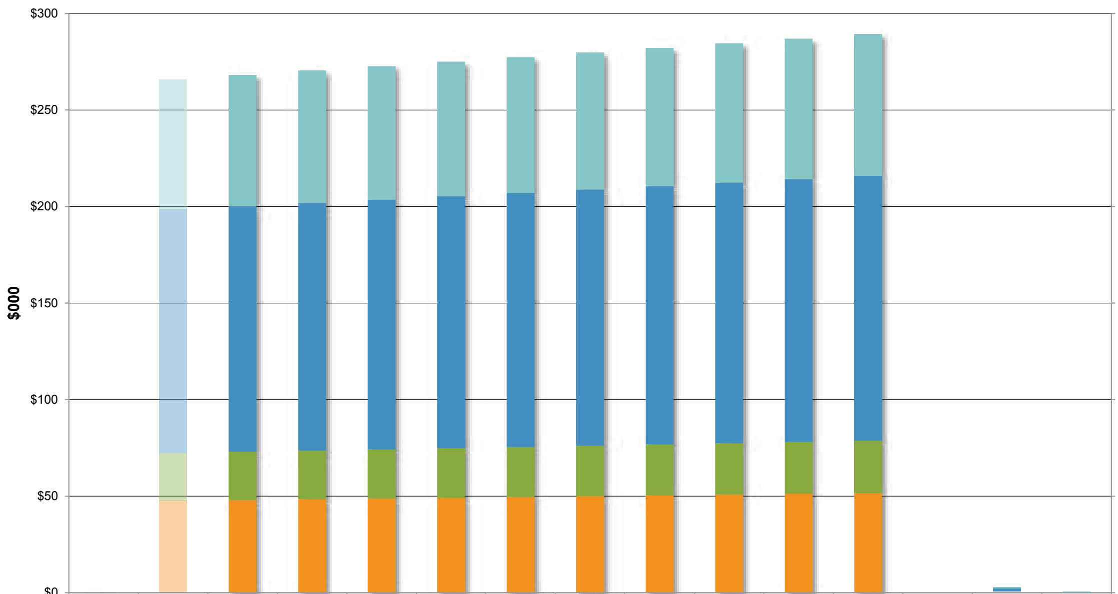
Maintenance activity	Response times
Urgent / essential	**1 day**
Routine	**As required**

Operations and maintenance 10-year expenditure forecast

The recommended 10-year operational expenditure forecast is shown in Figure 4.4-4 with $3 million forecast over the next 10 years. It is based primarily on historical trends but also includes the revised activities detailed above and levels of service to be achieved. This recommendation has also taken into account current funding constraints being experienced by Auckland Transport and Auckland Council. Note, however, that the actual plan to be approved by Auckland Transport and Auckland Council may yet differ from these network needs because of the impact of funding constraints.

The average annual expenditure for operations and maintenance on retaining walls over the next 10 years is approximately $280,000 which is approximately eight per cent of the total expenditure against retaining walls.

Figure 4.4-4 Planned retaining wall operations and maintenance expenditure
Source: LTP Budget Model 12 April 2012 after Refresh for AMP



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	Total (asset) (unit)	Annual average $/(unit)
North	25%	067	068	069	069	070	070	071	072	072	073	073	707	775	$91
Central	47%	126	127	128	129	130	132	133	134	135	136	137	1,321	1,459	$91
West	9%	025	025	025	025	026	026	026	026	027	027	027	260	552	$47
South	18%	048	048	048	049	049	050	050	050	051	051	052	498	200	$249
Total		266	268	270	273	275	277	280	282	285	287	289	2,787	2,986	$93

4.4.11 Renewal needs

Renewal strategy

Retaining wall assets are generally renewed following structural defects and safety-related issues identified through planned condition surveys and operational inspections. Sea wall renewals are based on condition survey results and any assets with significant defects are renewed, unless this is obviously the more expensive long-term option.

It is expected to be many years before renewal of noise walls becomes necessary, and likely that replacement drivers will be based on aesthetic / architectural values rather than structural condition and technical performance.

Renewal plan

10-year renewal plan

Auckland Transport's long-term renewal plan is to analyse data extracted from the RAMM database. Renewals are developed using age and condition-based analysis. A simple tool is used to model the 10-year renewal profiles for both methods. The resulting 10-year renewal profiles are used for asset management purposes.

Annual and three-year renewal plan

Auckland Transport also prepares a short-term renewal programme for delivering the forward works programme for the next one to three years. This programme includes site walkovers, confirmation of asset ownership and coordination with other work programmes.

Renewal analysis

Currently there is insufficient asset data to complete renewal analysis for the retaining wall asset group. This will be developed over time as better information becomes available with the planned condition assessments.

Operational priorities

Operational priorities are discussed under the preliminary renewal programme for 2012/13 (refer to Section 4.4.11, renewal 10-year work and expenditure forecast).

Historical trends

There is currently insufficient commonality between legacy data sets to provide a reliable regional view of historical expenditure trends. A future asset management improvement is to implement consistent tracking of expenditure by asset type and expenditure type.

Depreciation profile

The annual depreciation for road bridges and structures (includes retaining walls and corridor structures) is constant at $12 million over the next 10 years as indicated in Table 4.4-11.

Renewals 10-year work and expenditure forecast

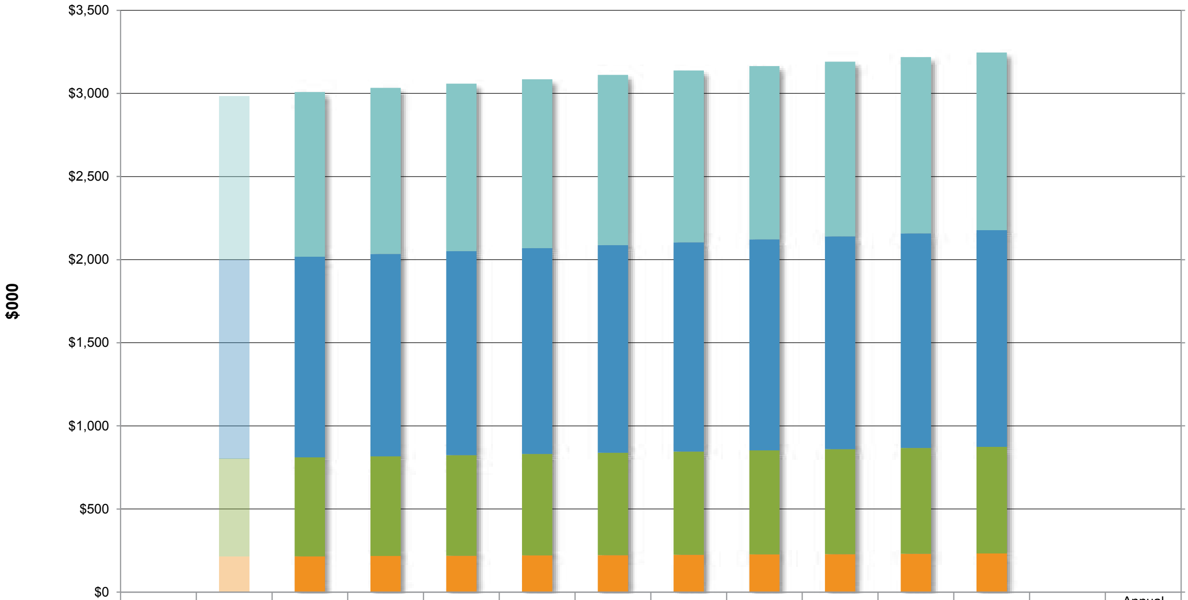
The analyses given above provide varying levels of indicative renewal work for the future. This demonstrates the current difficulty of forecasting future renewal needs.

The recommended 10-year renewal needs are shown in Figure 4.4-5 on page 150. Note, however, that the actual renewals plan that will be approved by Auckland Transport and Auckland Council may yet differ from these network needs because of the impact of funding constraints.

Table 4.4-11 Bridging structures depreciation forecasts
Source: Auckland Transport infrastructure depreciation profiles (25 April 2012)

Profile	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Depreciation ($ millions)	12	12	12	12	12	12	12	12	12	12	12	134

Figure 4.4-5 Planned retaining wall renewal expenditure
Source: LTP Budget Model 12 April 2012 after Refresh for AMP



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	Annual Average $ / area network
North	33%	982	990	999	1,007	1,016	1,025	1,033	1,042	1,051	1,060	1,069	10,293	$1,328
Central	40%	1,197	1,207	1,218	1,228	1,238	1,249	1,260	1,270	1,281	1,292	1,303	12,546	$860
West	20%	590	595	600	605	610	615	621	626	631	636	642	6,181	$1,120
South	7%	213	215	217	219	221	223	224	226	228	230	232	2,236	$1,118
Renewals (unit)		0	91	91	91	91	91	91	91	91	91	91	910	
TOTAL	100%	2,982	3,008	3,033	3,059	3,085	3,111	3,138	3,165	3,191	3,219	3,246	31,255	$1,047

Figure 4.4-5 shows that renewals are relatively constant at $3 million each year. There is $31.3 million available for retaining wall renewals for the next 10 years. Most of this is located in the Central area at $12.6 million, followed by $10.3 million for the North area. The Rodney retaining walls budget is mainly for network security to address slips on rural roads after storm events rather than programmed asset renewals.

Renewal projects

Separate renewal projects are not listed in this AMP as they are prepared within the one-year detailed work programme with multiple small projects. The $3.7 million Huia sea wall renewal is the only significant renewal project.

Major renewals are implemented through a design and build contract methodology. Contracts are let through a competitive tendering process. Minor renewals are included in the maintenance contract.

The preliminary renewal programme for 2012/13 has identified the following renewal project quantities for retaining walls with this draft AMP, as shown in Table 4.4-12. These quantities are based on renewing all poor and very poor condition assets currently shown in RAMM (as at November 2011).

These quantities represent an indicative programme that is still being refined. These renewal quantities will be better understood as new maintenance contracts are put in place and consistent information becomes available regionally (refer to Section 4.4.6, condition assessment programme).

Table 4.4-12 Indicative renewal quantities
Source: Road Corridor Maintenance (11 November 2011)

Management area	Estimated retaining wall projects for 2012/13 (or sites)
Central	69
North	2
South	2
West	18
Total	91

4.4.12 New works needs

New works plan

There are no separate retaining wall new works identified in the capital plan. Any new walls will be created as part of new roads / routes constructed to meet demand and their costs include in the overall project costs and budgeted accordingly. The capital plan to meet growth and demand is covered in Section 3, Growth and Demand.

New works programmes

There is no new works programme for retaining walls.

Growth related new works

There are about 54km of State Highway that NZTA intend to revoke the State Highway designation from. All of these roads, with the possible exception of SH18A, will remain arterial roads. The number of retaining walls is unknown from an initial assessment.

Levels of service related new works

There are no levels of service related to new works for retaining walls.

4.4.13 Disposal plan

Disposal is any activity associated with disposal of a decommissioned asset, including sale, demolition or relocation. For walls, the asset disposed has no residual value because it is unsuitable for reuse on the network. However, a sustainable network plan may include recycling suitable materials, for example excavated basalt wall stone for retaining wall reinstatement works.

4.4.14 Summary of 10-year network needs

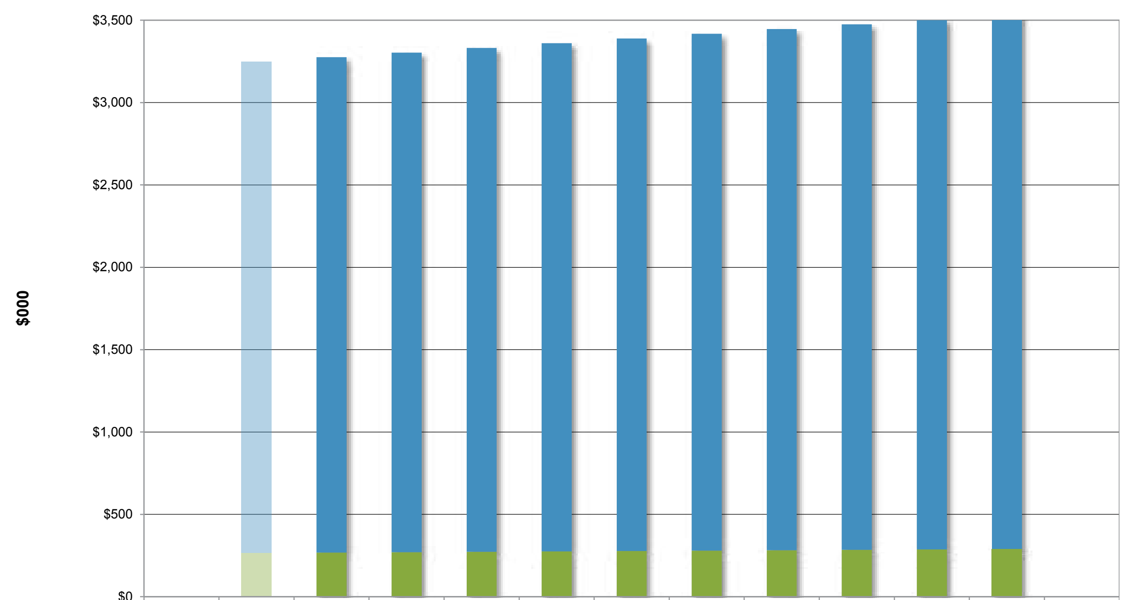
The total amount of expenditure for operations and maintenance and renewals over the next 10 years is $34 million. Average annual expenditure for operations and maintenance and renewals on retaining walls over the next 10 years is approximately $3.4 million, of which $279,000 (or 8 per cent) is for operations and maintenance, and $3.2 million (or 92 per cent) is for renewals.

The operations and renewal forecasts are summarised in Figure 4.4-6 and show that total annual costs are increasing from $3.3 million to $3.6 million per year.

Notes on the above expenditures:

- There are no separate new works identified with the retaining wall LCMP
- The proposed 10-year expenditures for OPEX and renewals includes an annual growth factor of +0.85 per cent to allow for consequential OPEX and consequential renewals from growth in the network and in demand for services
- Professional costs are included in renewal total costs.

Figure 4.4-6 Summary of retaining wall operations and renewal forecast
Source: LTP Budget Model 12 April 2012 after Refresh for AMP



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total
CAPEX New Works	0%	000	000	000	000	000	000	000	000	000	000	000	000
Renewals	92%	2,982	3,008	3,033	3,059	3,085	3,111	3,138	3,165	3,191	3,219	3,246	31,255
Operations & Maintenance	8%	266	268	270	273	275	277	280	282	285	287	289	2,787
TOTAL	100%	3,248	3,276	3,304	3,332	3,360	3,389	3,418	3,447	3,476	3,505	3,535	34,042

Historically, there were mixed approaches to funding retaining walls by the legacy councils and in particular there were different indicators for renewals. Over time Auckland Transport's planned operation and renewals budgets will better reflect the asset needs based on better information regionally, such as complete inventories, condition and risk assessments, and agreed service levels. A key improvement programme is to develop robust 10-year renewal programmes.

One particular consequence of this situation is that the budgeted items for asset renewal include few retaining or sea walls and no corridor structures, but a significant list of bridges. All three of these asset classes are funded from the same high-level budget (Bridges and Structures). Budget allocations recommended by the legacy councils will be altered to reflect the following overall distribution of renewal expenditure until the improvements outlined above can provide more robust input into the forward programmes:

- It is assumed that retaining walls comprise 10 per cent of the structures operations budget (with bridges 85 per cent and corridor structures 5 per cent)
- It is assumed that retaining walls comprise 25 per cent of the structures renewals budget (with bridges 70 per cent and corridor structures 5 per cent).

4.4.15 Approved Long Term Plan envelope

The approved Long Term Plan

This section compares the approved LTP envelope for OPEX and renewals with the retaining walls network needs as determined by this AMP at a regional level and identifies the likely impacts of any variances. Revenue and funding incomes to Auckland Transport (from Auckland Council ratepayers and NZTA government subsidies and the like) are allocated through the approved Long Term Plan budgets. The LTP was adopted on 28 June 2012.

OPEX impacts

Based on the information in Table 4.4-13, retaining walls operational expenditure shows no variance between the LTP allocated budgets and the AMP needs. However it is anticipated that the LTP will require further efficiency savings and therefore a funding gap for retaining walls operational expenditure may eventuate.

Renewals impacts

The LTP allocated budget for retaining wall capital renewals has a 10-year shortfall of $10.8 million (35 per cent reduction) compared to the network needs determined by this AMP. The approved LTP budget envelope appears to be insufficient to reduce the current levels of deferred renewals. The shortfall of $10.8 million, which is part of a $43 million reduction to central area structure renewals, equates to a reduction of approximately 300 retaining wall renewal projects over the 10 years of the plan.

Further efficiency savings

As required by the approved LTP, a further reduction in OPEX of $18.6 million per year, reducing to nil by 2016/17, will need to be allocated against asset related operational budgets. The impact of this reduction on retaining walls operational budgets is yet to be assessed and finalised.

Monitoring and management of Long Term Plan consequences

The consequences resulting from these variances will be monitored and reported as appropriate.

CAPEX new works

CAPEX new works contained in this AMP are derived from draft LTP listings as at April 2012 and are produced in section 4.4.12.

Table 4.4-13 Variance between LTP approved budget and AMP network needs for retaining walls (all un-inflated)
Source: LTP Budget Model 12 April 2012 after refresh for AMP and revised LTP Budget Model 28 June 2012

Retaining walls	10-year total LTP approved budget ($000s un-inflated)	10-year total AMP network needs ($000s un-inflated)	Variance 10-year total ($000s un-inflated)
Operations and maintenance	2,787	2,787	0
Renewals	20,408	31,255	-10,847
Retaining walls total	23,195	34,042	-10,847

The capital new works programme has been further refined and adopted in late June 2012. Details of this adopted programme are contained in the LTP.

AMP inflation effects

Un-inflated and inflated retaining walls needs for the AMP are shown in Table 4.4-14.

LTP inflation effects

Un-inflated and inflated retaining walls budgets from the LTP are shown in Table 4.4-15.

Table 4.4-14 Un-inflated and inflated retaining walls AMP needs

Source: LTP Budget Model 12 April 2012 after refresh for AMP and revised LTP Budget Model 28 June 2012

UN-INFLATED expenditure ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M		268	270	273	275	277	280	282	285	287	289	2,787
Renewal		3,008	3,033	3,059	3,085	3,111	3,138	3,165	3,191	3,219	3,246	31,255
Retaining walls total		3,276	3,303	3,332	3,360	3,388	3,418	3,447	3,476	3,506	3,535	34,042
AC Inflator	OPEX	3.30%	3.30%	3.30%	3.30%	3.50%	3.60%	3.10%	3.10%	3.30%	3.60%	n/a
AC Inflator	CAPEX	3.90%	3.40%	2.80%	2.90%	3.10%	3.30%	3.50%	3.70%	4.00%	4.00%	n/a
INFLATED expenditure ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M		277	289	301	314	328	341	354	369	386	403	3,361
Renewal		3,125	3,259	3,379	3,506	3,646	3,798	3,964	4,146	4,348	4,561	37,731
Retaining walls total		3,402	3,548	3,680	3,820	3,974	4,139	4,318	4,515	4,734	4,964	41,092

Table 4.4-15 Un-inflated and inflated retaining walls LTP budgets

Source: LTP Budget Model 12 April 2012 after refresh for AMP and revised LTP Budget Model 28 June 2012

UN-INFLATED expenditure ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M		268	270	273	275	277	280	282	285	287	289	2,787
Renewal		2,843	1,829	1,565	1,640	1,988	2,096	2,072	2,072	2,146	2,157	20,408
Retaining walls total		3,112	2,100	1,838	1,915	2,266	2,376	2,354	2,356	2,433	2,446	23,195
AC Inflator	OPEX	3.30%	3.30%	3.30%	3.30%	3.50%	3.60%	3.10%	3.10%	3.30%	3.60%	n/a
AC Inflator	CAPEX	3.90%	3.40%	2.80%	2.90%	3.10%	3.30%	3.50%	3.70%	4.00%	4.00%	n/a
INFLATED expenditure ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M		277	289	301	314	328	341	354	369	386	403	3,361
Renewal		2,954	1,965	1,728	1,864	2,330	2,537	2,595	2,691	2,900	3,030	24,594
Retaining walls total		3,231	2,254	2,029	2,178	2,658	2,878	2,950	3,060	3,285	3,434	27,956

4.4.16 Revenue sources

Revenue and funding incomes to Auckland Transport are contained in Auckland Transport's SAP financial management system.

Retaining walls and sea walls that protect and support a roadway are normally subsidised by NZTA but not where they protect private property (e.g. retaining walls above a roadway). Retaining wall expenditure is therefore a mix of both subsidised and unsubsidised. Noise wall maintenance and renewal is subsidised when construction has been agreed by the NZTA.

Operations and maintenance revenue

Wall operations and maintenance is normally subsidised at 43 per cent (from July 2012) by NZTA but not where walls support private property.

Capital renewals revenue

Wall renewal costs are normally subsidised at 43 per cent (from July 2012) by NZTA but not where walls support private property.

The function of the renewal budget is to maintain a level of service of an asset by intervening prior to either the end of the useful life of the asset, or the condition of the asset falling below an agreed level.

Capital new works

There are no retaining wall capital new works identified in this plan.

Retaining wall capital new works to cater for growth are generally funded and provided by developers of new subdivisions. The age and condition needs to be better understood to manage these assets going forward.

4.4.17 Key improvement initiatives

Key improvement initiatives relating to retaining walls is summarised in Table 4.4-16.

Table 4.4-16 Key improvement initiatives

Improvement initiative number	Description	AMP section	Priority
Wall 1	Collect asset information regionally to complete the inventory of retaining walls and sea walls (especially in the Rodney area)	4.4.4	High
Wall 2	Assess retaining wall condition regionally especially in the Papakura and Franklin areas	4.4.6	Medium
Wall 3	Assess sea wall condition regionally especially in the North Shore, Papakura, Franklin and Waitakere areas	4.4.6	Medium
Wall 4	Complete general and detailed inspections to assess performance issues for retaining walls and sea walls	4.4.7	High
Wall 5	It is recommended that expenditures on retaining walls, sea walls and noise walls be separated at General Ledger level from those on bridges	4.4.14	Very high
Wall 6	Start tracking historical expenditure trends of road retaining wall operations and maintenance, and renewal costs	4.4.14	High
Wall 7	Complete a renewal analysis for retaining walls as information becomes available	4.4.11	Medium
Wall 8	Understand the complete asset portfolio of the retaining walls that are to be revocated to Auckland Transport from NZTA	4.4.12	High

4.5 Contents

4.5 Corridor Structures

4.5.1 The service Auckland Transport provides

An Auckland Transport objective is that the network is well maintained so that it provides safe and continuous usage by vehicles and road users.

Corridor structures help Auckland Transport deliver a safe and pleasant network by providing physical mode separation and traffic control elements. They are specifically designed and maintained to:

- Help reduce the likelihood of significant adverse effects resulting from errors in vehicle driving, walking or cycling
- Provide physical separation and/or reduced traffic speeds both between traffic flows and between different types of road users in situations with elevated crash risks
- Improve road users visibility of signs
- Monitor the behaviour of traffic and people to allow for early intervention if unsafe situations develop
- Enhance the visual environment through use of ornamental features in appropriate locations.

There are currently no levels of service specific to corridor structures. This will be reviewed as part of the levels of service improvement plan with a focus on asset safety and condition.

4.5.2 Network overview

Auckland Transport has ownership and management responsibilities for the region's 55km of roadside barriers and 10 gantries. Corridor structures comprise of a range of assets including:

Railings and fences	Roadside barriers	Vehicle safety and crash barriers including median barriers (except bridge barriers)
	Hand rails	Pedestrian and cyclist rails and barriers (except bridge hand-rails)
	Bollards	Excluding lighting bollards which are included in the streetlight LCMP
	Sight rails	
	Gates	Including gates in barriers
	Fences	Owned by Auckland Council and maintained on its behalf by Auckland Transport
Other	Gantries	Usually used for mounting signs or cameras
	Islands	
	Sculptures and ornamental features	
	Traffic islands	Including raised medians, throat islands and pedestrian refuges (except painted traffic islands and painted medians as these are road marking assets)
	Roundabouts	
	Planters	Fixed, including raised planters
	Rest areas	
	Speed humps	Including bumps and platforms

4.5.3 Network valuation

The value of the corridor structures is shown in Table 4.5-1. (Refer to the appendices for the full valuation.)

4.5.4 Asset details

Auckland Transport has ownership responsibilities for the corridor structures as shown in Table 4.5-2.

Table 4.5-1 Corridor structures valuation
Source: Auckland Transport Asset Revaluation (30 June 2011)

Asset	Optimised replacement cost (ORC) $000s	Optimised depreciated replacement cost (ODRC) $000s	Annual depreciation (ADR) $000s
Railings and fences and other structures	47,272	25,997	1,800

Table 4.5-2 Corridor structures asset data
Source: Auckland Transport RAMM database (25 May 2011) for all groups except for islands (30 May 2012)

Group	Asset	Total quantity (each)	Total length (m)
Railings and fences	Barrier	1,171	55,061
	Bollard	495	1,273
	Fence	370	21,634
	Gate	4	258
	Hand rail	565	19,509
	Sight rail	732	10,137
Railings and fences total		3,337	107,872
Other	Gantry	10	-
	Island	1,798	-
	Roundabout	94	-
	Sculpture	4	-
Other total		1,906	-
Grand total		5,243	107,872

These quantities are only approximate because the legacy councils used widely different names for similar assets and stored their data in different RAMM tables.

There are a large number of different asset types and configurations, and a lack of standard names reduces the data usefulness. For example, there are 16 barrier types installed on the transport network as described in the RAMM database (refer to the appendices for full details). The lack of standard nomenclature reduces the data usefulness.

The useful asset life for corridor structures through the 2011 asset valuation process is as follows:

Railings and fences	10 – 50 years depending on type and material
Other structures	50 – 80 years

4.5.5 Data confidence

The RAMM database holds asset information for the corridor structure network, including condition rating information. Data anomalies and inconsistencies were noticed while extracting corridor structures data from these RAMM tables, including the way assets are described. Names and filing protocols for these assets should be reviewed to help improve asset management and maintenance.

The assessment of data confidence is based on the data confidence grading system and methodology described in Section 2.4.5 of the International Infrastructure Management Manual 2011.

Table 4.5-3 illustrates Auckland Transport's confidence (in the accuracy and completeness) in its asset data.

The current overall confidence level of asset data in terms of condition and performance of corridor structures is 'very uncertain'. The current confidence level of asset data in terms of asset quantity and description of the corridor structures is 'uncertain'.

4.5.6 Asset condition

Condition rating

Gantries and high mast lights are condition surveyed at least every three years. The standard RAMM inspection and condition reporting system is followed for these assets. No formal condition assessments are undertaken but these are managed through road routine inspections.

High mast lights are part of street lights asset group. However, high masts are included in the structures inspection schedule as they are structures of significant size. High mast lights are inspected as corridor structures when it is considered that the asset is more a structure than a streetlight.

Corridor structures

Only 22 per cent of the railing asset condition is recorded in RAMM and the balance having 'unknown' condition. Only 10 of the 1,144 assets listed in the Features Table have conditions recorded, of which all are 'excellent'.

No sensible statements can therefore be currently made on the overall condition of corridor structures. The gathering of condition information on corridor structures, or sub-assets within this category, will be prioritised and appropriate condition surveys implemented.

Table 4.5-3 Corridor structures data confidence

Data attribute	Very uncertain	Uncertain	Reliable	Highly reliable
Asset descriptors and quantity				
Asset age				
Condition				
Performance				

Condition assessment programme

A formal condition assessment programme is being developed for the road network and will start in July 2012. Future condition survey of gantries will be at least every three years (still being refined).

4.5.7 Asset performance and capacity

Performance

The performances of the various types of assets are affected by their characteristics and purposes or required levels of service as follows:

Barriers

The purpose of barriers is to prevent vehicles or people leaving the roadway or footpath and to minimise the adverse effects of this restraint. Pedestrian and vehicle barriers both have principal components with similar functions but they are not usually differentiated:

- Barrier
- Barrier anchor point
- Trailing termination / anchor point
- Mid-point tensioning or anchor point(s) (occasionally).

Regular and frequent inspections of all these elements are required, as one vehicle impact will reduce the elements ability to respond as designed to a consequent one. Damaged barriers are identified through customer fault notification, New Zealand Police for significant accidents, and routine inspections by the maintenance contractor.

Currently it is not possible to separate pedestrian barriers clearly from vehicle barriers or pedestrian handrails or fences. This has been identified as a future improvement initiative.

Bollards

Bollards are essentially barriers to vehicles but still allow free flow of pedestrians and cyclists. Because they have little energy-absorption capability, they are rarely used outside low-speed environments such as car parks, pedestrian and/or cycling areas.

Bollards deteriorate mainly because of impact damage and occasionally graffiti and vandalism so they require periodic inspection. Bollards are more likely to become redundant as other changes are made to the surrounding network.

Fences

Fences are erected to deter personnel, or occasionally vehicle, movement. This may be safety related or to direct movement. Their performances are affected by condition and deteriorate over time. Their level of service is also affected by appearance which can require aesthetic treatment (repainting etc) at more frequent intervals. They can be damaged by vehicles and vandalism.

Railings and sight rails

Railings can have one of two purposes, and sometimes a combination of both:

- Visual barriers
- Guide to passage such as handrails on steps or for cyclists at crossing points.

Visual barrier railings must provide a high visual contrast with the background and not be obscured by vegetation or other obstacles. Maintenance of this aspect requires frequent and regular inspection appropriate to the site significance.

As aids to mobility, rails must have sufficient strength to carry the required loads and not create obstacles to the movement of others or hazards to users.

Crash cushions

Crash cushions provide a safety feature at the end of barriers or around bridges by reducing vehicle acceleration on impact.

4.5.8 Asset risks and criticality

Asset risks

Asset risks across the transport network, identified through a formal risk analysis review, appear in the Section 8, Risk Management. Risks for corridor structures are shown in Table 4.5-4.

Table 4.5-4 Corridor structures risk summary
Source: Auckland City Council Transport Risk Analysis 2008

Risk	Net risk factor	Management options
Damaged and/or missing guard rails / medians / bollards / fences	Medium risk	• Appropriate inspection regime • Monitor and improve current practices • Ensure that safety measures / temporary traffic measures are implemented as part of all road works (temporary barriers) • Review of standards (MOTSAM, NZTA specs etc), and audit of controls and control works • Ongoing crash reduction studies (in conjunction with Police, NZTA) • Continual safety audits managed

Table 4.5-5 Additional corridor structures risk summary

Risk	Management options
Pedestrian rails in locations where there should be pedestrian barriers	Review network, identify deficiencies, institute programme of remedial works
Steep pedestrian walkways / cycle tracks, that exit onto footpaths / roadsides in an inherently unsafe manner	Review network for these features, identify deficiencies, introduce programme of remedial works. Typical remedies include a kink in the end of the path to discourage fast egress or a barrier on the kerb opposite the exit

Additional risks identified through the development of this AMP are summarised in Table 4.5-5.

Critical assets

Critical assets are those minor structures that are vital to providing service continuity and have unacceptable consequences should they fail. Although a formal analysis of asset criticality has not yet been undertaken, critical minor structures' assets are likely to be:

- Those preventing / restricting access to hazardous areas
- Those preventing hazardous mixing of different users, e.g. pedestrians and motor vehicles
- Crash attenuators
- Those located on Lifeline routes and busy roads and pedestrian ways.

Auckland Transport action plans for managing critical assets include:

- Completing a risk analysis of all corridor structures that includes the effects on critical routes
- Establishing and implementing an appropriate, risk-based and levels of service-based condition and performance assessment regime for miscellaneous structures
- Responding to asset failures in a timely manner
- Continued regular inspection and maintenance of miscellaneous structures' assets to ensure they continue to provide the required levels of service
- Review of asset failures to determine whether any changes to design, type or specification, installation or maintenance are required or appropriate.

4.5.9 Key issues

Key lifecycle issues that affect corridor structures assets are shown in Table 4.5-6.

Table 4.5-6 Key corridor structures issues

No.	Key issues with corridor structures	Action plans for managing these issues	Outcomes
1	Unreported damage to mode separation structures creating unsafe road environment	Contractor, public and police reporting Services reporting Regular inspection regime	Complete and fully functioning mode separation structures
2	Ongoing operations and maintenance issues when working in heavy traffic environments, including night work	Coordinated and planned traffic management plans that consider peak traffic needs, adequate signage and clear indication of the timings of alternate routes	Corridor structures are maintained adequately in all trafficked road networks
3	Unreported and untraceable damage caused by vehicle crashes and vandalism inflicting additional costs	Continued close liaison with the New Zealand Police and reporting by the public	All damaged corridor structures are reported
4	Maintain focus on the condition and integrity of structures on Lifeline routes essential for public safety and civil defence, as noted by AELG (refer to Section 8, Risk Management)	Develop a risk register in alignment with NZ Standard AS4360 to include risks associated with asset groups, such as pavements, bridges, footpaths	Corridor structures on Lifeline routes are in good condition

Table 4.5-7 Routine operations frequencies

Source: Draft Technical Specifications Volume 5, RCM South Contract (8 February 2012)

Category	Road hierarchy	Routine inspection frequency	Detailed inspection frequency
Berm and pedestrian facilities	Regional and district arterial routes, collector routes, local and collector routes (5,000 – 10,000 vpd)	Weekly	Three monthly
	Generally local sealed roads (1,000 – 5,000 vpd)	Two weekly	Three monthly
	Generally local sealed roads (<1,000 vpd), unsealed roads, access ways and car parks	Two monthly	Six monthly
Walkways	N/A	Four monthly	Six monthly

4.5.10 Operations and maintenance needs

Operations and maintenance plans

Auckland Transport keeps its corridor structures suitable, accessible, safe and well maintained by carrying out either planned maintenance or responsive maintenance. It also addresses progressive deterioration, corrosion, decay, damage and defects resulting from normal wear and tear of the structures or arising from health and safety issues and public complaints.

The principal drivers of minor structures' work are asset inspections by contractors, Auckland Transport technical staff and the public. The balance of work on these structures, between planned works identified by network inspections and reactive works is not currently available. Identifying this breakdown is important to planning and management of both maintenance and operations and renewals.

The scope of corridor structures operations and maintenance activities include:

- Inspections (general and detailed)
- Emergency response and works
- Vegetation removal
- Cleaning and repair of damaged assets.

Auckland Transport's operations plan includes:

Contractor and staff inspections of crash attenuators (railing terminals) and safety railing of all types	Looking for superficial damage and deterioration, or issues that might affect the safe or correct operation of the attenuators or railings These are independent inspections and are not necessarily simultaneous The defects required to be identified are defined in the key results schedules of their contracts
Contractor and staff inspections of miscellaneous structures of all types, other than safety railing	Looking for superficial damage and deterioration, or issues that might affect the safe passage of any road user These are independent inspections and are not necessarily simultaneous The defects they are required to identify include appearance, weed growth, vandalism, traffic damage and other damage
Periodic detailed inspections	These inspections provide the condition rating data for structures and are a significant input into the forward maintenance and renewal programme

Routine inspections are visual inspections by driving the road and recording any traffic safety issues (such as traffic damage and vandalism). Detailed inspections are field assessments to identify any defects including condition and performance at individual asset type level. The frequencies for routine and detailed inspections are summarised in Table 4.5-7 based on the road hierarchy for berm and pedestrian facilities.

Auckland Transport's maintenance plan includes the following:

- Cleaning operating paths / tracks of movable items such as crash attenuators
- Greasing moveable parts where required by the manufacturers' instructions
- Removing vegetation
- Minor concrete repairs
- Repairing crash / vandalism and other damage
- Repainting
- Replacing individual items damaged beyond economic repair.

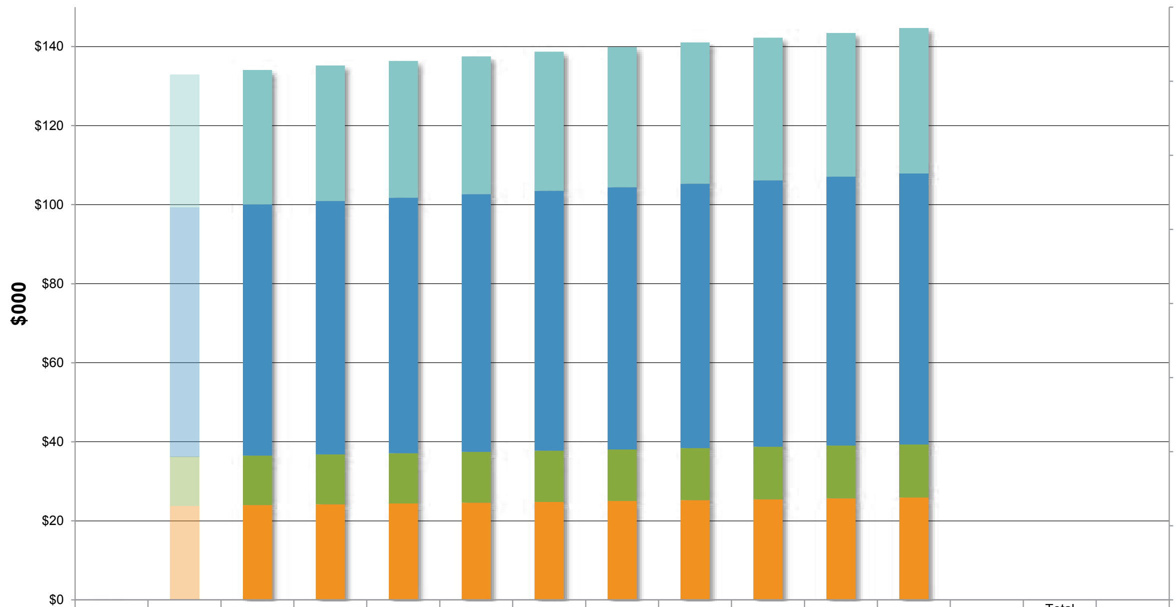
Routine physical works is the maintenance required to repair the fault identified by the routine operation inspections. The frequencies are the same for all road hierarchies and are summarised in Table 4.5-8.

Table 4.5-8 Physical maintenance works' frequencies

Source: Draft Technical Specifications Volume 5, RCM South Contract (8 February 2012)

Maintenance activity	Frequency
Vegetation (mechanical trimming)	one week
Guard rails	one day
Graffiti	one week

Figure 4.5-1 Planned corridor structures operations and maintenance expenditure
Source: LTP Budget Model 12 April 2012 after Refresh for AMP



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	Total (traffic barriers) (km)	Annual average $/(unit)
North	25%	034	034	034	035	035	035	035	036	036	036	037	353	14	$2,570
Central	47%	063	064	064	065	065	066	066	067	067	068	069	661	14	$4,805
West	9%	012	013	013	013	013	013	013	013	013	013	013	130	14	$945
South	18%	024	024	024	024	025	025	025	025	025	026	026	249	14	$1,813
Total		133	134	135	136	138	139	140	141	142	143	145	1,393	55	$2,533

Operations and maintenance 10-year expenditure forecast

The recommended 10-year operational expenditure forecast is shown in Figure 4.5-1 with $1.4 million forecast over the next 10 years. This recommendation has also taken into account current funding constraints being experienced by Auckland Transport and Auckland Council. Note, however, that the actual plan to be approved by Auckland Transport and Auckland Council may yet differ from these network needs because of the impact of these constraints.

The average annual expenditure for operations and maintenance on corridor structures over the next 10 years is approximately $140,000 – approximately 18 per cent of the total expenditure. Approximately half of the planned operational expenditure is for the Central area.

4.5.11 Renewal needs

Renewal strategy

Auckland Transport's current renewal strategy is either whole asset replacement or, where possible, limited to specific components or sections. Auckland Transport renews corridor structures assets when they reach the end of their effective or useful life. This is influenced by the type of asset, frequency of crash damage, aesthetics, materials and risk and safety considerations.

Renewal plan

10-year renewal plan

Auckland Transport's long-term renewal is the analysis of data extracted from the RAMM database. Renewals are developed using age and condition-based analysis. A simple tool is used to model the 10-year renewal profiles for both methods. The resulting 10-year renewal profiles are used for asset management purposes.

At present there is no system for either establishing the growth rate of these assets or for reflecting the quantity of new assets vested each year in future renewals programmes. While each annual change may be small, the cumulative effect can be significant. Auckland Transport will prioritise rectifying this gap in its asset management system.

Annual and three-year renewal plan

Corridor structure assets are currently renewed reactively. This includes damaged assets from vehicular crashes and faults reported from the public. As the new RCM contracts with an outcome focus are implemented, more planned renewals are expected from the identified defects.

There is some vulnerability around lack of programming of CCTV cameras as these are relatively short-lived items. A future improvement initiative is to identify their replacement needs.

Renewal analysis

Currently, there is insufficient asset data to complete renewal analysis for the corridor structures asset group. This will be developed over time as better information becomes available with the planned condition assessments.

Operational priorities

As discussed, the preliminary renewal programme for 2012/13 is mainly reactive. These renewal quantities are expected to be better understood as new maintenance contracts are put in place and consistent condition information becomes available regionally to develop robust renewal programmes.

Historical trends

There is currently insufficient commonality between legacy data sets to provide a reliable regional view of historical expenditure trends. A future asset management improvement is to implement consistent tracking of expenditure by asset type and expenditure type over time. This will enable robust analysis of expenditure trends in future.

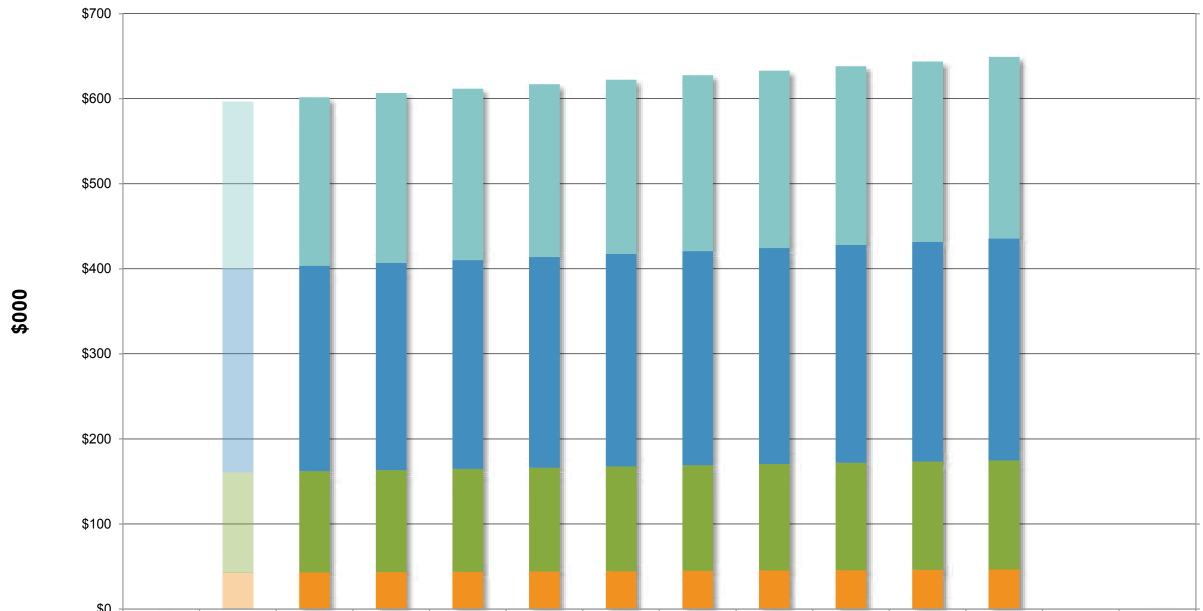
Depreciation profile

The annual depreciation for road bridges and structures (includes retaining walls and corridor structures) is constant at $12 million over the next 10 years as indicated in Table 4.5-9.

Table 4.5-9 Bridging structures depreciation forecasts
Source: Auckland Transport infrastructure depreciation profiles (25 April 2012)

Profile	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Depreciation ($ millions)	12	12	12	12	12	12	12	12	12	12	12	134

Figure 4.5-2 Planned corridor structures renewal expenditure
Source: LTP Budget Model 12 April 2012 after Refresh for AMP



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	Annual Average $ / area network
North	33%	196	198	200	201	203	205	207	208	210	212	214	2,059	$14,971
Central	40%	239	241	244	246	248	250	252	254	256	258	261	2,509	$18,248
West	20%	118	119	120	121	122	123	124	125	126	127	128	1,236	$8,990
South	7%	43	43	43	44	44	45	45	45	46	46	46	447	$3,253
Renewals (km)		0	0	0	0	0	0	0	0	0	0	0	0	
TOTAL	100%	596	602	607	612	617	622	628	633	638	644	649	6,251	$11,366

Renewals 10-year work and expenditure forecast

The analyses given above provide varying levels of indicative renewal work for the future. This demonstrates the current difficulty of forecasting future renewal needs.

The recommended 10-year renewal needs are shown in Figure 4.5-2. Note, however, that the actual renewals plan to be approved by Auckland Transport and the Auckland Council may yet differ from these network needs because of the impact of funding constraints.

Figure 4.5-2 shows that renewals are relatively constant at $600,000 per year. There is a total of $6.3 million for corridor structure renewals for the next 10 years with most of this located in the Central and North areas at $2.5 million and $2 million respectively.

Smaller assets, such as 'tear-drop' traffic islands within road carriageways, will generally be renewed when the carriageway is renewed. Larger assets, such as roundabouts, are less likely to be renewed in this way but decisions are made on a case-by-case basis.

Backlog of renewals

No renewal backlog has been identified for corridor structures due to the current level of asset information.

4.5.12 New works needs

New works plan

There are no separate corridor structures new works identified in the capital plan. Any new corridor structures will be created as part of new roads / routes constructed to meet demand and their costs are included in the overall project costs and budgeted accordingly. The capital plan to meet growth and demand is covered in Section 3, Growth and Demand.

Many new corridor structures are produced or acquired as part of other works. Some are produced 'in isolation' as a result of separate initiatives. New safety rails, traffic islands, roundabouts or barriers may be built as a minor safety improvement under the NZTA assisted Minor Improvements Programme.

Strategic drivers for new or upgraded corridor structures include:

- Service level improvement to improve safety, traffic flows and/or amenity, encouraging people to walk, cycle, drive and use the shared transport spaces
- Growth and demand-driven new works and improvements affecting minor structures are generally part of integrated projects that create or upgrade a wide range of assets, particularly pavements. Their costs are included in the project costs that are generally consolidated under the budget items that will have the greatest expenditure
- New minor structure assets in new subdivisions are associated with growth. These are taken over by Auckland Transport after the subdivision is vested in Auckland Council.

New works programmes

There are no separate corridor structures' new works identified in the capital plan.

Growth-related new works

NZTA intends to revoke the state highway designation from about 54km of existing state highway. All of these roads, with the possible exception of SH18A, will remain arterial roads. The quantities of corridor structures on these routes and their conditions have not been assessed.

Other new assets are acquired through the subdivision development process. Assets are vested in Auckland Council and management and stewardship responsibilities for road assets are transferred to Auckland Transport.

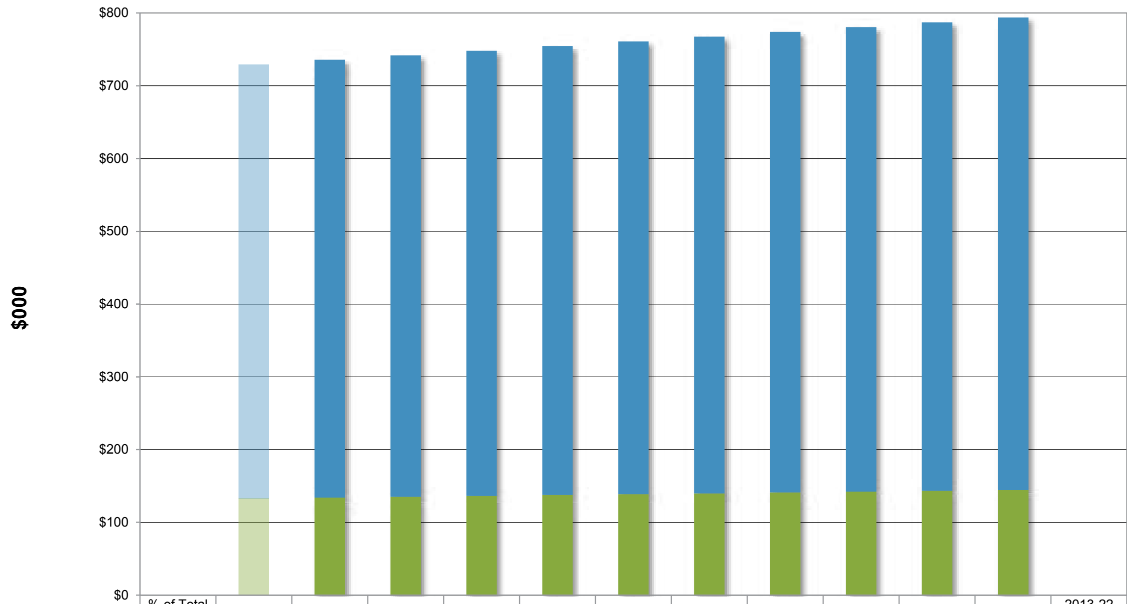
Levels of service-related new works

There are no levels of service related to new works for corridor structures. Generally, larger new capital projects such as major upgrade projects include new corridor structures in their scope and budget.

4.5.13 Disposal plan

Disposal is any of the activities associated with disposal of a decommissioned asset, including sale, demolition or relocation. There are currently no specific plans to dispose of corridor structures. They are disposed of relatively easily with minor works projects.

Figure 4.5-3 Summary of corridor structures operations and renewal forecast
Source: LTP Budget Model 12 April 2012 after Refresh for AMP



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total
CAPEX New Works	0%	000	000	000	000	000	000	000	000	000	000	000	000
Renewals	82%	596	602	607	612	617	622	628	633	638	644	649	6,251
Operations & Maintenance	18%	133	134	135	136	138	139	140	141	142	143	145	1,393
TOTAL	100%	729	736	742	748	755	761	767	774	781	787	794	7,644

4.5.14 Summary of 10-year network needs

The total expenditure for operations and maintenance and renewals over the next 10 years is $7.6 million. Average annual expenditure for operations and maintenance and renewals on corridor structures over this period is approximately $7.6 million, of which $139,000 (or 18 per cent) is for operations and maintenance, and $6.3 million (or 82 per cent) is for renewals.

The operations and renewal forecasts are summarised in Figure 4.5-3 and show that total annual costs are relatively constant at $800,000 per year.

Notes on the expenditures in Figure 4.5-3:

- There are no separate new works identified with the corridor structures LCMP
- The proposed 10-year expenditures for OPEX and renewals include an annual growth factor of +0.85 per cent to allow for consequential OPEX and consequential renewals from growth in the network and growth in demand for services.

Operations and maintenance, renewals and new works expenditures and budget forecasts on corridor structures are currently not identifiable within the SAP general ledger structure.

Historically, the legacy councils adopted mixed approaches to funding structures, in particular different indicators for renewals. Over time, Auckland Transport's planned operations and renewals budgets will better reflect the asset needs based on better regional information, such as complete inventories, condition and risk assessments, and agreed service levels. A key improvement initiative is to develop robust 10-year renewal programmes.

One particular consequence of this situation is that the budgeted items for asset renewals includes few retaining or sea walls and no corridor structures, but a significant list of bridges. All three of these asset classes are funded from the same high-level budget (Bridges and Structures). Budget allocations recommended by the legacy councils will be altered to reflect the following overall distribution of operations and renewals' expenditure until the improvements outlined above can be reflected in the forward programmes:

- Corridor structures are assumed to comprise five per cent of the structures operations' budget (and bridges 85 per cent and retaining walls 10 per cent)
- Corridor structures are assumed to comprise five per cent of the structures renewals' budget (and bridges 70 per cent and retaining walls 25 per cent).

4.5.15 Approved Long Term Plan envelope

The approved Long Term Plan

This section compares the approved LTP envelope for OPEX and renewals with the corridor structures network needs as determined by this AMP at a regional level and identifies the likely impacts of any variances. Revenue and funding incomes to Auckland Transport (from Auckland Council ratepayers and NZTA government subsidies and the like) are allocated through the approved Long Term Plan budgets. The LTP was adopted on 28 June 2012.

OPEX impacts

Based on the information in Table 4.5-10, corridor structures operational expenditure shows no variance between the LTP allocated budgets and the AMP needs. The apparent variance of +$925,000 shown above is not an increase in OPEX, but rather a re-allocation from corridor fixtures to corridor structures.

However it is anticipated that the LTP will require further efficiency savings and therefore the funding for corridor structures operational expenditure may be reduced.

Renewals impacts

The LTP allocated budget for corridor structures capital renewals has a 10-year shortfall of $2.2 million (35 per cent reduction) compared to the network needs determined by this AMP. The approved LTP budget envelope appears to be insufficient to reduce the current levels of deferred renewals. The shortfall of $2.2 million, which is part of a $43 million reduction to Central area structure renewals, equates to a reduction of approximately 300 corridor structures renewals over the 10 years of the plan.

Further efficiency savings

As required by the approved LTP, a further reduction in OPEX of $18.6 million per year, reducing to nil by 2016/17, will need to be allocated against asset related operational budgets. The impact of this reduction on corridor structures operational budgets is yet to be assessed and finalised.

Monitoring and management of Long Term Plan consequences

The consequences resulting from these variances will be monitored and reported as appropriate.

CAPEX new works

CAPEX new works contained in this AMP are derived from draft LTP listings as at April 2012 and are produced in section 4.5.12.

The capital new works programme has been further refined and adopted in late June 2012. Details of this adopted programme are contained in the LTP.

Table 4.5-10 Variance between LTP approved budget and AMP network needs for corridor structures (all uninflated)

Source: LTP Budget Model 12 April 2012 after refresh for AMP and revised LTP Budget Model 28 June 2012

Corridor structures	10-year total LTP approved budget ($000s un-inflated)	10-year total AMP network needs ($000s un-inflated)	Variance 10-year total ($000s un-inflated)
Operations and maintenance	2,318	1,393	925
Renewals	4,082	6,251	-2,169
Corridor structures total	6,400	7,644	-1,245

AMP inflation effects

Un-inflated and inflated corridor structures needs for the AMP are shown in Table 4.5-11.

LTP inflation effects

Un-inflated and inflated corridor structures budgets from the LTP are shown in Table 4.5-12.

Table 4.5-11 Un-inflated and inflated corridor structures AMP needs

Source: LTP Budget Model 12 April 2012 after refresh for AMP and revised LTP Budget Model 28 June 2012

UN-INFLATED expenditure ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M		134	135	136	138	139	140	141	142	143	145	1,393
Renewal		602	607	612	617	622	628	633	638	644	649	6,251
Corridor structures total		736	742	748	755	761	768	774	780	787	794	7,644
AC Inflator	OPEX	3.30%	3.30%	3.30%	3.30%	3.50%	3.60%	3.10%	3.10%	3.30%	3.60%	n/a
AC Inflator	CAPEX	3.90%	3.40%	2.80%	2.90%	3.10%	3.30%	3.50%	3.70%	4.00%	4.00%	n/a
INFLATED expenditure ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M		139	144	150	157	164	170	177	185	193	202	1,681
Renewal		625	652	676	701	729	760	793	829	870	912	7,546
Corridor structures total		764	796	826	858	893	930	970	1014	1063	1114	9,227

Table 4.5-12 Un-inflated and inflated corridor structures LTP budgets

Source: LTP Budget Model 12 April 2012 after refresh for AMP and revised LTP Budget Model 28 June 2012

UN-INFLATED expenditure ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M		223	225	227	229	231	233	235	237	239	241	2,318
Renewal		569	366	313	328	398	419	414	414	429	431	4,082
Corridor structures total		792	591	540	557	628	652	649	651	668	672	6,400
AC Inflator	OPEX	3.30%	3.30%	3.30%	3.30%	3.50%	3.60%	3.10%	3.10%	3.30%	3.60%	n/a
AC Inflator	CAPEX	3.90%	3.40%	2.80%	2.90%	3.10%	3.30%	3.50%	3.70%	4.00%	4.00%	n/a
INFLATED expenditure ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M		230	240	250	261	273	284	295	307	321	335	2,796
Renewal		591	393	346	373	466	507	519	538	580	606	4,919
Corridor structures total		821	633	596	634	739	791	814	845	901	941	7,715

4.5.16 Revenue sources

Revenue and funding incomes to Auckland Transport are recorded in Auckland Council's SAP financial management system.

NZTA normally provides financial subsidy for corridor structures that are related to road safety or vehicle use. For example, it will subsidise crash barriers in most instances but pedestrian barriers on footpaths only on rare occasions. Maintenance and renewals are subsidised at the base rate (43 per cent from July 2012) and approved new works at the base rate plus 10 per cent.

Operations and maintenance revenue

NZTA normally provides financial subsidy for operating and maintaining some corridor structures, at a base rate of 43 per cent (from July 2012). Further details, including the structures and types of work eligible for financial assistance, are contained in the NZTA Programme and Funding Manual.

Capital renewal revenue

The function of the renewal budget is to maintain a level of service of an asset by intervening prior to either the end of the useful life of the asset, or to prevent the condition of the asset falling below an agreed level.

Corridor structures renewal costs are normally subsidised at the same rates as road corridor maintenance work.

Capital new works revenue

Although there are no corridor structures' capital new works identified in this plan, NZTA normally subsidises approved new corridor structures at the base rate plus 10 per cent.

4.5.17 Key improvement initiatives

Key improvement initiatives relating to corridor structures are shown in Table 4.5-13.

Table 4.5-13 Key improvement initiatives

Improvement area	Description	AMP section	Priority / importance
Corridor structures 1	Review the naming and filing protocols for all these assets	4.5.5	Medium
Corridor structures 2	Prioritise the need for gathering condition information on corridor structures, or sub-assets within this category, and implement appropriate condition surveys accordingly	4.5.6	Medium
Corridor structures 3	Develop and implement asset names that clearly distinguish between pedestrian barriers and hand rails	4.5.7	Medium
Corridor structures 4	Complete a risk assessment for all miscellaneous structures	4.5.8	Low
Corridor structures 5	Organise financial records system so that OPEX and maintenance, capital renewals and capital new works expenditures and forecasts for corridor structures can be clearly identified	4.5.14	High
Corridor structures 6	Prioritise development of systems for either establishing the growth rate of these assets or for reflecting the quantity of new assets vested each year in future renewals programmes	4.5.11	Low
Corridor structures 7	Determine the quantity and condition of miscellaneous structures on State Highways proposed for revocation and the effects they will have on OPEX, maintenance and capital renewals programmes and budgets	4.5.12	High
Corridor structures 8	Identify CCTV camera replacement needs	4.5.11	High
Corridor structures 9	Improve roundabout disposal planning over time	4.5.13	Low
Corridor structures 10	Review practice of funding corridor asset maintenance and renewals (other than for guardrails) from Sealed roads – routine maintenance or Signs – Routine maintenance	4.5.14	High

4.6 Contents

4.6 Parking

4.6.1 The service Auckland Transport provides

Parking is an integral component of the transport network and helps deliver an effective and efficient transport system that enables Aucklanders to make smarter transport choices.

The parking levels of service (LOS) most relevant to that delivery are:

- Accessibility – appropriate levels of parking are provided
- Safety – parking buildings are safe and secure to use.

The details of the parking LOS being measured are provided in Section 2, Levels of Service. Several of these measures and targets are yet confirmed (TBC) and will be included in the improvement plan.

The following measures against key LOS are shown for indicative purposes.

Providing appropriate levels of parking for the road network is important to the Auckland Council, Auckland Transport and other interested organisations.

An Auckland Transport objective is that the parking assets and facilities that make up the publicly owned parking network will contribute to the transport network by providing parking that is suitable, accessible, safe and available to users on a fair and equitable basis. Parking requirements on the network include:

- Public transport users
- Schools and educational facility areas, for students, staff and visitors
- Commercial and industrial business areas, for customers and employees
- Retail shopping areas, for customers and employees
- Recreational, entertainment and sports areas, particularly at weekends and during summer
- Other high-use and demand areas
- Local residential street parking adjacent to commercial, sporting or other high-demand parking areas.

Designated parking restrictions and enforcement are used in specific locations to balance the need for short-term parking versus all-day parking by rationing limited parking space resources as appropriate.

Auckland Transport Parking is managed with an understanding of other parking services provided by privately owned commercial car parking facilities.

Auckland Transport recognises the need to carefully balance and proactively manage the demand for car parking against the beneficial effects of promoting and facilitating public transport. Balancing and managing these apparently conflicting demands is part of the Travel Demand Management (TDM) initiative. The cost and availability of parking space can be used as a travel demand measure within this context.

Parking and TDM play a part in implementing the Government Policy Statement, which requires changes to the transport system. These changes include reducing the distances that need to be travelled by modifying urban development patterns, encouraging people to use public transport, cycle or walk rather than take a car, and shifting car use from single person trips to multi-occupant use.

Table 4.6-1 Parking levels of service

Service value	Level of service	Service measure	Current performance	Target performance (indicative/ to be developed and agreed)
Accessible	Provide appropriate levels of parking on the road network	On-street parking occupancy rates	59%	TBC
		Percentage of drivers complying with parking restrictions	83%	82%
		Special vehicle lane compliance	96.8%	98%
		Percentage of user satisfaction with access to parking	75%	80%
Vehicle safety	Provide a safe parking building environment	Percentage of customers satisfied with vehicle security	70%	80%
		Percentage of customers satisfied with level of personal security	85%	80%
		Number of health and safety incidents	0	0

Auckland Transport has developed a parking strategy to address the issues, challenges and opportunities facing the parking on the network. Within this strategy it has summarised Auckland Transport's overall objective for parking as:

> **"To contribute to a safe, efficient and effective transport system in Auckland through the fair and equitable management of parking resources, and the enforcement of traffic and parking regulations."**

In achieving this overall objective, the emphasis will vary across different areas of operation:

On-street parking	To provide an equitable and efficient use of the road space by managing the demand for on-street parking while balancing the needs of road users, residents and businesses
Off-street parking	To provide an off-street parking service that is attractive to drivers and produces an economic and social benefit to Acklan
Park-and-ride	To grow public transport patronage and reduce pressure on congested corridors by providing park-and-ride opportunities at suitable locations
Enforcement	To ensure the equitable use of the road space and support a safe and efficient traffic flow within Auckland by fairly and consistently enforcing parking and traffic regulations; and to act as good ambassadors for Auckland Transport

4.6.2 Network overview

Auckland Transport has stewardship responsibilities for and manages the region's network of publicly owned parking facilities associated with the transport network, which includes:

- On-street parking (unrestricted, restricted and pay-and-display)
- 254 off-street car parks (of which 171 are managed by Auckland Transport and 83 by other Auckland Council divisions)
- 12 car park buildings.

These parking facilities are operationally supported by the following infrastructure assets and resources:

- 933 pay-and-display units
- Parking guidance signs, including variable message signs
- Parking meters
- Miscellaneous operational equipment, including bus lane enforcement cameras
- Parking officers equipped with Personal Digital Assistants (PDAs), printers and radio telephones
- Bicycle stands.

4.6.3 Network valuation

The approximate replacement value of the parking assets is shown in Table 4.6-2. Buildings are not included in the following valuation.

Table 4.6-2 Parking valuation
Source: Auckland Transport asset revaluation (30 June 2011)

Asset	Optimised replacement cost (ORC) $000s	Optimised depreciated replacement cost (ODRC) $000s	Annual depreciation (ADR) $000s
Pay-and-display	9,233	4,811	871
Off-street car parking	32,665	20,126	798
Lighting	299	210	9
VMS and equipment	173	95	15
TOTAL	42,370	25,242	1,693

4.6.4 Network asset details

Network asset quantities

Auckland Transport has stewardship responsibilities for and manages assets shown in Table 4.6-3.

Note that some quantities are to be confirmed.

On-street parking

In the on-street environment, parking is determined through a mix of development opportunities and effective traffic demand management, as set by Auckland Transport's strategy and by the overall development plans for transport-related activity.

Peak demand for parking spaces is much greater than supply, meaning that parking restrictions have had to be applied to the on-street kerbside. This is to ensure reasonable turnover of what is effectively a limited resource.

All on-street parking lies within the road reserve, and in most cases this is between the kerb-to-kerb formation of the road. In some localised areas, however, these on-street parking areas have been cordoned off in such a way that they may resemble off-street parking.

There are three types of on-street parking:

Type 1 Unrestricted	May or may not have marking No parking restriction signs When more than 85 per cent occupied, changed to Type 2 For safety reasons, infringement notices for warrant of fitness and expired registrations are issued, along with the removal of vehicles blocking a driveway or accessway, and abandoned vehicles Regular condition (as part of the road network) and occupancy surveys are carried out
Type 2 Restricted	Has a parking resolution for enforcement – i.e. parking restrictions apply Enforcement signage (e.g. clearways, P60, P120, etc.) May or may not have pavement marking to designate area of parking restriction pavement marking for special use parking (e.g. residents' parking, disabled, taxis, loading and drop-off zones) When more than 85 per cent occupied, changed to Type 3 Different colour and/or texturised surfacing to indicate shared usage (e.g. bus lane/cycle lane clearway etc.) Kept tidy and free of obstacles Signage and road markings are visible, legal, and follow MOTSAM and Traffic Control Device (TCD) regulations. Enforcement schedule in place which is automated where possible
Type 3 Pay-and-display	Enforced with additional equipment, permit processing, and informational systems Pay-and-display machines incorporating 'Txt to pay' (mobile parking) Good lighting and access required where machines are located Machines need to be well maintained, reliable and in good condition, easy and simple to operate, and provide information on tariffs and a contact number for faults; multi-lingual requirements need to be considered Reliable payment options Safe and secure systems in place for cash collections

Table 4.6-3 Parking assets

Source: Auckland Transport asset consolidation (14 February 2011)

Asset	Quantity (approximate)	Regional total	North	Central	West	South
On-street car parks	Total all types	2,000	600		1400	
	Restricted (km)	647		647		
	Restricted (% kerb line)	23		23		
Off-street car parks (including buildings)	Total (no.)	254	58	155	9	32
	Total (m²)	288,650	118,853	126,627	43,170	
	Auckland Transport managed	171	58	72	9	32
	Auckland Council managed	83		83		
	Park-and-ride (no.)	20	6	4	4	6
Car park buildings	Total (no.)	12	2	7	1	2
	Total (m²)	0				
	Number parks	5,477		5,477		
Miscellaneous equipment operational	PDAs	115		115		
	Printers	110		110		
	Radio phones	93		93		
	Enforcement cameras	15		15		
	Vehicles	28		28		
Pay-and-display units	Total (no.)	933	57	834	9	33
Parking meters	Total (no.)	0		0		
Variable message signs (VMS)	Total (no.)	11		11		
Car park lighting poles	Total (no.)	522	522			
Bicycle stands	Total (no.)	227	26	177	19	5

Each parking type provides consistent standards and a form of brand management to engage the perception of value in on-street space management. Standards include consistency in visual information management, road markings, restriction mix and service level agreements through effective enforcement.

The evolution of a city requires strategic planning to offer a degree of flexibility, as the growth from suburban village to urban chic should be managed appropriately. As the transition is made through the modes of on-street space management, special note is taken to enliven the culture and atmosphere of the suburban town centre or village, urban aesthetic and the vibe of the city. Auckland Transport aims to develop a range of enforcement signage and methodologies to embrace these differences, to give life and add value to effective urban design. An example of this is 'village restriction'. This should be generic and sympathetic through effective urban design. Signage should be minimalist, possibly colour coded; poles with recessed restriction notification pressed into the pole itself. Kerb mounted plaques and road markings can include restriction notification. An education programme will be required to assist enforcement methodology in these areas. As most villages are passionate to embrace and extend the village culture, the Mainstreet committees and Local Boards will embrace this direction.

The road provides the 'space' that on-street parking utilises to provide the parking service. The maintenance and renewal of the road asset consequently addresses the lifecycle management requirements of the on-street parking 'space'. As such, the lifecycle management plan (LCMP) for this on-street parking 'space' is indirectly captured by the road asset LCMP of this AMP so will not form part of this LCMP.

Likewise, the signs and markings associated with on-street parking are managed under other sections of this AMP and are not part of this LCMP. The future direction of restrictions and signage requirements shall be addressed within the plan, offering clear development direction as the location moves through the grading of modes.

The change from unrestricted to restricted parking is supported through demand for a limited resource. Areas that are continuously parked out at occupancy rates in excess of 85 per cent will determine the move between parking type (i.e. unrestricted, restricted, and pay-and-display). The restriction style is then gauged on development mix and consumer demand.

Off-street parking

The off-street parking asset is defined as any space with associated equipment, signage and pavement markings, external to the road reserve, and designated and available for use as vehicle parking.

Auckland Transport provides off-street parking as an alternative to on-street parking where there is identified significant short supply of parking because of intensive use. Auckland Transport also uses off-street parking to facilitate other transport strategies, such as greater pedestrian or public transport focused use, and TDM.

Auckland Transport also has car park buildings and park-and-ride facilities associated with public transport centres.

Parking facilities are divided into several hierarchies based on the type of facility (size, structure, etc.), and type of parking restriction or enforcement applied to it. These are categorised into four separate groups, which all have defined LOS:

Type 1 Off-street unrestricted	May or may not have surface markings Ideally a permeable surface with working drains and kerbing Asset is environmentally designed using sustainable materials where applicable. Bicycle parking facilities where required
Type 2 Off-street restricted	Enforcement signage (e.g. P60, P120, etc.) Marking designating special parking bays (e.g. disabled) Regularly patrolled by a parking officer to ensure compliance Bicycle parking facilities where required
Type 3 Pay-and-display	Enhanced with additional equipment, structures or purpose-planted vegetation Pay-and-display machines, lease, reserved spaces Coverings or canopies – anything that provides shelter Good urban design, incorporating walkways or paving, median strips, gardens or trees Bicycle parking facilities where required Good lighting
Type 4 Off-street parking building	Personnel are on site, i.e. staff and security (active and passive) Signage – includes floor/location/directions, and opening/closing times Enclosed building with cashier on site, barriers and ticket machines Best possible lighting conditions Park Safe accredited (refer to the Parking Performance Plan). Central access points Balanced provision of short-stay versus long-stay parking Public toilet facilities Minimised wooden wheel stops Clearly defined walkways Reliable lifts Graffiti removal Light boxes – used proactively to communicate parking spaces availability to road users Parking for motorcycles, mobility and parents with prams Power point facilities as a future requirement for electric cars

Table 4.6-4 Off-street parking buildings

Parking building name	Location	Year built	Levels	Spaces	Material	General comments	Uses
Civic	Auckland CBD	1971	3	930	Concrete	Underground car park building; lift facilities	Leased and casual parking
Fanshawe Street	Auckland CBD	1980s	4	509	Concrete frame supporting T-beam concrete floor slabs	Above ground car park building; lift facilities	Leased parking
Downtown	Auckland CBD	1978 and 2003	8	1960	Concrete	Above ground; lift facilities. Recently completed additional two floors	Leased and casual parking
Victoria Street	Auckland CBD	1960s and 1985 and 2004	10	850	Concrete	Above ground; lift facilities.	Leased and casual parking
Karangahape (K) Road	Auckland CBD		6	570	Concrete	Above-ground car park building	Leased and casual parking
Beresford Street	Auckland CBD	1961	3	121	Concrete frame with T-beam floor slabs	Above-ground car park building	Leased parking
Percy Street	Warkworth		2		Concrete, with passenger lift	Joint ownership: level 1 and land private, level 2 council	Casual parking
Moana Avenue	Orewa					Possibly joint owned with building owners	
Clonburn Road car park	Manukau					Information to be confirmed	
Killarney Street car park	Takapuna					Information to be confirmed	
To be confirmed	Manukau					Information to be confirmed	
To be confirmed	Papakura					Information to be confirmed	

Equipment within car park buildings is managed and renewed within the car park building's lifecycle management. Equipment generally falls into the following classes:

- Operating Systems
- Automatic Payment Machines (APM)
- Electrical and mechanical equipment
- Ticket machines, barrier arms, etc
- Payment machines
- Building services such as HVAC, lifts, etc.

A brief description of the off-street parking buildings is summarised in Table 4.6-4.

Three of the car park buildings are not fully owned by Auckland Transport but have specific lease terms and a fourth is yet to be determined:

Fanshawe Street car park building	Building is owned by Auckland Transport but land is leased
Karangahape Road car park building	Fully leased on long-term basis until 2014. Auckland Transport does not own land or building, but maintenance of property is Auckland Transport's responsibility
Warkworth, Percy Street	Joint ownership (level 1 private, level 2 council). Auckland Transport does not own land. Maintenance of property is Auckland Transport's responsibility
Orewa, Moana Avenue car park	Possibly joint owned by council and building owners – park is above buildings and has a back entrance to Orewa Library

Park-and-ride

Auckland Transport provides some park-and-ride facilities to encourage the use of public transport services. Park-and-ride sites are located at strategic areas to reduce vehicle travel on congested corridors. As such, park-and-ride sites are a TDM strategy.

The Auckland Transport Parking Strategy has identified that a comprehensive region-wide approach to park-and-ride facilities needs to be developed to move away from the ad hoc approaches that have been used up to now. Pricing packages to incorporate parking and public transport travel will help address park-and-ride demand and look at opportunities to integrate park-and-ride infrastructure with commercial development.

Park-and-ride facilities need to be safe and secure to use; upgraded park-and-ride facilities ideally provide a sealed surface, lighting, camera surveillance and regular patrols. Enforcement is also required to make sure they are only used by passenger transport commuters.

Parking operational equipment

Parking operational equipment facilitates the operational and business requirements of enforcing parking restrictions throughout the region. The objective of these enforcements is to give all users a fair and equitable share of limited parking resources. This requires a significant amount of infrastructural and operational assets.

The infrastructural parking equipment components are:

- Pay-and-display machines
- The parking guidance sign system (includes six variable message signs and associated fixed information signs).

Operational equipment is the parking enforcement team's essential tool for providing their service. The parking enforcement team is comprised of parking officers (sometimes called parking wardens), most of whom are actively performing enforcement duties. There are also area managers, supervisors, and other staff.

The active officers have a set of equipment issued to them, which consists of a suite of handheld devices

Table 4.6-5 Park-and-ride facilities
Source: MAXX website (November 2011)

Public transport service	Location	Spaces	General comments
Constellation Busway Station	Constellation Drive, Mairangi Bay		Currently no charge per day
Albany Busway Station	Oteha Valley Road, Albany		Currently no charge per day. New adjacent car park construction 2012/13
Papakura Rail Station	Ron Keat Drive, Papakura	230	Two accessible parks, 20 x 90-minute parks Currently charging $2 per day to offset the cost of providing security staff at the park-and-ride
Papatoetoe Rail Station	Station Road		
Homai Rail Station	Dalgety Drive		
Manurewa Rail Station	Access via Weymouth Road and Selwyn Road	142	
Sturges Rail Station	76 Swanson Road	170	
Sunnyvale Rail Station	Seymour Road	102	Free
Swanson Rail Station	Swanson Road	27	Two accessible parks
Pukekohe Rail Station			
Panmure Rail Station	Access via Forge Way and Mountwell Crescent	161	Seven accessible parks
Glen Innes Rail Station	Apirana Avenue	71	Two accessible parks
Orakei Rail Station	Orakei Road	178	10 x 240-minute parks
Onehunga Rail Station	Access via Onehunga Mall and Princes Street		Four accessible parks
Devonport Ferry			
Birkenhead Ferry			
Northcote Point Ferry			
Bayswater Ferry			Free weekday parking is offered if parking tickets are validated at Downtown Ferry Terminal and on board the ferries
West Harbour Ferry	West Harbour Marina		Private ownership
Pine Harbour Ferry	Pine Harbour Marina		Private ownership
Half Moon Bay	To be confirmed		

and Personal Digital Assistants (PDAs) as the essential enforcement tools. The devices include built-in Wi-Fi, Bluetooth, a 2.0MP camera, GPS, GPRS and GSM technologies, printers and radio telephones (RT). The MC55 PDAs enable the scanning of registration labels.

Other equipment in use includes bus lane enforcement cameras and vehicles.

4.6.5 Asset data confidence

The SPM database holds the asset information for parking assets, including condition rating information.

The assessment of data confidence is based on the data confidence grading system and methodology described in Section 2.4.5 of the International Infrastructure Management Manual 2011.

Data completeness for parking assets is based on the inventory in SPM databases. This shows that there is a need to improve the completeness of the data within SPM in relation to the parking assets. A programme of improvement on the data completeness is being undertaken.

Table 4.6-6 Confidence in asset and condition information

Data attribute	Very uncertain	Uncertain	Reliable	Highly reliable
Asset descriptors and quantity				
Asset age				
Condition				
Performance				

Table 4.6-7 Data completeness summary
Source: SPM database (March 2012)

Asset group	System data completeness		
	Measure	Age	Condition
Car parks	70%	70%	70%
Park-and-rides	40%	40%	40%

4.6.6 Asset condition

Condition rating

A programme of condition rating surveys is being undertaken on the parking assets. As well, professionals and contractors will conduct ongoing surveys, generally carried out on a three-year basis, and provide condition rating reports to Auckland Transport.

Off-street car parks (not including park-and-ride or car park buildings)

The overall condition for car parks is presented in Figure 4.6-1. This shows that 50 per cent of the car parks are in moderate to very good condition (grades 1 to 3), with 20 per cent in poor and very poor condition (grades 4 to 5) and 30 per cent in unknown condition.

Park-and-ride car parks

The overall condition for park-and-ride car parks is presented in Figure 4.6-2. This shows that 38 per cent of park-and-ride car parks are in moderate to very good condition (grades 1 to 3), with a small minority (2 per cent) in poor and very poor condition (grades 4 to 5). 60 per cent are unknown in terms of collected data.

Car park buildings

The condition rating profile of the region's car parking buildings is yet to be confirmed.

4.6.7 Asset performance and capacity

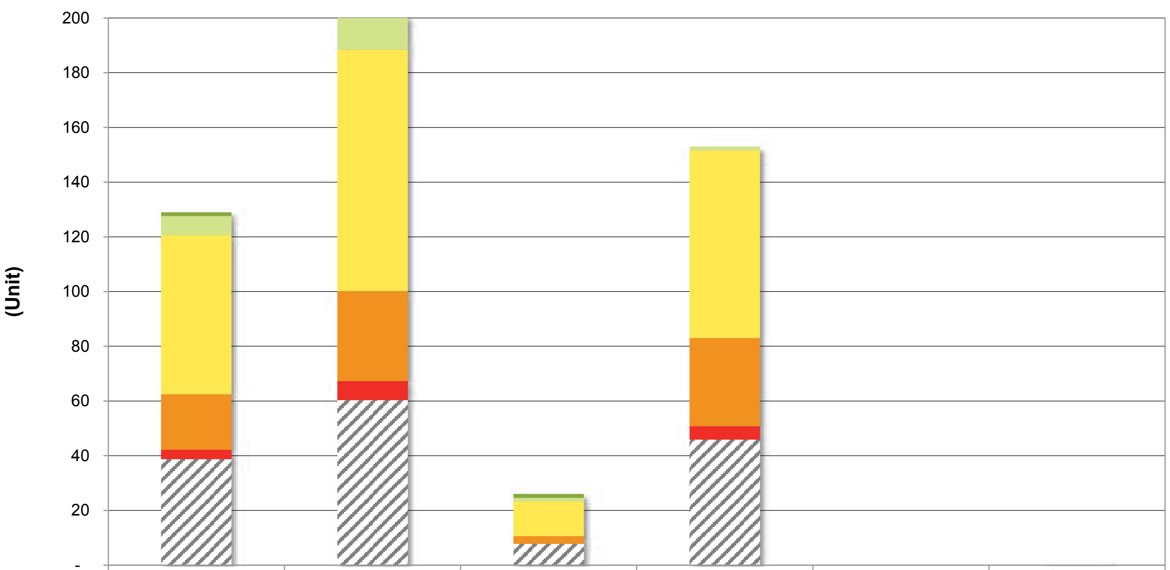
Performance

The performance of parking assets is mostly related to insufficient capacity to meet peak demand and the failure of electronic access and ticketing systems. Variable message signs are used to indicate the number of available parking spaces at the four city centre car park buildings, while internal way-finding signs light red or green to indicate whether a space is free.

Capacity

Capacity issues affecting the car park buildings are summarised in Table 4.6-8.

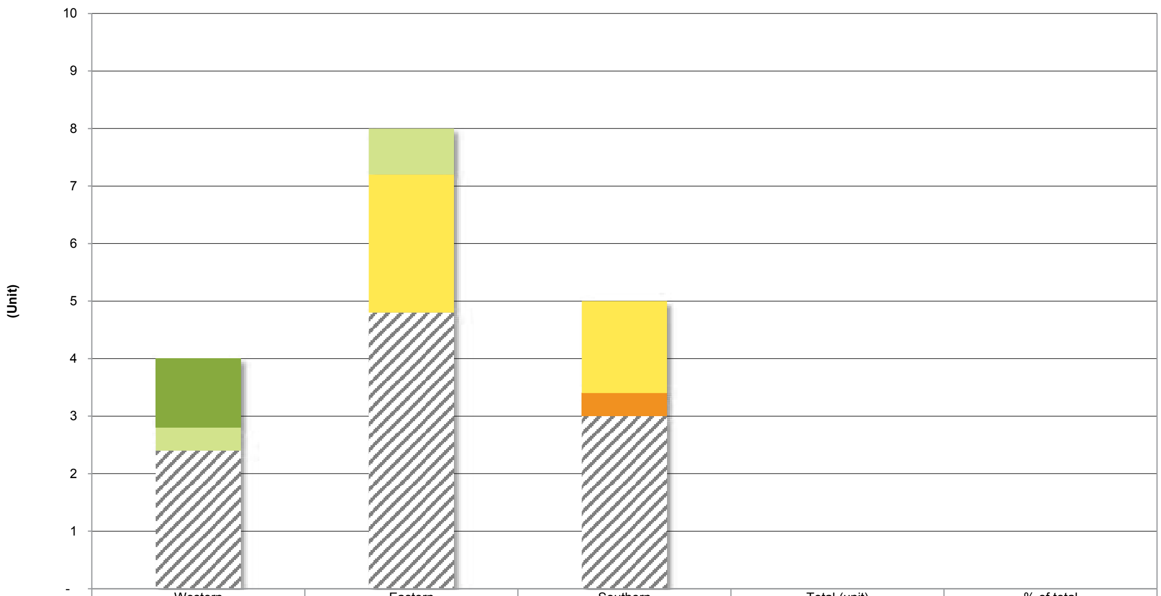
Figure 4.6-1 Off-street car park condition
Source: SPM database (March 2012)



	North	Central	West	South	Total (unit)	% of total
Very Good	1	0	1	0	3	1%
Good	7	13	1	1	22	4%
Moderate	58	88	13	69	228	45%
Poor	20	33	3	32	88	17%
Very Poor	4	7	0	5	15	3%
Unknown	39	60	8	46	153	30%
% of total	25%	39%	5%	30%	100%	
Total (unit)	129	201	26	153	509	100%

Figure 4.6-2 Park-and-ride condition

Source: SPM database (March 2012)



	Western	Eastern	Southern	Total (unit)	% of total
Very Good	1	0	0	1	7%
Good	0	1	0	1	7%
Moderate	0	2	2	4	24%
Poor	0	0	0	0	2%
Very Poor	0	0	0	0	0%
Unknown	2	5	3	10	60%
% of total	24%	47%	29%	100%	
Total (unit)	4	8	5	17	100%

Table 4.6-8 Capacity issues in key areas

Source: Auckland Transport: Parking Strategy (November 2011)

Location	Demand Characteristics/issues	Parking issues	Strategic response
City centre	High demand for limited on-street space, and competition from other uses (pedestrians, public transport) Competitive off-street parking market High evening demand from entertainment Increased resident parking demand	Pricing does not match demand variations Variable enforcement of district plan provisions Competition from private off-street providers Conflict between commercial and demand management objectives Pressure from retail sector for cheaper parking Residential parking pressures	Provision of public off-street parking, including parking buildings On-street pay and display Manage demand and encourage public transport alternatives through pricing and supply of on- and off-street parking Variable pricing in different parts of the city centre, and for different markets to reflect demand and supply variations
Regional and town centres	High demand for spaces during working and shopping hours	Inconsistent approach to pricing and supply between centres Residential parking pressure in and around centres Conflicts with traffic on arterials	Move to a more consistent supply and pricing approach for all regional centres, to reflect demand and supply variations Develop area parking plans for priority centres and surrounding residential areas Provide off-street options where on-street supply is constrained
Park-and-ride	High demand in key locations (e.g. Northern Busway) Growing informal park-and-ride on inner suburb streets	Current provision reflects ad hoc rather than planned approach Pressure on commercial and residential spaces from information park-and-ride locations Security issues at some locations Park-and-ride can use land that would be better used for centre development Currently free to users	Develop comprehensive region-wide approach to park-and-ride provision Integrate park-and-ride with public transport services Look at opportunities to integrate park-and-ride with commercial development Address park-and-ride demand as part of area parking plans
Activity centres (events)	Very high demand during events Conflicts with residential and commercial needs	Conflicts with residential and commercial parking needs Lack of knowledge on event-specific arrangements	Develop parking plans for high priority locations Implement event-specific restrictions and enforcement Provide information on event-specific arrangements
Arterials	High through-traffic movement Parking demands at some locations (e.g. commercial centres)	Poor public perception of enforcement Different rules and restrictions across the region Inaccurate resolutions, signage etc. can restrict enforceability	Provide regionally consistent definitions and enforcement for clearways, priority lanes and no-stopping areas Educate public on traffic management rationale Ensure cross-departmental focus on accurate implementation Provide off-street options where on-street supply is constrained

4.6.8 Asset risks and criticality

Asset risks

Section 8, Risk Management describes asset risks across the transport network, identified through a formal risk analysis review. Risks for the parking network are summarised inTable 4.6-9.

Additional risks identified through the development of this AMP are summarised in Table 4.6-10.

Critical assets

Through the development of this AMP, Auckland Transport has identified critical assets, including:

- Car park buildings
- Parking signs and line marking in the on-street environment
- Car park guidance system
- Pay-and-display machines.

Asset safety

There are potential hazards and safety issues caused by the risks listed above that affect safety, such as:

- Structural failure of car park buildings
- Visibility of parking officers.

Table 4.6-9 Parking risk analysis
Source: Auckland City Council Transport Risk Analysis 2008

Risk	Net risk factor	Management options
Structural failure of car park buildings	High risk	Ensure ongoing condition inspections and reporting and remedial actions
Inadequate on-street car parking due to increasing road corridor and bus lanes reduces parking and city fringe. Inadequate parking causes loss of revenue	High risk – requires remedial planning and action via the AMP	Continue to review car park inventory, number of spaces and levels of service annually. Review seasonal monitoring as required Advance opportunities to extend pay and display areas Continue to review best practice internationally
Inappropriate number of off-street car parking facilities (including disability parking)	High risk – requires remedial planning and action via the AMP	Review and increase ownership and shareholding of parking Increase influence of travel demand management (TDM)

Table 4.6-10 Additional risks
Source: Auckland data analysis February 2008

Risk	Management options
Parking equipment loss through vandalism, damage or theft e.g. pay and display machines, parking signs	Regular observation and monitoring by parking officers Calls to call centre by public
Public safety	Increased visibility from parking officers Close alignment with police activity
Parking officer safety	Increase officer capability to include offences for vehicle obstruction Continued review of perception of on-street parking and influencers Review of branding to send clear non-threatening messages
Under-utilisation of public transport	Restrict parking access Control parking demand through effective pricing

Table 4.6-11 Lifecycle issues affecting parking

No.	Key issues with parking assets	Action plans for managing these issues	Outcomes
1	Basic work programme based on historical practices	Provide 20-year horizons for AMP forward works programmes (FWPs), financials, deterioration and backlog analyses	Appropriate forward works programmes and expenditure forecasts. Renewals programme based on lifecycle needs
3	Expenditure, revenue and funding incomes to Auckland Transport are contained in SAP financial management system but appear to be incomplete	Review and confirm expenditure, revenue and funding incomes to provide transparency and completeness of allocations	Robust expenditure, revenue and funding allocations
4	Uncertainty of ownership and responsibilities of some parking assets, buildings and facilities	Clarify exact ownership and responsibility of some parking buildings and facilities, such as not on Auckland Transport road reserve land, associated with public transport facilities, parks or Auckland Council property groups	Agreed statement of ownership and responsibilities of all parking buildings and facilities
5	Lack of certainty and consistency information (e.g. on-street and off-street parking, buildings not entered in system) and location of data in various systems (SPM, RAMM and GIS systems are used)	Establish better data collection and systems to ensure all data collected contains all relevant information	Agreed asset management systems and data collection requirements in place for parking assets

4.6.9 Key issues and strategies

Key lifecycle issues that affect parking are summarised in Table 4.6-11.

4.6.10 Operations and maintenance needs

Scope of operations and maintenance

The objective of the operations and maintenance plan is to offer a systematic and logical approach to:

- Provide the parking service with fair and equitable rationing of the limited parking resource
- Maintain the day-to-day quality and standards of the parking resource, i.e. the on-street parking space, off-street open-level grade car parks and car park buildings.

These considerations drive the operations and maintenance plan, specifically:

- Enforcement of parking restrictions
- Timeframes for response to call centre requests for service
- Inspections, reporting and data collections relating to parking assets
- Maintenance activities and alignment of these to LOS requirements, to prioritise work across the region based on condition and importance
- Environmental sustainability practices where appropriate, such as recycled materials.

The operations and maintenance activities associated with the parking network are managed by integrated cooperation between Auckland Council's call centre, Auckland Transport's operations and maintenance staff and representatives, and the various contractors across the legacy areas of the region that are responsible for routine and emergency response and maintenance.

This AMP recognises the operations and maintenance needs and provides adequate funding for maintenance programmes.

Operations and maintenance strategy

Operations

Operations plans for parking include enforcement of parking restrictions, call centre operation and response systems, inspections, reporting, data collections and the use of the RAMM asset management system.

Routine network inspections of parking assets are carried out by contractors to identify defects as defined in the key results schedules. The results of these are not stored in RAMM but are used to plan the contractor's routine maintenance activities.

Operational strategies for monitoring, auditing, inspections and fault reporting for on-street and off-street parking are summarised following:

On-street parking	**Parking officers enforce parking restrictions and payment of parking charges, and issue infringement notices and fines** **Condition monitoring of the surfacing and pavement of on-street parking spaces is encompassed in the RAMM road condition rating survey and the high speed data surveys of the road network. The confidence level for the data collected here is very high; however, it does not have a parking focus** **Monitoring of on-street parking signs and line marking is undertaken through random audits by the Auckland Transport auditors, contract managers, and road maintenance contractors. Parking signs are not specifically singled out for inspection. Parking officers are the most reliable reporters of missing signs and deficient line marking. The condition data specifically for signs and line marking is considered unreliable at present** **Auckland Transport undertake condition rating, monitoring and programming for all street assets, i.e. road surface, pavement, kerb and channelling, street and parking signage, street lighting, drainage, structures, etc. Staff and contractors audit and report faults which are then programmed for repair, replacement or reinstatement** **The introduction of RAMM Contractor (another application of the RAMM software) allows real time reporting of faults, programming of works, and/or swifter response times to priority faults** **Parking officers report parking-specific issues such as missing, damaged, or inaccurately installed parking signage, faded line marking, missing or unserviceable pay and display machines, etc** **In addition, parking officers audit the appropriateness and accuracy of parking signage and markings in place on their individual 'beats'. The key objective is to facilitate more effective enforcement through present and accurate signage and delineation of on-street parking spaces** **The road asset inventory database is held in RAMM and is managed as part of the road surface asset group. Parking resolutions are created, maintained, and updated in AMIS**
Off-street parking	**Parking officers enforce parking restrictions and payment of parking charges, and issue infringement notices and fines** **A first full inventory review of Levels 1, 2 and 3 off-street car parks was undertaken in Auckland City by Opus International Consultants in June 2006 with a further review carried out in early 2009 by the Parking group** **All open level graded car parks are condition rated approximately every three years** **The report of this condition rating includes a proposed 10-year forward works programme for maintenance and renewals, a three-year rolling works programme, and the proposed work for the following year (and one-year works programme)** **An audit will be conducted of one-third of the all open-level graded car parks each year to review the design and safety standards of the car parks. In addition, this audit will be used to review and confirm the following year's work programme, and update the three-year rolling programme**
Parking operational equipment	**Condition and performance data for pay-and-display machines is considered very reliable: information from the machines is real time through GPS tracking in the machines, and servicing is undertaken by the supplier GISL Systems** **The condition and performance of PDAs and printers, RTs and bus lane enforcement cameras is considered very reliable as they are managed in-house by Auckland Transport** **The parking guidance signs are in the process of being added to the parking asset register**
Car park buildings	**Parking is responsible for all operating costs including power, telecom, rates and insurance and is also responsible for revenue collection** **The operational maintenance and renewals of these buildings are provided by Auckland Transport. These include the condition rating, inspection regime (including warrant of fitness), maintenance and renewals forward works programming and implementation of works for parking buildings**

Auckland Transport keeps the parking network suitable, accessible, safe and well maintained through an ongoing maintenance programme that addresses defects and failures, or arising from health and safety issues and public complaints.

Operational activities such as inspections, reporting and data collections are usually undertaken by consultants and contractors managed by Auckland Transport's parking or corridor maintenance teams. Maintenance works are usually undertaken by various sub-regional contracts managed by Auckland Transport's parking or corridor maintenance teams.

Routine and planned maintenance

Maintenance works for parking assets include:

- Minor (expensed) repairs to all parking facilities and assets
- Making safe
- Works required on green assets, and control of weeds and vegetation
- Enforcing requirements for the quality reinstatement of surfaces following development in, or access to the street environment (in accordance with the 'Condition for use of the street by utility operators')
- Cleaning and sweeping (delegated to Auckland Council's Parks division on behalf of Auckland Transport)
- Vegetation control of weeds and green assets (delegated to Auckland Council's Parks division on behalf of Auckland Transport).

Routine maintenance is the regular ongoing day-to-day work necessary to keep assets operating, including instances where portions of the asset fail and need immediate repair to restore operation. It includes both planned and unplanned maintenance as follows.

Planned maintenance programmes based on the operational needs of the assets:

Work carried out to a predetermined schedule (e.g. cleaning, pest control, lift maintenance), and small maintenance projects that are not capitalised	These works are generally identified via routine inspections, testing and monitoring of the asset condition, and the need for maintenance work
Economic efficiency	Is it cheaper to maintain the component or wait until the component breaks and fix or replace it then?
Risk of failure	Is the maintenance important to prevent the failure of the component when the cost of failure is high (in terms of dollar value, public health and safety, or public image)?
Health and safety	Health and safety issues are often identified through condition surveys, tenant property officer identification. Response maintenance aims to minimise, make safe or isolate the initial safety issue pending a long-term solution
Levels of service	Maintenance needed to maintain the LOS
Number of customer complaints	Is it better (and/or cheaper) to maintain the component regularly than to receive and resolve customer complaints?
Extend the life of the component	Will the life of the component be increased if it is regularly maintained? Is the cost of maintenance less than the benefit of extra life?

Maintenance is carried out through the following types of sub-regional contracts:

- Cleaning services
- Fire protection systems
- Building compliance
- Lift services
- Heating, ventilation and air conditioning (HVAC).

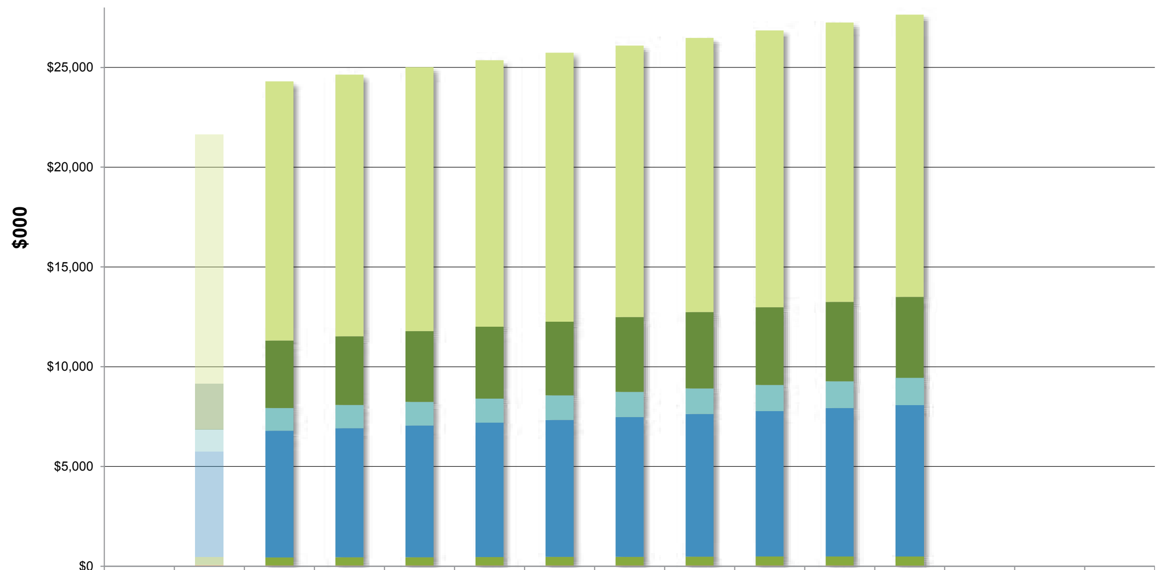
Unplanned maintenance

Unplanned maintenance is work carried out in response to reported problems or defects (e.g. repair after vandalism, damage, and failed building services). Usually, such maintenance is prompted by a request for service from the call centre. The nature of the defect will determine what response is appropriate. If the response required is either an emergency or urgent response then it will have a shorter incident response time and shorter time to 'make safe'. If the nature of the defect does not elicit one of these response requirements, it

Table 4.6-12 On-street parking response times for unplanned maintenance situations

Response	Item	Response time
Urgent	General maintenance	
	Carriageway safety repairs	Four hours to respond, make safe and repair
	Traffic services	
	Sign replacement repairs	One day to respond and replace
	Carriageway drainage	
	Repairs to catchpits, soakholes and culverts	Four hours to respond on-site Four days to make safe and repair
Emergency	Response to flooding from blocked catchpits, soakholes and culverts	One hour to respond on-site Four hours to make safe and repair
	Other emergency events	Half an hour to mobilise, one hour updates Start work within one hour of notification

Figure 4.6-3 Parking operations and maintenance forecast expenditure
Source: LTP Budget Model 12 April 2012 after refresh for AMP



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	Total (asset) (unit)	Annual average $/(unit)
On St Regional	52%	12,469	12,993	13,111	13,231	13,354	13,479	13,607	13,738	13,871	14,006	14,145	135,535	2,000	6,777
Off St Regional	14%	2,294	3,385	3,441	3,543	3,602	3,685	3,747	3,832	3,897	3,985	4,052	37,168	254	14,633
North	5%	1,117	1,140	1,162	1,186	1,209	1,233	1,258	1,283	1,309	1,335	1,362	12,478	662	1,885
Central	27%	5,281	6,346	6,473	6,602	6,734	6,869	7,006	7,146	7,289	7,435	7,584	69,484	82	84,737
West	2%	395	400	405	411	416	422	427	433	439	445	451	4,249	1,412	301
South	0%	067	042	043	043	044	045	046	047	048	049	050	458	39	1,173
Total	100%	21,622	24,304	24,634	25,016	25,360	25,734	26,092	26,480	26,853	27,255	27,643	259,371	4,449	5,830

becomes routine maintenance and is programmed for remedial work as part of the planned maintenance regime.

Unplanned (responsive) maintenance includes repair of assets to correct faults identified by inspections, or reports from the user of the asset. This maintenance is usually urgent in nature and may be an emergency.

On-street parking

Response times to unplanned maintenance situations in the on-street environment are set out in the transport city-wide roads maintenance contracts.

These are not specific to the on-street parking environment but are captured by default.

The urgent and emergency response times that affect the on-street parking environment are are summarised in Table 4.6-12.

Off-street parking – open level grade car parks

Response times for open level grade car parks are the same as for on-street parking set out above.

Car park buildings

Where appropriate, maintenance contracts provide specific standards to achieve best practice. Typical response timeframes are:

Emergency repairs	**Within two hours**
Urgent repairs	**Within 24 hours**
Routine call-outs	**Within five working days**

Operations and maintenance 10-year expenditure forecast

The recommended 10-year operations and maintenance expenditure forecast is shown above in Figure 4.6-3. The forecast is based primarily on historical trends but also includes the revised activities detailed above and, to some extent, LOS to be achieved. This recommendation has also taken into account current funding constraints being experienced by Auckland Transport and the Auckland Council. Note, however, that the actual plan to be approved by Auckland Transport and the Auckland Council may yet differ from these network needs because of the impact of funding constraints.

Based on this, a regional summary of operations and maintenance expenditure for the parking assets is forecast in Figure 4.6-3. This shows that the total operations and maintenance expenditure for parking equates to $259 million over 10 years.

The average annual expenditure for the operations and maintenance on parking over the next 10 years is approximately $26 million. As a result of growth, the annual forecasted expenditure increases from $21 million to $27.6 million. About a quarter of the planned operational expenditure is for the Central area.

4.6.11 Renewal needs

Renewal strategy

Auckland Transport manages the lifecycle of parking assets though an annual renewals programme. The programme is based on condition, criticality and using optimised decision-making techniques to prioritise works. This includes updating existing parking assets that are technologically redundant.

Asset renewal is defined as work performed to restore or replace an existing asset to the original LOS. If the renewal or replacement work enhances asset performance or capacity above the original LOS, then that part of the work is classified as a capital new work service-level improvement. Asset renewal work is generally identified as a result of in-house inspections, three-yearly condition surveys or user feedback. Renewal work is to be capitalised as required under the New Zealand accounting standard NZ IFRS.

A renewal strategy is important in developing a forward renewal programme which will help deliver Auckland Transport's parking policy outcomes and LOS performance targets.

Achieving these outcomes and performance targets is crucial to establish a base on which other target performance measures can be achieved in order to deliver that agreed customer LOS.

The function of the renewal budget is to maintain the LOS of an asset by intervening prior to the end of its useful life, or before its condition falls below an agreed level.

Remaining life estimates from the condition reports are used as indicators as to when certain building elements may be due for renewal. However, the remaining life predictions are not solely used to determine the best time to renew an asset. In the quest for efficiency and best economic value, the renewal of some assets can often be combined so they are done as one project, for example, the replacement of spouting and roof together. Combining projects ultimately saves time and money and reduces user disturbance. As a result, some assets may be renewed earlier or later than predicted due to combining renewal with other work.

Renewal plan

10-year renewal plan

Long-term renewal is based on analysis of data extracted from the SPM and RAMM databases. Renewals are developed using age and condition-based analyses to model the 10-year renewal profiles for both methods. Some validation is undertaken with public transport operations officers otherwise the analysis is mainly desktop. Currently criticality is not considered in the renewal analysis. The resulting 10-year renewal profiles are used for asset planning and programming purposes.

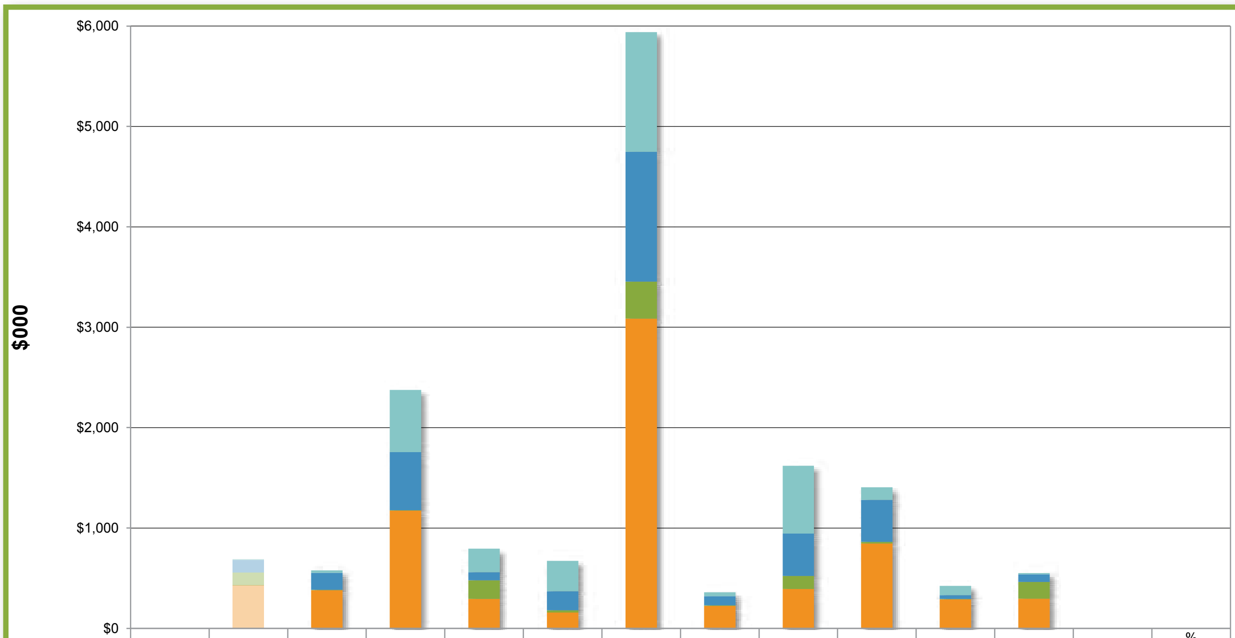
Annual and three-year renewal plan

Auckland Transport also prepares a short-term renewal plan for delivering the forward works programme for the next one to three years. This programme development also includes site walkovers, confirmation of asset ownership and coordination with other work programmes.

Renewal analysis

For the purposes of renewal analysis, the collected data for each car park facility is contained in the SPM database as separate components or renewal units. The 153 off-street car parks in SPM are made up of 509 discrete units. The four park-and-ride

Figure 4.6-4 Off-street car park condition-based renewal profile
Source: SPM March 2012



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	% Components renewed 2013-22
North	23%	6	24	620	235	302	1,193	39	676	125	92	12	3,318	138
Central	23%	124	169	578	79	190	1,293	91	423	417	37	77	3,354	201
West	6%	128	5	5	185	23	368	7	130	17	5	166	912	30
South	48%	429	380	1,172	295	158	3,086	224	393	846	290	297	7,141	172
Renewals (unit)		18	72	61	21	43	157	35	45	25	61	21	541	541
TOTAL	100%	687	578	2,375	794	674	5,940	361	1,621	1,405	424	552	14,724	

facilities in SPM are made up of 17 discrete units. The renewals profiles shown below are in terms of these units and the expenditure that would be required to renew these units (regardless of the actual budgets available). There is insufficient data in SPM on car park buildings upon which to base a reliable renewal analysis.

Overall, the renewals analyses give useful, indicative trends only, and more asset data is required before reliable results can be used for renewals programming. Consequently there is an ongoing improvement task of data collection for parking assets.

The parking network assets have been analysed by the following methods:

Condition-based method – off-street car parks

(not including park-and-ride or car park buildings)

The following analysis of renewals is based on the current condition of the assets and uses whole-of-life deterioration to identify indicative renewal needs.

45 per cent of car park assets are in moderate to good condition as detailed in Section 4.6.6. At least 20 per cent of assets are in poor to very poor condition (grades 4 and 5).

Assuming that the grades 4 and 5 assets will be replaced over the next five years, there is a need to renew a total of 541 components (106 per cent of the assets) over the following 10 years at a cost of approximately $15 million (un-inflated), as shown in Figure 4.6-4.

Notes on the condition-based renewal profile in Figure 4.6-4:

- Data has been outputted directly from SPM condition-based renewal analysis
- An OPEX threshold of $500 has been applied
- The significant renewal for 2016-17 is largely due to replacement of asphalt surfaces
- No data validation has been done
- This profile applies only to the 70 per cent of known assets (those that have data captured).

Condition-based method – park-and-ride car parks

The following analysis of renewals is based on the current condition of the assets and uses whole-of-life deterioration to identify renewal needs.

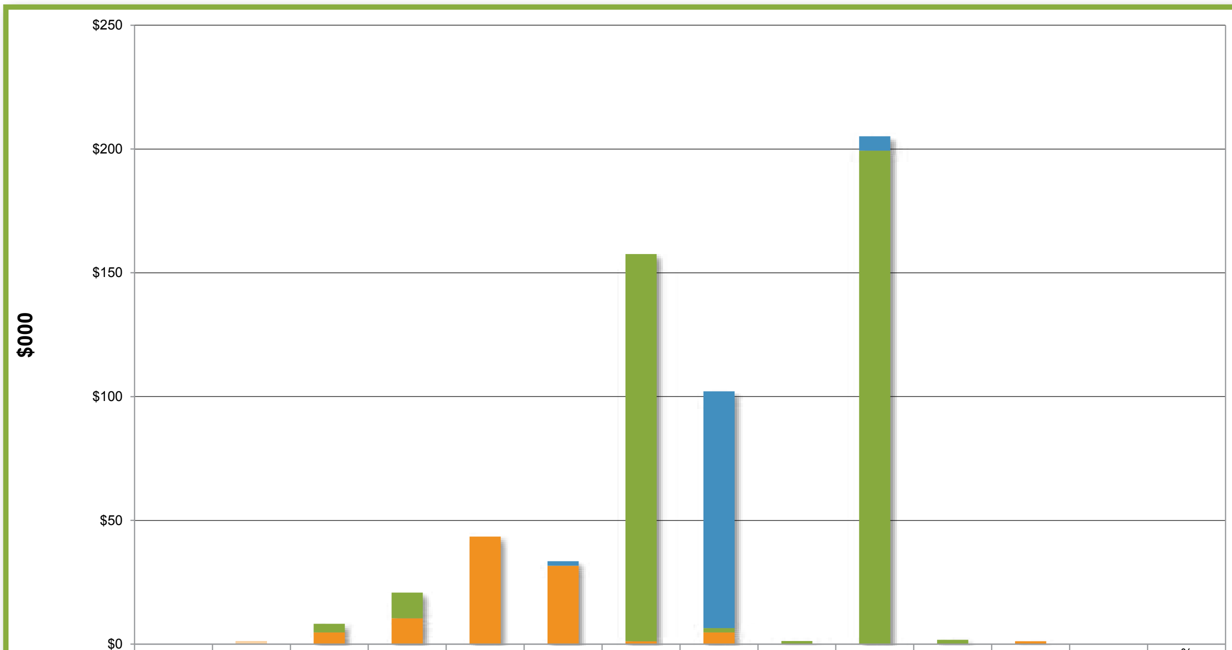
Park-and-ride car park assets are mainly in moderate to good condition as detailed in Section 4.6.6. Approximately two per cent of assets are in poor to very poor condition (grades 4 and 5). Assuming that the grades 4 and 5 assets will be replaced over the next five years, there is a need to renew 96 per cent of the assets over the following 10 years at a cost of approximately $15 million (un-inflated), as shown in Figure 4.6-5.

Assuming that the grades 4 and 5 assets will be replaced over the next five years results in the need to renew 16 components over the following 10 years at a cost of approximately $575,000 (un-inflated), as shown in Figure 4.6-5.

Notes on the condition-based renewal profile in Figure 4.6-5:

- Data has been outputted directly from SPM condition-based renewal analysis
- An OPEX threshold of $500 has been applied
- Only four of the 20 park-and-ride facilities are included in the analysis
- No data validation has been done
- This profile applies only to the 40 per cent of known assets (those that have data captured).

Figure 4.6-5 Park-and-ride condition-based renewal profile
Source: SPM March 2012



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	% Components renewed 2013-22
Western	18%					2		96		6			103	60%
Eastern	65%		3	10			156	2	1	199	2		374	113%
Southern	17%	1	5	11	44	32	1	5				1	98	100%
Renewals (unit)		0	3	0	2	2	3	2	1	3	1	0	16	96%
TOTAL	100%	1	8	21	44	34	158	102	1	205	2	1	575	

Condition-based method – car park buildings

The condition rating and renewal profile of the region’s car park buildings is yet to be confirmed.

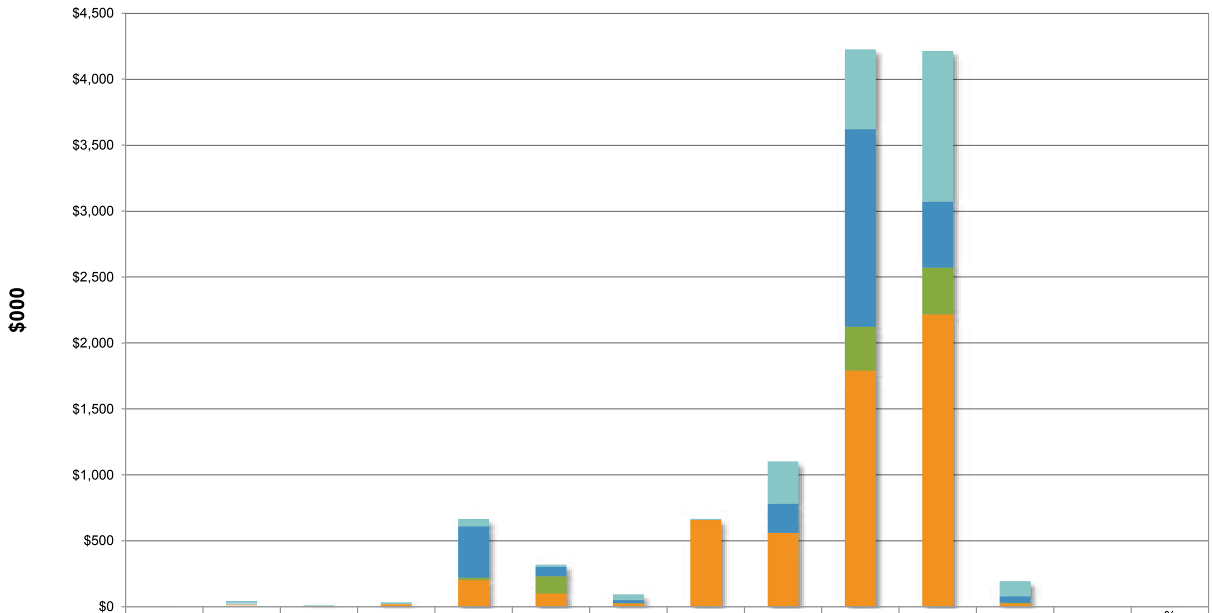
Age-based method – off-street car parks

The assets are analysed by component groups that have a range of economic lives dependent on the materials used and nature of the materials supported. Useful economic lives for car park components are expected to range from five to 50 years. 509 different components have been identified and Figure 4.6-6 shows that 418 of these components will need to be renewed over 10 years at a cost of approximately $12 million (un-inflated).

Notes on the age-based renewal profile in Figure 4.6-6:

- Data has been outputted directly from SPM age-based renewal analysis
- Total number of components has been taken from the condition-based renewal data
- An OPEX threshold of $500 has been applied
- The significant renewal for 2019-20 and 2020-21 is largely due to replacement of asphalt surfaces
- No data validation has been done
- This profile applies only to the 70 per cent of known assets that have data captured.

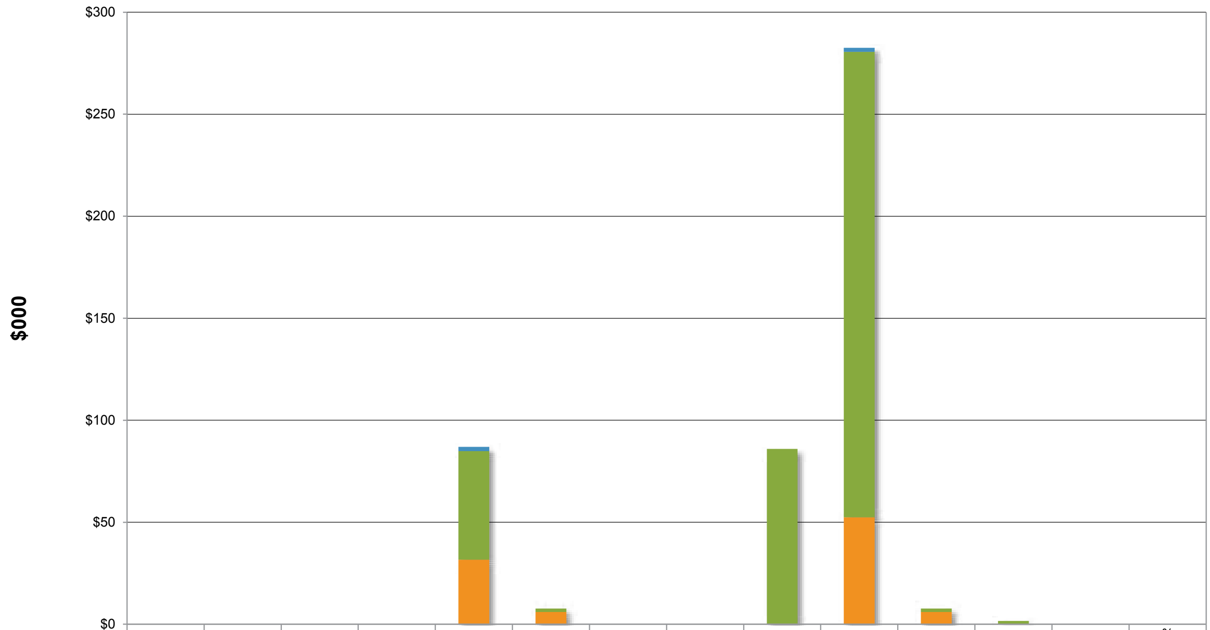
Figure 4.6-6 Off-street car park age-based renewal profile
Source: SPM March 2012



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	% Components renewed 2013-22
North	20%	9	4	14	57	15	44	6	321	604	1,143	115	2,324	74%
Central	24%	12	1		388	73	22	1	220	1,499	499	48	2,751	80%
West	7%	3			19	132	4			331	354	7	847	88%
South	49%	17	5	20	202	100	24	660	561	1,791	2,217	24	5,605	90%
TOTAL	100%	41	10	34	666	320	95	667	1,103	4,225	4,214	194	11,527	
Renewals (unit)		25	5	3	74	66	39	8	21	64	95	43	418	82%

Figure 4.6-7 Park-and-ride age-based renewal profile

Source: SPM March 2012



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	% Components renewed 2013-22
Western	1%				2					2			4	50%
Eastern	79%				53	2			86	228	2	2	372	100%
Southern	20%				32	6				53	6		96	80%
Renewals (unit)		0	0	0	4	2	0	0	1	4	2	1	14	82%
TOTAL	100%				87	8			86	283	8	2	473	

Age-based method – Park-and-ride car parks

The assets are analysed by component groups which have a range of economic lives dependent on the materials used and nature of the materials supported. Useful economic lives for park-and-ride car park components are expected to range from five to 50 years. A total of 17 different components have been identified and Figure 4.6-7 shows that a total of 14 components will need to be renewed over 10 years at a cost of approximately $473,000 (un-inflated).

Notes on the age-based renewal profile in Figure 4.6-7:

- Data has been outputted directly from SPM age-based renewal analysis
- Total number of components has been taken from the condition-based renewal data
- An OPEX threshold of $500 has been applied
- Only four of the 20 park-and-ride facilities are included in the analysis
- No data validation has been done
- This profile applies only to the 40 per cent of known assets that have data captured.

Age-based method – car park buildings

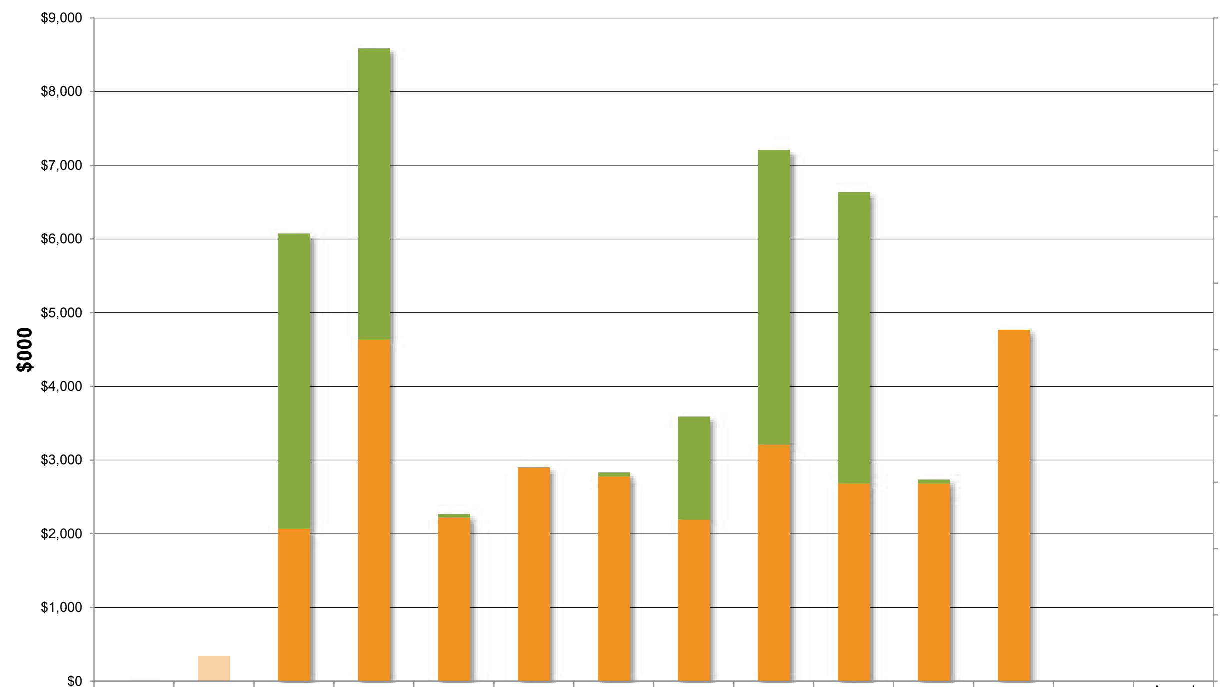
The age-based renewal profile of the region's car park buildings is yet to be confirmed.

Operational priorities

Operational priorities may dictate service level requirements which in turn may influence the need and priority for renewals. Renewal works are prioritised and programmed by staff using the following operational criteria, the first of which is most important:

1. Public health and safety risk
2. Strategic importance and location. High use or high importance parking facilities may be given higher priority for renewal over those in other areas. For example, parking facilities near public transport centres or commercial centres are generally prioritised over others which may be in poorer condition
3. Financial risk of deferring works (e.g. potential loss of income stream from ticketing machines, barrier arms, and parking building services)
4. Risk of other damage resulting from deferred renewals (e.g. a leaking roof that needs to be renewed).

Figure 4.6-8 Parking renewal forecast
Source: LTP Budget Model 12 April 2012 after refresh for AMP



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	Annual Average $ / asset
On Street	37%		4,000	3,950	50		50	1,400	4,000	3,950	50		17,450	873
Off Street	63%	339	2,076	4,639	2,219	2,902	2,783	2,193	3,211	2,687	2,687	4,766	30,161	11,874
TOTAL	100%	339	6,076	8,589	2,269	2,902	2,833	3,593	7,211	6,637	2,737	4,766	47,611	2,112

Historical trends

Legacy council renewals practices may influence the need and priority for renewals.

Depreciation profile

The annual depreciation for parking over the next 10 years is indicated in Table 4.6-13.

Renewal expenditure forecast

The analyses given above provide varying levels of indicative renewal work for the future. This demonstrates the current difficulty of forecasting future renewal needs.

Considering the above renewal analysis and the current funding constraints being experienced by Auckland Transport and Auckland Council, the recommended 10-year renewal needs are shown in Figure 4.6-8, however, that the actual renewal plan approved by Auckland Transport and Auckland Council may yet differ from these network needs because of the impact of funding constraints.

4.6.12 New works needs

New works strategy

Auckland Transport provides new or upgraded assets to meet increased demand for parking.

Parking studies of city and town centres across the region are undertaken to investigate the current usage and pattern, and to identify issues. From these studies, recommendations can be made to improve the parking situation of these centres.

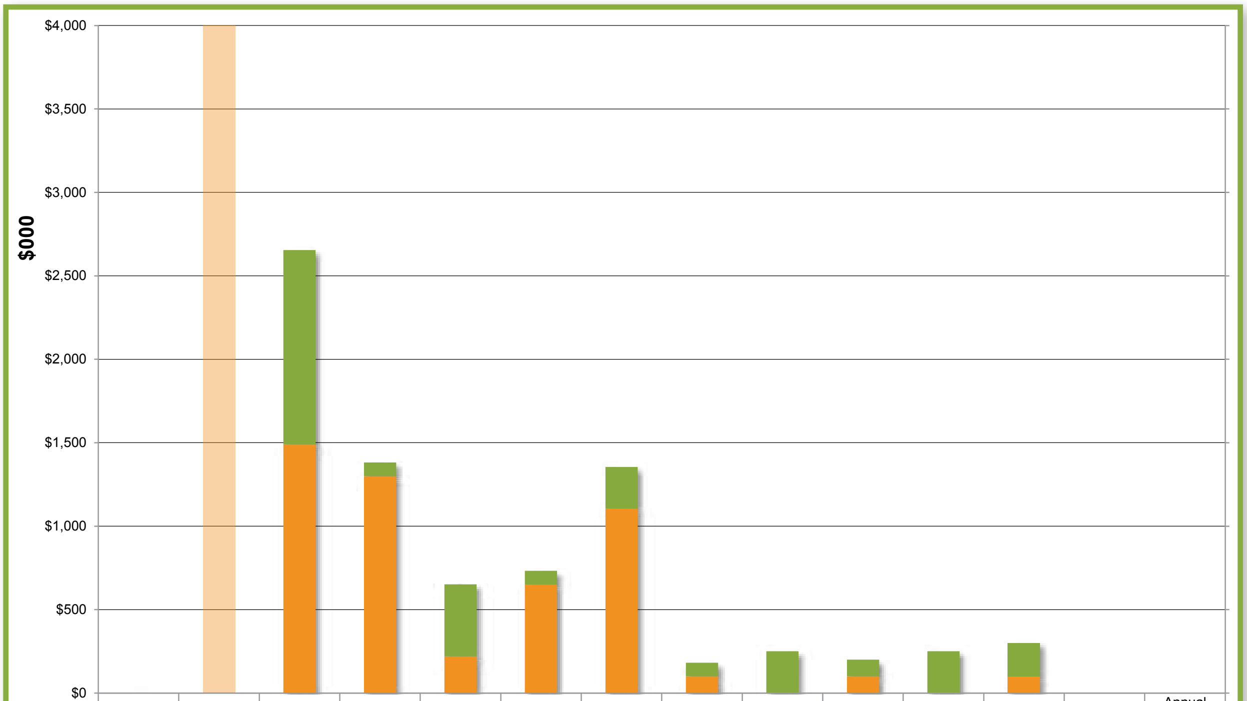
Based on the findings, parking plans were drafted which identified actions for the short-, mid- and long-term. Many short-term actions, in particular,

Table 4.6-13 Parking assets depreciation forecasts
Source: Auckland Transport infrastructure depreciation profiles (25 April 2012)

Profile	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Depreciation ($ millions)	1.7	2.2	2.3	2.4	2.4	2.5	2.5	2.5	2.6	2.6	2.6	26.4

Figure 4.6-9 Parking new works forecast

Source: LTP Budget Model 12 April 2012 after refresh for AMP



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	Annual Average $ / asset
On Street	36%		1,165	82	432	82	250	82	250	100	250	200	2,893	145
Off Street	64%	13,389	1,490	1,300	220	650	1,105	100		100		100	5,065	1,994
TOTAL	100%	13,389	2,655	1,382	652	732	1,355	182	250	200	250	300	7,958	353

on-street parking have been implemented (changes to time restriction, etc). It is considered appropriate for mid- and long-term actions to be incorporated in the AMP. Issues and recommendations for particular car parks are outlined in the parking performance plans.

The parking plans also suggest ongoing monitoring of parking needs and changes to parking ratios to better tailor the character and accessibility of public transport in the town centres, while the draft Regional Parking Strategy sees parking as an efficient tool for Travel Demand Management purposes and recommends a comprehensive parking plan to be developed for town centres.

New works programmes

A summary of capital new works expenditure for cycleways by network areas is shown in Figure 4.6-9.

The parking projects being undertaken over the next 10 years are forecast at approximately $8 million, or three per cent of the total expenditure on the parking network.

Off-street parking accounts for $5 million of this and comprises upgrades of car park buildings, including earthquake strengthening and parking equipment. The Davies Avenue car park building in central Manukau accounts for the historical 'spike' of $13 million in 2011/12 and for nearly $2 million from 2015 to 2017.

On-street parking accounts for approximately $3 million and comprises pay-and-display machines for new areas, parking permits and parking enforcement technology.

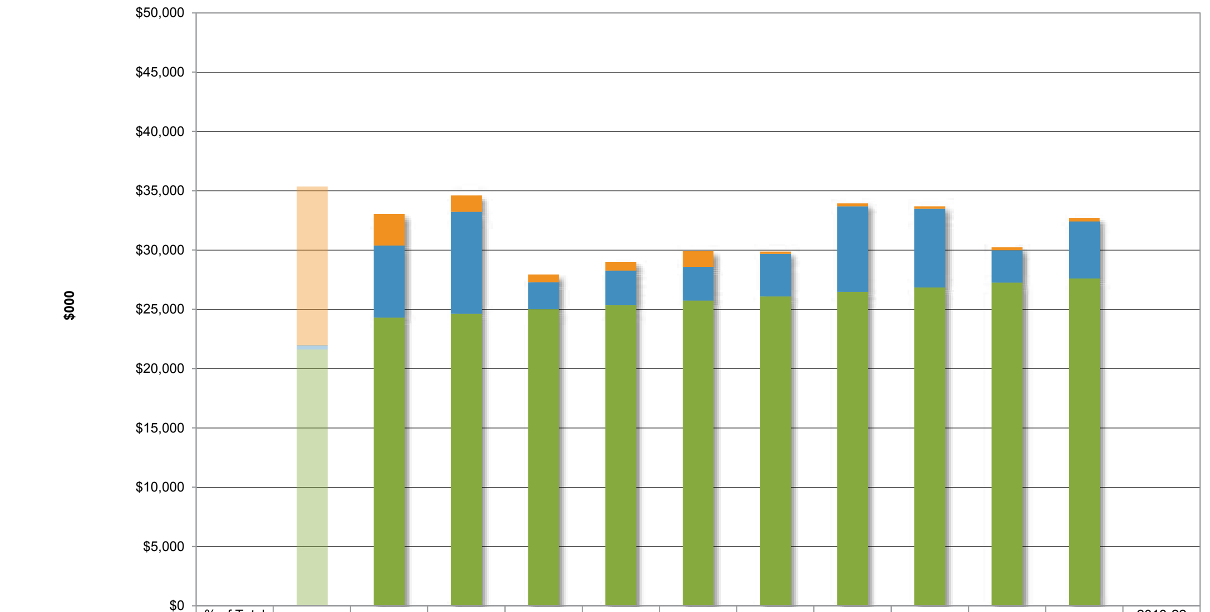
Capital new works are either growth related, such as the new car park building in Manukau or LOS improvements such as upgrading parking enforcement equipment and pay-and-display machines.

4.6.13 Disposal plan

Assets may become surplus to requirements for any of the following reasons:

- Under utilisation
- Obsolescence
- Provision exceeds agreed LOS
- Uneconomic to upgrade or operate
- Policy change
- Service provided by other means (e.g. private sector involvement)
- Potential risk of ownership (financial, environmental, legal, social, vandalism).

Figure 4.6-10 Parking expenditure forecast summary
Source: LTP Budget Model 12 April 2012 after refresh for AMP



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total
CAPEX New Works	3%	13,389	2,655	1,382	652	732	1,355	182	250	200	250	300	7,958
Renewals	15%	339	6,076	8,589	2,269	2,902	2,833	3,593	7,211	6,637	2,737	4,766	47,611
Operations & Maintenance	82%	21,622	24,304	24,634	25,016	25,360	25,734	26,092	26,480	26,853	27,255	27,643	259,371
TOTAL	100%	35,351	33,035	34,605	27,937	28,994	29,921	29,866	33,940	33,689	30,242	32,709	314,939

The current process for revising parking assets involves putting a report forward to Auckland Council and consulting with the public and Local Boards. In all cases, the asset disposal processes must comply with the Local Government Act 2002, which covers public notification procedures, required prior to sale and restrictions on the minimum value recovered.

Funds generated by the sale of disposed assets are retained by Auckland Council.

Open-grade car park assets within this AMP sometimes may be identified for transfer to other divisions within Auckland Council because their primary function is associated with an open space, reserve or park.

If real estate assets become redundant, they are disposed from this AMP, often by transfer to another council group to either enhance their services, or for alternative use as required, subject to the regional plan.

With a mounting drive for sustainability there is an increasing practice across the region of crushing, recycling and reusing old material where suitable. Material for recycling and reuse is stored in designated sites.

4.6.14 Summary of 10-year network needs

All expenditure for Auckland Transport is contained in its SAP financial management system.

The average annual expenditure for operations and maintenance, renewals and new works on parking assets is approximately $32 million, of which $26 million (82 per cent) is for operations and maintenance, $5 million (15 per cent) is for renewals and less than $1 million (three per cent) is for new works.

The total amount of expenditure for operations and maintenance, renewals and new works over the next 10 years is $315 million.

Notes on the expenditures in Figure 4.6-10:

- The proposed 10-year expenditures contained in this section are those of the Auckland Transport financial system (SAP) as at April 2012
- The proposed 10-year base expenditure for operations, maintenance and renewals includes an annual growth factor of +0.85 per cent to allow for consequential OPEX and consequential renewals from growth in the network and growth in demand for services.

4.6.15 Approved Long Term Plan envelope

The approved Long Term Plan

This section compares the approved LTP envelope for OPEX and renewals with the parking network needs as determined by this AMP at a regional level and identifies the likely impacts of any variances. Revenue and funding incomes to Auckland Transport (from Auckland Council ratepayers and NZTA government subsidies and the like) are allocated through the approved Long Term Plan budgets. The LTP was adopted on 28 June 2012.

OPEX impacts

Based on the information in Table 4.6-14, parking operational expenditure shows a variance between the LTP allocated budgets and the AMP needs. The LTP allocated budget for parking OPEX has a 10 year shortfall of $18.4 million (7 per cent reduction) compared to the network needs determined by this AMP.

However it is anticipated that the LTP will require further efficiency savings and as a result, this funding gap may be increased.

Renewals impacts

Based on the information above, parking renewals expenditure shows no variance between the LTP allocated budgets and the AMP needs. The apparent shortfall of $1.3 million (3 per cent reduction) shown above is not a reduction in renewals, but rather a re-allocation from parking signs and markings to road signs and markings.

Further efficiency savings

As required by the approved LTP, a further reduction in OPEX of $18.6 million per year, reducing to nil by 2016/17, will need to be allocated against asset related operational budgets. The impact of this further reduction on parking operational budgets is yet to be assessed and finalised.

Monitoring and management of Long Term Plan consequences

The consequences resulting from these variances will be monitored and reported as appropriate.

CAPEX new works

CAPEX new works contained in this AMP are derived from draft LTP listings as at April 2012 and are produced in section 4.6.12.

The capital new works programme has been further refined and adopted in late June 2012. Details of this adopted programme are contained in the LTP.

Table 4.6-14 Variance between LTP approved budget and AMP network needs for parking (all un-inflated)
Source: LTP Budget Model 12 April 2012 after refresh for AMP and revised LTP Budget Model 28 June 2012

Parking	10-year total LTP approved budget ($000s un-inflated)	10-year total AMP network needs ($000s un-inflated)	Variance 10-year total ($000s un-inflated)
Operations and maintenance	240,997	259,371	-18,374
Renewals	46,297	47,611	-1,314
Parking total	287,294	306,982	-19,688

Table 4.6-15 Un-inflated and inflated parking AMP needs

Source: LTP Budget Model 12 April 2012 after refresh for AMP and revised LTP Budget Model 28 June 2012

UN-INFLATED expenditure ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M		24,304	24,634	25,016	25,360	25,734	26,092	26,480	26,853	27,255	27,643	259,371
Renewal		6,076	8,589	2,269	2,902	2,833	3,593	7,211	6,637	2,737	4,766	47,611
Parking total		30,380	33,223	27,285	28,262	28,567	29,685	33,691	33,490	29,992	32,409	306,982
AC Inflator	OPEX	3.30%	3.30%	3.30%	3.30%	3.50%	3.60%	3.10%	3.10%	3.30%	3.60%	n/a
AC Inflator	CAPEX	3.90%	3.40%	2.80%	2.90%	3.10%	3.30%	3.50%	3.70%	4.00%	4.00%	n/a
INFLATED expenditure ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M		25,106	26,287	27,575	28,933	30,416	31,795	33,268	34,850	36,646	38,506	313,383
Renewal		6,313	9,227	2,506	3,298	3,319	4,348	9,033	8,621	3,698	6,696	57,059
Parking total		31,419	35,514	30,081	32,231	33,735	36,143	42,301	43,471	40,344	45,202	370,442

Table 4.6-16 Un-inflated and inflated parking LTP budgets

Source: LTP Budget Model 12 April 2012 after refresh for AMP and revised LTP Budget Model 28 June 2012

UN-INFLATED expenditure ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M		21,048	21,637	22,770	23,233	23,874	24,509	25,032	25,751	26,301	26,841	240,997
Renewal		5,956	8,466	2,144	2,774	2,703	3,460	7,075	6,499	2,597	4,622	46,297
Parking total		27,004	30,103	24,915	26,007	26,577	27,969	32,108	32,250	28,898	31,464	287,294
AC Inflator	OPEX	3.30%	3.30%	3.30%	3.30%	3.50%	3.60%	3.10%	3.10%	3.30%	3.60%	n/a
AC Inflator	CAPEX	3.90%	3.40%	2.80%	2.90%	3.10%	3.30%	3.50%	3.70%	4.00%	4.00%	n/a
INFLATED expenditure ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M		21,743	23,089	25,100	26,506	28,218	29,867	31,450	33,420	35,363	37,389	292,144
Renewal		6,189	9,095	2,368	3,153	3,167	4,188	8,863	8,442	3,508	6,494	55,468
Parking total		27,931	32,184	27,468	29,659	31,385	34,055	40,313	41,863	38,871	43,883	347,612

AMP inflation effects

Un-inflated and inflated parking needs for the AMP are shown in Table 4.6-15.

LTP inflation effects

Un-inflated and inflated parking budgets from the LTP are shown in Table 4.6-16.

4.6.16 Revenue sources

Auckland Transport revenue and funding income is contained in its SAP financial management system.

Operations and maintenance revenue

Parking operations and maintenance are not normally subsidised by NZTA, so this expenditure is generally funded by parking charges and Auckland Council rates.

Capital renewals revenue

Parking assets renewals are not normally subsidised by NZTA, so this expenditure is generally funded by parking charges, Auckland Council rates or development contributions.

Capital new works revenue

Parking capital new works are not normally subsidised by NZTA, so this expenditure is generally funded by parking charges, Auckland Council rates, development contributions or loans.

Income from parking charges and fines

A regional summary of historical income from parking charges and fines (not including Auckland Council rates or NZTA subsidy contributions) for 2011/12 in Table 4.6-16.

Notes on the incomes for 2011/12 in Table 4.6-16:

- Approximately 54 per cent of the income is from infringement fines and 46 per cent from parking charges
- For parking, there is an average annual expenditure for maintenance and renewals of $31 million and an income (including infringement fines) of $78 million.

4.6.17 Key improvement initiatives

Key parking improvement initiatives are shown in Table 4.6-17.

Table 4.6-16 Funding and income summary
Source: Auckland Transport SAP system (October 2011)

Funding and income	2011/12 total income ($000s)	% of income
Fees and income	35,754	46
Parking infringement	42,026	54
Total funding income	77,780	100

Table 4.6-17 Key parking improvement initiatives

Improvement initiative number	Description	AMP section	Priority
Parking 1	The average annual expenditure for renewal works on parking assets appears to be inadequate for the sustainable renewal of parking infrastructure such as building structures, systems for ventilation, security and ticketing, and open car parking pavements. Review and confirm the lifecycle renewals work and expenditure needs for each asset component type. Showing current and projected backlogs with proposed renewal costs and works. Establish capitalisation rules and distinguish between maintenance (OPEX) and renewals and new works (CAPEX)	4.6.9 and 4.6.12	High
Parking 2	Improve the level of asset data in terms of quantities, condition, age and performance of parking assets, which are currently 'uncertain'. Have a consistent asset management system or systems for car park buildings and infrastructure asset data, which are currently in RAMM, SPM, GIS or may not be a system	4.6.5 and 4.5.6	High
Parking 3	Have a consistent asset management system or systems for parking buildings and infrastructure asset data, which are currently in RAMM, SPM, GIS or may not be a system	4.6.5 and 4.5.6	High
Parking 4	Develop an understanding of the park-and-ride facilities pertaining to related public transport modes	4.6.3	Moderate
Parking 5	Review and confirm expenditure, revenue and funding incomes to provide transparency and completeness of allocations. For example, costs and incomes relating to infringement enforcement, court costs and fines	4.6.9	Moderate
Parking 6	Review parking and demand management policies, as well as strategies from the legacy councils, GPS, etc. Consolidate into new regional policies and strategies	4.6.17	Moderate

4.7 Contents

Auckland Transport
An Auckland Council Organisation

4.7 Footpaths

4.7.1 The service Auckland Transport provides

Auckland's footpaths provide the key link between journey origins and destinations for all other travel modes and provide a travel mode in their own right. They are an essential component of the transport system and help deliver an effective and efficient transport system that enables Aucklanders to make smarter transport choices.

The footpath levels of service (LOS) most relevant to that delivery are:

- Accessibility – the degree to which people, goods and services have opportunities to conveniently travel within the region
- Quality – the suitability of the built design and the standard of the maintained condition
- Safety – the degree to which the network maintains a safe pedestrian environment.

Section 2 of this AMP presents the details of the footpaths LOS being measured. Table 4.7-1 offers a representative sample only:

Aucklanders place a high importance on footpaths as shown by the relatively high proportion of call centre requests for service on footpaths issues.

Virtually every type of transport mode involves the use of a footpath somewhere along the journey. It is generally recognised that walking is an important component of an integrated transport system for pedestrian movement alongside and linking roadways, public transport modes and public space. Footpaths can also visually enhance the region and provide an attractive environment to encourage people to walk and use the shared transport spaces with focus given to areas near schools, commercial and recreational areas, public transport centres and areas of high usage.

There has been a national commitment to develop a strategy for walking, based on the recognition that it has the potential to contribute to Government economic, social and environmental objectives, and through recognising the need to develop alternative modes of transport. Auckland Transport expects footpaths and associated facilities to become a more significant asset group in the coming years as healthier, active transport choices become more popular.

Auckland Transport wants to provide an environment that encourages and promotes walking, by making walking safe, enjoyable, beneficial and easily accessible, and by making Auckland a place where people from all sectors of the community can walk for transport, health and enjoyment.

An Auckland Transport objective is that the footpath network is suitable, accessible, safe and well maintained, so that it will:

- Contribute to the transport network by providing footpaths that are safe and easy to use
- Provide an integrated, well planned and well maintained footpath network that meets the needs of the community

Table 4.7-1 Footpaths levels of service
Source: Auckland Transport AMP LOS.xlsx

Service value	Level of service	Service measure	Current performance	Target performance (indicative / to be developed and agreed)
Accessible	Increase availability of travel options for convenient travel across the Auckland region	Percentage of residents walking or cycling to work (%)	3.5% – Census 2006	5% – Census 2011
		Walking trips into the CBD during the morning peak	5,297	2% increase each year (2012/13, 2013/14 and 2014/15)
Asset quality	Assets are maintained in good condition	Percentage of Footpaths that score three or better on AMEM Pedestrian Environment survey	98%	95%
		Percentage of residents very satisfied, satisfied or neutral about the quality of footpaths in the Auckland region	76%	75%
		Percentage of residents very satisfied, satisfied or neutral about the quality of footpaths in their local area	76%	Not less than 75%
		Percentage of footpaths in moderate (condition grade 3) or better	92% (97% of known assets)	95%
Pedestrian safety	Minimise the number of pedestrian fatal and serious injuries	Percentage of pedestrians consider the network to be safe	67%	TBD
		Number of fatal and serious pedestrian injuries on local roads	62 (year to 31 Dec 2010)	Reducing trend

- Provide safe routes for vulnerable users, such as the elderly, disabled and young, to move to and from places within their community
- Provide a standard of footpath surfacing that contributes to the accessibility, safety, amenity, and character of Auckland streets and suburbs.

Auckland Transport uses maintenance, renewals and new works programmes to ensure that the footpath network meets the above objective.

4.7.2 Network overview

Auckland Transport has stewardship responsibilities for and manages the region's network of footpath and pedestrian facilities which includes approximately 6,879km of footpaths and 368,134 vehicle crossings.

The footpath network includes the following assets associated with the transport network:

- Footpaths
- Shared footpaths with cyclists
- Pedestrian access ways
- Walkways, boardwalks and pedestrian bridges
- Dropped kerb crossings for vehicles and pedestrians
- Shared spaces.

Pedestrian bridges are covered under the lifecycle plan for bridges and structures.

Footpath users include pedestrians as well as users of mechanised pedestrian aids such as prams, walkers, bicycles, mobility scooters, wheelchairs, miniature motorcycles, Segways, skateboards and the like.

Pedestrians also use the 76km of off-road cycleways that are outside of the normal road corridor. Off-road cycleways sometimes run through parks and recreational areas and are dedicated to cyclists and pedestrians. Details of cycleways are contained in a separate lifecycle management plan section of the AMP.

Footpaths and pedestrian accessway maintenance and renewals are not normally subsidised by NZTA, although new footpaths may be eligible for subsidy. Therefore the majority of the expenditure on footpaths is unsubsidised.

4.7.3 Network valuation

The approximate replacement value of the footpath network including bases and surfaces is $666 million:

Table 4.7-2 shows the optimised depreciated replacement cost and annual depreciation across the region.

4.7.4 Network asset details

Auckland Transport has stewardship responsibilities for and manages approximately 6,879 kilometres of footpath and shared pedestrian and cycleway network and 368,134 vehicle crossings, shown in Table 4.7-3.

Table 4.7-2 Footpaths valuation
Source: Auckland Transport asset revaluation (30 June 2011)

Asset	Optimised replacement cost (ORC) $	Optimised depreciated replacement cost (ODRC) $	Annual depreciation (ADR) $
Footpaths	666,253,660	386,198,102	16,179,209

Table 4.7-3 Footpath asset details
Source: Auckland Transport RAMM database March 2012

Asset	Regional total quantity (approximate)		Central	North	West	South
Footpaths	Total (km)	6,879	2,172	1,493	957	2,257
	Concrete (km)	5,963	1,504	1,361	913	2,185
	Asphaltic concrete hot mix (km)	583	428	95	19	42
	Chipseal (km)	230	215	2	8	5
	Other (km)	79	16	22	15	25
	Unknown (km)	24	8	13	2	0
Includes on-road shared pedestrian and cycleways	All types (km)			27		3
Vehicle crossings	All types (Number)	368,134	126,017	84,847	43,682	113,588

Concrete is the predominant footpath surfacing material. In the Central area there was an historical practice of using an asphaltic concrete hotmix; the older asphaltic concrete footpaths are being progressively replaced by concrete as part of the renewals programme.

Apart from certain streetscape and historical locations, the renewal of footpaths includes replacing other surfacing material types with concrete surfacing (typically minimum 1.8m wide by 100mm thick).

The useful asset life for concrete footpaths is assumed to be 50 years, while asphaltic concrete, chipseal and other surfacing materials last between 15 and 20 years. Other surfacing materials include, but are not limited to:

- Chipseal (including McCallums)
- Interlocking blocks / bricks
- Concrete tiles
- Special pavers (for example granite in city centre streetscapes)
- Unsealed (crushed rock, 'metal').

4.7.5 Asset data confidence

The RAMM database holds the asset information for the footpath network, including condition rating information. Data confidence relates to both the accuracy and completeness of data.

Table 4.7-4 illustrates Auckland Transport's confidence in the footpaths asset data.

Table 4.7-5 shows how complete the footpaths data inventory is, based on inventory analysis by asset type.

The current overall confidence level of asset data in terms of quantity and condition of the footpath network is reliable. 95 per cent of footpaths are rated for condition, with only 5 per cent in an unknown condition (refer to Section 4.7.6). However, information on vehicle and pedestrian crossings, off-street walkways and shared footpaths with cyclists is less reliable.

The current confidence level of asset data in terms of performance and age of the footpath network is uncertain, and this is addressed in the key improvement initiatives listed later in this section.

4.7.6 Asset condition

Condition rating

Footpath condition-rating surveys of all footpaths occur on a three year basis. Contractors conduct these surveys, and submit condition-rating reports to Auckland Transport.

Typically, inspections are planned for the year prior to the Asset Management Plan review. This provides a timely, overall picture of the network condition as near as possible to the three-yearly review, which feeds into the Long-term Plan review.

Assessment of the network's condition and performance is in accordance with a condition grade rating system. The rating system basis includes safety factors, structural defects, and aesthetics / visual amenity of the assessed footpath section and is in accordance with the methodology of The New Zealand Institute of Highway Technology. Through condition rating information, the broad condition / level of service of the

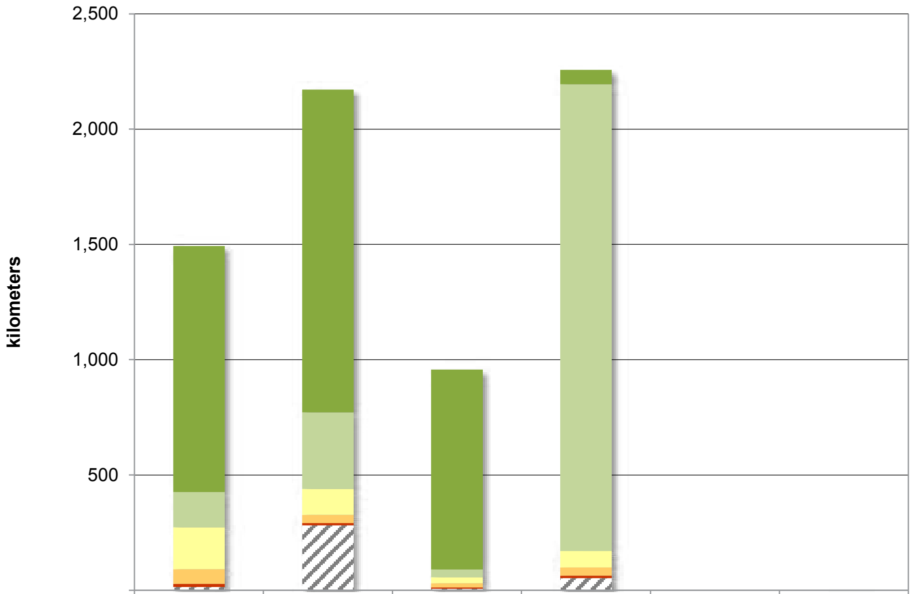
Table 4.7-4 Footpaths data confidence and reliability
Source: Auckland Transport RAMM database March 2012

Data attribute	Data inventory confidence			
	Very uncertain	Uncertain	Reliable	Highly reliable
Asset descriptors and quantity			X	
Asset age			X	
Condition			X	
Performance		X		

Table 4.7-5 Completeness of data
Source: Auckland Transport RAMM database March 2012

Asset	Completeness of data		
	Measure	Age	Condition
Footpaths	95%	95%	95%
Shared footpaths and cycleways	25%	20%	20%
Vehicle crossings	25%	20%	20%

Figure 4.7-1 Footpaths condition by quantity and per cent
Source: RAMM March 2012



	North	Central	West	South	Total (km)	% of total
Very Good	1,067	1,400	866	63	3,397	49%
Good	153	333	34	2,024	2,544	37%
Moderate	181	112	26	71	390	6%
Poor	63	36	17	35	152	2%
Very Poor	14	9	6	11	40	1%
Unknown	14	282	7	53	356	5%
Total (km)	1,493	2,172	957	2,257	6,879	100%
% of total	22%	32%	14%	33%	100%	

footpath can be determined. Condition grade rating is on a scale of one to five, where one is very good and five is very poor. Footpath condition rating is section based. Each section will have portions of it at different condition grades.

Outcomes of the footpath condition rating process, in conjunction with other significant factors, drive the development of the footpath renewal works programme. The renewal programme prioritises footpath sections in the worst condition – those with the most lengths in poor and very poor condition (namely grades four and five).

The renewal work is sometimes completed in entire sections of street to prevent patchwork construction and repair work, providing for a more consistent overall appearance of the footpath.

Figure 4.7-1 shows the condition rating profile of the region's footpaths, based on lengths and percentage of conditions within the geographical areas.

The above figures show that approximately:

- 86 per cent of footpaths are in good or very good condition
- 6 per cent are in moderate condition
- 3 per cent are in poor or very poor condition
- 5 per cent are in unknown condition.

The age of footpaths is less certain than condition across the region. Most footpaths were constructed or last renewed over 15 years ago and age or build-date information was not generally recorded in an asset management system in those times. Most legacy councils had started capturing age information over the last five years or so as part of their annual renewals programme and when taking over new footpaths from subdivisions and capital improvement projects.

Remaining useful life

There is a mixture of old and new footpaths across the region. It is estimated that, on average, the footpaths network is nearly halfway through its life with an average remaining useful life in the order of 20 to 30 years.

This is reflected in the 2011 valuation figures for the region's footpaths, which indicate that the optimised depreciated replacement cost is 58 per cent of the replacement value.

The condition information shown earlier in this section shows that the approximate average condition rating is two, out of a maximum of five. This indicates the approximate value of the remaining useful life. Condition rating four is considered as near the end of useful life.

Asset failure modes

The most common identified reason for footpath failure is cracking damage to footpath slabs caused by either vehicles or utility works. This is exacerbated by deterioration and weakening due to ageing of materials. Some footpaths have also failed because of tree root upheaval causing uplifting of footpath bases and displacement and cracking of footpath slabs. Movement of adjacent steep side-slopes can also cause settlement of footpath bases and displacement and cracking of footpath slabs.

4.7.7 Asset performance and capacity

Performance

The performance of footpaths is mostly related to condition because it is the surface of paths that provide the service to users. A good or bad surface condition gives the corresponding service performance. However, there are other factors that affect performance:

- Those factors mentioned above that affect condition, including vertical displacement that creates safety issues
- Site conditions which limit ability to get high performance for end users, such as steep gradient or narrow width
- Flooding
- Different material types, e.g. timber boardwalk construction
- Obstructions on paths such as illegally parked cars or trucks
- Moss in damp areas resulting in slippery surfaces.

Capacity

Most legacy councils adopted a policy of a minimum footpath width of 1.8m (against the previous minimum of 1.4m), addressing the physical capacity issue of footpath width. This would allow two prams to safely pass in opposite directions.

Even so, there are sometimes capacity issues caused by:

- Pedestrian peak flows on school access routes resulting in children being pushed onto the road carriageway
- Steep narrow typography in some northern and western areas resulting in under-width or no footpaths at all
- Shared footpaths with cyclists, which slow the cyclists down and increase risks to pedestrians.

4.7.8 Asset risks and criticality

Asset risks

Asset risks across the transport network, identified through a formal risk analysis review, appear in the Section 8, Risk Management. High level risks for the footpath network are shown in Table 4.7-6.

Additional lower level risks identified through the development of this AMP are shown in Table 4.7-7.

Critical assets

This AMP identifies critical assets which relate to safety issues, including:

- High speed cycle crossings on dual use footpaths
- Pedestrian and vehicle crossings that are close to major intersections, arterials or high usage roads.

Asset safety

The potential hazards and safety issues include:

- The risks listed in Asset risks and Critical assets that affect safety
- Pedestrian peak flows on school access routes resulting in children being pushed onto the road carriageway
- Shared footpaths use between pedestrians, cyclists and other wheeled users, which increase risks to all users.

Table 4.7-6 Footpaths risk analysis

Source: Auckland City Council Risk Analysis 2008

Risk	Net risk factor	Management options
Injury to footpath users from slips and falls and inaccessibility caused by inadequate footpath quality. Caused by settlement, cracking, tree root upheaval, poor design, construction, materials, lack of funding, utilities reinstatements	High risk – requires remedial planning and action via the AMP	• Review and improve current practices • Prioritise renewals of footpaths • Review budget levels • Review specifications of footpath design • Investigate the development of a measure for skid resistance • Meet response times for public complaints via the call centre
Injury to footpath users and Auckland Transport liability from inappropriate commercial use of footpath spaces, such as cranes, verandas, awnings, café furniture, hanging private planters and signs and the like	High risk – requires remedial planning and action via the AMP	• Enforcement • Meet response times for public complaints via the call centre • Review legacy council policies and adopt regional approach • Consider legacy council by-laws
Inadequate accessibility for physically and visually challenged persons, wheelchairs, strollers, walkers, prams, mobility scooters	High risk – requires remedial planning and action via the AMP	• Review and improve current practices • Prioritise renewals of footpaths • Review and increase budget levels • Review specifications of footpath design

Table 4.7-7 Additional risks

Source: ACC data analysis October 2008

Risk	Management options
Areas with steep footpaths causing a hazard to disabled people	• Alternative facilities for access • Alternative routes • Review current design
Footpath joints and pram crossings making a major contributor to 'tripping' hazards on the footpath network	• Use of the RAMM Contractor software extension to improve response to complaints • Rectify identified problems promptly • Review design and construction standards • Concrete grinding of joints to remove tripping hazards
Injuries of inconvenience to footpath users due to conflicts in the shared space between pedestrians and users of mechanised pedestrian aids such as prams, bicycles, mobility scooters, wheelchairs, miniature motorcycles, Segways, skateboards and the like	Footpath user education, warning notices, restriction notices and enforcement
Gradient changes at footpath or vehicle crossings a hazard to disabled people	• Use of the RAMM Contractor software extension to improve response to complaints • Rectify identified problems promptly • Review design and construction standards to minimise gradient changes
Contractor unable to deliver annual CAPEX renewal programme	• Encourage contractor to secure additional resources to deliver programme • Source alternative suppliers
Trees and vegetation encroaching over footpaths	• Policy review • Enforcement relating to private trees • Arboreal maintenance relating to public trees • Meet response times for public complaints via the call centre
Heavy vehicles driving on footpaths	• Enforcement • Better transport corridor management with relation access from external parties such as utility service providers, private developers, contractors

4.7.9 Key issues

Key lifecycle issues that affect footpaths (including driveway crossings, pram crossings and shared footpaths with cyclists) are shown in Table 4.7-8.

4.7.10 Operations and maintenance needs

Scope of operations and maintenance

Auckland Transport keeps the footpath network in a suitable, accessible, safe and well maintained condition. This is possible through an ongoing maintenance programme that addresses footpath defects resulting from inclement weather, wilful damage, or arising from safety issues and public complaints. This programme provides for both planned and responsive maintenance and includes the innovative use of concrete grinding to remove tripping hazards.

Auckland Transport manages the operations and maintenance activities associated with the footpaths network. This is achieved through an integrated response from Auckland Council's call centre, Auckland Transport's operations and maintenance staff and representatives, and the various contractors across the network areas of the region that are responsible for routine and emergency response and maintenance.

Table 4.7-8 Footpath key issues

No.	Key issues with footpaths	Action plan	Outcomes
1	Footpaths and associated facilities are expected to become a much more significant asset group in coming years as healthier, active transport choices become more popular Changing walking from recreational activity to viable transport mode	Prioritise service levels and funding for footpaths and pedestrian facilities to promote the use of footpaths	Appropriate service levels and adequate funding for footpaths and pedestrian facilities
2	Different standards from the seven previous legacy councils such as width, thickness and materials of footpaths Previous standards (such as Manukau council 65mm concrete footpath and 100mm vehicle crossings) are not adequate and require renewals to new specifications to best appropriate practice standards	Develop new policies and standards for the region The footpath policies and standards from the legacy councils need to be reviewed and consolidated into new regional (and local if appropriate) ones	A consistent and coherent approach to the provision of footpath in Auckland region
3	Footpath quality is a key issue for customers and a relatively high proportion of call centre requests for service are received for footpaths. Almost everybody uses footpaths on a daily basis Implement cost-effective ways to improve the level of service and safety of footpaths	Footpath complaints to be given high priority by the maintenance contractors to ensure that footpaths are safe for use Grinding of joints can be an economical method of removing tripping and scooter hazards and in some cases extend the life of footpaths before slab replacement. Grinding of concrete footpaths and pedestrian crossings is currently done in some network areas	Optimised responsive maintenance programmes
4	Uncertainty in asset data completeness and confidence in information for shared footpaths and vehicle crossing, and for age and performance of footpaths	Confirm and implement a regional approach to footpath data collection Age and length information to be recorded for all renewals	Improved optimised decision-making practice and future asset lives more accurately assessed
5	A significant amount of the central area (Auckland City Council) footpath network is deemed by legacy policy to require substantial renewals catch-up. This is due to the historical practice of construction in asphaltic concrete hotmix which has a much shorter life than concrete, as well as under-investment in footpath renewals, and increased specifications for concrete footpath width and thickness	Renewals catch-up profile addressed by the proposed footpaths renewals expenditure. However more transparency is required to identify the detailed sites and scope of the large renewals spends	Appropriate forward works programme and adequate funding
6	In some instances, there can be a pressure on the footpaths budgets for special non-renewal type work such as the Auckland city centre streetscape upgrade. This may reduce funds for the annual programme of footpath renewal works. These ambitious renewals and special upgrades have led to the elimination of funds for other capital new works such as for safety and accessibility around vulnerable user areas, e.g. schools, hospitals, and recreational areas	Consider targeted rates or loans for funding these types of non-renewal works that increase level of service and have higher maintenance requirements This issue requires review and re-allocation of funds if necessary	Appropriate forward works programme and adequate funding
7	Auckland should review 'shared spaces' best appropriate practices from the legacy councils, nationally and internationally, including technical specifications, operational practices and planning	Develop regional policies, strategies, practices and specifications for footpaths and shared spaces 'Shared spaces' for footpaths and roads are being introduced as part of the city centre upgrade programme which aims to create an Auckland city centre as one of the world's vibrant and dynamic cultural and business centres	A consistent and coherent approach to the provision of footpath in Auckland region. Appropriate service levels for footpaths and pedestrian facilities
8	Forecast for renewals more than two years ahead lacks sound rationale because the deterioration across the network is not yet well understood	Complete condition assessment for footpath asset and practise deterioration modelling	Consistent and improved footpath condition assessment and deterioration modelling practices
9	Some footpath programmes have combined renewals and upgrade works without a clear separation of budgets	Establish practices to separate budgets for capital renewals, capital new works for growth, and capital new works for service-level improvements	Clear and adequate budgets allocation for footpath renewals and new works

Operations and maintenance plan

Operations

The operational plan for footpaths includes:

- Call centre operation and response systems
- Inspections, reporting, data collections and the use of the RAMM asset management system
- Routine network inspections of footpaths by contractors to identify defects as defined in the key results schedules. The results of these are not stored in RAMM but are used to plan the contractor's routine maintenance activities.

The various network operations and maintenance contracts are significant in that they document and embody this work. As part of the developing process of Auckland Transport footpath principles, the operations plans are under review and subject to cross-referencing. In due course they will align with the Auckland Transport Code of Practice (ATCOP).

Maintenance

Maintenance plans for footpaths include cleaning, 'making safe' and minor (expensed) repairs to the footpath networks. The following categories assist with determining the management, programming and reporting responsibilities:

Routine works	Week-by-week basis work across the network, sourced from non-urgent, non-cyclic enquires from the call centre; network inspections undertaken by Auckland Transport or contractors (e.g. repairs to roughness, sunken trenches, broken panels, broken vehicle crossings, etc.)
Programmed works	Identified activity in the forward work programmes (which has in coordinated with utilities works to minimise disruption)
Responsive works	In response to call centre requests for service

Contractors delivering the maintenance services have the ability to programme works on a priority basis and are required to comply with the contract specifications and recognised guidelines for maintenance activities.

Repair works will be undertaken whenever a trip hazard or other safety issue has been identified using materials on a like-for-like basis. The length of the footpath being repaired may be less than 1-2m but the works are required to mitigate the safety hazard.

All service requests will be assessed by the engineer upon receipt. If the engineer considers the fault to be a safety hazard, the contractor will be notified and will repair the fault within 48 hours of notification by the engineer. If the contractor is unable to meet this deadline, a temporary repair will be undertaken to make the footpath safe until permanent repairs are possible. The permanent repair work will then be carried out in accordance with the agreed monthly programme. Renewal work will then be carried out in accordance with the schedule. Each request or complaint will be recorded in a sequential manner with the date it was received and the date of action noted.

Operational plans are being reviewed and cross-referenced as part of the developing process of Auckland Transport footpath principles. Auckland Transport is implementing footpath service levels that generally include the following maintenance plans:

- Enforce the requirements for quality reinstatement of surfaces following development of, or access to, the street environment by utility operators
- Reinstate entire footpath sections rather than isolated patches, thereby reducing patchwork appearance and maximising pedestrian safety and amenity
- Initiate footpath maintenance, in the main, as a 'reactive' response to repair and make safe
- Utilise forward planning associated with inspections to identify defects, reporting, condition rating and concrete-grinding programmes, typically based around a 12-week rolling programme of work
- Bundle non-urgent work into areas, integrating planned and unplanned maintenance to minimise disruption to the public. In this way, items of work in the vicinity are undertaken at the same time
- Meet safety issues, incidents and complaints received (typically via the call centre) within service level response times. Typically:
  - urgent response: be on site and restore within one day
  - emergency response: be on site and commence work within one hour of notification (includes a half hour for mobilisation), with one-hour progress updates to Auckland Transport representative
- Align maintenance activities with LOS requirements, to prioritise work on poor condition footpaths across the region
- Base concrete footpath grinding programme priorities on condition grade, to remove tripping hazards
- Follow legacy Auckland Regional Council guidelines on protection of the stormwater system, such as the control of toxic concrete grindings
- Repair footpaths with black oxide concrete to match the future renewals standard
- Use 'Hoggin' protection around tree roots
- Trial recycled materials (e.g. crushed glass in footpath bases) in a small area to determine suitability for general usage.

Operations and maintenance 10-year expenditure forecast

The recommended 10-year operations expenditure forecast is shown below in Figure 4.7-2. It is based primarily on historical trends but also includes the revised activities detailed above and levels of service to be achieved to some extent. This recommendation also takes into account current funding constraints experienced by Auckland Transport and Auckland Council. Note, however, that the actual plan that will be approved by Auckland Transport and Auckland Council may yet be different from these network needs because of the impact of funding constraints.

The table and graph below offer a summary of operations and maintenance expenditure for footpaths (excluding cycleways, green assets, weed and vegetation control) by area and by total region.

The average annual expenditure for operations and maintenance on footpaths over the next 10 years is approximately $6 million, which is around 14 per cent of total footpath expenditure.

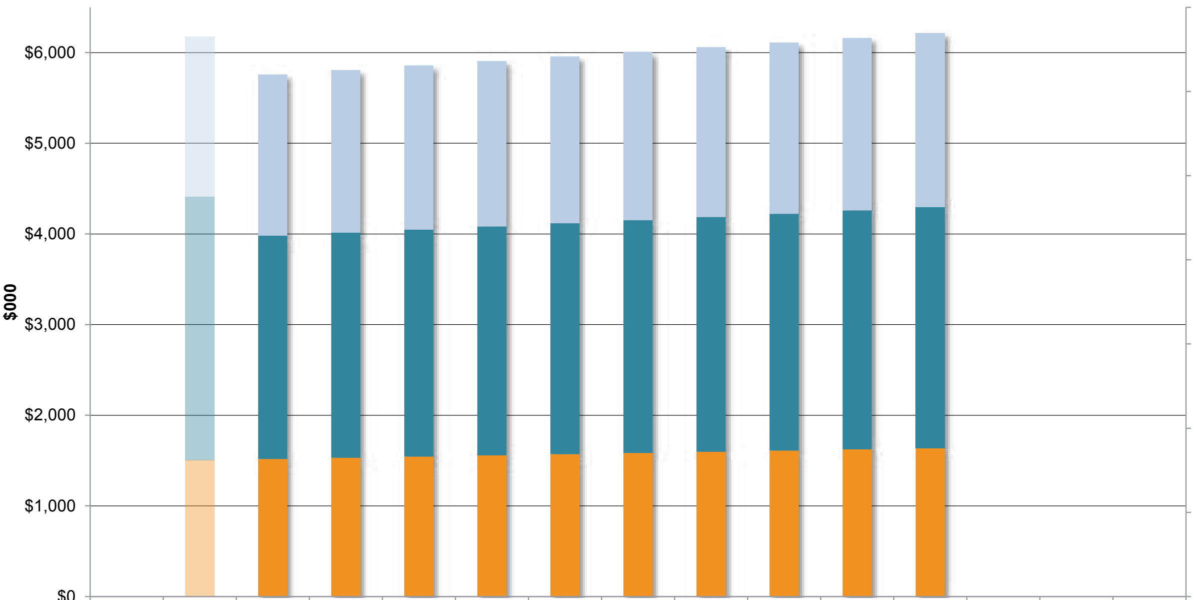
The West area (Waitakere legacy council) did not, apparently, allocate a separately coded expenditure for footpath maintenance and this is likely to be included as part of the general road network maintenance expenditure. This issue requires review, and re-allocation of funds if necessary.

Consequential OPEX will be required to cover the increased future maintenance costs associated with capital new works such as new subdivisions, city centre, sub-regional and town-centre footpath paving and planting and other special higher specification streetscape projects.

Delivering streetscape upgrade programmes utilises substantial physical works capital expenditure and as a result, the consequential OPEX is quite significant. This is largely due to the high value specification of block-paver materials used and the intricacies of cleaning and maintaining sand jointed and bedded interlocking pavers. These are more difficult to clean, and can demand more routine maintenance than a standard specification, due to loss of jointing or bedding sand. Maintenance repairs to interlocking block pavers is significantly more labour intensive than straight concrete or asphaltic concrete surfaced footpaths.

New footpaths in new subdivisions are associated with growth and are typically taken over by Auckland Transport after the subdivision is vested to Auckland Council. Consequential OPEX is required for ongoing maintenance of these new footpaths.

Figure 4.7-2 Footpaths 10-year operations and maintenance expenditure
Source: LTP Budget Model 12 April 2012 after refresh for AMP



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	Total footpaths km	Annual average $/km
North	31%	1,765	1,780	1,795	1,811	1,826	1,841	1,857	1,873	1,889	1,905	1,921	18,499	1,493	$1
Central	43%	2,909	2,462	2,483	2,504	2,526	2,547	2,569	2,591	2,613	2,635	2,657	25,587	2,172	$1
West	0%												00	957	$-
South	26%	1,505	1,517	1,530	1,543	1,556	1,570	1,583	1,596	1,610	1,624	1,638	15,768	2,257	$1
Total		6,179	5,760	5,809	5,858	5,908	5,958	6,009	6,060	6,112	6,164	6,216	59,854	6,879	$1

4.7.11 Renewal needs

Renewal strategy

The main driver for the renewals programme is to manage the lifecycle of the network effectively and for the least cost over time. Auckland Transport's Footpath Principle describes how it plans, programmes and delivers this outcome.

The renewal budgets allow for the replacement of footpaths and vehicle crossings that have reached the end of their useful life. The function of the renewal budget is to maintain a level of service of an asset by intervening prior to either the end of the useful life of the asset, or the condition of the asset falling below an agreed level.

The following considerations are pivotal in that decision making process for prioritising capital renewals works into the forward works programme:

- Policy change in favour of concrete footpaths in the Auckland Central area requires substantial renewals to replace asphalt footpaths with concrete
- Condition (condition grades 4 and 5 given higher priority)
- Strategic importance and location within the road network hierarchy (high use and high profile areas given higher priority)
- Safety issues, incidents and complaints received, typically via the call centre
- Performance considerations
- Age considerations, including obsolete or high-maintenance material types.

Renewal plan

For the purposes of this AMP, the renewals plan was constrained by requirements of physical asset condition lifecycle management, rather than by forecasting the likely funding envelope. In other words, the plan has been driven by asset condition factors rather than financial constraint. This will clearly inform stakeholders of the true picture of the network condition and what is required physically and financially over the next 10 years. Stakeholders can therefore agree and develop optimisations from this.

The footpath renewal programme targets those footpaths where the lengths of poor and very poor (condition 4 and condition 5) are greater than 40 per cent of the footpath section; aimed entirely at raising the overall condition grade of all footpath sections to meet technical and customer performance measures.

This approach is acceptable because it will raise the overall condition grade of the section to condition grade 1 (very good), and in the process treat any lengths of condition grade 3, which are the lengths most at risk for deteriorating into condition grade 4 and 5.

Often sections for upgrade also require kerb and channel upgrades as they have the kerb attached to the footpath. It has been most efficient to address those sections with berms between kerbs and footpaths so these poor sections have been completed first. Some footpath budget may need to be allocated for kerb and channel expenditure to address this, either through transfer to the drainage renewal budget where some NZTA subsidy may be available, or through allocation of a kerb and channel works programme to the footpath renewal budget.

The other renewals contracts which also cover the footpath network are carriageway renewals and general maintenance, road sweeping and road drainage maintenance, and street lighting renewals and maintenance contracts.

Renewal analysis

Renewals are required to restore an asset to its service potential once it has deteriorated to a condition where it no longer provides the required level of service and/or where it is near or at the end of its useful life.

The footpath renewals have been analysed at two levels:

- By the four network maintenance areas to indicate total renewals lengths' requirements to cover the rate of deterioration and avoid deferring renewals
- By individual sites that make up the detailed forward renewal works programme that delivers the overall network renewals length requirements.

The footpath renewal analyses use the following methods and operational priorities:

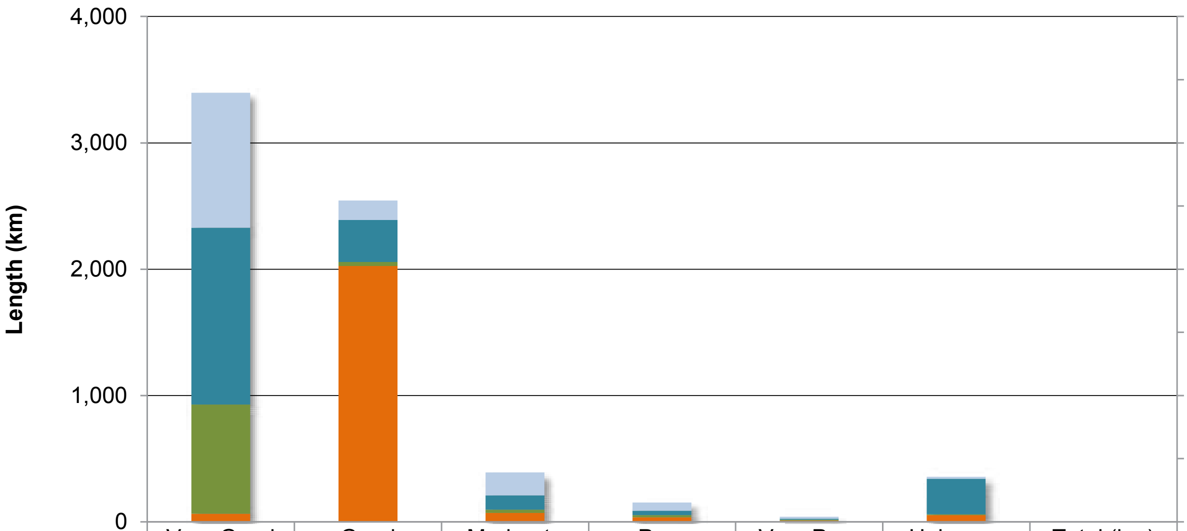
Condition-based method

The condition-based method analyses information from site-based data collection inspections. This method is considered accurate for footpaths in identifying specific sites that are in poor and very poor condition (grades 4 and 5), which are below the minimum service level. These are considered to be part of the backlog of renewals and the short-term renewal programme or maintenance programme to make safe as required.

The condition method is also useful in determining the effectiveness of past renewals programmes by comparing historical trends in condition grades over a number of years with historical renewal lengths.

However, for footpaths the condition-based method is one of a number of inputs and in itself is

Figure 4.7-3 Footpaths condition distribution by area
Source: RAMM data analysis



	Very Good	Good	Moderate	Poor	Very Poor	Unknown	Total (km)
NORTH	1067	153	181	63	14	14	1493
CENTRAL	1400	333	112	36	9	282	2172
WEST	866	34	26	17	6	7	957
SOUTH	63	2024	71	35	11	53	2257
Total (km)	3397	2544	390	152	40	356	6879
% of Total	49%	37%	6%	2%	1%	5%	

not considered accurate in determining the annual renewal lengths required for the 10-year renewals programme. In the condition-based analysis, it indicates that 368km of poor and very poor footpaths are required to be renewed over 10 years to address asset deterioration. However, the current programme allows for approximately 1,722 km of footpath renewals. This is because the footpaths renewals programme is based not on short lengths that are in poor condition, but rather on whole sections, whole streets, or on other operational priorities that require footpaths to be renewed as a longer section.

This condition profile shows:

- 3 per cent in poor or very poor condition (192 km)
- 6 per cent in moderate condition (398 km)
- 5 per cent unrated (356 km).

The above analysis illustrates the rationale of (a) targeting the North and the Central areas for renewal, and (b) seeking the completion of condition assessment in the South area. It is generally stated that the footpath network condition is in fairly good shape and the average annual renewals of approximately three to five per cent of the network (approx. 200 to 300km of total) will maintain quality to provide the required service level.

Age-based method

The age-based method indicates a renewal time at or near the end of the asset's useful life, corresponding to the number of years of useful life after the initial construction or last previous renewals date. This method is sometimes used where condition data is not available or is not as reliable as age-based data.

The data confidence in footpath age is considered to be reliable with approximately 95 per cent of footpaths rated for age.

Based on the assumptions and the available information in RAMM, the age of the footpaths by area is distributed in the frequency of every two years for the first 20 years and in every five years after that.

The fluctuations in the Figure 4.7-4 for footpaths older than 16 years indicate a low certainty in the accuracy of the data. The footpaths older than 30 years are of particular interest when developing the renewals programme, however, the data set's apparent low accuracy suggests it is unreliable as a basis for renewals programming.

Nevertheless, the age data indicates that on average the footpath network across the region is halfway through its age. The average remaining useful life of the whole footpath network can be assumed to be in the order of 20 to 30 years.

Analysis of the age data indicates the following approximately footpath quantities:

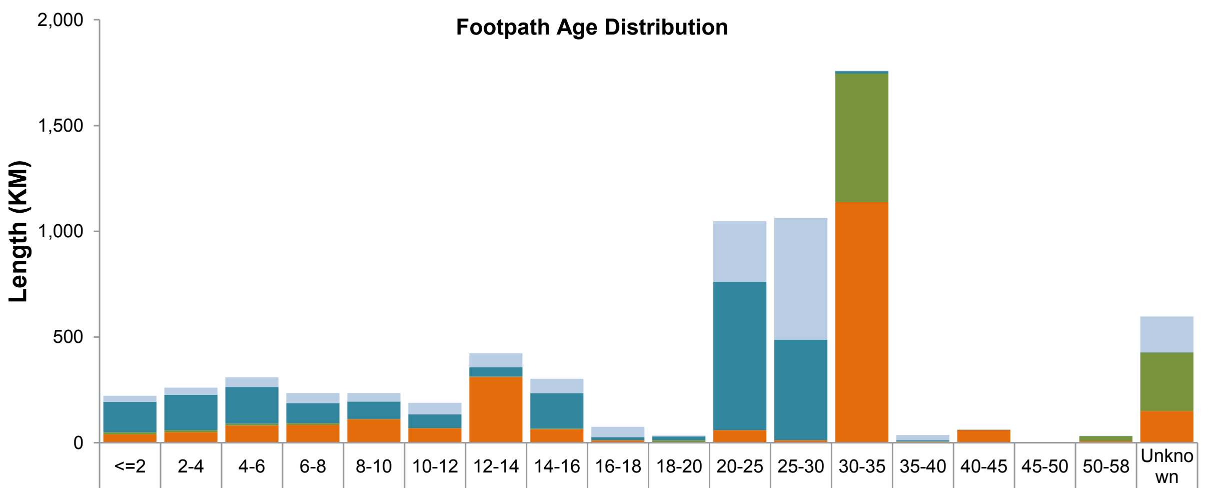
- 1.9 per cent (130km) older than 40 years need to be renewed
- 25 per cent (particularly from South and West areas) will be in poor and very poor condition within two to five years, depending on the frequency of usage and the damages from the accidents
- 2-5 per cent (140-300km) of the network needs to be renewed in the first five years
- 10-15 per cent (650-1,000km of total) may need to be renewed in the years after.

Operational priorities

Operational priorities may dictate service level requirements, which in turn may influence the need and priority for renewals. Operational priorities include the following:

- **Strategic importance and location within the road network hierarchy.** High-use or high-importance footpath areas may be given higher priority for renewal over those in other areas. For example, footpaths on arterial roads are generally prioritised over those on minor local roads, which may be in poorer condition.
- **Criticality, safety and other risks.** Assets that are in a particularly high-risk location or situation with high consequences of failure or failing to meet service requirements may be given higher priority for renewal over those in other locations or situations. For example, footpaths near schools are generally prioritised higher.
- **Preferred material types.** Operational priorities may dictate whether material types for asset renewals are based on 'like for like' or 'modern equivalent'. For example, whether asphalt (hot mix) or chipseal footpaths are replaced by the same material type or by concrete.
- **Whole street approach.** Operational priorities also include the trend toward a holistic, 'whole street approach' to replace footpaths in conjunction with other street renewal projects such as road rehabilitations, kerb and channel, utilities and other regional programmes such as undergrounding of power and telecoms.

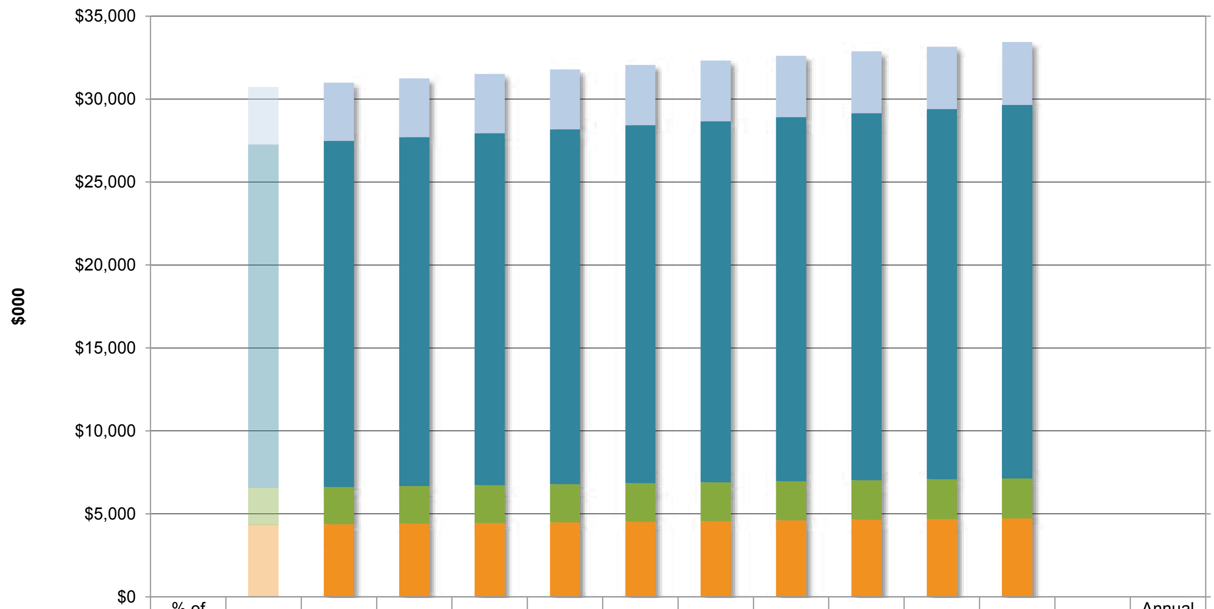
Figure 4.7-4 Footpaths age distribution by area
Source: RAMM data analysis



	<=2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-25	25-30	30-35	35-40	40-45	45-50	50-58	Unknown
%	3.2%	3.8%	4.5%	3.4%	3.4%	2.7%	6.1%	4.4%	1.1%	0.5%	15.2%	15.5%	25.6%	0.5%	0.9%	0.0%	0.5%	8.7%
North	29	35	45	47	40	56	66	68	49	4	285	576	1	24	0	0	0	169
Central	143	167	174	95	83	65	45	169	14	18	702	476	12	7	0	0	1	2
West	10	10	9	9	0	1	1	2	0	8	0	0	608	0	0	0	23	275
South	40	49	81	83	112	68	311	64	12	3	60	12	1138	5	60	3	8	150

Age (Years)

Figure 4.7-5 Footpaths expenditure summary (CAPEX renewal)
Source: LTP Budget Model 12 April 2012 after refresh for AMP



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	Annual Average $ /km
North	11%	3,482	3,511	3,541	3,571	3,602	3,632	3,663	3,694	3,726	3,757	3,789	36,486	$2,444
Central	67%	20,681	20,857	21,034	21,213	21,393	21,575	21,758	21,943	22,130	22,318	22,508	216,729	$9,978
West	7%	2,223	2,242	2,261	2,280	2,300	2,319	2,339	2,359	2,379	2,399	2,419	23,297	$2,434
South	14%	4,340	4,377	4,414	4,452	4,490	4,528	4,566	4,605	4,644	4,684	4,724	45,485	$2,015
TOTAL (000s)	100%	30,726	30,987	31,251	31,516	31,784	32,054	32,327	32,602	32,879	33,158	33,440	321,997	$4,681
Renewals (km)		164	166	167	169	170	171	173	174	176	177	179	1,722	

Operational priorities may come from sources such as local knowledge within Auckland Transport's operational and planning departments or from Local Boards or district plans.

Arguably, service level improvements that are not related to lifecycle deterioration or specification changes to increase asset base life should be funded by capital improvement budgets.

Historical trends

Legacy council renewal practices may influence the need and priority for renewals. For example, the Central area has an historical strategy to proactively replace asphalt (hot mix) footpaths with concrete. This has resulted in a programme of renewal for the Central area based more on material type than condition or age.

Depreciation profile

The annual depreciation for footpaths rises from approximately $16 million to $19 million over the next 10 years. The proposed annual renewals expenditure rises from approximately $31 million to $33 million over the same time. Therefore, it appears that the proposed footpath renewals programme over the next 10 years is approximately double the rate of depreciation.

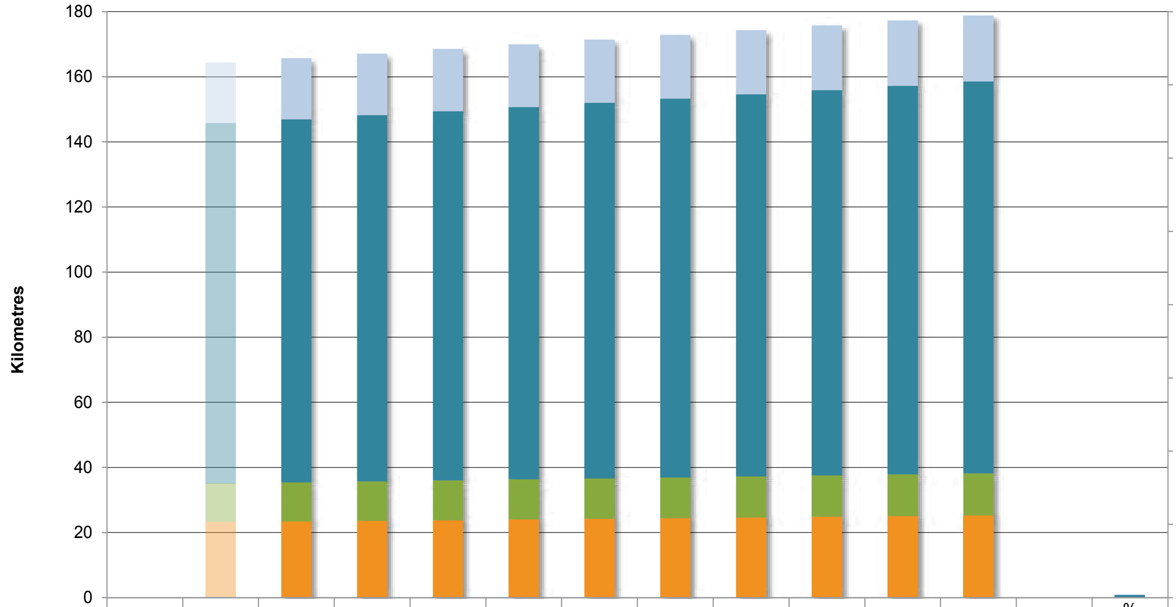
Renewals 10-year work and expenditure forecast

The analyses given provide varying levels of indicative renewals work for the future. This demonstrates the current difficulty of forecasting future renewal needs.

Considering the renewal analyses and the current funding constraints being experienced by Auckland Transport, the recommended 10-year renewal needs are shown in Figure 4.7-5. Note, however, that the actual renewals plan that will be approved by Auckland Transport may yet differ from these network needs because of the impact of funding constraints.

Based on the renewal analysis, a list of candidate sites for renewals is produced, validated on site, prioritised and selected to fit the available renewals budget envelope. The 10-year summary of capital renewals spends for footpaths across the region by year and area is shown in Figure 4.7-5 and the annual renewals length (kilometres) by year and area until 2021/22 is shown in Figure 4.7-6.

Figure 4.7-6 Footpaths 10-year renewals work summary by area
Source: LTP Budget Model 12 April 2012 after Refresh for AMP



	Network Length (km)	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	% Network renewed 2013-22
North	1,493	19	19	19	19	19	19	20	20	20	20	20	195	13%
Central	2,172	111	112	112	113	114	115	116	117	118	119	120	1,159	53%
West	957	12	12	12	12	12	12	13	13	13	13	13	125	13%
South	2,257	23	23	24	24	24	24	24	25	25	25	25	243	11%
TOTAL (km)	6,879	164	166	167	169	170	171	173	174	176	177	179	1,722	25%

Notes on the expenditure in Figure 4.7-6:

- The average annual expenditure for the renewals works on footpaths over the next 10 years is approximately $32 million, which is around 82 per cent of total footpath expenditure
- The renewals expenditure results in an average annual renewals length of approximately 172km, equal to 2.5 per cent of the footpaths network being renewed each year
- The forecast is based on the assumption that the renewals will be in concrete with a width average of 1.7m and unit rate of $110/m^2$
- The proposed 10-year base expenditure for renewals includes an annual growth factor of +0.85 per cent to allow for consequential renewals from growth in the network and growth in demand for services
- Auckland Central area has 32 per cent of the region's footpaths, but has a renewals programme accounting for 67 per cent of the region's footpaths renewals expenditure over the next 10 years. This allocation balance may be reviewed in the future.

To summarise, condition and age data analysis both indicate a renewal requirement of at least two per cent of the network for the next five years. Again, from the 10-year expenditure forecast, Auckland Transport expects to renew the annual average length of 172km (2.5 per cent) of the network. Based on the pure data analysis from RAMM and SAP, there are no additional renewal needs to be identified. The detailed analysis of backlogs of renewals is discussed in the following sub-section.

Backlog of renewals

Each network area has a different amount of renewals catch-up required to meet the specified level of service. This is due to historical under-investment in renewals.

Renewals backlog (catch-up) lengths are those in poor or very poor condition plus those that do not meet other service level requirements, such as asphalt footpaths in the Central area that are programmed to be replaced in concrete (228km, not including historically designed asphalt areas).

The level of projected expenditure within the regional areas gives the following projected lifecycle renewals and required catch-up profile.

From the profile, the overall renewals expenditure envelope appears to be sufficient to reduce the current levels of deferred renewals as shown by the red trend line to nil by around 2022.

A significant amount of the Central area footpaths network (428km) is asphaltic concrete (hotmix) much of which, due to policy change in favour of concrete, is considered out of specification and therefore requires substantial replacement with concrete, which is being done under the renewals programme. It is noted that in some cases the asphalt footpaths in the Central area are in poor to very poor condition due to high usage. It is also noted that asphaltic concrete has a much shorter life than concrete and the OPEX expenditure required to maintain them is generally higher than for concrete.

It is expected that the proposed level of renewals expenditure may lead to over-investment in the Central area after 2015, which is when the required catch-up is expected to be cleared, and this will be reassessed and reallocated to other areas if required.

Consideration will be given to re-allocating and optimising the renewals between the regional areas.

More transparency is required to identify the detailed sites and scope of the large renewals spent across the region of $322 million to 2022.

In spite of the decreasing backlog to the Central area and the region as a whole, it appears that the renewals for other areas in the region do not generally keep up with the normal deterioration and expiry of the footpath assets. More information is required to clarify the projected trends to confirm whether or not there would be an increasing amount of deferred renewals with the current projected expenditures and renewals programmes. Deferred renewals are considered unsustainable in the long term, and would require a strategy to manage possible catch-up renewals and re-allocation of funds.

Consideration may also be given to reinstating the Central area 'new footpaths programme' for road sections that have either no formed footpath or only footpath on one side of the road. This applies particularly to the Gulf islands.

4.7.12 New works needs

Capital new works plan

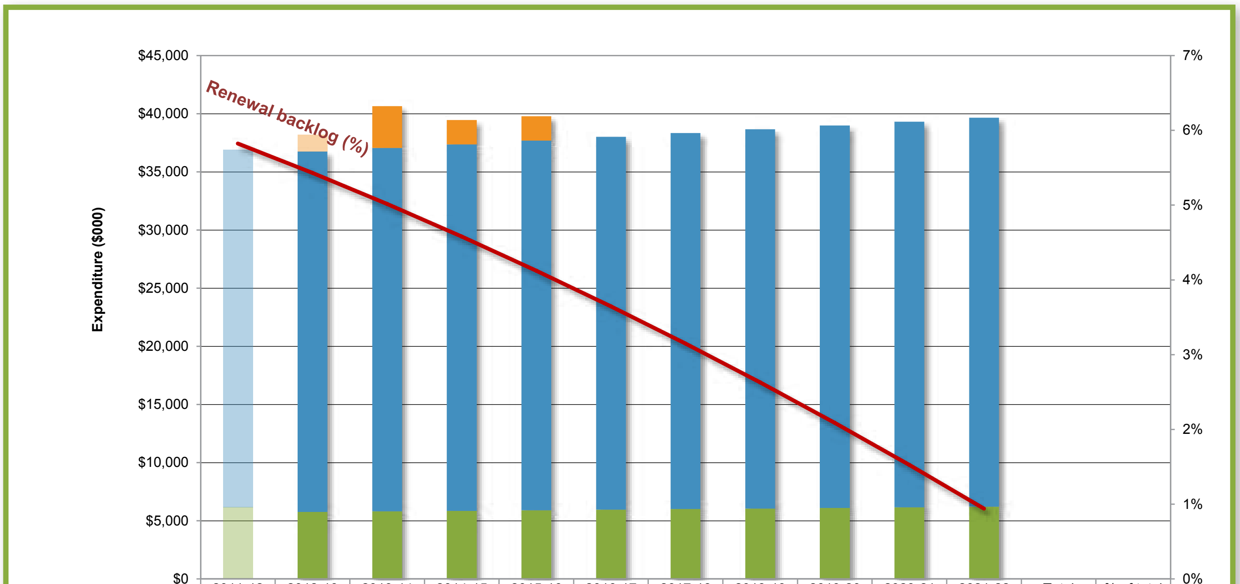
Auckland Transport builds and takes over new footpaths because of safety issues and accessibility requirements, or in response to public requests that meet certain engineering, environmental and community criteria.

Capital new works include new footpaths in new subdivisions, improvements and upgrades to footpaths in the city centre, sub-regional and town centres and other special higher specification streetscape projects. These new or upgraded footpaths are usually service level improvements rather than growth related.

The capital new works associated with the footpaths network are managed by Auckland

Figure 4.7-7 Footpaths renewals – 'catch-up' profile

Source: Auckland Transport RAMM database (March 2012) and Auckland Transport SAP system (March 2012)



	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	Total	% of total
New Capital works	000	1,436	3,599	2,086	2,103	000	000	000	000	000	000	9,224	2%
Renewals	30,726	30,987	31,251	31,516	31,784	32,054	32,327	32,602	32,879	33,158	33,440	321,997	82%
O&M	6,179	5,760	5,809	5,858	5,908	5,958	6,009	6,060	6,112	6,164	6,216	59,854	15%
Total	36,905	38,184	40,658	39,460	39,795	38,013	38,336	38,662	38,990	39,322	39,656	391,075	
Backlog	6%	5%	5%	5%	4%	4%	3%	3%	2%	2%	1%		

Table 4.7-9 CAPEX new works forecast
Source: LTP Budget Model 12 April 2012 after refresh for AMP

CAPEX new works physical	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10- year total
Auckland Harbour Bridge pathway (Mayoral proposal)		750	1,250									2,000
Tamaki Drive broadwalk between Kelly Tarltons and Millennium Bridge – Road 80%		686	2,349	2,086	2,103							7,224
TOTAL New Works		1,436	3,599	2,086	2,103	000	000	000	000	000	000	9,224

Transport's development team through various contractors across the regional network areas that are responsible for capital footpaths works. In some cases, these contractors are also responsible for footpath maintenance and renewals, but in most cases new footpaths are constructed by separate contractors in separate capital projects.

Sometimes new footpaths are constructed by developers of subdivisions and these footpaths are taken over by Auckland Council and Auckland Transport.

Strategic drivers for the construction of new or upgraded footpaths include:

- Service level improvements to improve safety and amenity, and to provide an integrated transport system for safe and convenient pedestrian movement alongside roads or linking roadways and public spaces
- New subdivisions
- Raised construction standards for concrete footpath widths, thicknesses and material strength.

Capital new works expenditure

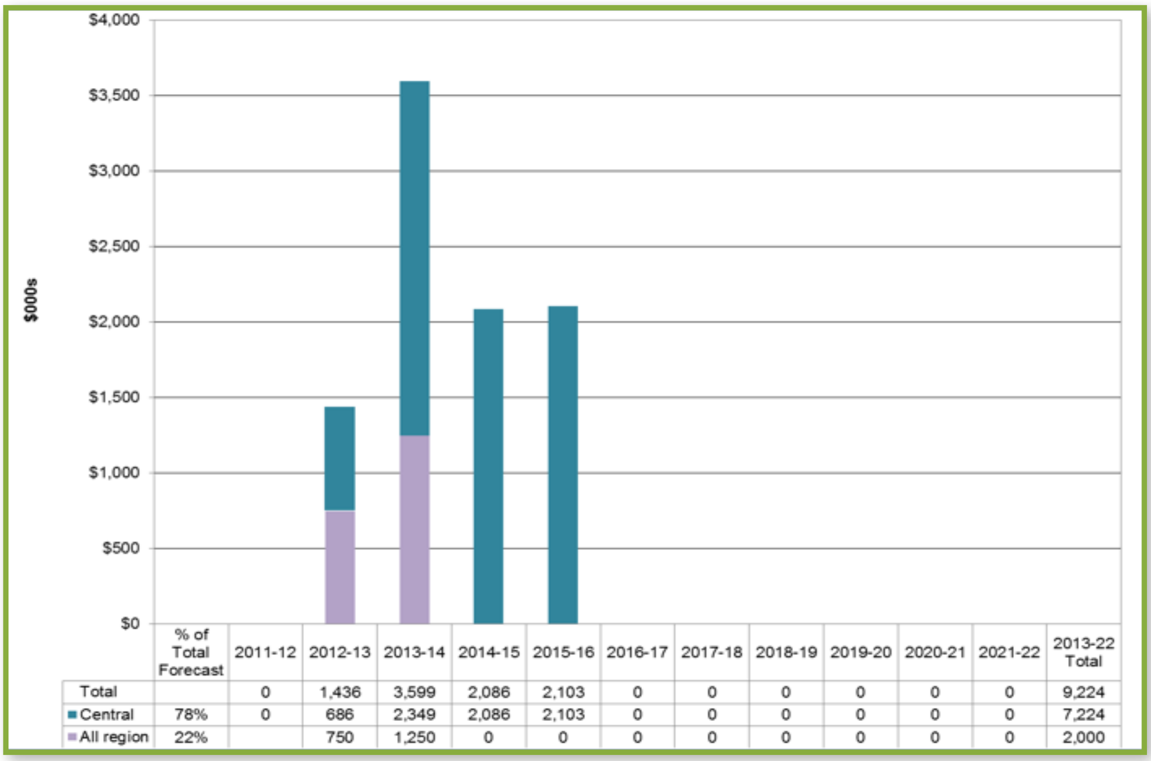
The capital new works expenditures contained in this section are those of the Auckland Transport financial system (SAP) as at April 2012.

The average annual expenditure for capital new works on footpaths over the next 10 years is approximately $922,400 million or two per cent of total footpath expenditure.

Some of the new footpaths over and above this budget are also included under other projects and budgets such as major road or streetscape improvements.

A summary of capital new works expenditure for footpaths is shown in Table 4.7-9 and Figure 4.7-8.

Figure 4.7-8 Footpaths 10-year new works expenditure
Source: LTP Budget Model 12 April 2012 after refresh for AMP



Growth-related new works

New footpaths built by Auckland Transport are generally a service-level improvement and not associated with growth; therefore, they do not attract development contributions. Vested new footpaths in new subdivisions however, are associated with growth and are discussed below.

Levels of service new works

The only significant dedicated new footpath project allowed for in the Auckland Transport budget is the Tamaki Drive boardwalk between Kelly Tarltons and the Millennium Bridge.

It appears that there will be very little dedicated new works expenditure for footpaths after the 2011-12 year. This may be due to budget constraints that recognise large city centre and Rugby World Cup streetscape upgrade spends up until 2010-11 and large renewals spends until 2019.

However some new footpath works will be included in the projects and financial projections for special projects associated with city centre, sub-regional and town centre streetscape upgrades. Implementation and delivery of these projects is by special project teams within Auckland Council and Auckland Transport. Upon completion, the footpath assets generated will transfer to Auckland Transport, which will take responsibility for their ongoing maintenance and lifecycle renewal planning.

These projects are essentially new works, so there will be associated operational expenditure for their ongoing maintenance, known as consequential OPEX (captured in the 10-year financial forecast). Refer to section 3.2.4 Consequential OPEX, of this AMP.

Vested assets

New footpaths in new subdivisions are associated with growth and are typically taken over by Auckland Transport after the subdivision is vested with Auckland Council. In these cases it is assumed that development contributions have been calculated and obtained. Consequential OPEX will be required for ongoing maintenance of these new footpaths. New footpath data is typically transferred from as-built plans to the RAMM database and GIS system.

4.7.13 Disposal plan

The disposal of old footpaths as result of the renewals programme will have a financial and environmental impact. With an increasing drive for sustainability there is an increasing practice across the region of crushing, recycling and reusing old concrete material where suitable. Material for recycling and reuse is stored in designated sites.

4.7.14 Summary of 10-year network needs

All values in this AMP allow for expected growth in demand but do not allow for market price fluctuations over time. Current and projected expenditure trends are as follows:

Notes on the expenditures in Figure 4.7-9:

- The proposed 10-year capital new works expenditures contained in this section are those of the Auckland Transport financial system (SAP) as at April 2012
- The proposed 10-year base expenditure for operations, maintenance and renewals includes an annual growth factor of +0.85 per cent to allow for consequential OPEX and consequential renewals from growth in the network and growth in demand for services
- Renewals expenditure results in a renewals length of approximately 180 kilometres or 2.6 per cent of the footpaths network being renewed each year
- Approximately 54 per cent of the expenditure for capital new works (sub-totalling $31 million) is allocated to projects named for both pedestrian and cycling facilities but not quantified for each separately.

4.7.15 Approved Long Term Plan envelope

The approved Long Term Plan

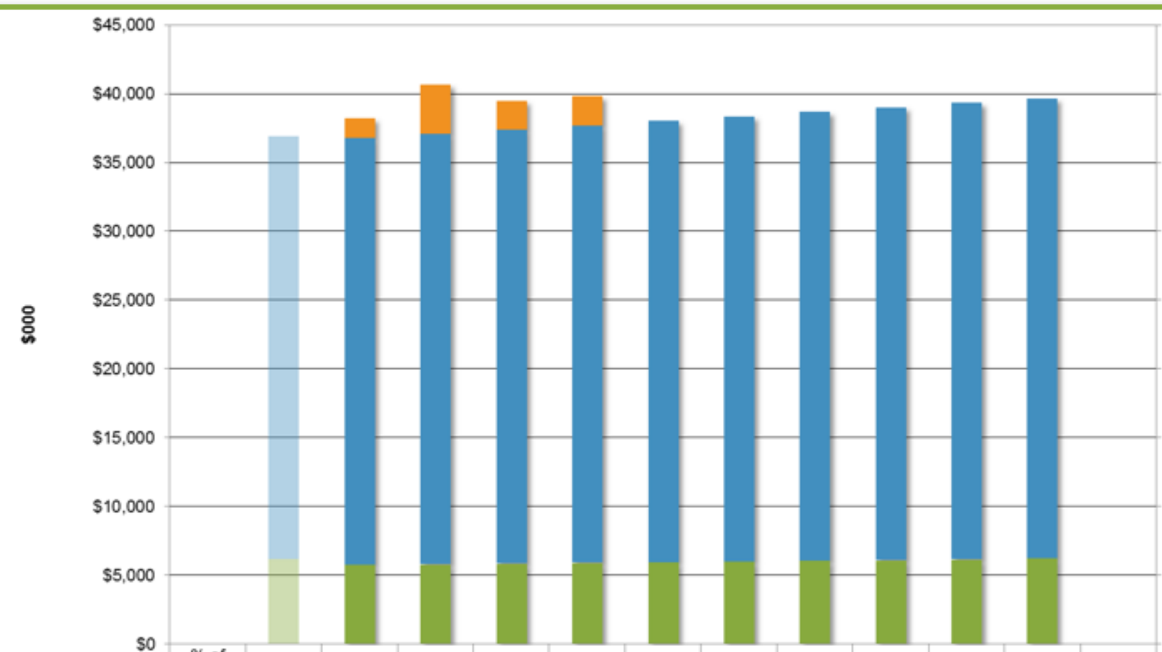
This section compares the approved LTP envelope for OPEX and renewals with the footpath network needs as determined by this AMP at a regional level and identifies the likely impacts of any variances. Revenue and funding incomes to Auckland Transport (from Auckland Council ratepayers and NZTA government subsidies and the like) are allocated through the approved Long Term Plan budgets. The LTP was adopted on 28 June 2012.

OPEX impacts

Based on the information in Table 4.7-10, footpath operational expenditure shows no variance between the LTP allocated budgets and the AMP needs. However it is anticipated that the LTP will require further efficiency savings and therefore a funding gap for footpath operational expenditure may eventuate.

Figure 4.7-9 Summary of footpaths 10-year expenditure

Source: LTP Budget Model 12 April 2012 after refresh for AMP



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total
CAPEX New Works	2%	000	1,436	3,599	2,086	2,103	000	000	000	000	000	000	9,224
Renewals	82%	30,726	30,987	31,251	31,516	31,784	32,054	32,327	32,602	32,879	33,158	33,440	321,997
Operations & Maintenance	15%	6,179	5,760	5,809	5,858	5,908	5,958	6,009	6,060	6,112	6,164	6,216	59,854
TOTAL	100%	36,905	38,184	40,658	39,460	39,795	38,013	38,336	38,662	38,990	39,322	39,656	391,075

Renewals impacts

The LTP allocated budget for footpath capital renewals has a 10-year shortfall of $7.7 million (2 per cent reduction) compared to the network needs determined by this AMP. The approved LTP budget envelope appears to be insufficient to reduce the current levels of deferred renewals. The shortfall of $7.7 million equates to a reduction of approximately 50km of footpath renewals over the 10 years of the plan.

Further efficiency savings

As required by the approved LTP, a further reduction in OPEX of $18.6 million per year, reducing to nil by 2016/17, will need to be allocated against asset related operational budgets. The impact of this reduction on footpath operational budgets is yet to be assessed and finalised.

Table 4.7-10 Variance between LTP approved budget and AMP network needs for footpaths (all un-inflated)

Source: LTP Budget Model 12 April 2012 after refresh for AMP and revised LTP Budget Model 28 June 2012

Footpaths	10-year total LTP approved budget ($000s un-inflated)	10-year total AMP network needs ($000s un-inflated)	Variance 10-year total ($000s un-inflated)
Operations and maintenance	59,854	59,854	0
Renewals	314,341	321,997	-7,657
Footpaths total	374,194	381,851	-7,657

Table 4.7-11 Un-inflated and inflated footpath AMP needs

Source: LTP Budget Model 12 April 2012 after refresh for AMP and revised LTP Budget Model 28 June 2012

UN-INFLATED expenditure ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M		5,760	5,809	5,858	5,908	5,958	6,009	6,060	6,112	6,164	6,216	59,854
Renewal		30,987	31,251	31,516	31,784	32,054	32,327	32,602	32,879	33,158	33,440	321,997
Footpaths total		36,747	37,060	37,374	37,692	38,012	38,336	38,662	38,991	39,322	39,656	381,851
AC Inflator	OPEX	3.30%	3.30%	3.30%	3.30%	3.50%	3.60%	3.10%	3.10%	3.30%	3.60%	n/a
AC Inflator	CAPEX	3.90%	3.40%	2.80%	2.90%	3.10%	3.30%	3.50%	3.70%	4.00%	4.00%	n/a
INFLATED expenditure ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M		5,950	6,199	6,458	6,740	7,042	7,323	7,614	7,932	8,287	8,659	72,203
Renewal		32,196	33,573	34,807	36,121	37,557	39,126	40,840	42,711	44,797	46,985	388,710
Footpaths total		38,146	39,772	41,265	42,861	44,599	46,449	48,454	50,643	53,084	55,644	460,913

Table 4.7-12 Un-inflated and inflated footpath LTP budgets

Source: LTP Budget Model 12 April 2012 after refresh for AMP and revised LTP Budget Model 28 June 2012

UN-INFLATED expenditure ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M		5,760	5,809	5,858	5,908	5,958	6,009	6,060	6,112	6,164	6,216	59,854
Renewal		30,871	30,401	30,461	30,764	31,262	31,591	31,830	32,088	32,401	32,671	314,341
Footpaths total		36,631	36,210	36,320	36,672	37,220	37,600	37,890	38,200	38,565	38,887	374,194
AC Inflator	OPEX	3.30%	3.30%	3.30%	3.30%	3.50%	3.60%	3.10%	3.10%	3.30%	3.60%	n/a
AC Inflator	CAPEX	3.90%	3.40%	2.80%	2.90%	3.10%	3.30%	3.50%	3.70%	4.00%	4.00%	n/a
INFLATED expenditure ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M		5,950	6,199	6,458	6,740	7,042	7,323	7,614	7,932	8,287	8,659	72,203
Renewal		32,075	32,660	33,642	34,961	36,628	38,236	39,873	41,684	43,774	45,904	379,438
Footpaths total		38,025	38,859	40,099	41,702	43,671	45,558	47,487	49,616	52,061	54,563	451,641

Monitoring and management of Long Term Plan consequences

The consequences resulting from these variances will be monitored and reported as appropriate.

CAPEX new works

CAPEX new works contained in this AMP are derived from draft LTP listings as at April 2012 and are produced in section 4.7.12.

The capital new works programme has been further refined and adopted in late June 2012. Details of this adopted programme are contained in the LTP.

AMP inflation effects

Un-inflated and inflated footpath needs for the AMP are shown in Table 4.7-11.

LTP inflation effects

Un-inflated and inflated footpath budgets from the LTP are shown in Table 4.7-12.

4.7.16 Revenue sources

Revenue and funding incomes to Auckland Transport from Auckland Council ratepayers and NZTA government subsidies and service charges are allocated through the approved LTP budgets and are contained in Auckland Transport's SAP financial management system.

Operations and maintenance revenue

Footpath operations and maintenance are not normally subsidised by NZTA, so the majority of footpath expenditure is funded by ratepayers.

Capital renewals revenue

Footpath renewals are not normally subsidised by NZTA either, so the majority of the expenditure on footpaths is funded by ratepayers. Footpath funding for renewal of the footpath network is through the footpath renewal budget.

Targeted rates funding is solely for raising the level of service of footpaths to the agreed levels, and in the case of footpaths, this is to renew those in condition grade 4 and 5, to above condition grade 3.

Capital new works revenue

Footpath capital new works to improve safety and levels of service may be subsidised by NZTA if they are part of a regional strategy, however much of the new CAPEX expenditure on footpaths is unsubsidised. Footpath new works that have cycling or shared space components can also be eligible for NZTA subsidy.

Footpath capital new works are generally funded from general rates, targeted rates or loans. Some capital improvement components of the renewals programme such as increasing footpath widths or thicknesses may be funded from renewals budgets. Footpath capital new works to cater for growth are generally funded and provided by developers in new subdivisions.

4.7.17 Key improvement initiatives

Key improvement initiatives relating to footpaths are included in Table 4.7-13.

Table 4.7-13 Key improvement initiatives

Improvement area	Description	Priority
Footpaths 1	Allocate costs in a more transparent way and check against a regional approach for prioritisation. This issue requires review and re-allocation of funds if necessary For example: • Waitakere City Council apparently had no separately coded expenditure allocated for footpath maintenance and it seems this is included as part of the general road network maintenance expenditure • Auckland Central area has only 32 per cent of the regions footpaths, but it has by far the most ambitious renewals programme, accounting for 67 per cent of the region's footpaths renewals expenditure over the next 10 years Expenditure, revenue and funding incomes to Auckland Transport are contained in Auckland Council's SAP financial management system	High
Footpaths 2	Improve the way Auckland Transport manages its assets including ongoing monitoring of renewal expenditure trends Clearly show what is happening to the physical condition and age of the network to confirm if the renewals spends and works are optimum, without under- or over-investment Develop renewals stories / narratives showing current and projected backlogs with proposed FWP renewals $s and works Manage renewals catch-up (historical under investment) by the proposed footpaths renewals expenditure with agreed timeframes. Do not over-invest in renewals; delay if programmed too soon	High
Footpaths 3	Develop regional service levels and understanding of their costs Prioritise service levels and funding for footpaths and pedestrian facilities	High
Footpaths 4	Bring in best appropriate international practices with regard to 'shared spaces' in the use of shared footpath and road spaces Consider a regional approach to the Auckland City Council's initiative on shared spaces between pedestrians and vehicle users	Medium
Footpaths 5	All of the footpath policies and strategies and standards from the legacy councils need to be reviewed and consolidated into new regional (and local if appropriate) ones. See this LCMP section on key issues for more details	Medium
Footpaths 6	Develop new policies and strategies and standards for the region Develop policies and strategies to promote the use of footpaths	Medium
Footpaths 7	Increase planning horizon to 20 years as 10 years does not cover the lifecycle of most assets or major projects Provide 20-year horizons for AMP forward works programmes, financials, deterioration analyses for each asset type and LCMPs	Medium
Footpaths 8	Trial new innovative practices and products. Options include revising standard specification to allow the use of recycled materials such as crushed glass and crushed concrete for footpath bases as well as trialling new permeable pavers, which are currently non-standard but may become so in the future	Medium
Footpaths 9	The current confidence level of asset data in terms of performance and age of the footpath network is 'uncertain'. Collect and analyse sufficient asset data in terms of performance and age to support decision making	Medium

4.8 Contents

4.8 Cycleways

4.8.1 The service Auckland Transport provides

Auckland's cycleways are a key component of the transport network and help deliver an effective and efficient transport system that enables Aucklanders to make smarter transport choices.

The cycleway levels of service (LOS) most relevant to delivery are:

- **Accessibility** – people, goods and services have options for convenient travel
- **Quality** – the suitability of the built design and the standard of the maintained condition
- **Safety** – the degree to which the network maintains a safe cycle environment
- **Environmental sustainability** – the degree to which the network provides travel options without compromising the environment for future generations.

Section 2, Levels of Service provides the details of the cycleway LOS being measured. Several of these measures and targets are yet to be confirmed (TBC) and will be included in the improvement plan.

The following measures against key LOS are shown for indicative purposes in Table 4.8-1.

Cycleways and associated facilities are expected to become a more significant asset group in the coming years as healthier, active transport choices become more popular.

An Auckland Transport objective is that the cycleway network is suitable, accessible, safe and well maintained, so that it will:

- Contribute to the transport system by providing cycling facilities that are safe and easy to use
- Provide an integrated, well-planned and well-maintained cycling network that meets the needs of the community
- Provide safe routes for cyclists to travel within their community, given that many cyclists are children travelling to and from school
- Provide a standard of surfacing that will support the accessibility, safety, amenity, and character of Auckland streets and suburbs.

Auckland Transport uses maintenance, renewals and new works programmes to ensure that the cycleway network is suitable, accessible, safe and well maintained.

4.8.2 Network overview

Auckland Transport has stewardship responsibilities for and manages the cycle network, which includes:

- Off-road dedicated cycleways (the Cycleway Lifecycle Management Plan (LCMP))
- Off-road shared footpaths, not including the paths running through parks and recreational areas (refer to the Footpaths LCMP)
- Cycling facilities such as cycleway/pedestrian bridges and cycle-parking racks (refer to the Bridges and Structures LCMP, the Corridor Fixtures LCMP and the Public Transport Network Asset Management Plan)
- On-road dedicated cycle lanes, and any other cycle activities on the general road carriageway shared with other vehicle users (refer to the Road Pavements LCMP)

Associated works and expenditure of approximately 83km of off-road cycleways, which are outside the normal road corridor and are dedicated to cyclists and pedestrians, are detailed in this cycleways LCMP.

Table 4.8-1 Cycleway levels of service

Service value	Level of service	Service measure	Current performance	Target performance (indicative/ to be developed and agreed)
Accessible	Increase availability of travel options for convenient travel across the Auckland region	Cycle trips into the CBD (inbound cycle counts) in morning peak	12,970	2% annual growth
		Percentage of user satisfaction with level of cycle access across the network	35%	TBD
		Cycling trips throughout the region during the morning peak	13,406	3% increase each year (2012/13, 2013/14 and 2014/15)
Quality	Assets are maintained in good condition	Percentage user satisfaction with the condition of cycleways	68% off-road 65% on-road	80%
		Percentage of cycleways in moderate (condition grade 3) or better	76%	95%
Cycle safety	Minimise number of cycle injuries that are fatal or serious	Number of fatal and serious cycle injuries on local roads	36 (year to 31 Dec 2010)	Reducing trend
		Percentage of cyclists consider the network to be safe	21%	TBC

The overview of the regional cycle network (including cycleways and cycle lanes) is shown in Figure 4.8-1. The red lines in the picture indicate the existing cycleway and cycle lane network across the region, while the blue dotted lines indicate proposed cycleways and cycle lanes. The original map is available from the Auckland Transport website.

Figure 4.8-1 Auckland's regional cycle network
Source: Auckland Transport Strategy and Planning (Version 4.0) September 2011

Table 4.8-2 Network valuation
Source: Auckland Transport Asset Revaluation (30 July 2011)

Cycleways asset	Optimised replacement cost (ORC) $000s	Optimised depreciated replacement cost (ODRC) $000s	Annual depreciation (ADR) $000s
Cycleway surface	25,737	18,346	728
Cycleway base	7,946	6,998	99

4.8.3 Network valuation

The approximate replacement value of the footpath network including bases and surfaces is $34 million.

Table 4.8-2 indicates the optimised depreciated replacement cost and annual depreciation across the region.

4.8.4 Network asset details

Auckland Transport has stewardship responsibilities for and manages approximately 83km of off-road cycleways, with an estimated average width of 1.9m.

Cycleways include dedicated paths and shared footpaths that are off-road carriageways, and cycling facilities such as cycleway/pedestrian bridges and cycle-parking racks.

Cyclists also use the general road carriageway shared with other vehicle users, as well as cycle lanes that are dedicated routes on road carriageways.

The useful asset life for concrete cycleways is assumed to be 50 years, while asphaltic concrete (AC), chipseal and other surfacing materials is expected to last between 15 and 20 years.

RAMM quantity data for cycleways on shared footpaths and through parks may not be complete.

4.8.5 Asset data confidence

The RAMM database holds the asset information for the cycle network, including condition rating information. This is Auckland Transport's master information store.

However, in terms of quantity, condition, performance and the age of the cycle network, the current confidence level of the region's asset data is 'uncertain'. This is because data has not been consistently collected and captured into RAMM. Such inconsistency is an issue for review and future action.

Table 4.8-4 illustrates Auckland Transport's confidence in the reliability of the cycle network's asset and condition information currently held in its asset database.

Table 4.8-5 shows the approximate completeness of Auckland Transport's cycleways data inventory based on inventory analysis by asset type.

Table 4.8-3 Regional total off-road cycleways
Source: RAMM and other sources (March 2012)

Asset	Regional total quantity (approximate based on legacy AMPs unless otherwise stated)		North	Central	West	South
Cycleways	Off-road asphaltic concrete (km)	58	14	21	11	12
	Off-road concrete (km)	25	7	6	6	6
	Excludes shared footpaths (km, ex RAMM)	31	27	0.5	0.1	3
Cycling facilities	Pedestrian/cycle bridges	n/a	Included in the Bridges and Structures LCMP - asset details			
	Parking stands (quantity) (excluding PT facilities)	227	26	177	19	5
On-road cycle lanes	All materials (km)	100	60	–	40	5

Table 4.8-4 Data confidence level
Source: AT RAMM database March 2012

Data attribute	Data inventory confidence			
	Very uncertain	Uncertain	Reliable	Highly reliable
Asset quantity				
Asset age				
Condition				
Performance				

Table 4.8-5 Completeness of data
Source: AT RAMM database March 2012

Asset	Completeness of data		
	Measure	Age	Condition
Off-road cycleways	50%	25%	0%
Shared footpaths cycleways	25%	20%	20%
Cycle bridges (dedicated)	0%	0%	0%
Parking stands	0%	0%	0%
On-road cycle lanes	0%	0%	0%

The current confidence level of asset data in terms of the condition of the cycle network is 'uncertain'. However, assumptions can be made about its current condition based on age, given that cycleways have generally been constructed as new initiatives in the last 10 to 15 years.

There is some uncertainty about the level of data on footpaths shared with cyclists, and on cycleways through parks and recreational areas. There is also the issue of whether such paths and cycleways are owned, managed and funded by Auckland Council or Auckland Transport.

4.8.6 Asset condition

Condition rating

Cycleway condition rating surveys are undertaken on all footpaths on a three-year basis by professional contractors. The condition of cycleways is affected by:

- Tree root upheaval causing uplifting and cracking of paths
- Service vehicles driving on cycleways leaving mud and wheel marks, or damaging and cracking the surface
- Movement of adjacent steep side slopes causing settlement of path bases and displacement and cracking of path slabs
- Age.

Condition rating reports are submitted to Auckland Transport. The condition rating data of the region's cycleways and cycling facilities has not been consistently collected and captured into RAMM. This is an issue for review and future action.

Given the relative newness of the cycleways, their condition is likely to be in the very good to good range (condition grades 1 to 2) for concrete cycleways and moderate (condition grade 3) for asphalt cycleways, although some cycleways may be in poor condition (condition grade 4). Therefore, the approximate overall condition rating of cycleways is considered anecdotally to be good.

Outcomes of the condition rating process, in conjunction with other significant factors, drive development of the renewal works programme. The renewal programme prioritises sections in the worst condition (those with the most lengths in condition grade 4 and 5).

Remaining useful life

The age of cycleways is less certain than condition across the region. Most legacy councils had started collecting and recording age information over the last five years or so as part of their annual renewals programme and when taking over new cycleways from capital improvement projects.

Given that most cycleways were constructed in the past 10 to 15 years and having a mixture of concrete and AC cycleways with different useful lives, on average, the cycleway network is a quarter of the way through its lifespan, with an average remaining useful life in the order of 10 to 20 years.

4.8.7 Asset performance and capacity

Performance

The performance of cycleways is mostly related to condition because it is the surface of paths that provides the service to users. A good or bad surface condition gives the corresponding service performance. However, there are other factors that affect performance.

- The factors mentioned above that affect condition, including vertical displacement that creates safety issues
- Site conditions which limit the ability to get high performance for end users, such as steep gradients or narrow widths
- Flooding
- Different material types, such as asphaltic concrete or unsealed construction
- Obstructions on paths such as illegally parked cars or trucks
- The improper use of cycleways and shared footpaths by motorcycles and scooters
- Hazards for on-road cyclists from catchpit grates
- Skidding resistance.

Capacity

Cycleways are generally shared with pedestrian traffic, which can slow cyclists down. This is not considered a significant factor in capacity.

4.8.8 Asset risks and criticality

Asset risks

Auckland Transport has a responsibility to assess risks in order to best manage the network with the resources available, and to avoid and mitigate the effects of potential and likely events. Section 8, Risk Management details the risk management processes across the system and includes the AMP risk register. The register has been developed from a formal risk-analysis review.

Most of the risks related to the cycle network have impacts on health, safety and service delivery as shown in Table 4.8-6.

Critical assets

Cycleway assets are becoming increasingly important to transport activity. These assets affect the hazards and safety of on-road vehicles and pedestrians, especially where pedestrians and cyclists share a common path.

Criticality of assets identified through the development of this AMP include:

- High-speed cycle crossings on dual-use footpaths
- Shared footpath use between pedestrians, cyclists and other wheeled users, which increases risks to all users
- Cycle lanes and cycle crossings that are on or close to major intersections, arterials or high-usage roads.

Cycleway road markings and signs are seen to be important to the operation of the cycle network; however these may not be defined as critical assets for the network. They affect the road carriageway network, and are identified in the Road Pavements LCMP.

The strategies for managing these associated assets are: reviewing the design and construction standards; responding in a timely manner to complaints; rectifying the problems identified.

Asset safety

There are potential hazards and safety issues caused by:

- Risks listed in asset risks and critical assets
- Pedestrian peak flows on school access routes resulting in children being pushed onto the road carriageway
- Shared footpaths use between pedestrians, cyclists and other wheeled users, which increase risks to all users.

4.8.9 Key issues

Key lifecycle issues affecting on-road and off-road cycleways and facilities are shown in Table 4.8-7.

4.8.10 Operations and maintenance needs

Scope of operations and maintenance

The operations and maintenance activities associated with the cycle network are managed by Auckland Transport through an integrated response from Auckland Council's call centre, Auckland Transport's operations and maintenance staff and representatives, and the various contractors across the region that are responsible for routine and emergency response to maintenance.

Note: Off-road cycleways dedicated to cyclists and pedestrians sometimes run through parks and recreational areas and may not be part of the transport network. Issues of ownership, management and funding responsibilities need to be clarified and confirmed.

Operations and maintenance plan

Contracts are awarded on a competitive basis to procure the physical works necessary to deliver the scope of the projects listed above. These contracts are being retendered currently and normally

Table 4.8-6 Cycleway risk analysis

Risk	Net risk factor	Management options
Serious injury and fatal accidents involving cyclists conflicting with vehicles on roads and on road cycle-lanes	High risk	Dedicated and shared off-road cycleways and on well-marked road cycle lanes reduce this risk
Inconvenience and injury to pedestrians from cyclists and the improper use of shared footpaths by motorcycles and scooters	Moderate risk	To be developed. Review appropriate signage to reduce these risks
Inadequate maintenance resulting in a slippery / rutted surface	Moderate risk	Review and improve current practices / standards and specifications, e.g. use of materials
Inadequate cycleway quality – caused by poor design, construction materials, lack of funding, utilities reinstatement etc. resulting in accidents and inaccessibility	Moderate risk	Review and improve current practices / standards and specifications Prioritisation of cycleway renewals Incorporate cycleways into Auckland Transport Code of Practice (ATCOP)

Table 4.8-7 Lifecycle issues affecting on-road and off-road cycleways
Source: Feedbacks from various stakeholders and contractors

No.	Key issues with cycleways	Action plan	Outcomes
1	There is a perceived high risk and incidence of serious injury and fatal accidents involving vehicles and cyclists This is due to the increase in the number of young cyclists around schools, adult-commuter cyclists and the speed of cyclists on racing cycles	• Adopt and implement measures to improve cyclist safety. Promote public awareness of these measures • Educate drivers, cyclists and pedestrians towards safer behaviour	Better performance of cycleway facilities and improved knowledge of vehicle and cyclist safety
2	Auckland City Council RAMM information presents data which offers uncertain consistency and location (on- and off-street cycleways and shared footpath cycleways) because cycle facilities data may be 'lost' in the footpath and carriageway data	• Confirm and implement a regional approach to the collection and storage of data for cycleways and facilities	Better understanding of the condition of the cycle network. More accurate assessment of asset lives that drive to appropriate renewal programme
3	There is difficulty in finding appropriate corridors. Steep and narrow topographical constraints in some northern and western areas affect the quality, cost and feasibility of on-street and off-street cycleways	• Confirm a regional policy or standard for this issue. • Adopt 'optimised' decision to prioritise challenging or expensive options	Optimised decision making practice. A consistent and coherent approach to the provision of cycleways in Auckland region
4	Low usage of cycleways	• Actively promote the use of cycleways as a transport alternative	High usage of cycleways, creating a greener and healthier Auckland
5	Improper use of cycleways (e.g. by motorbikes and scooters)	• Upgrade signage and publicity campaign to educate motorbike users. • Enforce improper use of cycleways (e.g. by motorbikes and scooters)	Improved knowledge of cycleway users
6	Off-road cycleways dedicated to cyclists and pedestrians sometimes run through parks and recreational areas and may not be part of the transport network	• Clarify ownership, management and funding responsibilities for off-road cycleways that run through parks and recreational areas	Clear ownership and funding responsibilities for off-road cycleways
7	Renewals for cycleways budgets are sometimes not managed separately from footpath renewals	The budgets and projects for cycleway renewals to be separately identified and managed from footpath renewals	Dedicated budgets and projects for cycleway renewals, and opportunity to apply for NZTA subsidies where eligible

intended for five years or more for roading-related works.

Contractors delivering the maintenance services can programme works on a priority basis. The contractors must comply with both contractual specifications and recognised guidelines for maintenance activities.

The contractors' delivery of the maintenance works and related outputs is linked to the operational LOS of the transport network.

Historical levels of operations and maintenance expenditure have provided the current LOS of the network. It is expected that this LOS will be maintained in the future; this expectation informs the long-term lifecycle management strategies of this AMP. This position may change in the future as a result of Auckland Transport adopting a different level of service in view of funding and budgetary constraints.

Operations

The operations plan for cycleways includes:

- Call centre operation and response systems
- Inspections, reporting, data collections and the use of the RAMM asset management system
- Routine network inspections of cycleways by contractors to identify defects as defined in the key results schedules – the results of these are not stored in RAMM but are used to plan the contractor's routine maintenance activities.

This work is documented and embodied in the various network operations and maintenance contracts. The various operational plans are being reviewed and cross-referenced as part of the developing process of Auckland Transport cycleways principles and will align with the Auckland Transport Code of Practice (ATCOP).

Maintenance

Maintenance plans for cycleways include cleaning, making safe and minor (expensed) repairs. The maintenance budgets provide for on-going routine maintenance which ensures that cycleways are kept in a safe condition. Maintenance work includes the repair of damage from vehicles, from the environment, and from utility and building works. Often minor maintenance and making safe is carried out reactively in response to call centre requests for service.

This work is documented in the various legacy council internal practice notes and plans and/or is embodied in various network maintenance contracts.

Auckland Transport is implementing cycleway LOS and policies region-wide that generally include the following maintenance considerations:

- Ensure the asset management plan recognises operations and maintenance needs and provides adequate funding for maintenance programmes

- Reinstate entire cycleway sections rather than isolated patches, thereby reducing any patchwork appearance and maximising pedestrian safety and amenity
- Record all future cycleway upgrade or renewal works on a Geographic Information System (GIS) to improve monitoring and programming of future cycleway works.

The maintenance plan for the cycle network is generally reactive, with the response intended to repair and make safe as required. The forward planning includes inspections, reporting, condition rating and concrete grinding programmes, typically based around a 12-week rolling programme of work.

The typical timeframes for response include:

- Urgent response: be on site and restore service within one day
- Emergency response: be on site and commence work within one hour of notification (includes a half hour for mobilisation) with one-hour progress updates to Auckland Transport representative(s)
- Non-urgent work: bundle work into areas, integrating planned and unplanned maintenance to minimise disruption to the public so that items of work in the vicinity are undertaken at the same time.

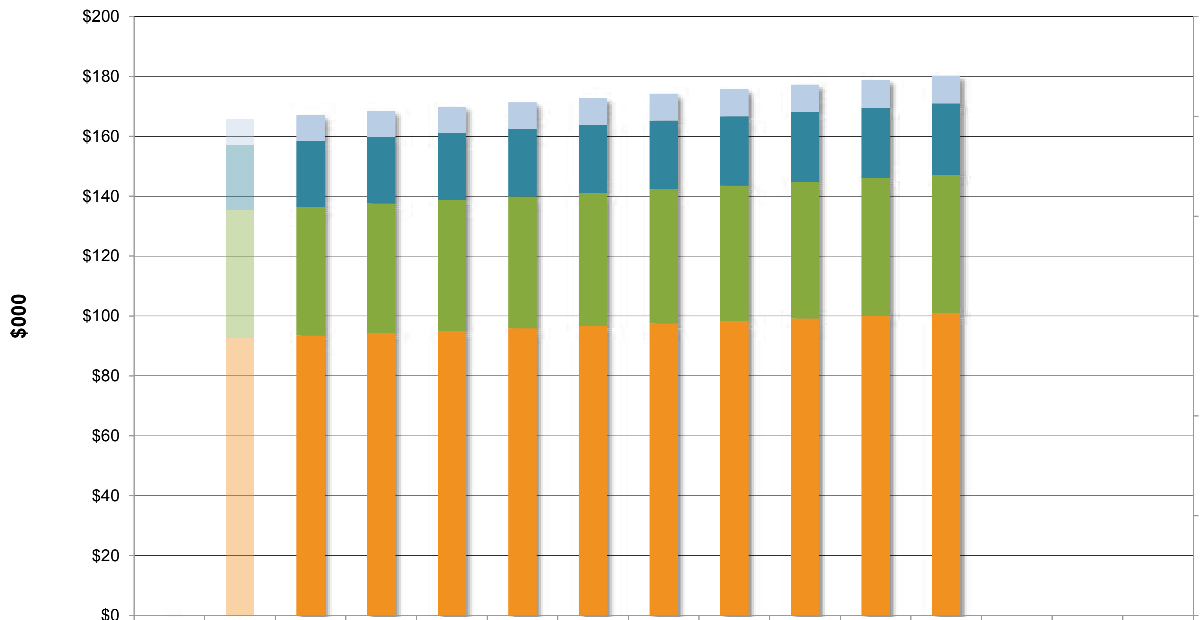
Cycleways maintenance activities align with the LOS requirements to prioritise work on condition grades 4 or 5 (poor or very poor) cycleways across the region. Cycleways maintenance shall follow the guidelines on protection of stormwater system, such as the control of toxic concrete grindings.

An on-going maintenance programme addresses cycleway defects resulting from inclement weather, wilful damage, or arising from safety issues and public complaints. This is either planned maintenance or responsive maintenance and includes the innovative use of concrete grinding to remove tripping hazards.

Operations and maintenance 10-year expenditure forecasts

The recommended 10-year operational expenditure forecast is shown below in figure 4.8-2. It is based primarily on historical trends but also includes for the revised activities detailed above and the LOS to be achieved to some extent. This recommendation

Figure 4.8-2 Cycleways 10-year operations and maintenance expenditure summary
Source: LTP Budget Model 12 April 2012 after refresh for AMP



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	Total cycleways km	Annual average $/km
North	3%	009	009	009	009	009	009	009	009	009	009	009	090	21	$427
Central	9%	022	022	022	022	023	023	023	023	023	024	024	228	27	$846
West	17%	043	043	043	044	044	044	045	045	046	046	046	446	17	$2,623
South	38%	093	093	094	095	096	097	098	098	099	100	101	971	18	$5,397
Auckland Region	33%	066	115	065	115	065	065	115	065	065	115	065	854		$-
Total		232	282	234	285	237	238	290	241	243	294	246	2,589	83	$3,120

has also taken into account current funding constraints being experienced by Auckland Transport. Note however that the actual plan that will be approved by Auckland Transport may yet differ from these network needs because of the impact of funding constraints.

A summary of operations and maintenance expenditure for cycleways by area and by total region is shown in Figure 4.8-2.

The average annual expenditure for operations and maintenance on cycleways over the next 10 years is approximately $259,000, which is approximately two per cent of total cycleway expenditure.

Consequential OPEX is required to cover the increased future maintenance costs associated with capital new works, which is proposed to be $10 million per year for the next 10 years.

There is substantial physical works capital expenditure for new or improved cycleways, and as a result, the consequential OPEX may be significant.

4.8.11 Renewal needs

Renewal strategy

The capital renewal works associated with the cycle network are managed by integrated cooperation between Auckland Transport's maintenance staff and representatives, and the various contractors that are responsible for capital renewal works across the legacy areas of the region.

The renewal budgets allow for the replacement of cycleways that have reached the end of their useful life. Since the cycle network is relatively new and in good to excellent condition, renewals are expected to be relatively low but will increase with time as the network ages.

The renewal strategy is important in developing a forward renewals programme, which will help deliver and sustain the agreed customer LOS, and avoid deferred renewals.

The main driver for the renewals programme is to manage the lifecycle of the network effectively and at the least cost over time. Auckland Transport's footpaths and cycleways policies describe how the organisation plans, programmes and delivers this outcome. The following considerations are pivotal in that decision making process:

- Prioritisation
- Technical standards
- Design
- Implementation.

Another driver for cycling facilities on shared footpaths is that their renewal is linked to footpath renewals, which is often driven by the trend toward a 'holistic, whole-street approach' to replace footpaths in conjunction with other street renewal projects. These projects include roads, kerbs and channelling, utilities and other regional programmes such as underground power and telephone lines.

It is expected that cycleway and cycling facilities renewals for the region will match the normal deterioration and expiry of assets.

Cycleways renewal is undertaken when all or part of a cycleway has reached the end of its economic life. The required level of replacement or rehabilitation will depend on age, condition, the level of ongoing maintenance and the useful lives of the materials used.

Renewal plan

The function of the renewals budget is to maintain a LOS of an asset by intervening prior to either the end of the useful life of the asset, or the condition of the asset falling below an agreed level.

The cycleways renewal programme targets those cycleways where the lengths are in poor to very poor condition (rated 4 or 5 respectively). It aims to raise the overall condition grade of all cycleway sections to meet technical and customer performance measures.

This approach is acceptable because it will raise the overall condition grade of the section to condition grade 1 (very good), and in the process treat any lengths of condition grade 3, which are the lengths most at risk for deteriorating into condition grade 4 and 5.

Typically, renewals for cycleways are constructed by the general maintenance contracts for the footpath network. These budgets may not be identified separately. This issue requires review as it is considered better to separate cycleway renewals from footpath renewals. Cycleway renewals may be eligible for NZTA subsidy while footpaths may not.

Renewal analysis

Renewals are required to restore an asset to its service potential once it has deteriorated to a condition where it no longer provides the required LOS and/or where it is near or at the end of its useful life.

The cycleway renewals have been analysed:

- By the four network maintenance areas to indicate the total renewals lengths needed to sustain the rate of deterioration and avoid deferring renewals
- By individual sites that make up the detailed forward renewals works programme and deliver the overall network renewals length requirements.

The cycleway renewal analysis methods are indicated below.

Condition-based method

This analysis of renewals is based on the current condition of the assets. It uses whole-of-life deterioration to identify indicative renewal needs.

The condition-based method is based on prioritising renewals of the worst-condition cycleways. Where the asset condition is below the minimum agreed LOS (typically poor and very poor condition grades) the asset is considered to be part of the backlog of renewals. Where condition data is lacking, assumptions may be made over the general condition of the network but for not individual sites.

For cycleways and shared footpaths / cycleways, the data confidence of this method is considered to be uncertain.

Age-based method

The age-based method programmes renewals at or near the end of the asset's useful life, which corresponds to the number of years of useful life after the initial construction or last previous renewals date. This method is sometimes used where condition data is not available or is not as reliable as age-based data.

The data confidence in cycleway age is considered to be uncertain, with only about 25 per cent of cycleways rated for age. Based on the available data in RAMM, the rated 25 per cent of the total cycle network is approximately less than 15 years in age, which is not enough to estimate the renewals need for the whole cycleways network.

Operational priorities

Operational priorities may dictate LOS requirements which in turn may influence the need and priority for renewals. Operational priorities include:

- **Strategic importance and location within the road network hierarchy.** High-use or high-importance cycleway areas may be given higher priority for renewal over those in other areas
- **Criticality, safety and other risks.** Assets that are in a high-risk location, a situation with high consequences of failure, or which fail to meet service requirements, may be given higher priority for renewal over those in other locations or situations. For example, cycleways near schools are generally prioritised higher
- **Preferred material types.** Operational priorities may dictate whether material types for asset renewals are based on 'like for like' or 'modern equivalent'. For example, whether asphalt (hot mix) or chipseal cycleways are replaced by the same material type or by concrete.

Operational priorities may come from sources such as the local knowledge within Auckland Transport's operational and planning departments or from Local Boards or district plans.

Historical trends

There is currently insufficient commonality between the legacy data sets to provide a reliable regional view of historical expenditure trends for the cycleways network. A future asset management improvement will implement consistent tracking of expenditure by asset type and expenditure type over time. This will enable robust expenditure trends analysis in future.

Depreciation profile

The average annual depreciation for cycleways is approximately $827,000. The proposed annual average expenditure dedicated to renewals is approximately $120,000. Therefore, it appears that the proposed renewals dedicated to cycleways over the next 10 years is less than the rate of depreciation by a factor of approximately seven.

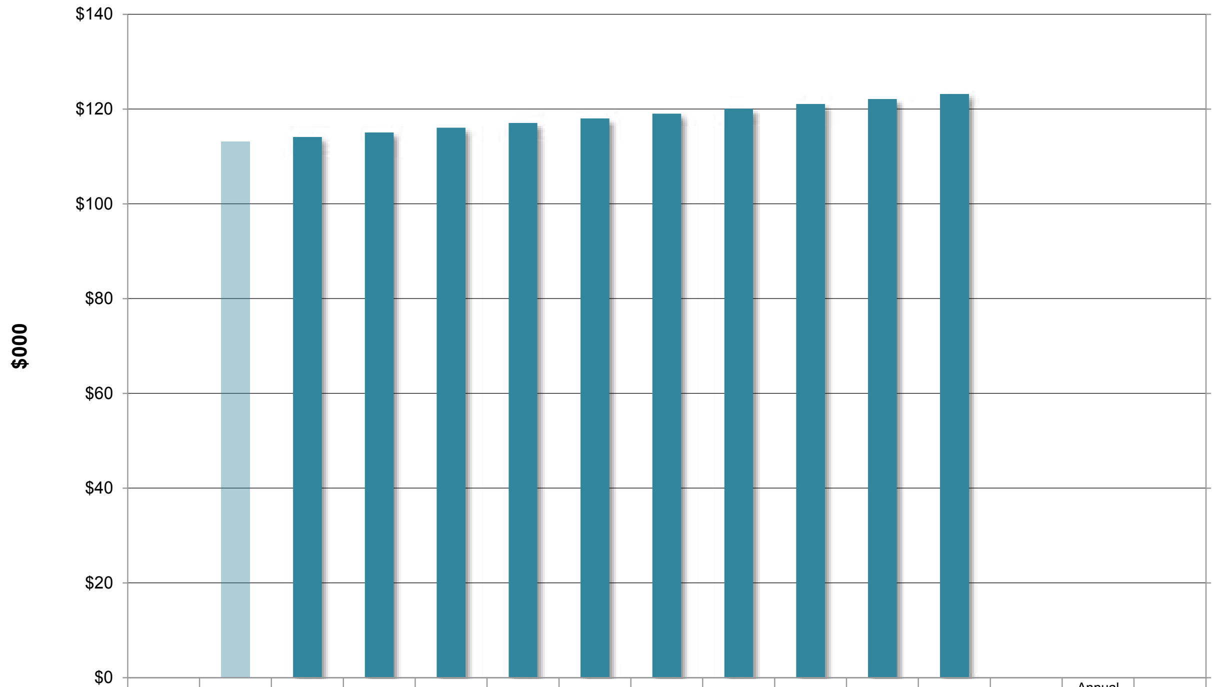
It is noted that the proposed new works programme will add $10 million of cycleway improvements per year for the next 10 years, which compares to the replacement value of $34 million for the total current stock of cycleway assets.

Renewals 10-year work and expenditure forecast

The analyses given above provide varying levels of indicative renewal work for the future. This demonstrates the current difficulty of forecasting future renewal needs.

Figure 4.8-3 Cycleways 10-year renewals expenditure summary

Source: LTP Budget Model 12 April 2012 after refresh for AMP



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	Annual Average $ / area network	Network Length
Central	100%	113	114	115	116	117	118	119	120	121	122	123	1,186	$4,392	27
TOTAL	100%	113	114	115	116	117	118	119	120	121	122	123	1,186	$4,392	27
Renewals (unit)		0.54	0.55	0.55	0.56	0.56	0.56	0.57	0.57	0.58	0.58	0.59	5.67		

Considering the above renewal analyses and the current funding constraints being experienced by Auckland Transport, the recommended 10-year renewal needs are shown in Figure 4.8-3. Note however that the actual renewal plan that will be approved by Auckland Transport may yet differ from these network needs because of the impact of funding constraints.

Based on the renewal analysis, the 10-year summary of renewals expenditure for cycleways across the region by year and area, also showing renewal length and network length in kilometres, is shown in Figure 4.8-3.

The total 10-year renewals expenditure forecast for the cycleways network is approximately $1.2 million, which is one per cent of the total expenditure on the cycleway network. It will only renew 21 per cent of cycleways in the Central area over 10 years.

Auckland City was apparently the only legacy council that had allocated a separately coded expenditure for cycleway renewals. It is possible that other legacy councils had included this as part of their general footpath renewals expenditures. This issue requires review and reallocation of funds if necessary.

Backlog of renewals

Renewals backlog (catch-up) lengths are those in poor or very poor condition plus those that do not meet other service-level requirements.

Each network area has a different amount of renewals catch-up required to meet the specified level of service. These variations derive from historical under-investment in renewals.

Table 4.8-8 Assumed indicative forward works programme of cycleway renewals

Note: Assumptions require ongoing review and confirmation as information becomes available

Cycleway material	Proposed renewal expenditure ($)	Assumed unit renewal cost (net $/m^2)	Annual renewal quantity (m^2)	Network quantity (m^2)	Percentage of network renewed annually	Average useful life (years)	Average expiry rate
Asphalt (AC)	118,000	30	4,000	110,626	3.6%	15	6.7%
Concrete	0	110	0	47,683	0.0%	50	2.0%
TOTAL	118,000	n/a	4,000	158,309	n/a	n/a	n/a

The lifecycle characteristics for each asset-component type are estimated values only. Further studies are recommended to establish:

- Average useful life (years)
- Expiry rate percentage / year (100 / average life)
- Backlog percentage estimated/assumed
- Expiry (number annual rate)
- Backlog quantity at 2011 (number).

In the meantime, an assumed, indicative annual renewals programme with annual renewal spending of $118,000 and annual renewal quantities for asphalt cycleways would still not appear to address the lifecycle deterioration of the cycleway bases and surfaces. Such a programme would not address any catch-up backlog issues of assets in poor or very poor condition, as shown in Table 4.8-8.

It appears that the dedicated renewals expenditure is not sufficient to meet the needs of the cycle network. It is possible that cycleway renewals are included as part of general footpaths renewals or cycleways maintenance or new works expenditures. This issue requires review and reallocation of funds if necessary.

4.8.12 New works needs

Capital new works plan

The new works associated with the cycle network are managed by Auckland Transport's cycle development team led by a cycling specialist through various capital works contractors across the network areas of the region. In some cases the contractors are also responsible for footpath and cycleways maintenance and renewals, but in most cases new cycleways are constructed by separate contractors in separate capital projects.

The decision to put forward the capital new works programme is made based on the similar criteria and considerations described in the renewals overview.

Capital new works expenditure

As mentioned in the expenditure summary earlier in this section, new works expenditure for cycleways is forecasted and allocated funds jointly with footpath improvement projects and road corridor improvement projects over the year. There are unspecified portions of cycleway new works expenditure in the footpaths and roads expenditure forecast. This is because on-road cycleways are sometimes treated as part of the general road carriageway shared with other vehicles; or as shared footpaths with pedestrians. These combined allocations need to be reviewed, clarified, separated and re-allocated if required.

Capital new works 10-year expenditure forecast

A summary of capital new works expenditure for cycleways by network areas is shown in Figure 4.8-4.

The total 10-year new works expenditure forecast is approximately $100 million, which is 96 per cent of the total expenditure on the cycle network. The above costs include professional costs.

The $10 million per annum is to be used for region-wide cycleway development and construction as part of the Regional Cycling and Walking Programme. It may include new dedicated or shared off-road cycleways, on-road cycle lanes, intersection improvement to increase cyclists' safety and visibility at intersection, bike parking, public bike hire scheme, etc.

Growth related new works

New cycleways are generally a LOS improvement and not associated with growth. As such, they do not attract development contributions.

Levels of service related new works

Capital projects for LOS improvements are included in the projects and financial projections for capital new works, and typically include special projects associated with city centre, sub-regional and town centre streetscape upgrades.

Special projects teams at Auckland Council and Auckland Transport implement and deliver these projects. The new works projects will require associated operational expenditure for their ongoing maintenance, known as consequential OPEX (captured in the 10-year financial forecast). Refer to the Consequential OPEX section of this LCMP.

Vested assets

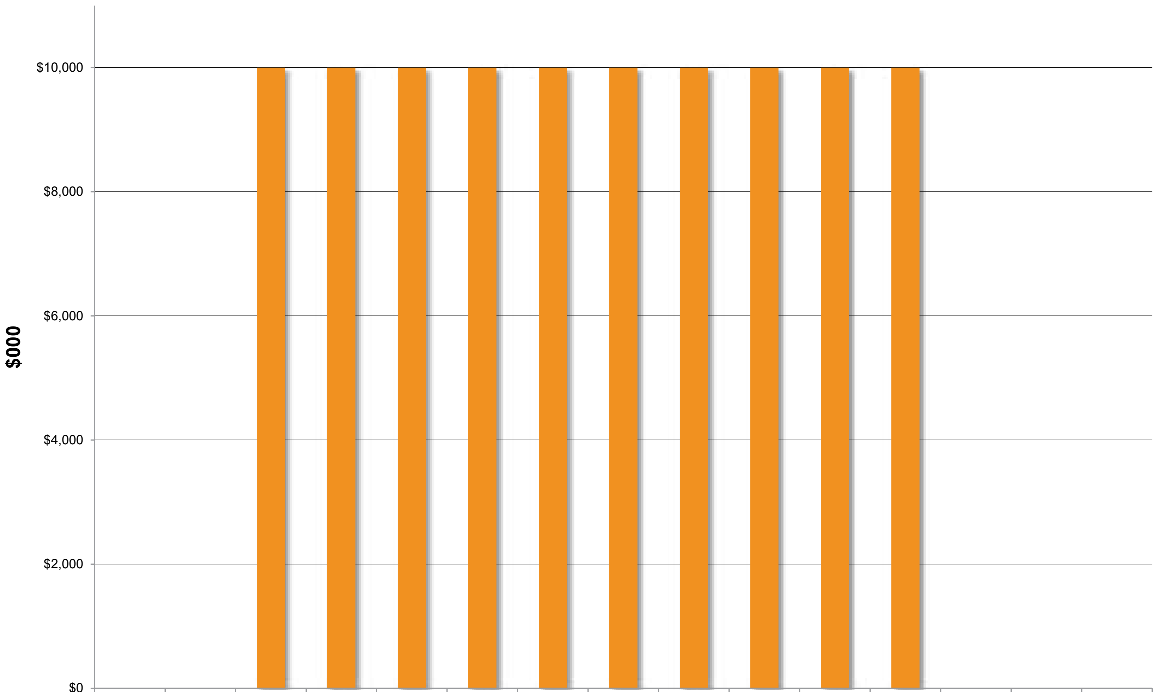
Some new cycleways, shared footpaths or cycling facilities may be constructed by developers or other Auckland Council organisations and then vested with Auckland Transport.

4.8.13 Disposal plan

The disposal of old cycleways as a result of the renewals programme will have a financial and environmental impact.

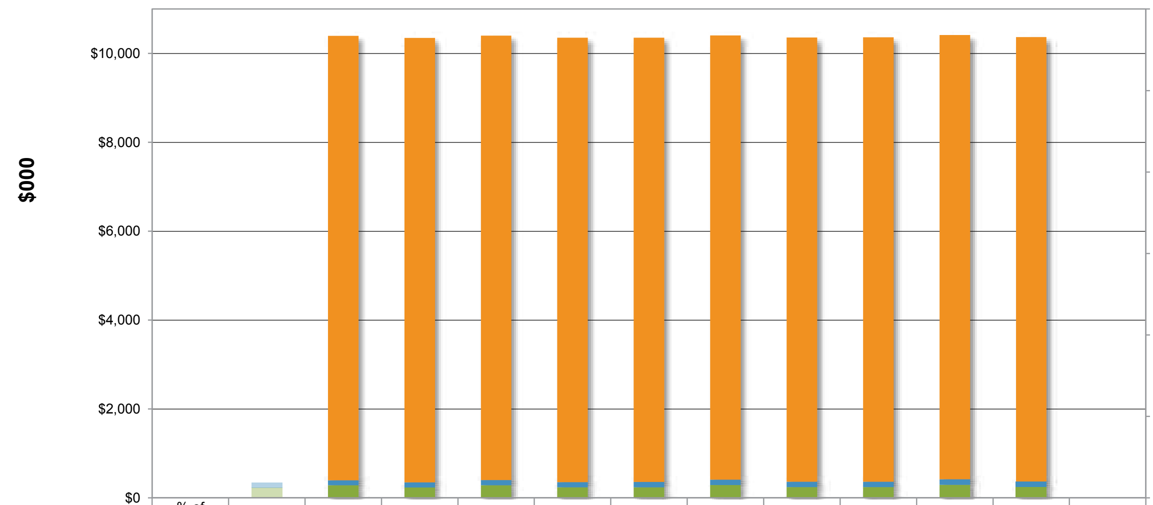
With a growing drive for sustainability across the region, the practice of crushing, recycling and re-using old concrete material where suitable is increasing. Material for recycling and reuse is stored in designated sites.

Figure 4.8-4 Cycleways 10-year CAPEX new works expenditure
Source: LTP Budget Model 12 April 2012 after refresh for AMP



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	Total network (km)	Annual average $/km
Regionwide	100%	00	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	100,000	83	$120,482

Figure 4.8-5 Summary of 10-year cycleway expenditure
Source: LTP Budget Model 12 April 2012 after refresh for AMP



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total
CAPEX New Works	96%	00	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	100,000
Renewals	1%	113	114	115	116	117	118	119	120	121	122	123	1,186
Operations & Maintenance	2%	232	282	234	285	237	238	290	241	243	294	246	2,589
TOTAL	100%	345	10,397	10,349	10,401	10,354	10,356	10,409	10,361	10,364	10,416	10,369	103,775

4.8.14 Summary of 10-year network needs

All values in this AMP allow for expected growth in demand but do not allow for market price fluctuations over time.

Current and projected expenditure trends are shown in Figure 4.8-5.

Notes on the expenditures in Figure 4.8-5:

- The proposed 10-year capital new works expenditures contained in the above source file are those of the Auckland Transport financial management system (SAP), as at April 2012. Auckland Transport has reviewed and prioritised the projects for provisional new works expenditure allocations as subject to the approval from the Auckland Council.
- The proposed 10-year base expenditure for operations, maintenance and renewals includes an annual growth factor of +0.85 per cent to allow for consequential OPEX and consequential renewals from growth in the network and growth in demand for services.
- Additional to the total expenditure above that is dedicated to cycleways over the next 10 years, there are other combined projects such as footpath and road corridor improvement projects that may add to the maintenance, renewal or new works of cycleway or cycling assets. An example is the proposed Tamaki Drive boardwalk improvement between Kelly Tarltons and Millennium Bridge.

4.8.15 Approved Long Term Plan envelope

The approved Long Term Plan

This section compares the approved LTP envelope for OPEX and renewals with the cycleways network needs as determined by this AMP at a regional level and identifies the likely impacts of any variances. Revenue and funding incomes to Auckland Transport (from Auckland Council ratepayers and NZTA government subsidies and the like) are allocated through the approved Long Term Plan budgets. The LTP was adopted on 28 June 2012.

OPEX impacts

Based on the information in Table 4.8-9, cycleways operational expenditure shows no variance between the LTP allocated budgets and the AMP needs. However it is anticipated that the LTP will require further efficiency savings and therefore a funding gap for cycleways operational expenditure may eventuate.

Table 4.8-9 Variance between LTP approved budget and AMP network needs for cycleways (all un-inflated)
Source: LTP Budget Model 12 April 2012 after refresh for AMP and revised LTP Budget Model 28 June 2012

Cycleways	10-year total LTP approved budget ($000s un-inflated)	10-year total AMP network needs ($000s un-inflated)	Variance 10-year total ($000s un-inflated)
Operations and maintenance	2,589	2,589	0
Renewals	1,186	1,186	0
Cycleways Total	3,775	3,775	0

Table 4.8-10 Un-inflated and inflated cycleways AMP needs
Source: LTP Budget Model 12 April 2012 after refresh for AMP and revised LTP Budget Model 28 June 2012

UN-INFLATED expenditure ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M		282	234	285	237	238	290	241	243	294	246	2,589
Renewal		114	115	116	117	118	119	120	121	122	123	1,186
Cycleways total		396	349	401	354	356	409	361	364	416	369	3,775
AC Inflator	OPEX	3.30%	3.30%	3.30%	3.30%	3.50%	3.60%	3.10%	3.10%	3.30%	3.60%	n/a
AC Inflator	CAPEX	3.90%	3.40%	2.80%	2.90%	3.10%	3.30%	3.50%	3.70%	4.00%	4.00%	n/a
INFLATED expenditure ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M		292	250	314	270	281	353	303	315	395	342	3,115
Renewal		119	124	128	133	138	144	150	157	165	173	1,431
Cycleways total		411	374	442	403	419	497	453	472	560	515	4,546

Renewals impacts

Based on the information above, cycleways renewals expenditure shows no variance between the LTP allocated budgets and the AMP needs.

Further efficiency savings

As required by the approved LTP, a further reduction in OPEX of $18.6 million per year, reducing to nil by 2016/17, will need to be allocated against asset related operational budgets. The impact of this reduction on cycleways operational budgets is yet to be assessed and finalised.

Monitoring and management of Long Term Plan consequences

The consequences resulting from these variances will be monitored and reported as appropriate.

CAPEX new works

CAPEX new works contained in this AMP are derived from draft LTP listings as at April 2012 and are produced in section 4.8.12.

The capital new works programme has been further refined and adopted in late June 2012. Details of this adopted programme are contained in the LTP.

AMP inflation effects

Un-inflated and inflated cycleways needs for the AMP are shown in Table 4.8-10.

Table 4.8-11 Un-inflated and inflated cycleways LTP needs

Source: LTP Budget Model 12 April 2012 after refresh for AMP and revised LTP Budget Model 28 June 2012

UN-INFLATED expenditure ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M		282	234	285	237	238	290	241	243	294	246	2,589
Renewal		114	115	116	117	118	119	120	121	122	123	1,186
Cycleways Total		397	349	401	354	356	409	361	364	416	369	3,775
AC Inflator	OPEX	3.30%	3.30%	3.30%	3.30%	3.50%	3.60%	3.10%	3.10%	3.30%	3.60%	n/a
AC Inflator	CAPEX	3.90%	3.40%	2.80%	2.90%	3.10%	3.30%	3.50%	3.70%	4.00%	4.00%	n/a
INFLATED expenditure ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M		292	250	314	270	281	353	303	315	395	342	3,115
Renewal		119	124	128	133	138	144	150	157	165	173	1,431
Cycleways total		410	373	443	403	420	497	453	472	560	515	4,546

LTP inflation effects

Un-inflated and inflated cycleways budgets from the LTP are shown in Table 4.8-11.

4.8.16 Revenue sources

Revenue and funding incomes to Auckland Transport are contained in Auckland Transport's SAP financial-management system.

Operations and maintenance revenue

The maintenance of cycleways is normally subsidised by NZTA even though footpaths and pedestrian accessway maintenance is generally not subsidised by NZTA.

Capital renewals revenue

The renewals of cycleways are normally subsidised by NZTA even though footpaths and pedestrian accessway renewals are generally not subsidised by NZTA.

Cycleways funding for renewal of the cycleway network is through the footpaths and cycleways renewal budget, mostly from rates and NZTA subsidies.

Capital new works revenue

Cycleways capital new works to improve safety and LOS are generally funded from rates or loans.

Some capital improvements to cycleways may also come with the footpaths renewals and new works programmes funded from those budgets.

Capital new works to cater for growth are generally funded and provided by developers in new subdivisions, but this is not expected to be significant for cycleways.

4.8.17 Key improvement initiatives

Key improvement initiatives relating to cycleways are shown in Table 4.8-12.

Table 4.8-12 Cycleway improvement initiatives

Improvement area	Description	Priority
Cycleways 1	Review and if necessary reallocate funds to asphalt cycleway renewals as it appears that expenditure is not sufficient to meet the needs of the cycleway network. It is possible that cycleway renewals are included as part of general footpaths renewals or cycleways maintenance or new works expenditures	High
Cycleways 2	Prioritise investment for a regional approach for connecting the cycle network. Actively promote use of cycleways as a transport alternative	Medium
Cycleways 3	Clarify and confirm ownership, management and funding responsibilities for off-road cycleways through parks and recreational areas that may not be part of the transport network	Medium
Cycleways 4	Collect and captured into RAMM the region's cycleways and cycling facilities asset data in terms of quantity, condition, performance and age of the cycle network	High

4.9 Contents

Auckland Transport
An Auckland Council Organisation

4.9 Street Lighting

4.9.1 The service Auckland Transport provides

Street lighting is an important amenity to local communities and an essential component of the transport network. Good street lighting helps improve road safety. It reduces night-time road traffic accidents, improves security for pedestrians and for neighbouring areas, and aids crime prevention.

Auckland Transport provides street lighting which complies with the standard illumination levels. This enables safe and easy movement of vehicle and pedestrian traffic on the road network during the hours of darkness, particularly on urban streets. By lighting up the road corridor environment, street lighting encourages night-time use of local facilities and active transport modes such as walking and cycling.

The key performance measures to deliver required levels of service (LOS) for street lighting are:

- **Quality** – to ensure that all street lighting equipment is maintained to a standard that reflects safe, economic, effective and reliable operation
- **Safety** – to minimise the number of accidents on urban roads as a result of poor and insufficient lighting systems, to provide a better security / safety level to all road users (vehicle users, cyclists and pedestrians), to reduce crime and the fear of crime at night time, and to encourage people to walk and use shared transport spaces, particularly near schools, commercial and recreational areas, public transport centres and areas of high usage
- **Sustainability** – to provide sustainable energy use options to the network without compromising the environment for future generations.

Table 4.9-1 Street lighting levels of service

Service value	Level of service	Service measure	Current performance	Target performance (indicative/ to be developed and agreed)
Quality	Assets are maintained in good condition	Percentage of street lighting in moderate condition (grade 3) or better	59% (94% of known assets)	95%
		Percentage of street lights with one or more defects	20%	< 2%
Safe vehicle and pedestrian environment	Minimise fatal and serious injuries	Percentage of urban streets and roads provided with street lights and operational hours	Compliance 100% (Estimated)	% Streets – 100% Annual burning hours – Not < 4,250
		Compliance with average level of illumination on residential streets – 2 lux	50%	100%
		Compliance with average level of illumination on collector roads – 3 lux, primary and secondary arterial roads – 4 lux	80%	100%
		Compliance with average level of illumination at major intersections – 7.5 lux	90%	100%
		Compliance with average level of illumination at commercial centres – 6 lux	>90%	100%
Environmental sustainability	Provide assets and services at the least lifecycle cost	Percentage of savings on electricity costs when street lights are fitted with 'smart controls' or LED technology	2%	60% by year 2018
Environmental sustainability	The network is managed to minimise carbon emissions	Percentage of network installed with energy-efficient street lighting (LED lamps)	5%	15% by year 2014

Section 2, Levels of Service of this AMP presents the details of the street lighting LOS being measured. Table 4.9-1 offers a representative sample only.

In coming years, street lighting and associated facilities are expected to become a more significant asset group to make Auckland a 'greener' and 'sustainable' transport network.

One of the Auckland Transport objectives is to ensure that the street light network is attractive, of good quality, easy to maintain, and cost effective. Street lights will contribute to Auckland's transport network in that they:

- Provide safer conditions for vehicle users, cyclists and pedestrians crossing roads, by illuminating physical features, obstacles and hazards, particularly at intersections and bends
- Provide safer conditions for footpath users, bus shelter users, car park users, mobility-scooter users and cycle-lane users (cyclists), by illuminating physical features, obstacles and hazards
- Provide better visibility of roads, footpaths and car parks, and thereby promote personal security and discourage possible crime on the roads. This crime prevention through environmental design is known as 'CPTED' and brings particular benefits to vulnerable users, such as the elderly, disabled and young, to move to and from places within their community
- Provide attractive environments to encourage people to walk and use shared-transport spaces with focus given to areas near schools, commercial and recreational areas, public transport centres and areas of high usage.

Auckland Transport uses three main methods to deliver effective, safe and well-maintained street lighting networks:

Maintenance programme	An on-going maintenance programme to address street lighting defects resulting from inclement weather or willful damage. The programme includes responsive maintenance arising from regular inspections or public complaints to the call centre, as well as planned maintenance
Renewals programme	Auckland Transport manages the lifecycle of existing assets through an annual renewals programme based on condition and importance. The programme employs optimised decision-making techniques, as described in this section
New works programme	Capital new street lighting programmes respond to public-saftey issues or public requests, in order to meet certain engeneering and community criteria. This work complies with the lighting standards, and inlcudes new street lights installed through overhead-to-underground cable projects

Auckland Transport is also responsible for the maintenance of town centre amenity lighting within the road corridor, which includes lighting attached to buildings and under verandas, lighting on reserves and sports lighting.

A street lighting governing principle has been developed by Auckland Transport. This provides guidance on providing lighting along legal public roads and outlines Auckland Transport's approach to achieving appropriate illumination levels.

Overall, lighting performance and design requirements for any new development or maintenance works must comply with the lighting standards described in AS/NZS1158. Refer to the details in the Auckland Transport Code of Practice (ATCOP).

4.9.2 Network overview

Auckland Transport has stewardship responsibilities for the street lighting network of 98,000 street lights which illuminates approximately 4,416 km of urban roads, and 6,879 km of footpaths, cycleway and pedestrian accessway, as well as car parks, bus shelters and public transport centres.

Auckland Transport is responsible for planning, designing, installing, maintaining, and renewing the region's street lighting network, which includes:

Columns (poles)	60,000 (approx.) vertical support poles, commonly called columns, mount luminaires (lanterns) above the road
Bracket and outreach arms	98,000 (approx.) structural members attach luminaires to columns. 38,000 brackets attach luminaires to buildings and Vector and Telecom poles. 60,000 outreach arms extend from the vertical sections of columns
Luminaires and lamps	100,000 (approx.) units, including control gear and housings. Luminaires are also commonly known as lanterns, lamps and light bulbs

The street lights in the old Franklin area are owned by Counties Power (Electricity Network Company). Work is currently in progress to value these assets with a view to purchasing them from Counties Power. Currently Auckland Transport pays for a service to provide lighting in this area.

Where there are concerns about public safety regarding the lighting on the streets, Auckland Transport is working more closely with the Police to upgrade the lighting standard in those areas. This will be the continuing trend due to the increased night-time activities.

4.9.3 Network valuation

The valuation of the street lighting network has been developed based on information within RAMM.The detailed information by street lighting elements is shown in Table 4.9-2.

4.9.4 Network asset details

The definitive record of the street lighting asset owned by Auckland Transport is held in the RAMM database. Access and updating rights are restricted to responsible personnel within the street lighting section.

The RAMM database holds details of asset information such as type, material, location description, maintenance area, electricity supplier, date of installation, ownership.

The table below details the inventory of street lighting data currently held in the RAMM database.

Note that the quantities of brackets include the curved arm sections that are integrated with the vertical sections of steel columns.

Belisha beacon lighting for pedestrian-crossing poles is powered through the street lighting network. For the purpose of this AMP, the 340 pedestrian crossing Belisha beacon lights in the region are considered as part of the street lighting network.

The street lighting asset has generally grown by approximately 1,000 new lighting columns (two per cent) a year through the overhead-to-underground (OHUG) programme's infill and road corridor improvement projects.

Table 4.9-2 Street lighting replacement value
Source: Auckland Transport Valuation (30 June 2011)

Street lighting asset	Optimised replacement cost (ORC) $000s	Optimised depreciated replacement cost (ODRC) $000	Annual depreciation (ADR) $000s
Lighting columns (poles)	103,194	57,730	4,076
Brackets and outreach arms	24,469	11,473	1,254
Luminaires (lanterns)	37,385	17,410	1,982
TOTAL	165,047	86,613	7,312

Table 4.9-3 Street lighting asset detail
Source: Auckland Transport RAMM system, March 2012

Asset	Regional total quantity (approximate numbers)		North	Central	South	Unknown
Lighting lamps	TOTAL	100,677	22,804	13,862	30,417	864
	High-pressure sodium	53,623	1999	12055	11345	713
	Mercury vapour	984	183	10	531	47
	Sodium vapour	35,796	19025	46	16715	7
	Metal halide	5,194	903	307	676	58
	LED	479	10	130		
	Cosmo	1,155	18	1088	6	
	Fluorescent	282	64	120	12	
	Halogen	409	400		1	
	Other	2,755	202	106	1131	39
Luminaires (lanterns)	TOTAL	100,677	22,804	13,862	30,417	864
Brackets and outreach arms	TOTAL	97,850	22,463	13,765	29,692	54
Light support columns / poles (by material type)	TOTAL	59,769	13,187	7,198	24,963	
	Steel	43,635	9282	4432	16698	
	Concrete	14,737	3607	2675	7562	
	Timber	762	142	42	554	
	Other	635	156	49	149	

38 per cent of the lighting support columns in the region are not owned by Auckland Transport. The distribution of ownership is shown Table 4.9-4.

4.9.5 Asset data confidence

Auckland Transport aims to ensure that the asset information in RAMM is reliable, timely and accurate. Auckland Transport undertakes audits of the standard and quantity of existing, new or upgraded assets, providing condition-rating and quality assurance. These processes go towards the development of optimal renewal and maintenance programmes, levels of service, and LTP and Board plans.

The RAMM database holds the asset information for the street light network, including condition rating information. Data confidence relates to both the accuracy and completeness of data.

Table 4.9-5 illustrates Auckland Transport's confidence in the street lights asset data.

Table 4.9-4 Street lighting columns by owner
Source: Auckland Transport RAMM system, March 2012

Pole owner	North	Central	West	South	Total
Auckland Transport bus station	151			4	155
Auckland Transport roads	13,006	14,421	7,198	24,959	59,584
Auckland Transport wharves	30				30
Auckland Transport total	13,187	14,421	7,198	24,963	59,769
Crown NZTA	102			213	315
Other	5	30		5	40
Parks	638	2		98	738
Power	6,767	16,194	6,094	4,199	33,254
Property housing	51	2	11	36	100
Telco	499	845	261	40	1,645
Other total	8,062	17,073	6,366	4,591	36,092
Unknown	205	26	102	4	337
Total	21,454	31,520	13,666	29,558	96,198

Table 4.9-5 Asset data confidence
Source: Auckland Transport RAMM database March 2012

Data attribute	Data confidence			
	Very uncertain	Uncertain	Reliable	Highly reliable
Asset descriptors and quantity				
Asset age				
Condition				
Performance				

Table 4.9-6 indicates the completeness of the asset data.

In terms of age, condition and performance, the current overall data confidence level of street lighting asset data is ‘uncertain’. On-going visual inspections and maintenance contract work will gradually boost data confidence levels. This issue will be addressed as a future improvement.

4.9.6 Asset condition

Condition rating

Assessment of the network condition and performance is in accord with a condition grade rating system. The rating system basis includes health and safety factors, structural defects, and the aesthetics / visual amenity of street lights. Development accords with the methodologies of The New Zealand Institute of Highway Technology. Condition rating is performed on a scale of 1 to 5; 1 being ‘very good’ and 5 ‘very poor’. Through this information, Auckland Transport determines the broad condition/LOS of street lighting, ranging from ‘very good’ to ‘very poor’.

For the street lighting network, condition rating surveys and inspections are typically planned to occur in the year prior to the Transport Asset Management Plan review. This provides a timely, overall picture of the network condition near to the three-yearly review, which feeds into the Long Term Plan review.

The condition of street lighting is affected by:

- Vehicle damage (main cause)
- Age
- Corrosion, especially in coastal areas
- Obsolescence, e.g. technological advances resulting in replacement of old SOX luminaires with high-pressure sodium (SON)
- Diffusers (opaque lantern cover) losing effectiveness through dirt or cracking with age
- Electrical component corrosion
- Cleanliness of the lantern covers
- Lamps (bulbs) burning out.

Condition rating

The condition rating profile of the region’s street lighting columns (poles), brackets and luminaires owned by Auckland Transport is shown by Figure 4.9-1, with 59 per cent in moderate to very good condition and 37 per cent unknown.

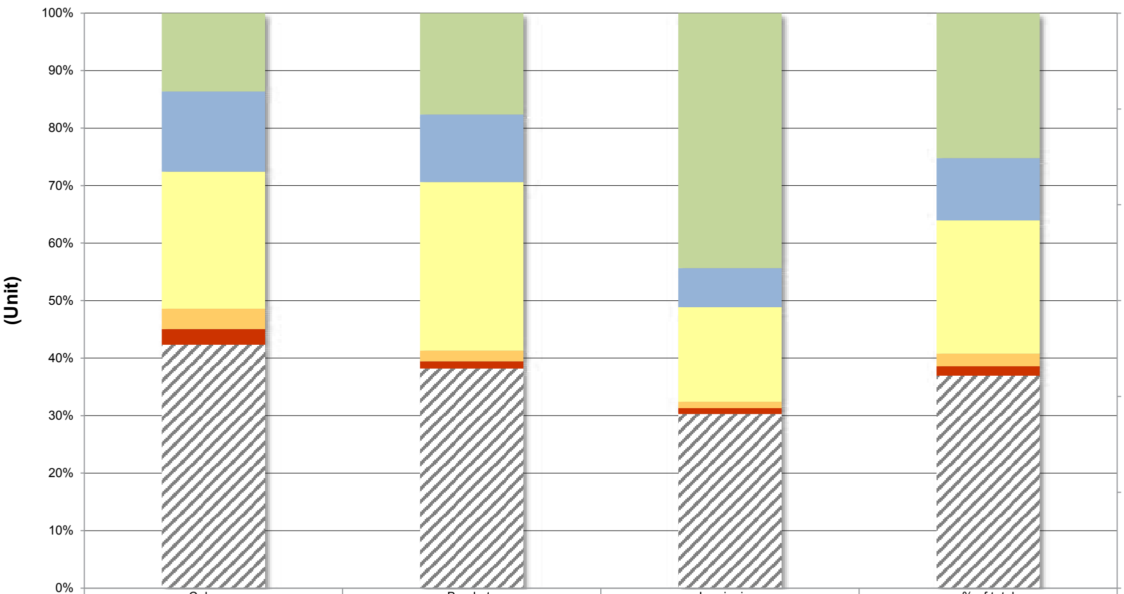
Figure 4.9-2 shows that 50 per cent are in condition grade 3 and above (moderate to very good condition) and 7 per cent are in poor and very poor condition. Nearly half of the columns (43 per cent) are unrated and the condition is unknown.

Observation of the network and feedback from the maintenance team suggests that a significant number of the unknown assets are in poor and very poor condition (condition grades 4 and 5). To substantiate such observations requires better asset knowledge, which will be achieved by implementing condition assessment through the asset management contracts (refer to Section 4.9.17, key initiatives).

Table 4.9-6 Completeness of data
Source: Auckland Transport RAMM database March 2012

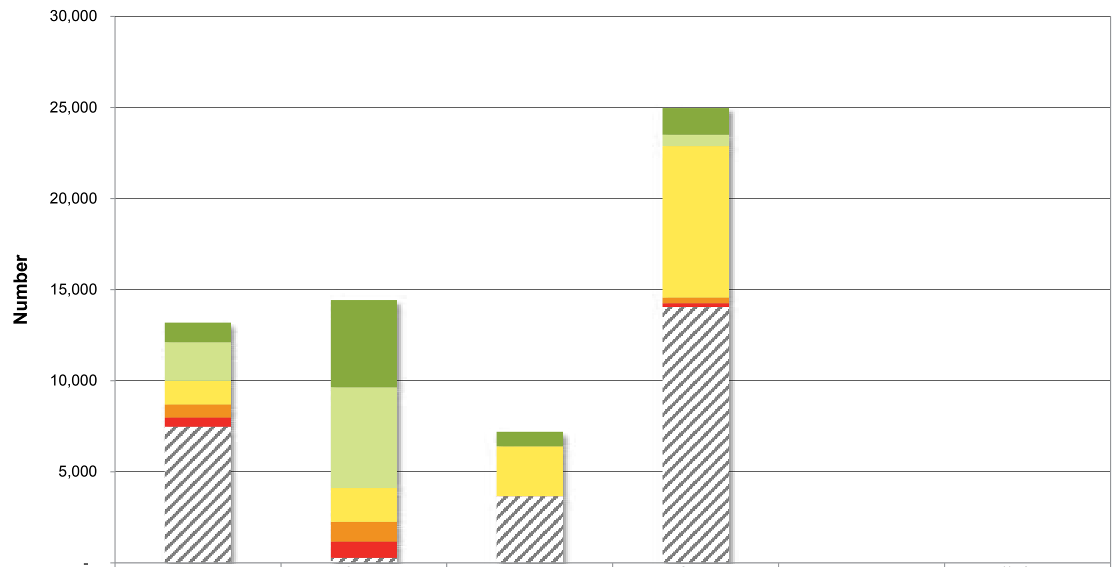
Asset	Completeness of data (%)		
	Measure	Age	Condition
Lighting columns (poles)	95	25	57
Brackets	95	25	50
Luminaires (lanterns)	95	40	50

Figure 4.9-1 Overall street light assets condition profile
Source: Auckland Transport RAMM system, March 2012.



	Columns	Brackets	Luminaires	% of total
Very Good	14%	18%	44%	25%
Good	14%	12%	7%	11%
Moderate	24%	29%	16%	23%
Poor	4%	2%	1%	2%
Very Poor	3%	1%	1%	2%
Unknown	42%	38%	30%	37%
Total	100%	100%	100%	100%

Figure 4.9-2 Auckland Transport-owned street light column condition profile
Source: Auckland Transport RAMM system, March 2012



	North	Central	West	South	Total (number)	% of total
Very Good	1,074	4,787	800	1,461	8,122	14%
Good	2,129	5,533	14	626	8,302	14%
Moderate	1,300	1,858	2,714	8,318	14,190	24%
Poor	709	1,082	18	304	2,113	4%
Very Poor	501	893	0	213	1,607	3%
Unknown	7,474	268	3,652	14,041	25,435	43%
Total (number)	13,187	14,421	7,198	24,963	59,769	100%
% of total	22%	24%	12%	42%	100%	

Brackets

Figure 4.9-3 shows that 59 per cent of brackets are in condition grade 3 and above (moderate to very good condition) and three per cent is in poor and very poor condition. Approximately one-third of the brackets (38 per cent) are unrated and the condition is unknown. It is also noted that less than one per cent of the 97,850 brackets in RAMM are not linked to the road ID and are thus excluded from the above condition analysis.

The planned condition assessment will improve the understanding of the asset condition over time (refer to Section 4.9.17, key initiatives).

Luminaries

Figure 4.9-4 shows that 68 per cent of luminaries are in condition grade 3 and above (moderate to very good condition) and two per cent are in poor and very poor condition. Approximately one-third of the brackets (30 per cent) are unrated and the condition is unknown. About one per cent of the 100,677 luminaires are not linked to road ID and therefore are excluded from the above condition analysis.

The planned condition assessment will address this over time (refer to Section 4.9.17, key initiatives).

The above condition analysis shows the condition of street lights does not necessarily equate to network performance. Performing to the agreed LOS is dependent on factors outside asset condition; such as the effect of trees, column spacing, road alignment, reliability of the power-supply company, performance of control systems and weather conditions, which may affect lighting levels.

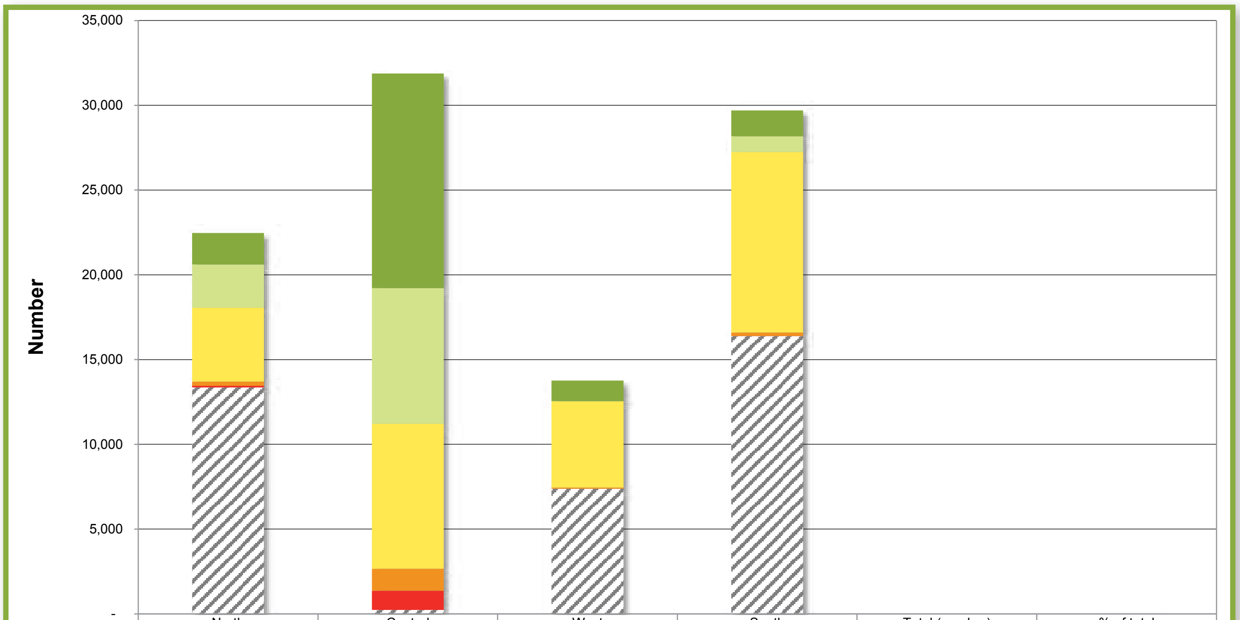
The renewal programme prioritises street lights in the worst condition (condition grades 4 and 5), as well as placing importance on location and road category.

Remaining useful life

The remaining useful life can be projected by analysing asset data with respect to effective lives and ages.

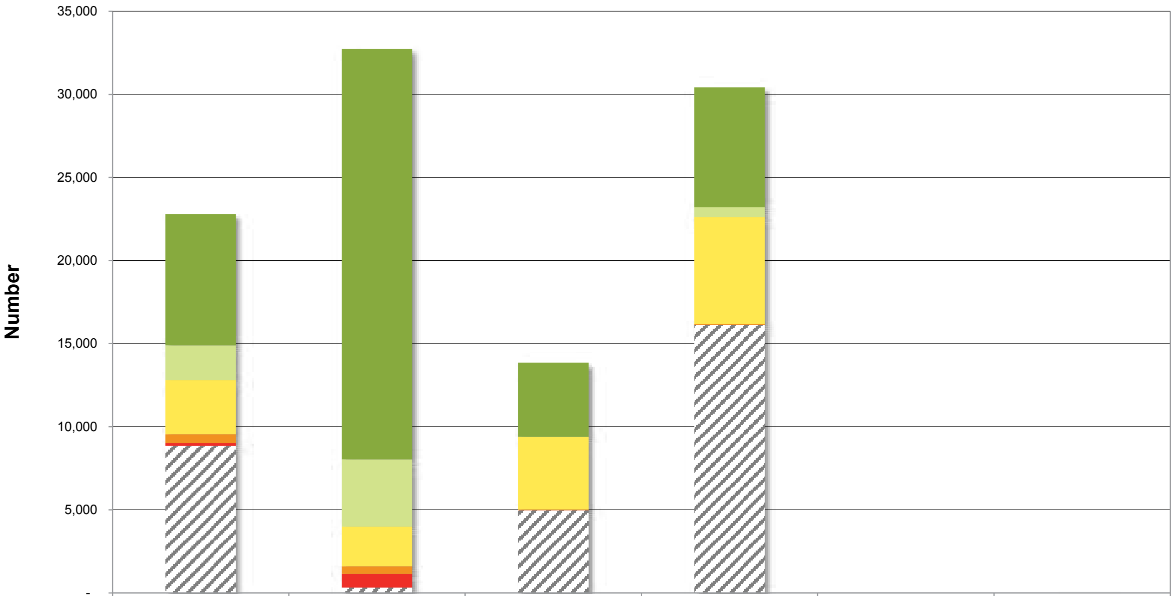
In the case of street lighting data in RAMM, the age is uncertain across the region. Most street lighting assets were constructed or last renewed over 10 years ago, and age or build-date information was not generally captured in a system. During the last five years, legacy councils started capturing age information as part of their annual renewals programme. Auckland Transport is now trying to reassess the information collected in past years and is taking over new street lighting from subdivisions and capital improvement projects.

Figure 4.9-3 Auckland Transport-owned street light brackets condition profile
Source: Auckland Transport RAMM system, March 2012



	North	Central	West	South	Total (number)	% of total
Very Good	1,853	12,662	1,213	1,516	17,244	18%
Good	2,550	7,996	19	928	11,493	12%
Moderate	4,357	8,561	5,088	10,650	28,656	29%
Poor	251	1,298	68	204	1,821	2%
Very Poor	93	1,122	0	13	1,228	1%
Unknown	13,359	237	7,377	16,381	37,354	38%
Total (number)	22,463	31,876	13,765	29,692	97,796	100%
% of total	23%	33%	14%	30%	100%	

Figure 4.9-4 Auckland Transport-owned street light luminaires condition profile
Source: Auckland Transport RAMM system, March 2012



	North	Central	West	South	Total (number)	% of total
Very Good	7,905	24,701	4,467	7,207	44,280	44%
Good	2,096	4,050	14	592	6,752	7%
Moderate	3,257	2,371	4,360	6,442	16,430	16%
Poor	534	470	48	57	1,109	1%
Very Poor	171	826	1	6	1,004	1%
Unknown	8,841	312	4,972	16,113	30,238	30%
Total (number)	22,804	32,730	13,862	30,417	99,813	100%
% of total	23%	33%	14%	30%	100%	

From the available information in RAMM, the effective lives of street lighting assets are assumed to be:

- Columns (poles) – 30 years
- Brackets – 30 years
- Luminaires (lanterns) – 25 years.

For asset management planning purposes, it is estimated that the street lighting network is generally 65 per cent through its life. Therefore the average remaining useful life of the network could be in the range of 10 to 15 years. A complete condition rating process of street lighting will provide timely and accurate information for this analysis. This is discussed in Section 4.9.9, key issues.

Asset failure modes

The most common identified causes of failures for street lighting are:

- Power outage
- Age-related deterioration
- End-of-life failure of lamps
- End-of-life failure of ballasts
- Controller failures on sections of the network
- A roadside accident such as a car-versus-pole (CVP) crash.

Those failure modes can be controlled by routine and emergency maintenance / renewal programmes which meet the design and requirements of the applicable street lighting principles / standards as detailed in the ATCOP and AS/NZS 1158. Special luminaires may be considered on a case-by-case basis in special amenity areas.

4.9.7 Asset performance and capacity

Performance

The performance of the street lighting network links directly to the strategic objectives and service level targets of Auckland Transport.

Auckland Transport's current practice is that any new development or maintenance works for street lighting comply with the current version of lighting standard AS/NZS 1158 as detailed in the ATCOP.

Street lighting LOS (Table 4.9-1) identifies the performance measures and the target level of performance set to meet the desired LOS. However, the current performance level is yet to be confirmed until the first cycle of asset inspections is completed.

According to the available information from street lighting audits and studies on the existing networks by the legacy councils, the performance of street lighting by network area is shown in Table 4.9-7.

This indicates that significant areas of the Auckland region do not meet the standard or recommended illumination (lux) levels.

The outcome of the studies highlights the needs for renewal and new street lighting requirements across the network. However, street lighting projects are mostly considered as part of the road corridor projects and minor safety projects. Other than that, lighting upgrades are likely to be done when the existing light nears or reaches the end of its useful life. The provision of additional or infill lights require new capital funding which is unlikely to attract NZTA financial assistance.

The main issues of low compliance of light levels in streets are:

- Increase in traffic volumes over the years
- Inadequate monitoring of lux levels in high-pressure sodium lights
- The introduction of AS/NZS 1158 – previously each council had their own lighting requirements; these became out-dated
- Upgrades undertaken without reference to the lighting standard
- The ownership issue between Auckland Council and Auckland Transport.

Capacity

There do not appear to be further issues regarding street lighting capacity except to note that as the volume of traffic grows across the road network, more roads will fall within categories that require the current lighting standard. There is presently no system in place within Auckland Transport which captures changes in traffic volume data and feeds it to the street lighting team in order to maintain the currency of the lighting category registers.

4.9.8 Asset risk and criticality

Asset risks

Auckland Transport has a responsibility to assess the risks in order to best manage the network with the resources available. The intent is to avoid and mitigate the effects of events which are likely to happen. Section 8, Risk Management of this AMP details the risk management process across the network.

Risks related to the street lighting network are shown in Table 4.9-8.

Critical assets

Street lighting assets are critical to the safety and amenity of traffic and the community. It is important that street lighting is provided at an adequate standard and quality, and that lighting meets LOS long-term sustainability requirements.

Street lighting audits identify the possible criticality of street lighting assets attached to the non-council columns for street lighting purposes. They include multifunction columns and luminaires on brackets attached to Vector and Telecom columns for power and support.

Multifunction columns are now a standard specification in the higher profile commercial/retail parts of the city and are designed to accommodate street lights, traffic signals, CCTV cameras, red-light cameras, radio equipment and advertising banners. The columns optimise these services by reducing the need for separate columns; however, they are expensive in terms of installation, maintenance and replacement.

Overhead lines limit the installation of new berm-placed street light columns. Vector and Telecom columns are spaced to suit their own service requirements and not to the council lighting standards.

Table 4.9-7 Street lighting performance by network area

Network Area	Level of service / performance of street lighting
North	Some areas are below recommended illumination standards
Central	Significant areas are below recommended illumination standards
West	Insufficient information at this stage – to be reviewed
South	Insufficient information at this stage – to be reviewed

Table 4.9-8 Street lighting risk analysis
Source: AMP Section 8 Risk Management

Risk	Risk factor	Management options
Hazards from fallen street light columns	Moderate risk	Improve the existing maintenance plan, provide regular inspections, and streamline the response to customer complaints to the call centre
Unsafe conditions for road users due to outages or inadequate street lighting illumination on road carriageways	Moderate risk	In the long-term decision making processes, consider implementing an efficient and cost-effective street lighting network
Unsafe conditions for footpath and car park users due to outages or inadequate street lighting illumination on footpaths and car parks	Moderate risk	See above
Electrocution from street lighting power supply	Moderate risk	Ensure that works are undertaken only by contracting companies and staff that have the necessary electrical safety approvals of the power and electrical network companies and Auckland Transport
Change in public's satisfaction at level of street lighting	Moderate risk	• Review specifications of street lighting design • Offer remedial planning and action via the AMP • Adopt new technology for better and more efficient lighting design and undertake surveys
Contractor unable to deliver annual CAPEX renewal programme	Moderate risk	Encourage contractor to secure additional resources to deliver programme

Components that commonly lead to street lightinging outages and that compromise safety include:

- Lamps
- Fuses
- Wiring
- Wiring cover plates
- Controller failures
- Electrical supply failures.

Currently, banners are allowed to be erected on existing street light columns. In general, older street light columns are not designed for this additional loading. This is a safety concern because some columns will fail as a result of this practice. Auckland Transport is currently looking at a testing programme to identify columns at risk.

There are also a number of subdivisions in the North area where Bermeka lights are at risk of falling. This is a matter of public safety. There are about 600 Bermeka columns in service in the North area, at an estimated cost of $1.4 million.

HUB columns

Approximately 330 multi-function columns (MFP), manufactured in China and purchased from HUB Australia, serve the central city. These columns have proved to have sub-standard welding. 40 such columns in the most vulnerable positions have been remediated. A monitoring programme is being set up to manage the possible risk of pole failure due to fatigue. This involves regular testing of the columns, and data analysis from the columns in service.

The estimated cost of the programme is $540,000 over the next 10 years.

4.9.9 Key issues

Key lifecycle issues that affect street lighting, are shown on Table 4.9-9.

Traditionally street lights have been supplied on dedicated circuits which are switched at the source. With the availability of new technology (intelligent photocells and transceivers), it is now international

Table 4.9-9 Street lighting lifecycle issues

Source: Feedbacks from various stakeholders and contractors

No.	Key issues street lighting	Action plan	Outcomes
1	Significant areas of the region are below the standard and recommended illumination (lux) levels New infill street lighting is required particularly at intersections, bends and main roads	Use accident investigation studies to highlight street lighting deficiencies that contribute to accidents Adopt new technical service levels to standards for lighting AS/NZS 1158, and clarify the prioritised area / road hierarchy to start with over a chosen timeframe	New street lighting standardised and new infill lighting is considered as part of road corridor projects
2	Considerable electricity usage and costs from street lights	Continue to consider and trial new technologies for street lighting, including: • Use of various lighting levels during the specific time of day to save energy and extend lantern life. • LED lamp technology for more power-efficient and reliable use of asset. • Other low-discharge lamp technology (e.g. compact fluorescent). Consider competitively priced energy supply services	Level of service and efficiency of street lighting improves in cost-effective ways for the long term
3	Nearly 35 per cent of the street light network relies on columns owned by others. Shared ownership and responsibilities of these assets with power and telecom companies needs to be carefully managed	Reduce proportion of columns which are not owned by Auckland Transport in conjunction with planned upgrades through the Vector overhead-to-underground pole replacement programme	Auckland Transport compliance with key stake holders (electricity supply companies and their contractors) in street lighting delivery
4	Uncertainty in asset data completeness and confidence in information by portfolio/asset class / criticality, and across the legacy councils Lack of condition assessment information. Condition assessment from ground level does not give good data on luminaires (lanterns) and brackets	Confirm and implement a regional approach to street lighting data collection Implement condition assessments for all activity types Consider database (RAMM) development for the street lighting network and ensure that the database users/developers understand and utilise the same terminology for street lighting	Complete understanding of the condition of the street lighting network enabling appropriate improvement action plans through OPEX, renewals and new-work programmes
5	The proposed renewals may not be sufficient to sustain the deterioration of the lighting assets because the condition of many assets is poor or unknown	Implement an upgrade/renewal programme to target the replacement of unsafe wooden, concrete and fibreglass columns as a priority Determine the deterioration profile of the street lighting assets and review the adequacy of the proposed renewal works	A robust, optimised renewals programme for the street lighting network
6	Different legacy council street lighting control systems, different power supply and utility companies and their contractors, and different levels of service from the seven previous legacy councils with respect to lighting specifications	Improve communication between contractors, service providers and Auckland Transport and work on the consistency issue Review and consolidate street lighting policies and standards from the legacy councils, and develop new policies for the region	New maintenance contracts within road-corridor maintenance to manage inconsistency issue The development of street lighting governing principles achieves a consistent and coherent approach to the provision of lighting on public roads across the Auckland region (refer to the details in ATCOP)
7	Street lighting and associated facilities are expected to become a much more significant asset group in coming years as 'greener', healthier transport choices become more popular	Consider street lighting specifications and levels of service broadened in focus to pedestrian, not just vehicle, needs	Security for both the road users and the neighbouring residents Improvement of public confidence in walking as both a recreational activity and a viable transport mode
8	Effectiveness of street lighting reduced by overhanging trees Vandalism and other damage to cover plates at the base of columns Earth leakage on street-light columns Outages due to the reliance on power supply	Ensure that new street lighting is standardised to the required service level and that street lighting outages are addressed within agreed response times Set up regular inspections of the condition of street-light assets Implement a programme of routine testing of earth leakage, checking bolts on frangible bases and cover plates Implement streamline response procedure for rectifying outages	Optimised maintenance and renewals programmes to respond to customer complaints via call centres. Emergency response services
9	Coordination of the forward-works programmes for street lighting renewals with other programmes such as: road and kerb realignments, urban streetscape projects requiring new or upgraded lighting, and utilities programmes such as overhead-to-underground power and telephone lines	Ensure more information sharing and coordination between Auckland Transport divisions and departments relating to their proposed forward-works programmes Apply the National Code of Practice for Utilities Access to the transport corridors to improve coordination between the stakeholders in order to improve delivery of projects	The National Code of Practice for Utilities Access to the transport corridors is implemented in a co-ordinated manner which ensures that all parties can cooperate, collaborate and engage with each other constructively through open communication
10	A significant number of car versus pole (CVP) crashes	Implement a process of cost recovery for car and pole crashes	Optimised unscheduled-maintenance plan to respond to CVP accidents within target response times

practice to connect each street light directly to the electricity network and control each light individually. The advantages are:

- Each light connects to the main electricity network, so that when a fault occurs, it is likely that only one light will go out
- It is possible to connect other services (such as electronic signs, Wi-Fi, cell phone transceivers) to the street-light columns. This minimises the number of columns in the road corridor
- The cost of a photocell is a fraction of the cost of dedicated circuits and central control.

On the other hand, the rapid changes of technologies in street lighting may carry the risk of increasing installation and maintenance issues.

4.9.10 Operations and maintenance needs

Scope of operations and maintenance

Auckland Transport keeps the street lighting network maintained through an on-going programme that addresses street lighting. Such defects result from outages and damage due to age, inclement weather, willful damage, or arise from safety issues and public complaints. The maintenance programme can be either planned or responsive.

An integrated response from the following service groups manages the operations and maintenance activities associated with the street lighting network:

- Auckland Council's call centre
- Auckland Transport's operations and maintenance staff and representatives
- The power supply companies
- The utility companies that own the columns that support street lights
- The Auckland Transport contractors responsible for routine and emergency response and maintenance.

In some sub-regional areas maintenance and operations contractors also hold responsibilities for street lighting capital renewals and new works.

Auckland Transport's street lighting standards outline the operations and maintenance considerations for all street lighting, ensuring that:

- The Asset Management Plan recognises the lifecycle of street lighting assets and provides adequate funding for maintenance and renewal programmes
- Works can be done only by contracting companies and staff with the necessary electrical safety certification from power and electrical network companies and approval from Auckland Transport.

Operations and maintenance plan

Through contracts awarded on a competitive basis, Auckland Transport procures the physical works necessary to deliver the scope of works listed above. Such contracts are normally for long periods of time – five years or more for roading-related works.

Contractors delivering maintenance services are able to programme works on a priority basis and are required to comply with the contract specifications and recognised guidelines for maintenance activities.

Contractor performance on delivering the maintenance works and related outputs links to the operational LOS of the transport network.

Historical levels of operations and maintenance expenditure provide the basis for current LOS of the network. The expection that the current LOS will continue in the future underlies the long-term lifecycle management strategies of this AMP. This position may change in the future as a result of Auckland Council and Auckland Transport adopting a different level of service in view of the funding and budgetary constraints.

Operations

The operations plan for street lighting includes:

- Call centre operation and response systems
- Inspections, reporting, data collections and the improvement of the RAMM asset management system
- Routine network inspections of street lighting by contractors to identify defects – as defined in the key results schedules of the maintenance contract. The results of these inspections are not generally stored in RAMM but are used to plan the contractor's routine maintenance activities
- Recording all future street lighting upgrade or renewal works on a Geographic Information System (GIS) in order to improve monitoring and programming of future street lighting works.

These plans are documented and embodied in the various network operations and maintenance contracts, street lighting policy and the ATCOP.

Maintenance

Maintenance plans for street lighting include cleaning, making safe, and minor (expensed) repairs to the street lighting networks. The under-contract work is classified by the categories below:

Planned maintenance	Planned routine inspections on a week-by-week basis across the network to: • Carry out routine day-to-day maintenance, repair and/or replacement of all missing, damaged, defective and faulty equipment and component parts • Carry out patrol inspections, including routine night-time inspections of all illuminated street furniture across the network • Assess all street lighting luminaires for cleaning and condition • Carry out electricity testing • Make isolated repairs to assets • Replace lamps as they are near the end of their life • Update inventory as and when required in RAMM • Replace and upgrade obsolete or failed fittings and lamps with modern equivalent components
Unplanned maintenance	Ongoing, repetitive activity required to safely maintain the general lighting network: • Carry out patrol inspection, including night-time inspections of all illuminated street furniture across the network • Respond to requests for service (RFS) such as replacement of faulty components and luminaires, and restoration of failed power supplies • Report observed faults, and updating them in RAMM.
Emergency work	An activity in response to unexpected events on the network that are not of the contractor's making nor under their initial control, including proactive and reactive responses which: • Offer clean-up following motor-vehicle accidents • Remedy over-slips • Remedy dropouts (under slips) • Provide temporary traffic control for emergency services • Address safety issues related to utility-services work within the roading corridor • Undertake minor safety maintenance work, the consequence of responsive maintenance.

The routine inspection of street lighting is carried out by contractors on monthly basis on local roads, and fortnightly on both collectors and arterial routes.

To make appropriate actions within allowable response times, emergency works and some programmed works are often initiated from the service request system (from call centres and complaints) through contractors. For example, emergency service requests have an initial response within four hours, feedback to the initial response within 24 hours and completion of the work within three to four days, depending on the level of emergency. In circumstances where the response time is inappropriate to a particular instance, the engineer has the discretion to override these response and completion times.

As part of responsive maintenance, minor safety maintenance is often carried out reactively in response to call centre requests for service.

In general, all maintenance activities will align with standards / guiding principles of street lighting and meet the LOS requirements. These plans are documented and embodied in the various network maintenance contracts, street lighting policy and the ATCOP.

Operations and maintenance 10-year expenditure forecast

The recommended 10-year operational expenditure forecast is shown in Figure 4.9-4. It is based primarily on historical trends but also includes the revised activities detailed above and LOS to be achieved to some extent. This recommendation has also taken into account current funding constraints being experienced by Auckland Transport and Auckland Council. Note however that the actual plan approved by Auckland Transport and Auckland Council may yet differ from these network needs because of the impact of funding constraints.

Operations expenditure for street lighting includes power, costs associated with call centre operation and response systems, inspections, reporting, data collections and the use of the RAMM asset-management system. However, some of these expenditures (such as for call centre operation and response) may be under other asset types or overheads and not assigned to street lighting.

Maintenance expenditure for street lighting includes cleaning, making safe, and minor (expensed) repairs to street lighting networks.

A regional summary and comparison of operations and maintenance expenditure (by area) for the street lighting network is illustrated in Figure 4.9-5.

The total 10-year operations and maintenance expenditure forecast for the street lighting network is approximately $184 million.

The main operations and management expenditure for the street lighting network is for electrical power (69 per cent of total operational and management expenditure) and maintenance costs (31 per cent), as shown in table 4.9-10

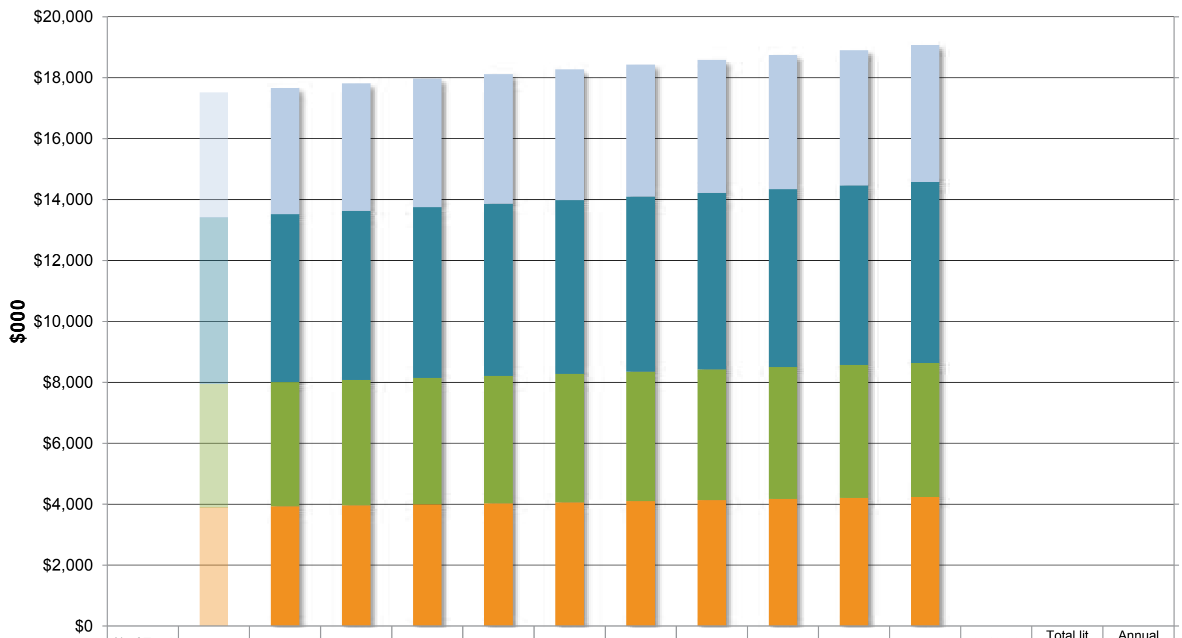
Electricity consumption is a major operational cost of the street lighting network. This is a driver for improving energy efficiency to reduce power supply costs. There are currently several electricity supply agreements to be reviewed so that they may better reflect the composition of the Auckland Transport network and needs.

Consequential OPEX

Consequential OPEX will be required to cover the increased future maintenance costs associated with new street lighting assets from capital new works, such as new subdivisions, city centre and town centre upgrades, and roading improvement projects.

There is substantial physical works capital expenditure in delivering streetscape upgrade programmes, and as a result, the consequential OPEX may be quite significant.

Figure 4.9-5 Street lighting operations and maintenance expenditure summary by area
Source: LTP Budget Model 12 April 2012 after refresh for AMP



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	Total lit network (km)	Annual average $/km
North	23%	4,116	4,151	4,186	4,222	4,257	4,294	4,330	4,367	4,404	4,441	4,479	43,131	1,007	$4,283
Central	31%	5,463	5,509	5,556	5,603	5,651	5,699	5,747	5,796	5,846	5,895	5,945	57,248	1,324	$4,324
West	23%	4,043	4,077	4,112	4,147	4,182	4,218	4,254	4,290	4,326	4,363	4,400	42,370	652	$6,498
South	22%	3,895	3,928	3,962	3,995	4,029	4,063	4,098	4,133	4,168	4,203	4,239	40,818	1,433	$2,848
Total		17,517	17,665	17,816	17,967	18,120	18,274	18,429	18,586	18,744	18,903	19,064	183,567	4,416	$4,157

Table 4.9-10 Street lighting OPEX operations and maintenance
Source: File AMP Financials January 2012 (27 January 2012

Expenditure type ($000s)	2011/12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-yr total 2013 to 2022
Sub-total electricity	12,071	12,174	12,277	12,382	12,487	12,593	12,700	12,808	12,917	13,027	13,137	126,501
Sub-total maintenance	5,445	5,492	5,538	5,585	5,633	5,681	5,729	5,778	5,827	5,876	5,926	57,066
O&M total	17,517	17,665	17,816	17,967	18,120	18,274	18,429	18,586	18,744	18,903	19,064	183,567

Also, provision of street lighting in new subdivisions is associated with growth and is typically taken over by Auckland Transport after the subdivision is vested with Auckland Council. Consequential OPEX will be required for on-going maintenance of these new street lighting assets.

4.9.11 Renewal needs

Renewal strategy

The renewal strategy is important in developing a forward renewals programme to deliver Auckland Transport's street lighting service outcomes.

The following considerations are pivotal in decision making processes for prioritising street lighting renewals works into the forward works programme:

- Deterioration of asset and risk of operational or structural failure
- Strategic importance and location within the road network hierarchy (high-use areas, intersections)
- Safety issues, based on inspections, incidents and complaints received
- Assets reaching the end of their economic life.

The primary driver in developing the CAPEX renewal forward works programme is to achieve the LOS performance targets that deliver the agreed customer LOS.

Another driver for street lighting renewals comes from the Auckland Transport holistic 'whole-street approach' to replace street lighting in conjunction with other street renewal projects, such as roads upgrades, and undergrounding power and telephone lines.

For the purposes of this AMP, the renewal plan is constrained by requirements of physical asset-condition lifecycle management, rather than by forecasting the likely funding envelope, i.e. the renewal plan is asset-condition driven rather than financially constrained. This will clearly inform stakeholders of the true picture of the network condition, and what is required physically and financially over the next 10 years. Stakeholders can therefore agree on optimised renewal options.

It is intended that renewals for the region will approximately match the normal deterioration and expiry of street lighting assets. However, at this stage it is unclear whether the proposed level of renewals expenditure will achieve renewals quantities that match normal deterioration and expiry of the street lighting assets. Likewise, the extent of the required catch-up renewals from historical under-investment in renewals is unclear. This issue requires further analysis and is expected to be presented in future versions of this AMP.

The general decision-making strategy for the street lighting network has been to:

- Renew poor and very poor condition assets (condition 4 and 5 assets); doing so tends to decrease maintenance costs
- Replace wooden, fibreglass and concrete columns with approved columns from the ATCOP list
- Replace obsolete luminaires with approved luminaires from the ATCOP list
- Progressively replace fluorescent luminaires (e.g. compared to fluorescent bulbs, SON produce higher output levels, better quality light, cheaper operating costs and longer lifespans)
- Reduce the energy cost of the street lighting network by installing energy-efficient luminaires and control systems.

Street light renewals are coordinated to occur with utility company overhead-to-undergrounding (OHUG) programmes and other street upgrade work such as footpath and kerb-and-channel renewal.

As mentioned earlier in Section 4.9.9, Key issues, Auckland Transport could utilise more energy-efficient luminaires – in particular, LED lights in place of existing High Pressure Sodium (HPS) lights. According to available information, use of LEDs could create power savings as high as 40 per cent (while maintaining similar light levels on streets). LED lights have other advantages, such as longer life (20 years), better light distribution, lower light pollution and white light. However, there are other factors to be considered, such as the high capital cost of installing LED lights. As well, if the upgrade included the entire network, this would involve changes of lighting colour which may, in different lighting environments, affect the vision and reactions of road users.

Renewal plan

Auckland Transport's decision-making process for street lighting renewals is summarised as follows:

Asset inspection	Identify assets requiring immediate remedial works, capital works, operational works, monitoring and investigation works. General recommendations for subsequent action may follow. Such actions could include replacing the asset or some of its components. The inspections are detailed in the annual RAMM report
Preparation of forward works programme	Produce a three-year indicative programme for renewal forecasts, using condition and performance assessments and risk-assessment criteria to determine future works
Validation	Verify sites, by means of a validation-walkover, prior to finalising the annual forward works programme
Confirmation of asset ownership status	Verify the accuracy of asset-ownership status, e.g. private, Auckland Council, Auckland Transport, NZTA
Prepare one-year detailed work plan	Outline the condition and performance rating for each street lighting asset and safety issue, providing the recommended capital/operational works and forward works programme. Revise the budget for each renewal project or work package
Coordination of programmes	Ensure on-going liaison with utilities and other asset groups so that knowledge of their renewal plans is understood. Utility renewals are co-ordinated with Auckland Transport renewals where practical

Renewal analysis

Renewals are required to restore an asset to its service potential once it has deteriorated to a condition where it no longer provides the required LOS and/or where it is near to the end of its useful life.

The street lights renewals have been analysed by using the following methods:

Condition-based method

The condition-based method gives priority to renewing the worst condition first. Where the asset condition is below the minimum agreed service levels (typically poor and very poor condition grades 4 and 5), this asset is considered to be part of the backlog of renewals. Where condition data is lacking, assumptions may be made generally over the condition of the network but for not individual sites.

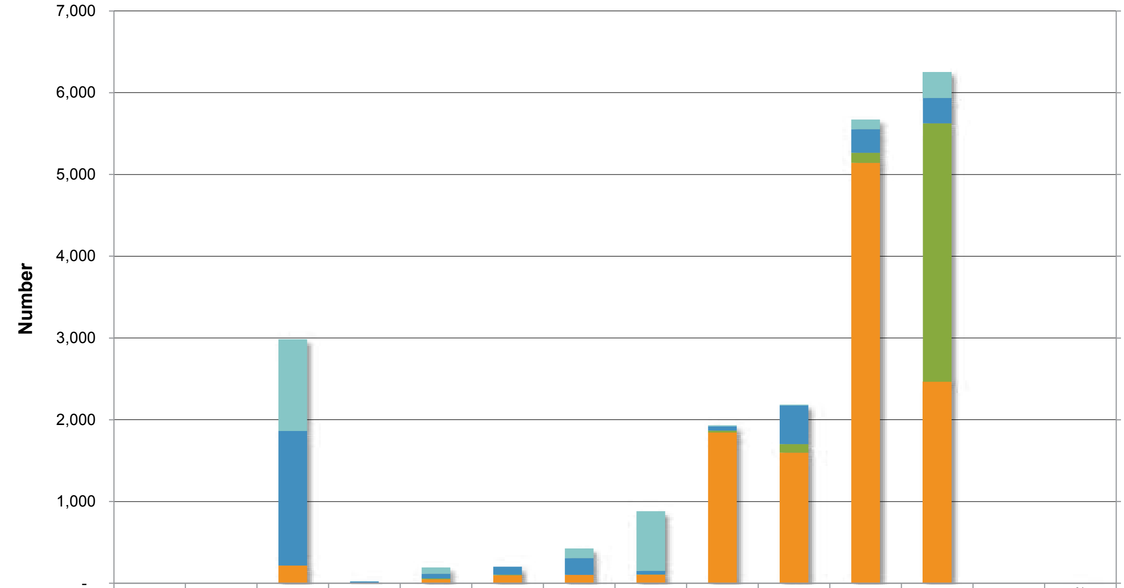
The data confidence in street lighting condition is considered to be 'uncertain to reliable' with approximately 50 per cent of street lights rated for condition.

The following analysis of renewals is based on the current condition of the assets and uses whole-of-life deterioration to identify indicative renewal needs.

It also assumes the following:

- Base data has been output directly from RAMM
- Condition date if unknown defaults to GPS date – if this is unknown then a default of 2010 has been assigned
- Only street light assets in Auckland Transport roads, wharves and bus stations (which have a group description of Auckland Transport) have been analysed
- Only maintenance area codes of 1, 2, 3 or 4 (corresponding to North, Central, West and South respectively) have been analysed
- Minimum remaining useful life is one year
- Replacement costs have been taken from the 2011 valuation – asset types with 0 years' base life and $0 replacement costs have not been included in quantities
- No data validation has been undertaken.

Figure 4.9-6 Street light columns condition-based renewal results
Source: Auckland Transport RAMM system (March 12)



	No. of Components	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	% Components renewed 2013-22
North	13,187	0	1,122	2	77	0	119	728	11	9	120	317	2,505	19.0%
Central	14,421	0	1,646	23	58	97	204	44	54	475	288	308	3,197	22.2%
West	7,198	0	0	0	11	7	0	4	22	104	122	3,161	3,431	47.7%
South	24,963	0	217	0	49	99	104	105	1,845	1,598	5,143	2,465	11,625	46.6%
TOTAL (number)	59,769	0	2,985	25	195	203	427	881	1,932	2,186	5,673	6,251	20,758	34.7%

Lighting columns

Based on the condition analysis (refer to Section 4.9.6, condition rating), the 10-year condition-based renewal profile for lighting columns is shown in Figure 4.9-6. Seven per cent of assets in all regions are poor and very poor condition (grades 4 and 5), with 43 per cent of unknown condition columns. The profile shows that there are renewals expected in the Central and North area for the first year, whereas few renewal needs are shown in West area until 2021, when the renewal cost is expected to be as high as about six million, half of the total renewal expenditure for that year. A significant increase of renewals needs in the South area is also expected after five years of renewals for only condition grade 4 and 5 (poor and very poor).

Condition is unknown for 43 per cent of all street light columns; for analysis purposes, this portion has been assigned a default condition grade of 3.

Brackets

Based on the condition analysis (refer to Section 4.9.6, condition rating), the 10-year condition-based renewal profile for lighting brackets is shown in the Figure 4.9-7. The RAMM data shows that about one-third of the condition of brackets is unknown and three per cent of assets in all regions are in poor and very poor condition (grades 4 and 5). Assuming the grade 4 and 5 assets will be replaced over the next five years results in renewals needs totalling 40,000 units, or nearly 50 per cent of the network total.

Condition is unknown for 38 per cent of all street light brackets; for analysis purposes, this portion of the brackets has been assigned a default condition grade of 3.

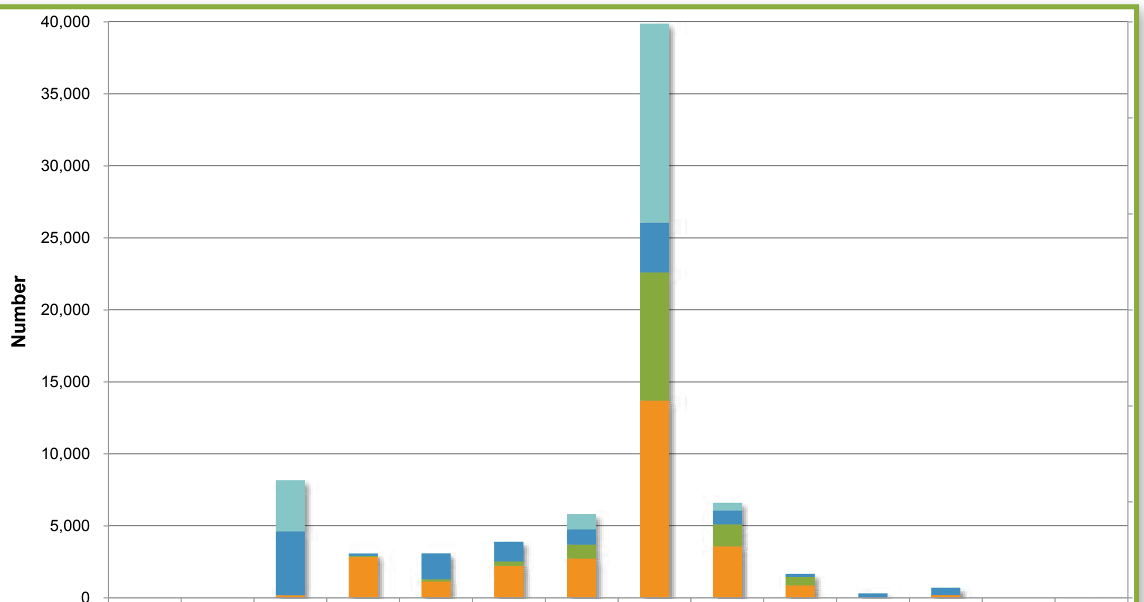
Luminaires

Based on the condition analysis (Section 4.9.6, Condition rating), the 10-year condition-based renewal profile for street lights (luminaires) is shown in Figure 4.9-8. The RAMM data shows that about one-third of the condition of brackets is unknown and two per cent of assets in all regions are in poor and very poor condition (grades 4 and 5). The renewals need for all regions is identified, resulting in renewing 65 to 70 per cent of assets over 10 years, except for the Central area which will have 22 per cent of lights renewed after 10 years.

Condition is unknown for 30 per cent of all street light lights; for analysis purposes, this portion of the brackets has been assigned a default condition grade of 3.

Figure 4.9-7 Street light brackets condition-based renewal results

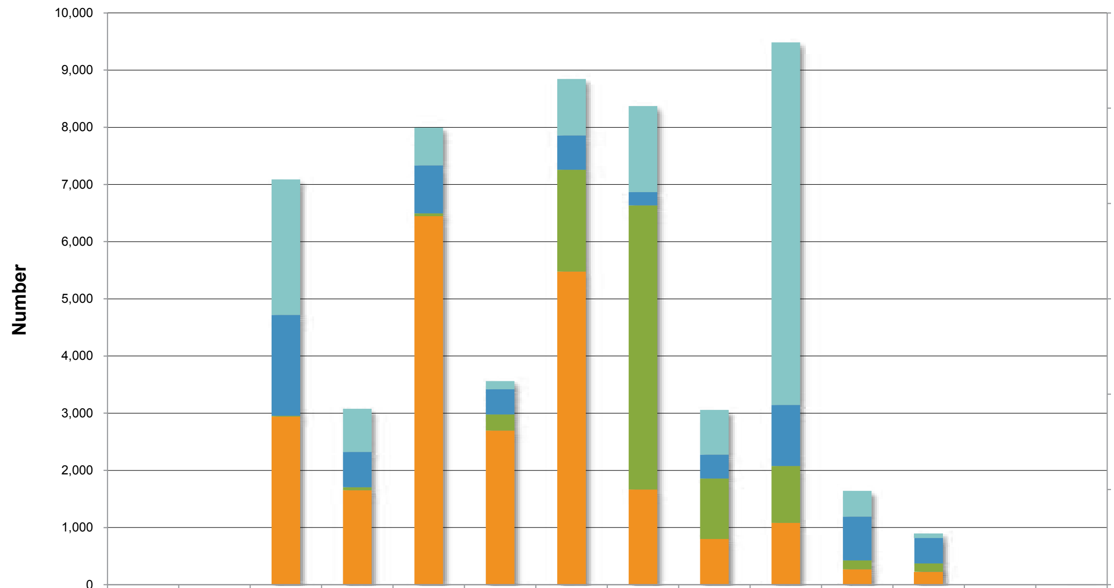
Source: Auckland Transport RAMM system (March 12)



	No. of Components	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	% Components renewed 2013-22
North	22,463	0	3,566	0	12	8	1,063	13,825	551	13	15	22	19,075	84.9%
Central	31,876	0	4,423	179	1,788	1,374	1,053	3,464	951	207	313	502	14,254	44.7%
West	13,765	0	14	78	163	298	967	8,893	1,531	589	0	0	12,533	91.0%
South	29,692	0	173	2,834	1,133	2,228	2,735	13,698	3,579	868	0	192	27,440	92.4%
TOTAL (number)	97,796	0	8,176	3,091	3,096	3,908	5,818	39,880	6,612	1,677	328	716	73,302	75.0%

Figure 4.9-8 Street lights condition-based renewal results

Source: Auckland Transport RAMM system (March 12)



	No. of Components	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	% Components renewed 2013-22
North	22,804	0	2,368	757	662	144	987	1,503	783	6,341	449	76	14,070	61.7%
Central	32,730	0	1,764	615	838	440	600	233	419	1,068	767	444	7,188	22.0%
West	13,862	0	12	55	48	282	1,778	4,970	1,057	994	156	145	9,497	68.5%
South	30,417	0	2,943	1,652	6,447	2,696	5,479	1,665	800	1,083	270	227	23,262	76.5%
TOTAL (number)	99,813	0	7,087	3,079	7,995	3,562	8,844	8,371	3,059	9,486	1,642	892	54,017	54.1%

Age-based method

The age-based method programmes renewals at or near the end of the assets useful life, which corresponds to the number of years of useful life after the initial installation or last previous renewals date. This method is sometimes used where condition data is not available or is not as reliable as age-based data.

The data confidence in street lights age is considered to be uncertain with approximately only 25 per cent of street lights rated for age.

Lighting columns

Based on the construction / installation date in RAMM and other available information regarding age, the analysis provides the indicative renewal work for 10 years. The profile shows that only two units have been identified to be renewed over 10 years.

Where construction dates are unknown the following default dates have been applied:
Central = 2008
North = 2005
South = 2007
West = 2010

Brackets

Based on the construction / installation date in RAMM and other available information regarding age, the analysis provides indicative renewal work for 10 years. The profile shows identifies only six per cent (608 units) of street light brackets for renewal over 10 years, mainly in year nine and 10.

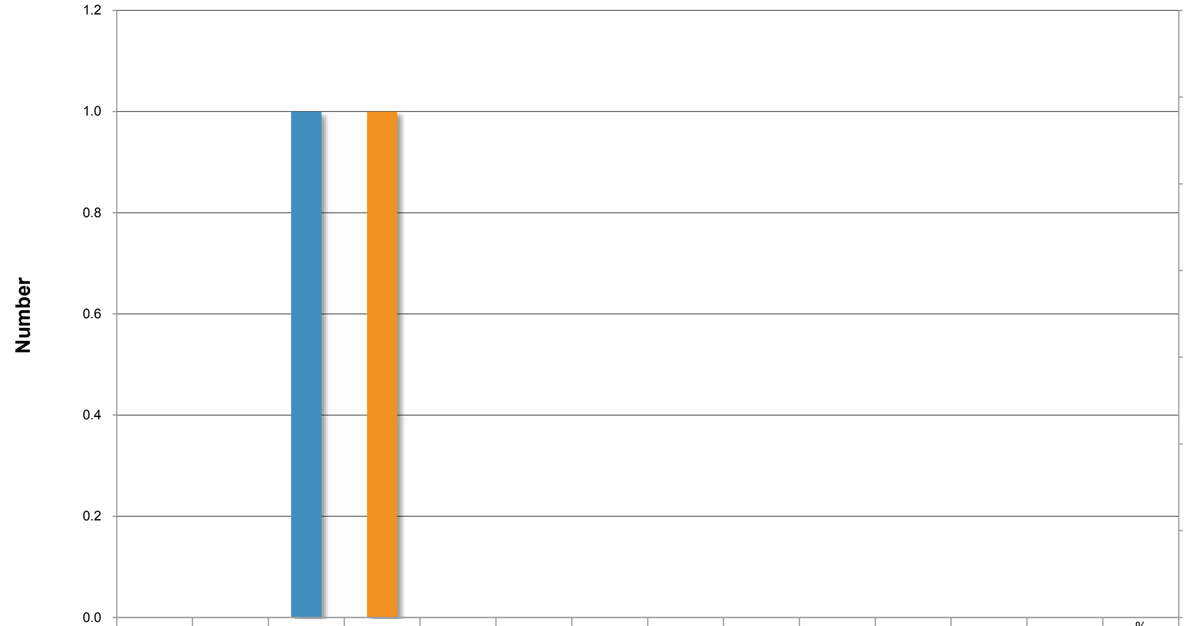
Where construction dates are unknown the following default dates have been applied:
Central = 2008
North = 2005
South = 2001
West = 2007
All street light brackets have been included in the analysis as there is no data to differentiate ownership

Luminaires

Based on the construction / installation date in RAMM and other available information regarding age, the analysis is done to provide the indicative renewal work for 10 years. The profile shows that only 3.3 per cent (3280 units) of the total are identified to be renewed over 10 years, all in year 10, while the luminaires in the West area are not likely to be renewed.

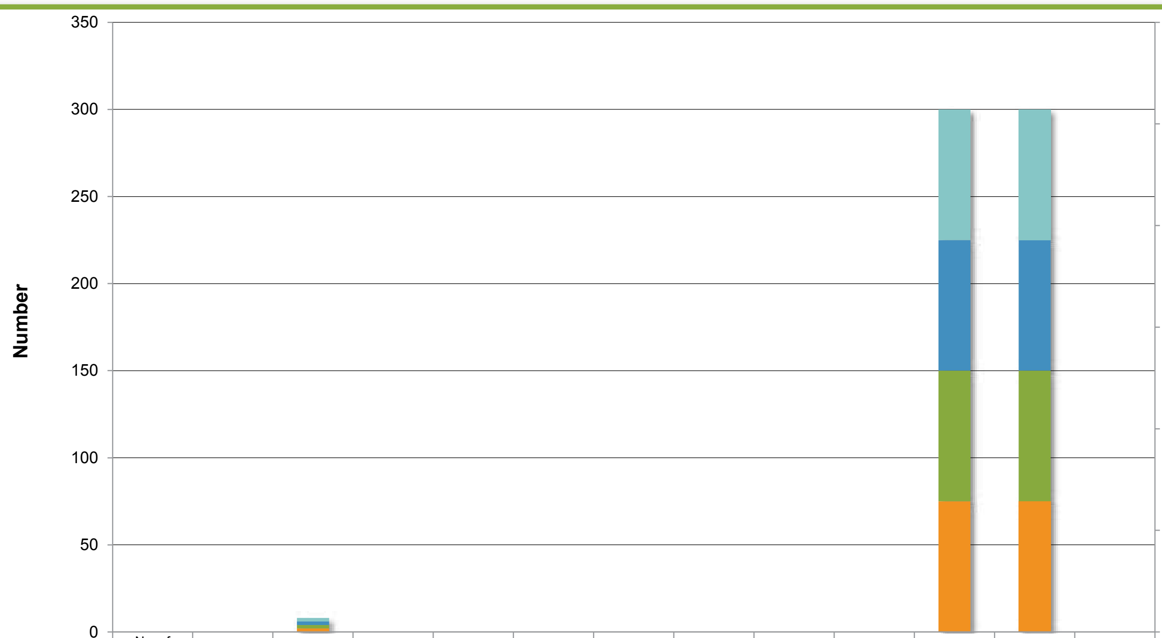
Where construction dates are unknown the following default dates have been applied:
Central = 2008
North = 2009
South = 2011
West = 2001
All street light lights have been included in the analysis as there is no data to differentiate ownership

Figure 4.9-9 Street lights columns age-based renewal results
Source: Auckland Transport RAMM system (March 12)



	No. of Components	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	% Components renewed 2013-22
North	13,187	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
Central	14,421	0	1	0	0	0	0	0	0	0	0	0	1	0.0%
West	7,198	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
South	24,963	0	0	1	0	0	0	0	0	0	0	0	1	0.0%
TOTAL (number)	59,769	0	1	1	0	0	0	0	0	0	0	0	2	0.0%

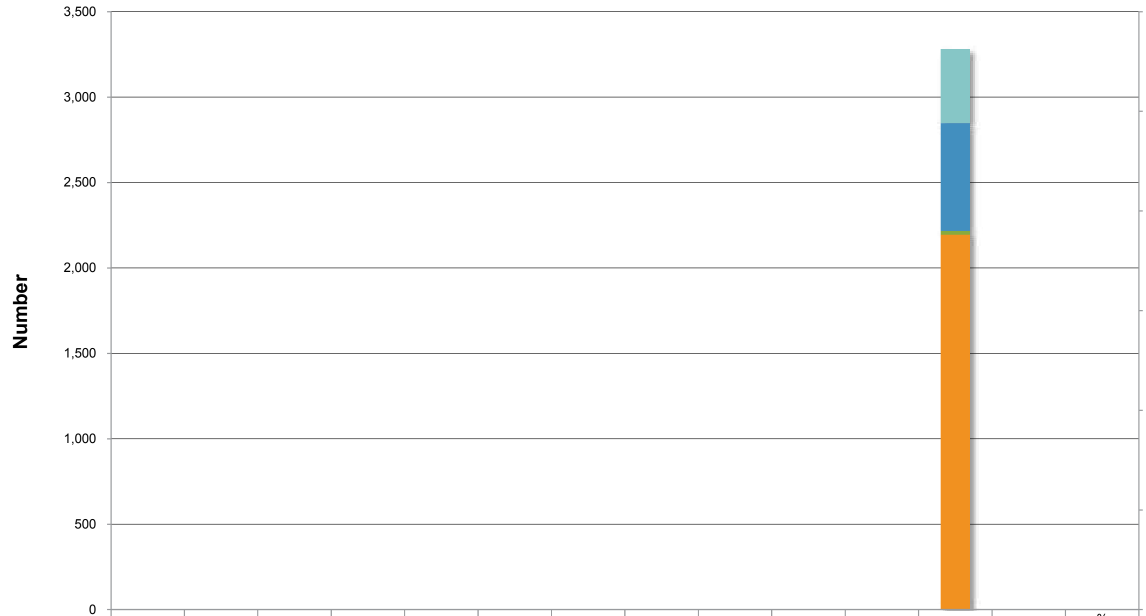
Figure 4.9-10 Street lights brackets age-based renewal results
Source: Auckland Transport RAMM system (March 12)



	No. of Components	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total
North	22463	0	2	0	0	0	0	0	0	0	75	75	152
Central	31876	0	2	0	0	0	0	0	0	0	75	75	152
West	13765	0	2	0	0	0	0	0	0	0	75	75	152
South	29692	0	2	0	0	0	0	0	0	0	75	75	152
TOTAL (number)	97796	0	8	0	0	0	0	0	0	0	300	300	608

Figure 4.9 11 Street lights age-based renewal results

Source: Auckland Transport RAMM system (March 12)



	No. of Components	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	% Components renewed 2013-22
North	22,804	0	0	0	0	0	0	0	0	0	0	432	432	1.9%
Central	32,730	0	0	0	0	0	0	0	0	0	0	631	631	1.9%
West	13,862	0	0	0	0	0	0	0	0	0	0	23	23	0.2%
South	30,417	0	0	0	0	0	0	0	0	0	0	2,194	2,194	7.2%
TOTAL (number)	99,813	0	0	0	0	0	0	0	0	0	0	3,280	3,280	3.3%

Operational priorities

Operational priorities may dictate service level requirements which in turn may influence the need and priority for renewals.

Operational priorities for street lighting assets include prioritising condition and need over age, e.g. a bracket in very poor condition may not merit replacement based on age but, for safety reasons, needs replacement. Priorities include replacing non-steel columns with steel columns, and replacing the columns on arterial routes programmed for improvement works.

Historical trends

The legacy data sets currently offer insufficient commonality to provide a reliable regional view of historical expenditure trends. A future improvement is to implement consistent tracking of expenditure by asset type and expenditure type over time. This will enable robust expenditure trends analysis in future.

Depreciation profile

The annual depreciation for street lights rises from approximately $7 million to $8 million over the next 10 years as indicated in Table 4.9-11.

The proposed annual renewals expenditure also rises from approximately $7 million to $8 million over the same time. Therefore, it appears that the proposed street lighting renewals programme over the next 10 years is approximately equal to the rate of depreciation.

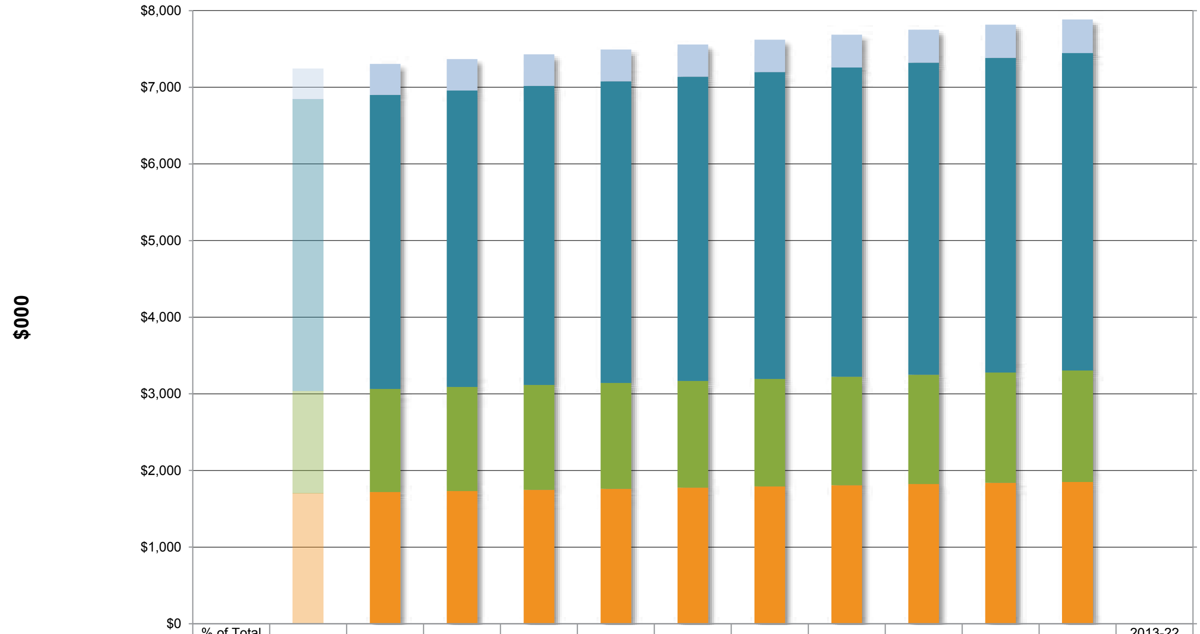
Renewals 10-year work and expenditure forecast

The analyses given above provide varying levels of indicative renewal work for the future. This demonstrates the current difficulty of forecasting future renewal needs.

Table 4.9-11 Street lighting depreciation forecasts
Source: Auckland Transport infrastructure depreciation profiles (25 April 2012)

Profile	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Depreciation ($ millions)	7	7	7	7	7	8	8	8	8	8	8	83

Figure 4.9-12 Street lighting renewals expenditure
Source: LTP Budget Model 12 April 2012 after refresh for AMP



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total
North	6%	402	406	409	413	416	420	423	427	431	434	438	4,218
Central	53%	3,804	3,836	3,869	3,902	3,935	3,968	4,002	4,036	4,070	4,105	4,140	39,861
West	18%	1,334	1,345	1,357	1,368	1,380	1,392	1,403	1,415	1,427	1,439	1,452	13,978
South	24%	1,703	1,718	1,733	1,747	1,762	1,777	1,792	1,807	1,823	1,838	1,854	17,852
TOTAL	100%	7,244	7,305	7,367	7,430	7,493	7,557	7,621	7,686	7,751	7,817	7,883	75,909
Renewals (equiv. pole set)		2,415	2,435	2,456	2,477	2,498	2,519	2,540	2,562	2,584	2,606	2,628	25,303

Considering the current funding constraints being experienced by Auckland Transport and Auckland Council, the recommended 10-year renewals needs are shown in Figure 4.9-12. Note however that the actual renewals plan to be approved by Auckland Transport and Auckland Council may yet differ from these network needs because of the impact of funding constraints.

The total 10-year renewals expenditure forecast for the street lighting network is approximately $76 million. The average annual expenditure of $7.6 million may or may not be sufficient to sustain the deterioration of the lighting network assets, as nearly half of the network is in unknown condition. The expected renewal quantity of street lighting assets per year is shown by using the equivalent pole-set approach (assumed cost per pole set = $3,000).

Backlog of renewals

Each network area has a different amount of renewals catch-up needed to meet the specified LOS. This is due to historical under-investment in renewals.

Table 4.9-12 Assumed indicative forward works programme of street light renewals

Street lighting asset	Proposed renewal expenditure ($)	Assumed unit renewal cost (net $)	Annual renewal quantity (no.)	Network quantity	Percentage of network renewed annually	Average useful life (years)	Average expiry rate (%)
Columns	4,300,000	2,100	2,048	59,769	3.4	30	3.3
Brackets	1,250,000	400	3,125	97,850	3.2	30	3.3
Luminaires (lanterns)	1,850,000	500	3,700	100,677	3.7	25	4.0
TOTAL	7,400,000	3,000	n/a	n/a	n/a	n/a	n/a

The lifecycle characteristics for each asset component type are estimated. Further studies are recommended to establish:

- Average useful life (years)
- Expiry rate percentage/year (100/average life)
- Backlog percentage estimated/assumed
- Expiry (number annual rate)
- Backlog quantity at 2011 (number).

As more information becomes available, the above assumptions will require on-going review and confirmation.

In the meantime, to compare the lifecycle deterioration costs of the street lighting network against the current level of expenditure, Table 4.9-12 presents an assumed, indicative annual renewals programme. Showing an annual renewal spend of $7.4 million over the next three years, the table offers annual renewal quantities for columns, brackets and luminaires. These figures do not, however, account for the catch-up backlog of more than seven per cent of assets in poor or very poor condition.

Note: Assumptions require on-going review and confirmation as information becomes available

4.9.12 New works needs

Capital new works plan

Auckland Transport's development and maintenance staff, collaborating with contractors responsible for new street lighting works, manage the capital new works associated with the street lighting network. Strategic drivers for the construction of new street lighting include:

- Service level improvements to increase safety and amenity, and to provide an integrated transport system for safe and convenient night-time driving, while facilitating pedestrian movement alongside and between roadways and public spaces. Such improvements include new infill street lighting at intersections, bends and main roads
- New subdivisions
- Undergrounding projects where power pole supports for street lighting will be removed.

Auckland Transport arranges street lighting new works to occur alongside other street-upgrade work, such as footpath and kerb-and-channel renewal, and the overhead-to-underground (OHUG) programmes (in which Vector columns are removed). Note that some OHUG street lighting works are categorised as renewals and not new works.

Sometimes developers of subdivisions construct new street lighting. Once subdivisions are vested with Auckland Council, Auckland Transport takes over the street lighting.

Capital new works 10-year expenditure forecast

The average annual expenditure for capital new works on street lighting over the next 10 years as shown in Figure 4.9-13 is approximately $2 million or approximately seven per cent of total street lighting expenditure.

Growth-related new works

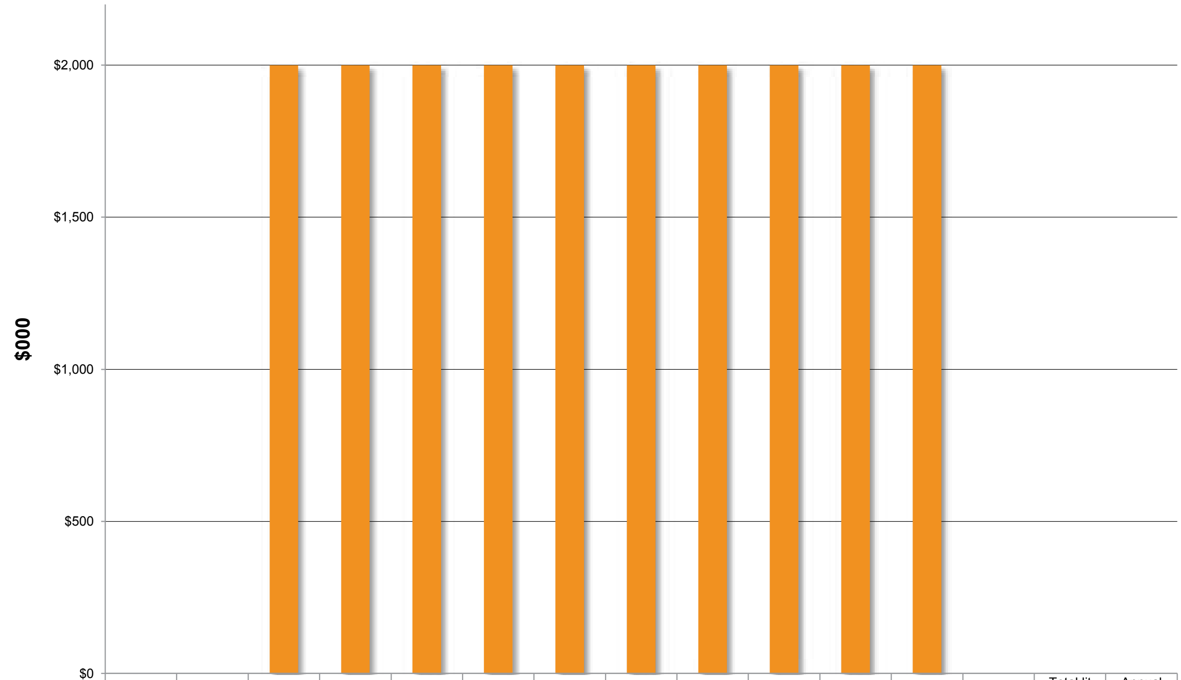
New street lighting is generally a service level improvement and not associated with growth. As such it does not attract development contributions. However, as the number of vehicles increases, or as the network infrastructure changes (e.g. from rural to urban), then there may be greater requirements for street lighting.

Levels of service related new works

Capital projects for LOS improvements are included in the projects and financial projections for capital new works, and typically include special projects associated with city-centre, sub-regional and town-centre streetscape upgrades.

Streetscape upgrade projects for the city centre, sub-regional and town centres will include new works service level improvement work to street lighting. Sometimes this involves undergrounding of overhead power and telephone lines, which typically support street lighting brackets. The streetscape or undergrounding projects necessitate new street light columns and luminaires.

Figure 4.9-13 CAPEX new works expenditure forecast
Source: LTP Budget Model 12 April 2012 after refresh for AMP



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	Total lit network (km)	Annual average $/km/yr
Total		00	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	20,000	4,416	$453
Regionwide	100%	00	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	20,000	4,416	$453

The special projects teams at Auckland Council and Auckland Transport implement and deliver these projects. Upon completion, the new street lighting assets transfer to Auckland Transport, which then takes responsibility for their on-going maintenance and lifecycle renewal planning. These projects are essentially new works, so there will be associated operational expenditure for their on-going maintenance, known as consequential OPEX (captured in the 10-year financial forecast). Refer to the Consequential OPEX section of this LCMP. The capital programme and financial forecast for the street lighting component of city centre streetscape upgrades may appear to be with Auckland Council. If necessary, this issue requires review and reallocation of funds.

Vested assets

New street lighting in new subdivisions is associated with growth and is typically taken over by Auckland Transport after the subdivision is vested with Auckland Council. In these cases it is assumed that development contributions have been calculated and obtained. New street lighting data is typically transferred from as-built plans to the RAMM database and GIS system. Consequential OPEX will be required for on-going maintenance of this new street lighting.

4.9.13 Disposal plan

The disposal of street lighting assets generally relates to damaged and redundant equipment. The disposal of assets after the end of their useful lives as a result of the renewal programme will have a financial and environmental impact.

With an increasing drive for sustainability, there is an increasing practice across the region for disposing of the assets responsibly and recycling them where applicable. Whenever possible, new items will be made of recyclable materials, providing some financial return from decommissioned assets.

According to the maintenance contracts, surplus material and broken items are disposed of at the contractor's off-site dump. Special care is taken with the disposal of gas filled lamps which contain hazardous substances.

4.9.14 Summary of 10-year network needs

Auckland Transport's SAP financial management system contains all expenditure for Auckland Transport lighting.

All values in this AMP allow for expected growth in demand but do not allow for market-price fluctuations over time.

As a base line, the average annual expenditure needs for operations and maintenance, renewals and new works on the street lighting network is approximately $28 million, of which:

- $18 million (66 per cent) is for operations and maintenance; two-thirds of which is for electricity
- $8 million (27 per cent) is for renewals, of which $1.2 million is for replacement of lights where power poles are being replaced by underground lines
- $2 million (7 per cent) is for new works.

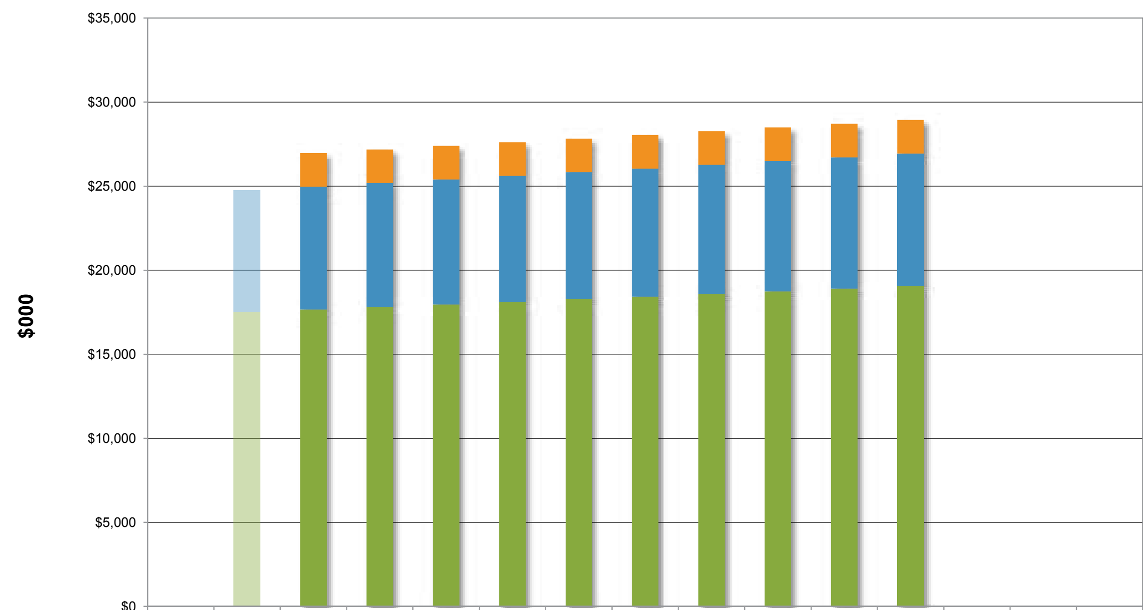
Total expenditure for operations and maintenance, renewals and new works over the next 10 years is $279 million.

Forecast expenditure for street lighting over the next 10 years by activity types is shown in Figure 4.9-14.

Notes on the expenditures in Figure 4.9-14:

- The proposed 10-year capital new works expenditures contained in the above source file are those currently held in the Auckland Transport financial system (SAP) as at March 2012. Auckland Transport has reviewed and prioritised the projects for provisional new works expenditure allocations as subject to the approval from the Auckland Council
- It appears that the Auckland region has zero new works expenditure for street lighting for the next five years from now. This may be due to budget constraints after the upgrades for city centre and Rugby World Cup streetscapes, coupled with large renewals spend until 2019. It is recognised that street lighting improvement projects are often treated as part of the highly prioritised road-corridor renewals / capital projects and are not always shown separately under the street lighting lifecycle management section
- The proposed 10-year base expenditure for operations, maintenance and renewals includes an annual growth factor of +0.85 per cent to allow for consequential OPEX and consequential renewals from growth in the network and growth in demand for services.

Figure 4.9-14 Street lighting expenditure summary by activity types
Source: LTP Budget Model 12 April 2012 after refresh for AMP



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	Network lit (km)	Total $/km/yr
CAPEX New Works	7%	000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	20,000	4,416	453
Renewals	27%	7,244	7,305	7,367	7,430	7,493	7,557	7,621	7,686	7,751	7,817	7,883	75,909	4,416	1,719
Operations & Maintenance	66%	17,517	17,665	17,816	17,967	18,120	18,274	18,429	18,586	18,744	18,903	19,064	183,567	4,416	4,157
TOTAL	100%	24,760	26,971	27,183	27,397	27,613	27,830	28,050	28,271	28,495	28,720	28,947	279,477	4,416	6,329

4.9.15 Approved Long Term Plan envelope

The approved Long Term Plan

This section compares the approved LTP envelope for OPEX and renewals with the street lighting network needs as determined by this AMP at a regional level and identifies the likely impacts of any variances. Revenue and funding incomes to Auckland Transport (from Auckland Council ratepayers and NZTA government subsidies and the like) are allocated through the approved Long Term Plan budgets. The LTP was adopted on 28 June 2012.

OPEX impacts

Based on the information in Table 4.9-13, street lighting operational expenditure shows no variance between the LTP allocated budgets and the AMP needs. However, it is anticipated that the LTP will require further efficiency savings and therefore a funding gap for street lighting operational expenditure may eventuate.

Renewals impacts

Based on the information above, street lighting capital renewals expenditure shows no variance between the LTP allocated budgets and the AMP needs.

Further efficiency savings

As required by the approved LTP, a further reduction in OPEX of $18.6 million per year, reducing to nil by 2016/17, will need to be allocated against asset related operational budgets. The impact of this reduction on street lighting operational budgets is yet to be assessed and finalised.

Monitoring and management of Long Term Plan consequences

The consequences resulting from these variances will be monitored and reported as appropriate.

CAPEX new works

CAPEX new works contained in this AMP are derived from draft LTP listings as at April 2012 and are produced in section 4.9.12.

The capital new works programme has been further refined and adopted in late June 2012. Details of this adopted programme are contained in the LTP.

AMP inflation effects

Un-inflated and inflated street lighting needs for the AMP are as shown in Table 4.9-14.

Table 4.9-13 Variance between LTP approved budget and AMP network needs for street lighting (all un-inflated)
Source: LTP Budget Model 12 April 2012 after refresh for AMP and revised LTP Budget Model 28 June 2012'

Street lighting	10-year total LTP approved budget ($000s un-inflated)	10-year total AMP network needs ($000s un-inflated)	Variance 10-year total ($000s un-inflated)
Operations and maintenance	183,567	183,567	0
Renewals	75,909	75,909	0
Street lighting total	259,476	259,476	0

Table 4.9-14 Un-inflated and inflated street lighting AMP needs
Source: LTP Budget Model 12 April 2012 after refresh for AMP and revised LTP Budget Model 28 June 2012

UN-INFLATED expenditure ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M		17,665	17,816	17,967	18,120	18,274	18,429	18,586	18,744	18,903	19,064	183,567
Renewal		7,305	7,367	7,430	7,493	7,557	7,621	7,686	7,751	7,817	7,883	75,909
Street lighting total		24,970	25,183	25,397	25,613	25,831	26,050	26,272	26,495	26,720	26,947	259,476
AC Inflator	OPEX	3.30%	3.30%	3.30%	3.30%	3.50%	3.60%	3.10%	3.10%	3.30%	3.60%	n/a
AC Inflator	CAPEX	3.90%	3.40%	2.80%	2.90%	3.10%	3.30%	3.50%	3.70%	4.00%	4.00%	n/a
INFLATED expenditure ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M		18,248	19,011	19,805	20,673	21,599	22,458	23,351	24,326	25,416	26,555	221,442
Renewal		7,590	7,915	8,206	8,515	8,854	9,224	9,628	10,069	10,561	11,076	91,637
Street lighting total		25,838	26,926	28,011	29,188	30,453	31,682	32,979	34,395	35,977	37,631	313,079

Table 4.9-15 Un-inflated and inflated street lighting LTP budgets
Source: LTP Budget Model 12 April 2012 after refresh for AMP and revised LTP Budget Model 28 June 2012

UN-INFLATED expenditure ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M		17,665	17,816	17,967	18,120	18,274	18,429	18,586	18,744	18,903	19,064	183,567
Renewal		7,305	7,367	7,430	7,493	7,557	7,621	7,686	7,751	7,817	7,883	75,909
Street lighting total		24,971	25,183	25,397	25,613	25,830	26,050	26,271	26,495	26,720	26,947	259,476
AC Inflator	OPEX	3.30%	3.30%	3.30%	3.30%	3.50%	3.60%	3.10%	3.10%	3.30%	3.60%	n/a
AC Inflator	CAPEX	3.90%	3.40%	2.80%	2.90%	3.10%	3.30%	3.50%	3.70%	4.00%	4.00%	n/a
INFLATED expenditure ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M		18,248	19,011	19,805	20,673	21,599	22,458	23,351	24,326	25,416	26,555	221,442
Renewal		7,590	7,915	8,206	8,515	8,854	9,224	9,628	10,069	10,561	11,076	91,637
Street lighting total		25,838	26,926	28,011	29,188	30,453	31,681	32,978	34,395	35,977	37,631	313,079

LTP inflation effects

Un-inflated and inflated street lighting budgets from the LTP are as shown in Table 4.9-15.

4.9.16 Revenue sources

Revenue to maintain and renew street lights comes from the NZTA subsidy and ratepayer funding. The NZTA subsidy for operations and maintenance expenditure (OPEX), capital renewals expenditure (CAPEX) and service level improvement works is currently set at 44 per cent. Projects funded by NZTA from 2009/10 include the maintenance of Belisha beacon controlled pedestrian crossings.

Obtaining NZTA financial assistance for LOS improvements is unlikely, except possibly on major arterial roads.

Auckland Transport's SAP financial management system contains revenue and funding incomes to Auckland Transport.

Operations and maintenance revenue

Street lighting operations and maintenance is normally subsidised by NZTA, so the majority of the operations and maintenance expenditure on street lighting is funded jointly by central government and Auckland ratepayers.

Capital renewals and new-works revenue

Street lighting renewals and new works may qualify for NZTA financial assistance, so the majority of the capital expenditure on street lighting is funded jointly by central government and Auckland ratepayers.

Within Auckland Transport, the street lighting renewals and new works budget provides renewals and new works funding for the street lighting network.

The renewal budget's purpose is to maintain a LOS by intervening either before the end of the useful life of an asset, or before the condition of the asset falls below an agreed level. Targeted rates funding is solely to raise the LOS of street lighting to the agreed levels, renewing assets in poor or very poor condition, to moderate condition and above.

Note that renewals budgets may fund some capital improvement components of the renewals programme. As well, rates or loans generally fund some capital new works related to safety and levels of service improvements; and developers in new subdivisions generally fund and provide some capital new works catering for growth and demand.

4.9.17 Key improvement initiatives

Key improvement initiatives relating to street lighting are shown in Table 4.9-16.

Table 4.9-16 Key improvement initiatives

Improvement area	Description	Priority
Street lighting 1	• Improve the way Auckland Transport manages its assets, including on-going monitoring of renewal expenditure trends. • Clearly show what is happening to the physical condition and age of the network to confirm if the renewals spends and works are optimum, without under-investment or over-investment • Develop renewals stories/narratives showing current and projected backlogs with proposed forward works programme renewals $s and works • Manage renewals catch-up (historical under investment) by the proposed street lighting renewals expenditure with agreed timeframes. Do not over-invest in renewals, delay if programmed too soon	High
Street lighting 2	• The development of improved, robust links between financial needs, LOS and associated risks will be a key future improvement.	High
Street lighting 3	• Develop a framework for LOS improvement • Prioritise service levels and funding for street lighting over roads, bus shelters, car parks and pedestrian facilities • Improve understanding of the community's willingness to pay for street light upgrades	High
Street lighting 4	• All of the street lighting policies, strategies and standards from the legacy councils need to be reviewed and consolidated into new regional and if appropriate, local ones. See this LCMP section on key issues for more details • Review recent and current trials in LED street lighting technology and stay abreast of this technology • Improve the control of street lights by adopting the international practice to connect each street light directly onto the electricity network and control each light individually	High
Street lighting 5	• Develop new policies and standards for the region • Develop policies to promote innovations in street lighting technology, such as LED lamps which have the potential to reduce power costs by about 50% and improve lamp reliability	Medium
Street lighting 6	• Improve asset knowledge by completing condition rating for Auckland Transport-owned street lighting asset (as part of RAMM development) • Complete terminology changes in RAMM (e.g. street lighting 'poles' to 'columns') • Complete 100% of network ground visit to identify the inventory condition and age of street lighting key components, by the end of 2012	Medium
Street lighting 7	• Review the working relationship with electricity distribution network owners to provide an integrated and coordinated service • Improve knowledge of actual power consumption and how efficiency savings can be realised	Medium
Street lighting 8	• Allocate costs in a more transparent way to provide a regional approach for prioritisation. This issue requires review and reallocation of funds if necessary For example, it is unclear whether the proposed levels of renewals expenditure will achieve renewals quantities for each of the street lighting asset types that match the normal deterioration and expiry of street lighting assets, or to what degree, if any, the level of required catch-up renewals from historical under-investment in renewals will be; this issue requires further analysis which is expected to be presented in future versions of the AMP • Expenditure, revenue and funding incomes to Auckland Transport are contained in Auckland Council's SAP financial management system.	Medium
Street lighting 9	Trial new innovative practices and products. Options include revising standard specification to allow the use of recycled materials	Medium
Street lighting 10	• Provide 20-year horizons for the AMP forward-works programmes and financials. Provide a deterioration analyses for each asset type and LCMPs	Low

4.10 Contents. Lifecycle Management Plan.

4.10 Traffic Systems and Operations

4.10.1 The service Auckland Transport provides

Traffic systems and operations are integral components of the transport network and help deliver an effective and efficient transport system by optimising traffic flows. They help deliver safety outcomes by enforcing mode separation and managing traffic-flow conflicts at busy intersections.

The traffic systems and operations levels of service (LOS) most relevant to the network are:

- Quality – the suitability of traffic systems' design and the standard of their maintained condition
- Reliability – traffic systems' role in reducing road peak congestion and maintaining journey time reliability across the network
- Ease of use – traffic systems facilitate safe navigation and efficient journeys
- Vehicle safety – traffic systems facilitate safe movement of traffic and alert road users of impending hazards.

Details of the traffic systems and operations LOS being measured are provided in Section 2, Levels of Service. Several of these measures and targets are yet to be developed (TBD) or confirmed (TBC) and will be included in the improvement plan.

Measures against key LOS are shown in Table 4.10 -1 for indicative purposes.

4.10.2 Network overview

Traffic systems include traffic signals and other devices that control and monitor the flow of traffic. Traffic systems also alert road users to hazards and provide essential travel information. Overall, these systems improve safety and increase the efficiency of traffic movement.

Auckland Transport's traffic systems include signal equipment, CCTV, electronic signage and red light cameras. Traffic signals facilitate separation of conflicting traffic movements at controlled intersections and crossings to avoid potential collisions. The signals are programmed to optimise the flow of traffic through the intersection to improve efficiency and reduce delays. Traffic signals are also coordinated to optimise the flow of traffic across the corridor. Signalised pedestrian crossings provide safety and accessibility for vulnerable road users.

CCTV facilitates visual monitoring of major routes and intersections. This enables quick response to incidents to minimise the impact on the wider network.

The operation of traffic systems is undertaken by the Joint Transport Operations Centre (JTOC). JTOC is a joint venture between Auckland Transport and NZTA. The partnership agreement between the parties was signed in October 2011. Its purpose is to facilitate integrated traffic management across the Auckland region.

Traffic systems under Auckland Transport ownership include 536 signalised intersections, 135 signalised pedestrian crossings, 127 CCTV cameras and four red light camera units. These systems have many asset components:

- Traffic signal equipment including poles, lanterns, controllers
- Monitoring equipment including CCTV, SCATS
- Electronic signs – 40km/h school speed zone signs, driver feedback signs, real-time travel information signs, variable message signs and safety warning signs
- Red light cameras
- Ducts, cables and loops.

Table 4.10-1 Traffic systems and operations levels of service

Service value	Level of service	Service measure	Current performance	Target performance (indicative/to be developed and agreed)
Quality	Assets are maintained in good condition	Percentage traffic signals operational on the network at any given time	99%	98%
		Percentage of traffic control systems in moderate condition (grade 3) or better	98%	95%
Reliability	Improve or maintain road travel time reliability	Percentage response time to signal outages within standard timeframes	88%	90%
		Percentage of arterial routes with signal optimisation in place	5%	10%
		Percentage Corridor Productivity maintained or improving on key arterial routes	TBC	Maintain at 50% of the ideal
Easy to use	Improve navigability across the network	Percentage of arterial network with real time information (signage) available	TBC	0.08
Vehicle safety	Improve community road safety	40kph variable school speed zones implemented	10	Improve baseline

In addition to management of related assets, traffic systems involves:

- Traffic operations – responsible for investigating traffic safety and other network improvements related to operation of traffic-control devices
- Road safety – investigates safety improvements which can be facilitated through traffic control devices.

These operational activities consist of professional services for investigations, design and minor physical works.

4.10.3 Network valuation

The value of traffic systems assets is shown in the Table 4.10-2. It excludes electronic signs and red light cameras because appropriate asset data was not available for these items at the time of valuation.

4.10.4 Network asset details

There are 536 signalised intersections and 135 signalised pedestrian crossings in the Auckland Transport network. The signalised intersections and pedestrian crossings by area are shown in Table 4.10-3.

There are many sub-assets or components that make up traffic systems assets. Table 4.10-4 describes the traffic systems asset components.

Table 4.10-2 Traffic systems valuation
Source: Auckland Transport asset revaluation (30 June 2011)

Asset	Optimised replacement cost (ORC) $000s	Optimised depreciated replacement cost (ODRC) $000s	Annual depreciation (ADR) $000s
Traffic systems	60,797	35,405	4,494

Table 4.10-3 Signalised intersections and pedestrian crossings
Source: Auckland Transport RAMM database (February 2012)

Area	North	Central	West	South	Total
Signalised intersections	80	251	62	143	536
Signalised pedestrian crossings	18	68	10	39	135

Table 4.10-4 Classification of traffic systems asset

Asset group	Components
Traffic signal equipment	The asset components of signals include lanterns, poles, controllers, target boards, logic racks, detector cards and pedestrian call boxes. The quantities for the signal equipment are shown in the traffic systems inventory table
Monitoring and control equipment – CCTV, SCATS equipment	This includes CCTV cameras and SCATS equipment such as computers, SCATS server etc. There are 127 CCTV cameras in the Auckland Transport network
Red light camera	Auckland Transport owns four red light camera units
Electronic signs	This includes 40km/h school speed zone signs, driver feedback signs, real time travel information signs, variable message signs and safety warning signs. The asset components include signs, poles, solar panels, controllers and speed detection equipment
Ducting, cables and loops	These include ducts, communication cables, power cables and detection loops

Table 4.10-5 shows the quantity of significant asset components by area.

The three major components of traffic signals are lanterns, controllers and poles. Figure 4.10-1 shows the distribution of lantern types by area. LED is the preferred lantern type as it has low energy consumption and long life. It has a higher initial capital cost and lower whole-of-life cost compared to other types.

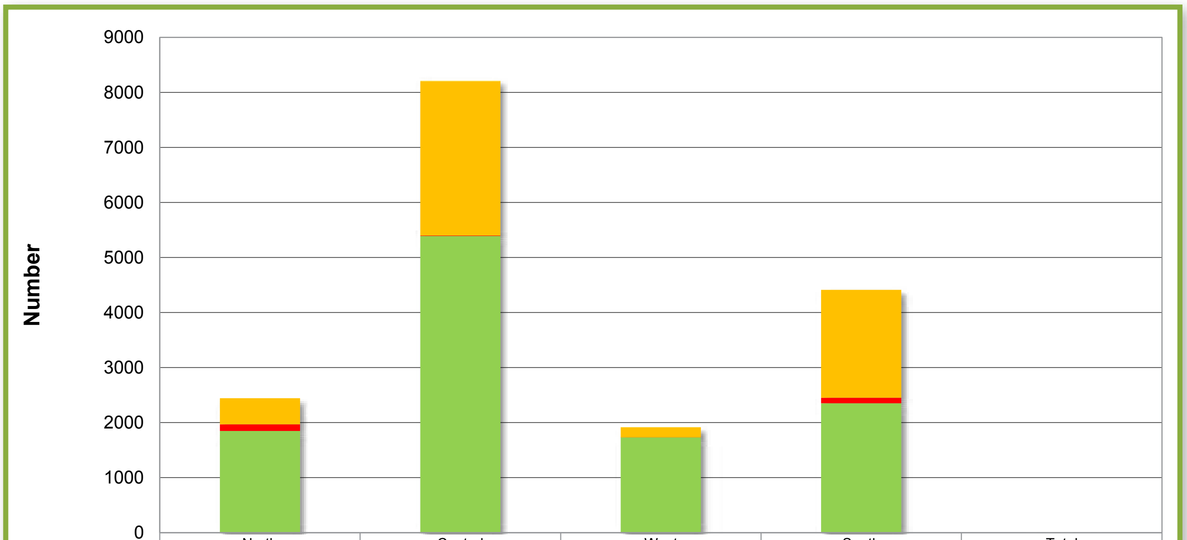
Figure 4.10-2 shows the distribution of controller types by area. TSC4 is the preferred controller type for renewals as all makes and models of TSC3 are out of production.

Figure 4.10-3 shows the distribution of pole types by area. The choice of the pole type is based on functional requirement.

Table 4.10-5 Traffic systems asset inventory
Source: Auckland Transport RAMM database (February 2012)

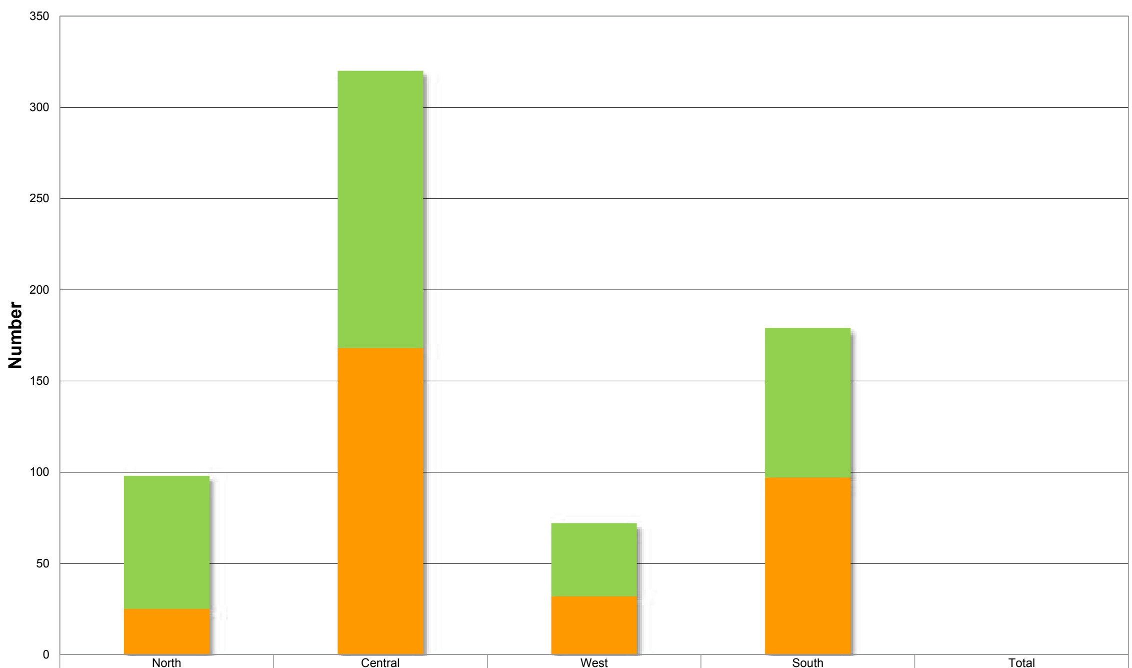
Asset	North	Central	West	South	Total
Controller	98	320	72	179	669
Detection card	102	338	94	201	735
Lantern	2,442	8,211	1,920	4,412	16,985
Logic rack	98	320	72	179	669
Ped call box	520	1,815	401	908	3,644
Pole	740	2,453	517	1,260	4,970
Target board	1,340	4,563	1,039	2,474	9,416
CCTV	17	68	22	20	127

Figure 4.10-1 Lamp types by area
Source: Auckland Transport RAMM database (February 2012)



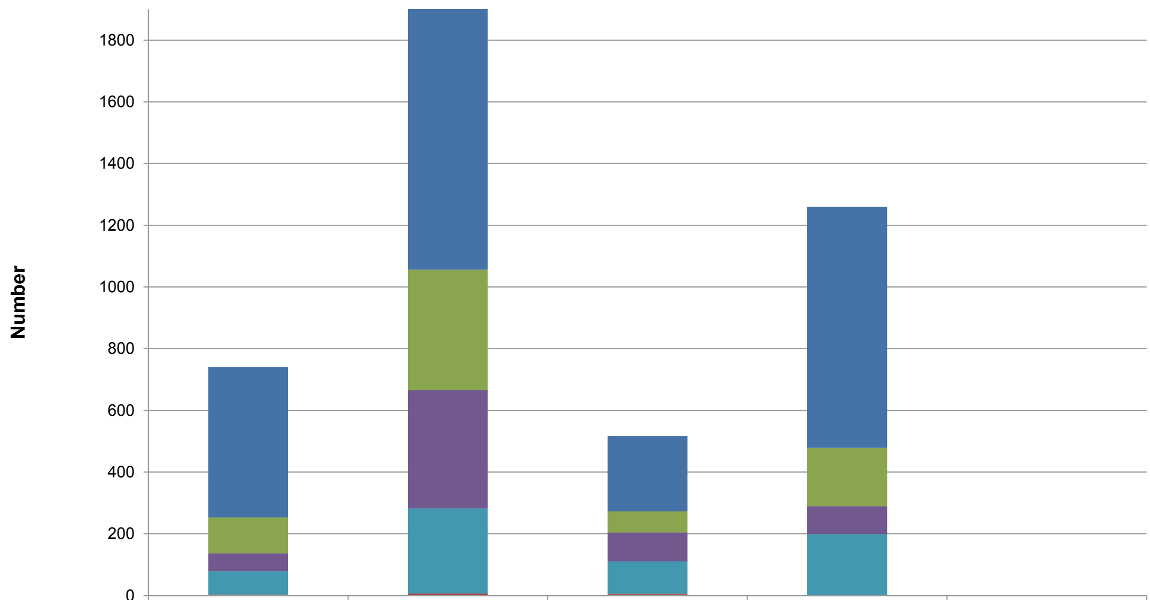
	North	Central	West	South	Total
Incandescent		7	6		13
Quartz Halogen	474	2804	180	1958	5416
LED Inserts	117	8	1	103	229
LED	1851	5392	1732	2347	11322
Unknown			1	4	5

Figure 4.10-2 Controller types by area
Source: Auckland Transport RAMM database (February 2012)



	North	Central	West	South	Total
TSC4	73	152	40	82	347
TSC3	25	168	32	97	322

Figure 4.10-3 Pole types by area
Source: Auckland Transport RAMM database (February 2012)



	North	Central	West	South	Total
STANDARD	487	1397	245	781	2910
MASTARM	117	391	68	190	766
JUSP	58	383	94	91	626
JUMA	76	276	105	198	655
Frangible 5m			1		1
COMBINATION	2	6	4		12

Useful life

Traffic systems includes assets of varying lifecycle characteristics. The durability of these assets depends on type, materials, location and exposure to weather.

The average useful life of lanterns and target boards is 15 years. Ped call boxes have an average life of 10 years and CCTV cameras last for five years. Among the many types of poles currently used on the network, useful lives differ significantly. The average useful life of a signal pole is estimated to be 35 years.

4.10.5 Asset data confidence

The RAMM database holds asset information for the traffic systems, including condition rating information. The assessment of data confidence is based on the grading system and methodology described in Section 2.4.5 of the International Infrastructure Management Manual 2011.

Table 4.10-6 illustrates Auckland Transport's confidence in the reliability of the asset information for traffic systems in its asset database.

The asset information for traffic systems is considered reliable. The asset data for these assets is well managed by comprehensive data collection and maintenance regimes.

Table 4.10-7 shows the completeness of inventory data by asset type.

Electronic signs are part of traffic systems which does not have complete information in RAMM. Asset data for these assets is being collected and updated currently.

4.10.6 Asset condition

Condition rating

Periodic condition rating surveys of all traffic systems are undertaken by maintenance contractors. The condition of the assets is assessed and updated in RAMM by regular inspection and subsequent repair or maintenance.

Traffic systems condition profile

Traffic systems are critical assets comprised of electronic components. Malfunction or outage of these assets will have a serious impact on the safety and efficiency of the network. These assets have strict condition inspection regimes and the condition information is mostly complete. The conditions of the major asset components of traffic systems are shown in the Figure 4.10-4. This indicates that the majority of the traffic systems assets are in moderate or better condition.

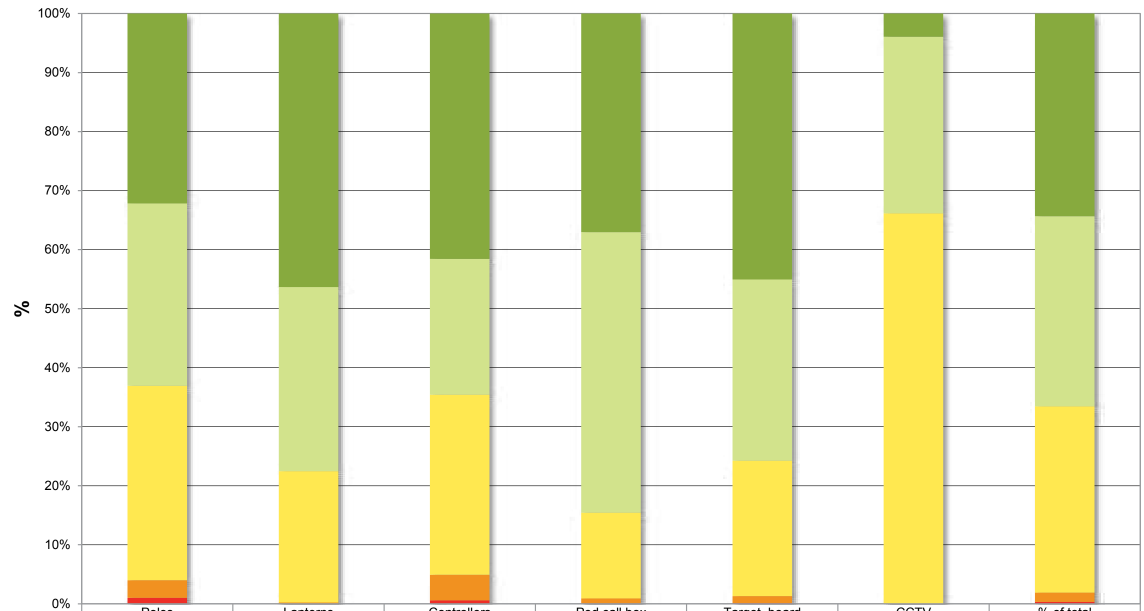
Table 4.10-6 Traffic systems data confidence and reliability
Source: Auckland Transport RAMM database (February 2012)

Data attribute	Data confidence			
	Very uncertain	Uncertain	Reliable	Highly reliable
Asset descriptors and quantity				
Asset age				
Condition				
Performance				

Table 4.10-7 Completeness of inventory data
Source: Auckland Transport RAMM database February 2012

Completeness of inventory data			
Asset	Measure	Age	Condition
Poles	100	92	100
Controllers	100	97	100
Lanterns	100	98	100
Ped call box	100	95	100
Target board	100	97	100
CCTV	100	100	100

Figure 4.10-4 Traffic systems condition profile
Source: Auckland Transport RAMM database February 2012



	Poles	Lanterns	Controllers	Ped call box	Target board	CCTV	% of total
Very Good	32%	46%	42%	37%	45%	4%	34%
Good	31%	31%	23%	48%	31%	30%	32%
Moderate	33%	22%	30%	15%	23%	66%	32%
Poor	3%	0%	4%	1%	1%	0%	2%
Very Poor	1%	0%	1%	0%	0%	0%	0%
Unknown	0%	0%	0%	0%	0%	0%	0%
Total	100%	100%	100%	100%	100%	100%	100%

Failure modes

There are numerous failure modes affecting traffic systems assets. The most common causes of failure are damage due to vehicle collisions, inclement weather and road works. The latter mainly affects the detector loops and detector loop feeder cables.

Vandalism and theft also result in loss of assets. Power circuit faults cause failure of lamps and other electronic equipment.

4.1.7 Asset performance and capacity

Performance

The performance of traffic systems assets impacts on the safety and efficiency of traffic movement. Performance is measured by recording faults and outages affecting the system. The performance of signals is monitored remotely through the SCATS system. CCTV also assists in monitoring the performance of the network. Travel time has been used as a key performance measure and consideration is being given towards adopting corridor productivity as a performance measure. Crash studies measure the safety performance of the network.

Capacity

Increases in traffic and pedestrian volumes warrant capacity improvements of traffic system assets such as signalisation of intersections and crossings and installation of CCTV cameras. Capacity improvements also include upgrading signal equipment such as controllers, and linking isolated intersections to the SCATS system. Optimisation of signal phasing and synchronisation of signals also improves the performance and capacity of the network.

4.10.8 Asset risks and criticality

Asset risks

Risks associated with management and service delivery of traffic systems are shown in Table 4.10-8.

Critical assets

All traffic signals and CCTV are critical assets. The outage or malfunction of signals has a serious impact on the safety and efficiency of the network. CCTV monitoring is critical for the quick response to incidents and blockages. Electronic signs play a key role in preventing accidents by alerting the road users of hazards.

4.10.9 Key issues

The major issues and strategies concerning management of traffic systems are listed in Table 4.10-9.

Table 4.10-8 Traffic systems and operations – risks

No	Risk	Net Risk Factor	Management options
1	Traffic system becomes non-operational due to failure of power supply and communication services	High Risk	Liaise with service providers and develop emergency response plans
2	Damage to traffic system assets due to accidents and vandalism	Medium Risk	Liaise with police to minimise vandalism and theft Ensure safety of traffic systems equipment is considered during design Install railings and/or barriers where appropriate
3	Failure of assets prior to expected useful life	Medium Risk	Exercise caution when approving new products and materials Ensure technical specifications have been met for installation and maintenance of traffic system assets
4	Inappropriate design resulting in maintenance and operational issues	Medium Risk	Consider whole-of-life costs and issues when designing new assets
5	Damage to ducts, loops and cables caused by road works and other utility works	Medium Risk	Develop processes and systems to minimise accidents Ensure proper communication with contractors and utility operators Charge for third party damage

Table 4.10-9 Traffic systems and operations Key Issues

No.	Key Issues	Action Plan	Outcomes
1	Damage of traffic signal components resulting in signal failures, including vehicle detection loops which suffer frequent damage due to trenching for utility services and road works	Monitor and maintain traffic control equipment so that damage and failures are remedied within a set response time. Continually review the advancements in the technology of "vehicle detection" from around the world, especially technology that does not require underground loops	Improved systems to prevent damage to signal assets resulting in reduced failure / outages of signals
2	Improved LOS required for pedestrian crossings in key pedestrian routes and more effective and efficient LOS for other road users	Addition of new signalised intersections, improving pedestrian crossings on key pedestrian routes such as the trialling of countdown timers in Queen Street	Prioritised improvement works for high risk sites with high vehicle and pedestrian volumes
3	High capital investment is required to upgrade to new technology, such as LED lanterns which have long term lifecycle benefits and energy savings	Auckland Transport communicates increased network needs to NZTA and Auckland Council	Agreed funding to implement optimised programmes for new technologies
4	Underground ducting in certain areas is in very poor condition. Significant gaps and aging in the telecommunications network is becoming more problematic and reduces the effectiveness of the signals network	Work with utility companies to address the poor condition of underground ducting in the city centre. Address gaps in, and aging of, the telecommunication network. Improve the "as-built" requirements for all future sites and upgrades	Improved knowledge of underground ducting. Programmes to upgrade ducts in poor condition are implemented
5	The increased cost of maintenance and renewal of multi-function poles introduced recently in some areas will have a significant impact on OPEX. There appear to be issues with faults caused by water infiltration	Multi-function poles are a new asset and their performance is currently being monitored. More stringent review is required before procurement of multifunctional poles	Maintenance, operations and lifecycle costs of new assets are acceptable
6	Lack of adequate asset information in RAMM for electronic signs	Ongoing data collection, coupled with data improvement plans, are in place to improve the quality of both the condition and performance the data of traffic systems	Asset data is up to date

4.10.10 Operations and maintenance needs

Scope of operations and maintenance

Auckland Transport owns, maintains and operates traffic systems to facilitate safe and efficient movement of vehicles and pedestrians. Maintenance and operation of traffic systems includes responsibilities to:

- Adjust signal phasing and synchronise signals to optimise traffic flow
- Constantly monitor traffic through SCATS and CCTV to facilitate response to incidents and emergencies
- Undertake planned and reactive maintenance to mitigate failures of operation of signals and CCTV which immediate affect the network's safety and efficiency. This equipment is maintained to minimise faults and outages
- Keep road users informed through signs and other media about travel times, incidents and potential hazards
- Respond to faults and complaints within target times
- Liaise with service providers to minimise disruption caused by power and communication outages.

Traffic operations are executed by the Joint Transport Operations Centre (JTOC). It undertakes to:

- Provide 24/7 monitoring and proactive management of traffic systems in the Auckland region, including but not limited to traffic signals and CCTV cameras for roads and public transport
- Manage traffic flows across the Auckland Transport network to set LOS and reporting on performance
- Provide input into strategies, policies, plans, processes and guidelines when requested by Auckland Transport
- Provide 24/7 incident management of all unplanned events and/or incidents in accordance with established standards, procedures and guidelines
- Implement optimisation of signals and provide inputs into the optimisation analysis process, and into specific optimisation projects (as requested by Auckland Transport)
- Proactively broadcast and publish travel information
- Take responsibility for receiving and responding to requests from Auckland Transport concerning operation of traffic systems
- Provide recommendations on identification and prioritisation of traffic systems projects to improve road network performance.

Traffic operations

The purpose of the traffic operations unit is to carry out operational management of the network and to service the stakeholder and customer interfaces. The unit is responsible for investigating and responding to public enquiries on traffic and road safety issues. It also investigates and reports to local boards on traffic and safety issues, and provides advice to local boards on traffic management issues within their areas.

The responsibilities of traffic operations also include identification and prioritisation of projects to improve network performance, and the development of projects up to the point of handover to the AT investigation and design and infrastructure development. The transport operations unit is also responsible for reviewing resource consent applications on behalf of Auckland Transport, and it provides advice to Auckland Council.

Road safety

The road safety unit is responsible for identifying, prioritizing and developing projects to improve road safety. Analysis of crash data identifies trends, black spots and focus areas for activities on the network. The unit also provides road safety engineering input into projects undertaken by Auckland Transport. As well, it serves as a liaison for, and co-ordinator of, activities with internal and external partners.

The road safety unit is responsible for the development of a minor safety works programme and safety around schools programme. This involves identification, evaluation and prioritisation of candidate road safety improvement projects. The unit also undertakes investigation and design of road safety improvement projects.

Operations and maintenance plan

Operations

Auckland Transport uses the SCATS to monitor and control signals. The operation of the signals can be controlled and their performance monitored remotely through this system. Using CCTV cameras, staff monitor signalised intersections and major routes. The JTOC at Smales Farm is equipped with staff and facilities to undertake SCATS and CCTV operations. The operation of traffic systems includes:

- Observation and monitoring of signals performance through congestion alerts, system warnings and active monitoring of known areas of congestion and traffic flow breakdown
- Planned on-site monitoring of signals
- Planned route optimisation studies on selected routes, including traffic counting and travel time surveys
- Temporary adjustment to signal phasing to clear queues or other incidents
- Congestion monitoring and remediation
- Incident management to avoid traffic congestion arising from incidents
- Monitoring the faults log generated by SCATS
- Proactive testing of SCATS to ensure route optimisation is functioning as planned
- Updating VMS to advise travellers of abnormal road conditions
- Communication with the media (radio, TV, newspapers, etc.) about traffic conditions
- Receiving complaints from the call centre, and updating service status
- Managing and assisting with traffic management for special events.

Maintenance

The maintenance strategy of traffic systems includes preventive maintenance, scheduled maintenance and unscheduled maintenance.

Preventive maintenance of the network is required for continuity of operation and performance efficiency. Activities are carried out regularly, based on the manufacturer's requirements and the local environment. Such activities include:

- Planned lamp replacements
- Planned cleaning and polishing of lamps
- Condition and operation checks on all vehicle detectors and loops, including those in the SCATS system; carrying out any necessary adjustments and minor repairs arising from such checks
- Checks on the condition and operation of all pedestrian detectors, buzzers and audio/tactile facilities; carrying out any necessary adjustments and minor repairs arising from such checks
- Checks on the condition and operation of all signal hardware and wiring, and the alignment of all lanterns; carrying out any necessary adjustments or minor repairs arising from such checks
- Checks on the condition and operation of all controllers and cabinets; carrying out any necessary adjustments or minor repairs arising from such checks.

Scheduled maintenance includes sizeable activities that are outside the scope of preventative maintenance. In case of damage due to accidents, unscheduled maintenance "patches up" the site to ensure that signals are operational again. A follow up is then initiated to reinstate the site to full operation. Examples include replacing a bent pole, or renewing a badly damaged but functioning lantern.

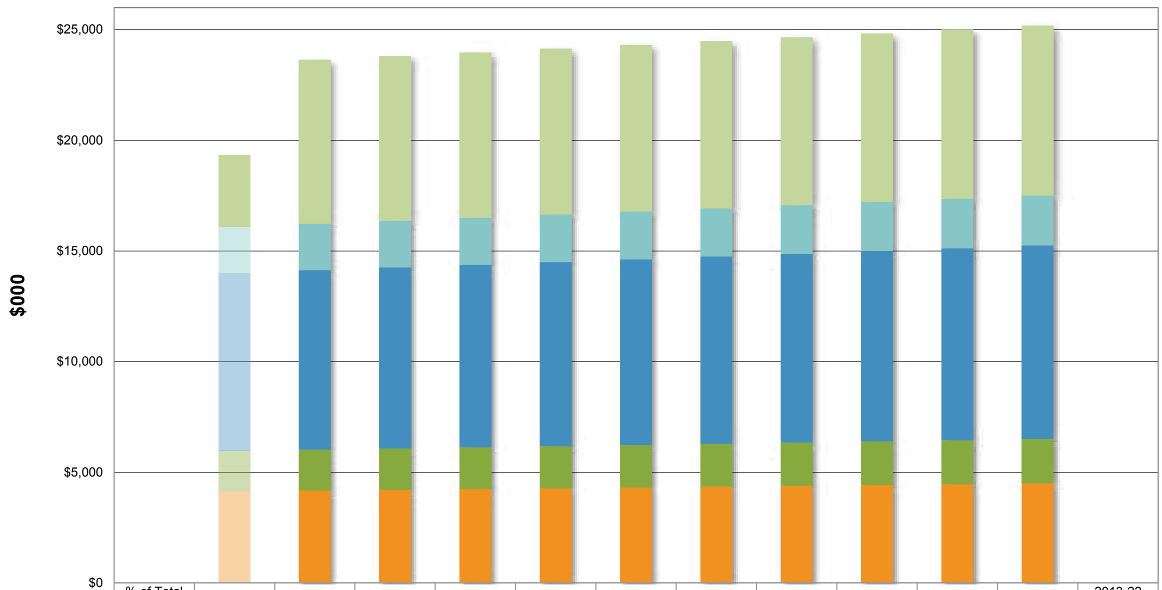
Unscheduled maintenance involves responding to faults/complaints and restoring operations within target response times. Unscheduled work also includes maintenance to fix damages caused by accidents. The quantity of unscheduled maintenance is a measure of performance and is an input to upgrade programmes. It is also a measure of the performance of the maintenance contractor, because it indicates the effectiveness of preventive maintenance and scheduled maintenance work.

Operations and maintenance 10-year expenditure forecast

Operational expenditure, including physical works and professional services, covers a wide range of operations and maintenance activities. This includes JTOC cost, electricity charges, communication costs and the software license costs required to operate the network. This also includes costs of activities undertaken by the traffic operations and road safety units.

The recommended 10-year operational expenditure forecast is shown in Figure 4.10-5. It is based primarily on historical trends but also includes for, to some extent, the revised activities detailed above and LOS to be achieved. This recommendation also takes into account current funding constraints being experienced by Auckland Transport and Auckland Council. Note, however, that the actual plan approved by Auckland Transport and Auckland Council may yet differ from these network needs because of the further impact of funding constraints.

Figure 4.10-5 Traffic systems and operations – operations and maintenance 10-year expenditure needs
Source: LTP Budget Model 12 April 2012 after refresh for AMP



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total
Region Wide	31%	3,251	7,422	7,450	7,477	7,506	7,534	7,563	7,591	7,621	7,650	7,680	75,492
North	9%	2,071	2,088	2,106	2,124	2,142	2,160	2,178	2,197	2,216	2,235	2,254	21,699
Central	35%	8,042	8,111	8,180	8,249	8,319	8,390	8,461	8,533	8,606	8,679	8,753	84,280
West	8%	1,839	1,855	1,871	1,887	1,903	1,919	1,935	1,952	1,968	1,985	2,002	19,276
South	18%	4,133	4,168	4,203	4,239	4,275	4,311	4,348	4,385	4,422	4,460	4,498	43,310
Total	100%	19,336	23,644	23,809	23,976	24,145	24,314	24,486	24,658	24,832	25,008	25,185	244,058

Table 4.10-10 Estimated growth rates of signalised intersections
Source: JTOC

	North	Central	East	West
Average increase rate	**5%**	**2%**	**4%**	**4%**

The recommended operations and maintenance expenditure forecast over the next 10 years is $244 million. The central area has the largest spend due to the presence of higher number of signalised intersections.

Consequential OPEX includes the costs of operations and maintenance of the assets that will be created in the future.

Due to ongoing developments to reduce congestion and improve flow of traffic in the Auckland region, there is likely to be a significant increase in the number of signalised intersections and CCTV surveillance sites. Growth rate of signalised intersections have been estimated for the four areas as shown in Table 4.10-10.

The OPEX expenditure also includes the operation and maintenance of electronic signs. It is likely that more intelligent transportation systems (ITS) assets will be created in the future to adopt new technology. These have proved to be beneficial in improving the safety and efficiency of the network.

State highway revocations

In the near future, NZTA intends to revoke state highway designation for 54km of roads in the Auckland region. The ownership and maintenance will then be transferred to Auckland Transport. There are 20 signalised intersections on these roads, which require an additional annual operations and maintenance expenditure of approximately $150,000.

4.10.11 Renewal needs

Renewal strategy

Asset renewal is the process of restoring the LOS delivered by an asset to its original design level, or close to it, by replacing the worn components. The renewal strategy provides the framework for decision-making around renewals. The strategy focuses on achieving the desired LOS at a minimum lifecycle cost. Table 4.10-11 shows the criteria for renewal of poles, controllers and CCTV cameras – assets which make up the significant portion of the renewal expenditure.

Renewal of traffic systems is primarily driven by deteriorating condition and performance. Renewal also depends on where an asset fits within the manufacturing lifecycle and the manufacturer's support lifecycle. Ideally, an electronic component should be supported for seven years following the end of the manufacturing lifecycle. However, this not always practised: for electronic assets, obsolescence or failure to obtain parts have become significant drivers of the remaining useful life – more so than the product's condition as such.

In the case of controllers, it is the type that defines an asset's life and usability, rather than the make or model. The average useful life of controllers is 15 years. All of the TSC/3 type are out of production, and many of them are out of support. These controllers are maintained, where possible, by repairing and swapping components. However, many are not compatible with newer SCATS improvements features. All of the TSC/4 controllers currently in production are compatible with the latest SCATS improvements and are built to meet the next planned level of SCATS.

Renewal plan

Traffic systems include a wide range of assets with different criteria for renewals. Asset condition is recorded by periodic inspections. Candidates for renewals include assets in poor or very poor condition which cannot be fixed by maintenance. Asset performance is monitored using records of complaints and faults. Poor performance results in increased maintenance costs. The assets are renewed when it becomes uneconomical to maintain them.

Replacement of lamps and other minor components are considered expensed as routine maintenance. Renewals of poles, controllers and CCTV cameras make up the bulk of the programme.

Auckland Transport has renewal contracts in place for the implementation of the programme. JTOC plays a major role in the management of traffic systems and provides key inputs into the development of renewal programmes.

Renewals analysis

Condition-based method

The following analysis of renewals is based on the current condition of the assets and uses whole-of-life deterioration to identify indicative renewal needs. It is difficult to predict the deterioration of assets involving electronic components. Increased frequency of faults also indicates deteriorating condition. Renewal is warranted when it is no longer viable to repair or maintain the asset. The condition information on traffic systems is mostly up-to-date. The analysis uses current condition to estimate the remaining life of the asset. Based on this analysis, the annual renewal quantities are shown in Table 4.10-12.

Table 4.10-11 Asset renewal strategy

Asset	Renewal reason	Strategy
Poles	Condition	Renewal of poles is mostly driven by deteriorating condition
	Age	The expected life of controllers varies on location, material and exposure to weather. Hence age is not the primary consideration for renewals
	Functionality	In a few cases, Auckland Transport replaces poles due to lack of functionality stemming from an inability to house signal equipment, or because of failure to meet revised design standards
Controllers	Condition and performance	The condition and performance is monitored by inspections and the number of faults/complaints recorded. An increase in number and frequency of faults is likely to trigger renewal
	Availability of spare parts	Spare parts for electronics become obsolete after the manufacturer stops their production. The inability to maintain such assets warrants renewals.
	Compatibility	Old controllers which are in good condition are sometimes replaced due to lack of compatibility with newer systems.
	Age	The expected life of controllers varies and some old controllers have lasted beyond their expected life. Hence age is not the primary consideration for renewals
CCTV cameras	Condition and performance	CCTV cameras are replaced based on condition and performance

Table 4.10-12 Condition-based average useful life and recommended annual renewal quantities
Source: JTOC (April 2012)

Average useful life (year)	Component	South	West	Central	North	Total
15	Controllers	9	3	19	4	36
15	Lanterns	201	65	493	74	833
10	Ped callbox	82	36	164	47	329
35	Poles	39	7	97	24	168
15	Target boards	119	32	282	39	472
5	CCTV	4	4	12	3	23

Table 4.10-13 Age-based average useful life and recommended annual renewal quantities

Average useful life (year)	Component	North	Central	South	West	Total
15	Controllers	6	21	12	5	44
15	Lanterns	162	552	329	92	1135
10	Ped callbox	52	181	103	29	365
35	Poles	29	70	37	15	151
15	Target boards	89	307	184	49	629
5	CCTV	3	14	5	4	26

Further details of the condition-based analysis can be found in the appendices.

Age-based method

The useful life for most traffic systems assets have been estimated based on experience. The analysis uses current-age and average useful life to estimate the remaining useful lives of assets. The recommended annual renewal quantities and the average useful life of traffic systems assets are shown in Table 4.10-13.

Table 4.10-14 Unit rates

Asset	Unit rate ($)
Controller	45,000
Pole	4,000
Lantern	3,000
Target board	135
Ped call box	1,000
CCTV	15,000

Further details of the age-based analysis can be found in the appendices.

The unit rates for renewal of traffic systems are based on historical trends and current contracts. Table 4.10-14 shows the unit rates for major traffic systems assets

Operational priorities

The road corridor operations unit and JTOC are responsible for preparing and implementing the renewal programme, which is based on local priorities. The RCO liaises with relevant parties and reviews conflicts and opportunities.

Historical trends

There is currently insufficient historical data to provide a reliable regional view of historical expenditure trends. Future asset management improvement is to implement consistent tracking of expenditure by asset type and expenditure type over time. This will enable robust expenditure trends analysis in future.

Depreciation profile

The total depreciation for traffic systems and operations including surfaces and pavement bases ranges from $4 million to $7 million over the 10 years. The total depreciation of traffic systems over 10 years is $66 million. The 10-year depreciation profile is shown in Table 4.10-15.

Renewals 10-year work and expenditure forecast

The analyses given provide varying levels of indicative renewals work for the future. This demonstrates the current difficulty of forecasting future renewals needs.

Considering the renewals analyses and the current funding constraints being experienced by Auckland Transport and Auckland Council, the recommended 10-year renewals needs are shown in Figure 4.10-6 and Figure 4.10-7. Note however that the actual renewals plan approved by Auckland Transport and the Auckland Council may differ from these network needs because of the impact of funding constraints.

The recommended renewal expenditure for traffic systems for the next 10 years is $65 million. The renewal expenditure for North and Central areas is covered under the region-wide expenditure. The expenditure is not split appropriately by area in the current financial system.

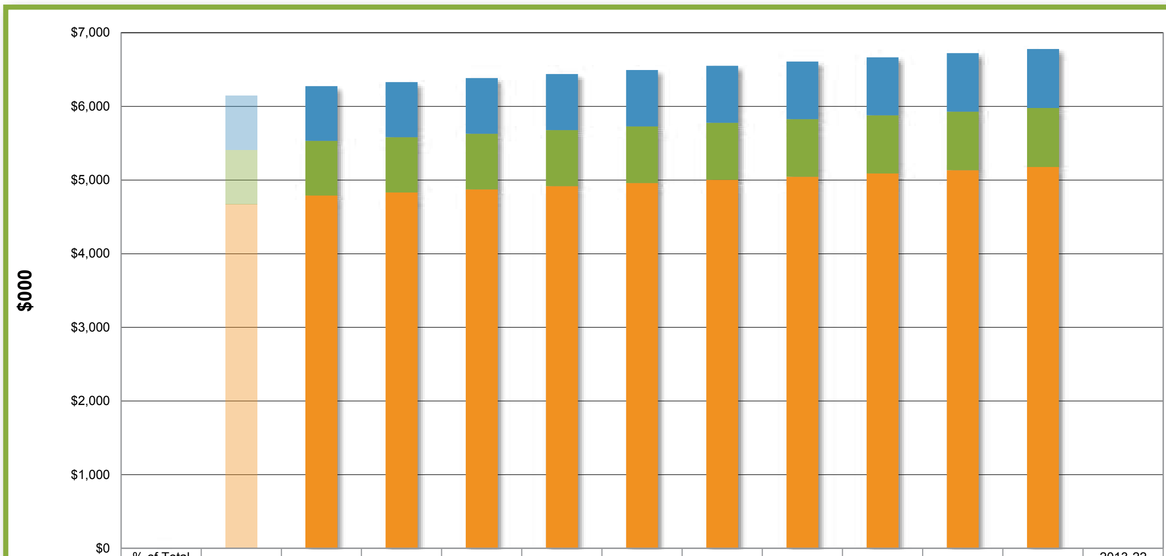
State highway revocations

NZTA intends to revoke the state highway designation for 54km of roads in the region. These roads will then be owned and maintained by Auckland Transport. There are 20 signalised intersections on these roads which require an additional annual CAPEX renewals expenditure of approximately $200,000.

Table 4.10-15 Traffic systems depreciation forecast

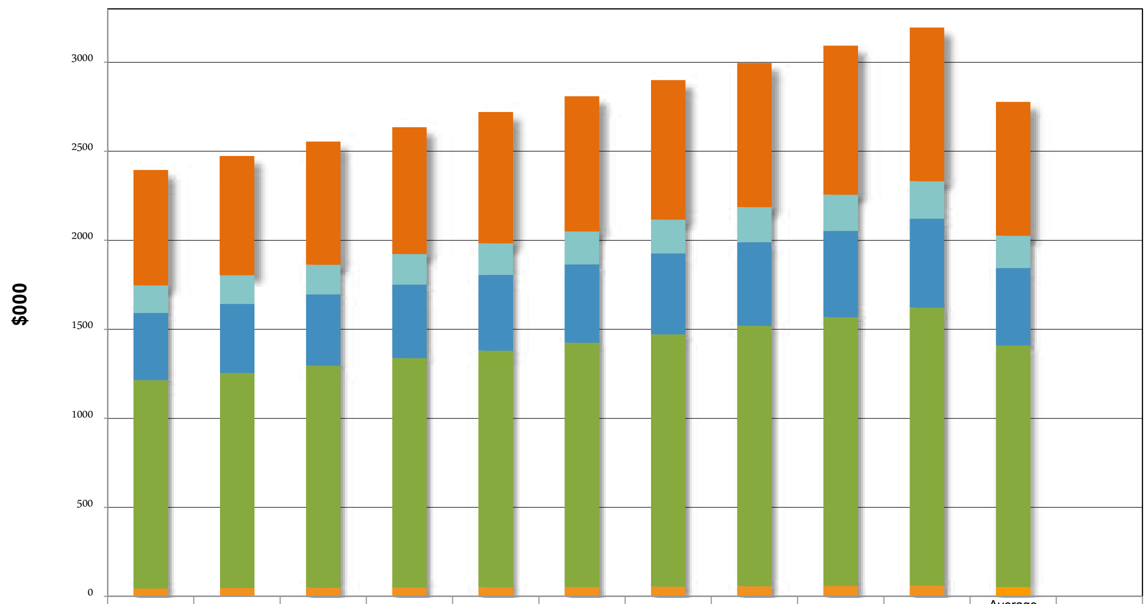
Profile	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 total
Depreciation ($ millions)	4	4	5	5	6	6	7	7	7	7	7	66

Figure 4.10-6 Traffic systems and operations – 10-year renewals expenditure forecast
Source: LTP Budget Model 12 April 2012 after refresh for AMP



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total
North	0%												
Central	0%												
West	12%	735	741	748	754	760	767	773	780	787	793	800	7,704
South	12%	737	743	749	756	762	768	775	782	788	795	802	7,720
Region Wide	76%	4,671	4,790	4,832	4,874	4,916	4,959	5,002	5,046	5,090	5,134	5,179	49,822
TOTAL	100%	6,142	6,275	6,329	6,384	6,439	6,495	6,551	6,607	6,665	6,722	6,781	65,246

Figure 4.10-7 Traffic systems and operations – 10-year renewals work forecast
Source: LTP Budget Model 12 April 2012 after refresh for AMP



	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	Average Annual Quantity	2013-22 Total
Target Boards	648	669	691	712	737	760	784	810	837	864	751	7512
Poles	155	161	167	172	177	184	190	197	203	209	182	1815
Ped Components	377	387	401	413	426	441	455	470	485	501	436	4356
Lanterns	1171	1209	1247	1288	1328	1371	1416	1462	1510	1560	1356	13562
Controllers	44	47	48	50	52	53	55	57	58	61	53	525

Backlog of renewals

Traffic systems are critical assets that have low tolerance for deferral of renewals. Malfunction or outage of these assets has a serious impact on the safety and efficiency of the networks. Assets in poor or very poor condition that cannot be addressed by maintenance are renewed without delay. This is demonstrated by the condition profile of the assets which shows the quantity of assets below average condition is negligible.

4.10.12 New works needs

New works plan

Auckland's growing traffic requires measures to address safety, capacity and efficiency issues. Increased traffic can result in inefficiencies and safety concerns at uncontrolled intersections, and may warrant the need for traffic systems. Auckland Transport is responsible for identifying site requirements and installing the traffic systems that address these issues. New traffic system assets are installed as improvements to the existing network or as part of new roading projects. They include signalisation of uncontrolled intersections, CCTV, electronic signs and signalised pedestrian crossings to improve safety and accessibility for pedestrians. Capital new works also include upgrading existing intersections with additional poles or with new controllers to improve the performance of the intersection.

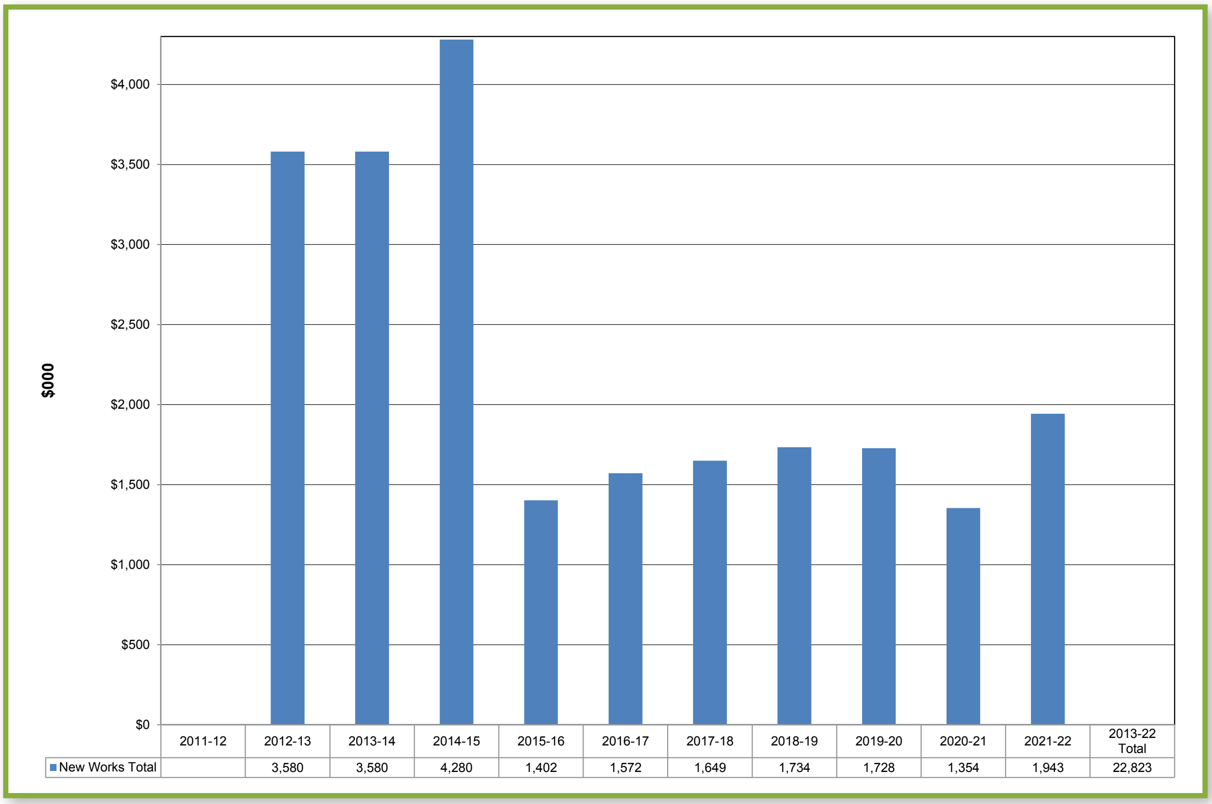
Auckland Transport identifies capital new works items for traffic systems through information obtained from studies, surveys and network modelling.

Corridor studies and crash reduction studies identify sites that have safety issues which could be resolved by implementing traffic systems. Potential new works are also identified through operational issues such as congestion and delay. These come to light through monitoring of the network and customer complaints. Other contributions include feedback obtained from contractors involved in operating the network. Transport planning and traffic modelling identifies needs for signalised intersections on new roading projects and subdivisions.

Auckland Transport evaluates potential sites, and initiates site development where funding criteria is met.

JTOC is involved in all stages of the design and construction of traffic system assets to ensure compliance to standards and consistency across the network.

Figure 4.10-8 Traffic systems and operations new works 10-year expenditure needs
Source: LTP Budget Model 12 April 2012 after refresh for AMP



A summary of capital new works expenditure for traffic systems is shown in Figure 4.10-8.

The recommended capital new works expenditure for traffic systems over the next 10 years is $23 million. $11 million will be spent in the first three years and there will be an average expenditure of $1.5 million for the following years.

New works programmes

Growth related new works

This includes the installation of traffic systems as part of new roading projects or new subdivisions.

Levels of service related new works

LOS improvement projects include signalisation of existing roundabouts or uncontrolled intersections. The installation of new electronic signs and CCTV on the existing network is also a LOS related improvement. Safety and operational issues warranting signalisation occur in a growing number of uncontrolled intersections in the Auckland Transport network. There is also a need for more CCTV and electronic signage to improve monitoring and operation of the network.

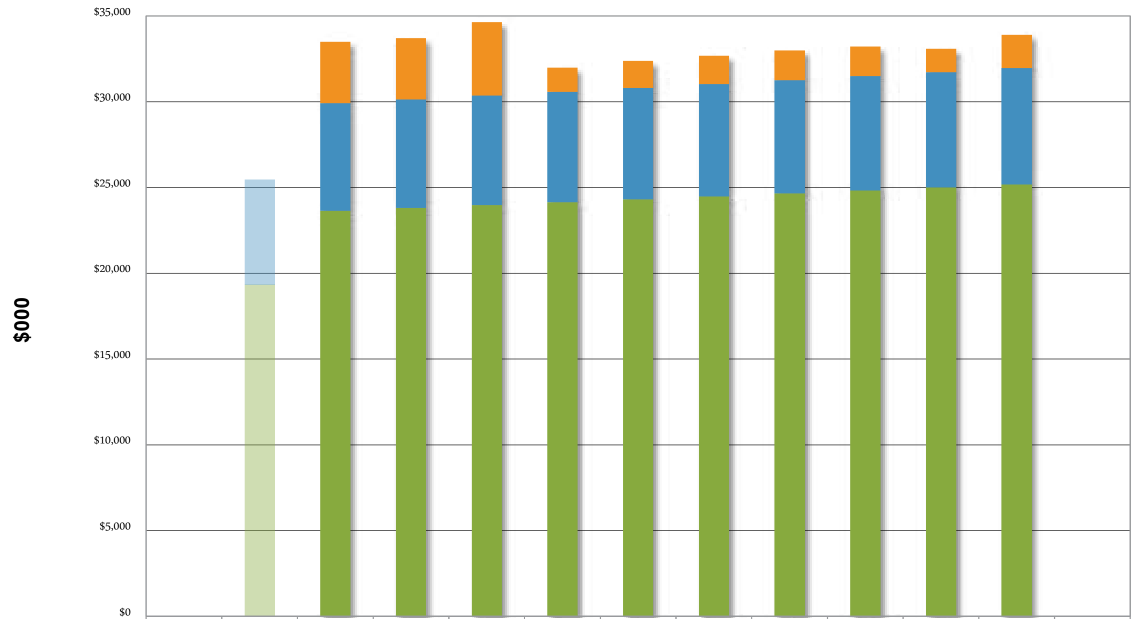
Significant projects include expansion of CCTV on the arterial network. This is an initiative to enable better monitoring and response on the arterial roads. Another major capital improvement is the rollout of real-time travel information signs on major routes such as from the airport to the city centre. The signs provide information for planning journeys.

4.10.13 Disposal plan

The disposal of assets after the end of their useful lives as a result of the renewal programme will have a financial and environmental impact.

With an increasing drive for sustainability, there is a growing focus across the region on responsible disposal of assets, and recycling where applicable. It

Figure 4.10-9 Traffic systems and operations 10-year expenditure summary
Source: LTP Budget Model 12 April 2012 after Refresh for AMP



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total
CAPEX New Works	7%	000	3,580	3,580	4,280	1,402	1,572	1,649	1,734	1,728	1,354	1,943	22,823
Renewals	20%	6,142	6,275	6,329	6,384	6,439	6,495	6,551	6,607	6,665	6,722	6,781	65,246
Operations & Maintenance	73%	19,336	23,644	23,809	23,976	24,145	24,314	24,486	24,658	24,832	25,008	25,185	244,058
TOTAL	100%	25,479	33,498	33,718	34,640	31,985	32,381	32,686	33,000	33,225	33,085	33,909	332,127

is also important, whenever possible, for new items to be made of recyclable materials. For example, LED lantern bodies are to be made of aluminium instead of PVC so that they can be recycled at the end of their useful lives.

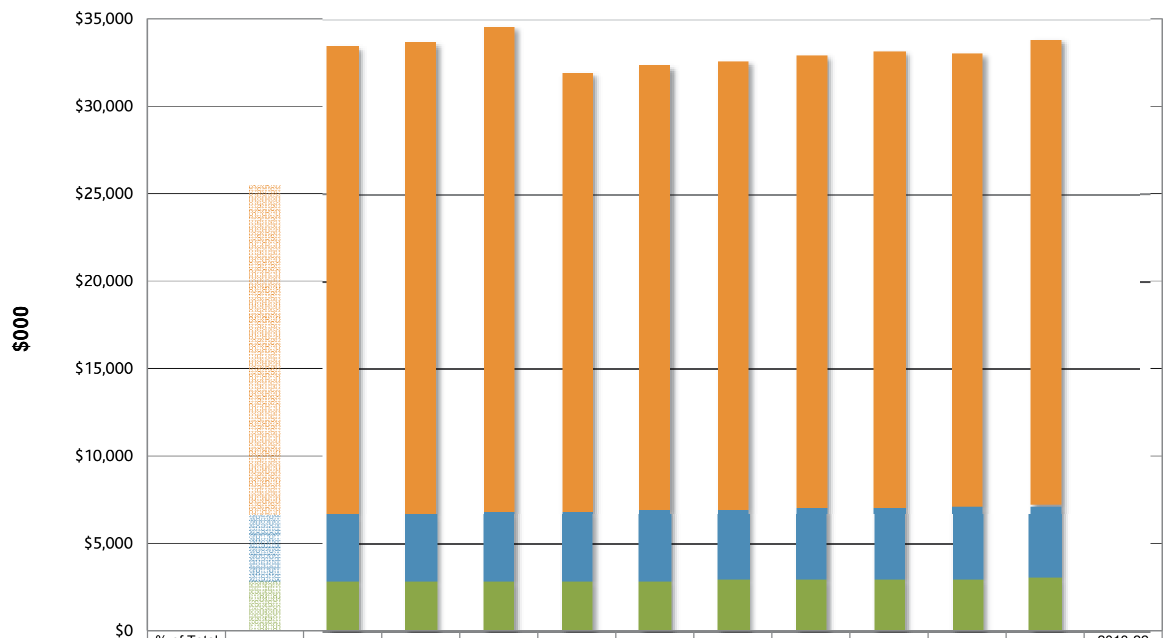
4.10.14 Summary of 10-year network needs

The 10-year expenditure summary for traffic systems and operations is shown in Figure 4.10-9. The total expenditure for traffic systems and operations over the next 10 years is $332 million. This includes $244 million for operations and maintenance, which is 73 per cent of the total expenditure. The capital new works expenditure is 7 per cent of total expenditure and renewals is 20 per cent.

Notes on the expenditures in Figure 4.10-9:

- The proposed 10-year capital new works expenditures contained in this section are those of the Auckland Transport financial system (SAP) as at March 2012
- The proposed 10-year base expenditure for operations, maintenance and renewals includes an annual growth factor of +0.85 per cent to allow for consequential OPEX and consequential renewals from growth in the network and growth in demand for services.

Figure 4.10-10 Traffic systems and operations 10-year expenditure summary (activity)
Source: LTP Budget Model 12 April 2012 after refresh for AMP



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total
Traffic Systems	79%	18,833	26,796	26,959	27,823	25,110	25,448	25,693	25,948	26,113	25,913	26,676	262,478
Traffic Operations	12%	3,814	3,847	3,879	3,912	3,946	3,979	4,013	4,047	4,081	4,116	4,151	39,971
Road Safety	9%	2,832	2,856	2,880	2,905	2,929	2,954	2,979	3,005	3,030	3,056	3,082	29,677
TOTAL	100%	25,479	33,498	33,718	34,640	31,985	32,381	32,686	33,000	33,225	33,085	33,909	332,127

The 10-year expenditure forecast by unit is shown in Figure 4.10-10. The traffic systems expenditure is $262 million, which is 79 per cent of total expenditure. Traffic operations expenditure is $40 million and road safety spend is $30 million over the next 10 years.

The traffic systems expenditure includes capital new works, operations and maintenance, and renewal expenditure for all traffic systems assets. The traffic operations and road safety expenditure covers the expenditure of the respective business units and consists only of OPEX expenditure.

4.10.15 Approved Long Term Plan envelope

The approved Long Term Plan

This section compares the approved LTP envelope for OPEX and renewals with the traffic systems and operations network needs as determined by this AMP at a regional level and identifies the likely impacts of any variances. Revenue and funding incomes to Auckland Transport (from Auckland Council ratepayers and NZTA government subsidies and the like) are allocated through the approved Long Term Plan budgets. The LTP was adopted on 28 June 2012.

OPEX impacts

Based on the information in Table 4.10-16, traffic systems operational expenditure shows a variance between the LTP allocated budgets and the AMP needs. The LTP allocated budget for traffic systems OPEX shows a 10-year variance of $5 million compared to the network needs determined by this AMP. However, the variance of $5 million is not a shortfall, but rather a re-allocation in the AMP from traffic systems and operations to community transport.

However it is anticipated that the LTP will require further efficiency savings and as a result, this funding gap may be increased.

Renewals impacts

The LTP allocated budget for traffic systems capital renewals has a 10-year shortfall of $876,000 (one per cent reduction) compared to the network needs determined by this AMP. This equates to a reduction of four signalised intersection renewals and three CCTV renewals over the 10-year period. The approved LTP budget envelope appears to be insufficient to meet the projected renewal needs.

Table 4.10-16 Variance between LTP approved budget and AMP network needs
Source: LTP Budget Model 12 April 2012 after refresh for AMP and revised LTP Budget Model 28 June 2012

Traffic systems and operations	10-year total LTP approved budget ($000s un-inflated)	10-year total AMP network needs ($000s un-inflated)	Variance 10-year total ($000s un-inflated)
Operations and maintenance	239,058	244,058	-5,000
Renewals	64,370	65,246	-876
Traffic systems and operations total	303,428	309,304	-5,876

Further efficiency savings

As required by the approved LTP, a further reduction in OPEX of $18.6 million per year, reducing to nil by 2016/17, will need to be allocated against asset related operational budgets. The impact of this further reduction on traffic systems and operations operational budgets is yet to be assessed and finalised.

Monitoring and management of Long Term Plan consequences

The consequences resulting from these variances will be monitored and reported as appropriate.

CAPEX new works

CAPEX new works contained in this AMP are derived from draft LTP listings as at April 2012 and are produced in section 4.10.12.

The capital new works programme has been further refined and adopted in late June 2012. Details of this adopted programme are contained in the LTP.

AMP inflation effects

Un-inflated and inflated traffic systems and operations needs for the AMP are shown in Table 4.10-17.

Table 4.10-17 Un-inflated and inflated traffic systems and operations AMP needs
Source: LTP Budget Model 12 April 2012 after refresh for AMP and revised LTP Budget Model 28 June 2012

UN-INFLATED expenditure ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M		23,644	23,809	23,976	24,145	24,314	24,486	24,658	24,832	25,008	25,185	244,058
Renewal		6,275	6,329	6,384	6,439	6,495	6,551	6,607	6,665	6,722	6,781	65,246
Traffic systems and operations total		29,919	30,138	30,360	30,584	30,809	31,037	31,265	31,497	31,730	31,966	309,304
AC Inflator	OPEX	3.30%	3.30%	3.30%	3.30%	3.50%	3.60%	3.10%	3.10%	3.30%	3.60%	n/a
AC Inflator	CAPEX	3.90%	3.40%	2.80%	2.90%	3.10%	3.30%	3.50%	3.70%	4.00%	4.00%	n/a
INFLATED expenditure ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M		24,424	25,407	26,429	27,546	28,738	29,838	30,980	32,228	33,625	35,082	294,297
Renewal		6,519	6,799	7,050	7,317	7,609	7,929	8,277	8,658	9,082	9,527	78,768
Traffic systems and operations total		30,943	32,206	33,479	34,863	36,347	37,767	39,257	40,886	42,707	44,609	373,065

Table 4.10-18 Un-inflated and inflated traffic systems and operations LTP budgets
Source: LTP Budget Model 12 April 2012 after refresh for AMP and revised LTP Budget Model 28 June 2012

UN-INFLATED expenditure ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M		23,144	23,309	23,476	23,645	23,814	23,986	24,158	24,332	24,508	24,685	239,058
Renewal		6,195	6,247	6,300	6,354	6,408	6,462	6,517	6,573	6,629	6,685	64,370
Traffic systems and operations total		29,338	29,556	29,777	29,998	30,222	30,448	30,676	30,905	31,137	31,370	303,428
AC Inflator	OPEX	3.30%	3.30%	3.30%	3.30%	3.50%	3.60%	3.10%	3.10%	3.30%	3.60%	n/a
AC Inflator	CAPEX	3.90%	3.40%	2.80%	2.90%	3.10%	3.30%	3.50%	3.70%	4.00%	4.00%	n/a
INFLATED expenditure ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M		23,907	24,873	25,878	26,976	28,147	29,229	30,352	31,579	32,953	34,386	288,279
Renewal		6,436	6,712	6,958	7,221	7,508	7,822	8,164	8,538	8,955	9,393	77,707
Traffic systems and operations total		30,344	31,585	32,836	34,196	35,655	37,050	38,516	40,118	41,908	43,778	365,986

LTP inflation effects

Un-inflated and inflated traffic systems and operations budgets from the LTP are shown in Table 4.10-18.

4.10.16 Revenue plan

Revenue and funding incomes to Auckland Transport are contained in Auckland Transport's SAP financial management system.

Operations and maintenance revenue

Traffic systems operations and maintenance is normally subsidised by NZTA at a rate of 44.3 per cent, with the balance funded by Auckland Council.

Capital renewals revenue

Traffic system renewal is normally subsidised by NZTA at a rate of 44.3 per cent, with the balance funded by Auckland Council.

Capital new works revenue

Capital new works for traffic systems is subsidised by NZTA at a rate of 53 per cent. The balance is funded by Auckland Council and developers. The need for some traffic systems arises partly or wholly from new developments. Accordingly, these are funded by developer contributions.

4.10.17 Key improvement initiatives

Table 4.10-19 shows the key improvement initiatives that have been identified for traffic systems and operations.

Table 4.10-19 Key improvement initiatives

Improvement initiative	Description	Priority
Traffic systems and operations 1	• The traffic systems unit is procuring a number of ITS assets. Asset information for these and other assets, such as red-light cameras, needs to be captured to facilitate better asset management	High
Traffic systems and operations 2	• Review the signalised locations with substantial pedestrian traffic for improvement works	High
Traffic systems and operations 3	• Underground ducts that have been neglected are deteriorating. These need to be identified and included in the improvement programme	High
Traffic systems and operations 4	• Traffic systems include a variety of asset components. Some of the newly introduced assets have failed prematurely, resulting in increased maintenance costs. The performance of assets needs to be monitored and documented to facilitate better decision making	Medium

Signs and Road Markings.

4.11 Contents. Lifecycle Management Plan

4.11 Signs and Road Markings

4.11.1 The service Auckland Transport provides

The network of signs and road markings provides for safe and efficient way-finding and movement across the transport network. The levels of service (LOS) most relevant to achieving delivery are:

- Quality – the suitability of the signs and road markings design and the standard of their maintained condition
- Ease of use – the availability of effective signage and real-time information for easy use of facilities and navigation across the network.

Signs and road markings also have the following important functions:

- Parking signs are necessary for management and enforcement of on-road parking. This is a significant issue in areas where neighbouring businesses rely on enforcement of parking time limits to ensure availability of on-road parking
- Parking signs are important in residents-only parking permit areas to control parking
- Some regulatory signs and markings are important for network operation, e.g. bus and high occupancy vehicle (HOV) lanes, and clearways.

The details of the signs and road markings levels of service being measured are provided in Section 2, Levels of Service. Several of these measures and targets are yet to be confirmed (TBC) and will be included in the improvement plan. Table 4.11-1 gives representative operations performance for signs and road markings.

4.11.2 Network overview

Signs and road markings guide motorists and ensure safety and efficiency of the road network. Signs provide regulatory instructions to road users, warn of hazards, and offer general information such as street names. Auckland Transport owns and manages the region's 94,935 regulatory and warning signs, and advanced destination signs (ADS). There are also 338km of standard markings and 170km of high performance markings in RAMM, but these records relate only to the former Auckland City Council area.

Table 4.11-1 Signs and road marking Levels of Service

Service value	Level of service	Service measure	Current performance	Target performance (indicative / to be developed and agreed)
Easy to use	Improve navigability across the network	Percentage of clearly visible street name plates on all major intersections	80%	TBC
		Percentage of arterial network with real-time information (signage) available	TBC	8%
Quality	Assets are maintained in good condition	Percentage of signage in moderate (condition 3 grade) or better	79% (99% of known assets)	95%

Table 4.11-2 Signs and road marking valuation
Source: Auckland Transport asset revaluation (30 June 2011)

Asset	Optimised replacement cost (ORC) $000s	Optimised depreciated replacement cost (ODRC) $000s	Annual depreciation (ADR) $000s
Regulatory and warning signs, ADS, and high performance markings	30,658	17,164	2,244

Table 4.11-3 Signs and road marking asset data
Source: Various as listed

Asset	Unit	North	Central	West	South	Total	Data source and date
Regulatory and warning signs, and ADS	No	25,782	34,796	8,478	25,879	94,935	RAMM (April 2012)
Standard markings	km	0	338	0	0	338	Asset consolidation (14 February 2011)
High performance markings	km	0	170	0	0	170	Asset consolidation (14 February 2011)

4.11.3 Network valuation

The value of the signs and road markings network is shown in Table 4.11-2. Refer to the appendices for the full valuation.

4.11.4 Network asset details

This signs and road markings network asset has three sub-classes, and their quantity by geographical split is summarised in Table 4.11-3. Reference to signs includes both post and sign.

The function of ADS signs is to improve and aid navigation to specific areas of the city, improve safety and reduce unnecessary travel. ADS signs are important for integrating local roads with the state highway network. Note that reflective raised pavement markers (RRPMs) and ceramic studs are marking assets.

The following road marking assets are not currently stored in the RAMM database:

- Centre line
- Edge line
- Limit lines
- Pedestrian crossings
- Parking control lines.

The benefits and costs of maintaining these road marking assets in RAMM needs to be assessed and this is identified as a future improvement initiative.

The useful asset life for signs and road markings assets based on the 2011 revaluation is assumed to be:

- 12 years for reflective signs but less if the dominant colour is red
- 20 years for ADS
- Seven years for thermoplastic markings.

Note that the useful asset life for road markings is assumed to be one year except where they are 'long life'.

4.11.5 Asset data confidence

The RAMM database holds asset information for the signs network, including condition rating information. The assessment of data confidence is based on the data confidence grading system and methodology described in Section 2.4.5 of the International Infrastructure Management Manual 2011.

Table 4.11-4 illustrates, with respect to signs, Auckland Transport's confidence levels in the accuracy and completeness of its asset data.

The current overall confidence level of asset data in terms of condition and performance of the signs network is 'uncertain'. The current confidence level of asset data in terms of asset quantity of the signs network is 'reliable', as most legacy councils kept good records in RAMM. Road marking asset records have historically been recorded in separate spreadsheets or left incomplete, and could not be assessed for confidence.

Table 4.11-5 shows the completeness of signs inventory data. This shows that signs are mostly complete for condition. Auckland Transport intends to improve the data completeness with the planned condition assessment programme (refer to Section 4.11.6) and with the planned improvement initiatives.

4.11.6 Asset condition

Condition rating

Only ADS signs are condition rated as road markings and are maintained or renewed on an annual basis (except for high performance road marking). ADS condition surveys are currently undertaken every three years. The asset condition rating results are recorded in the RAMM database.

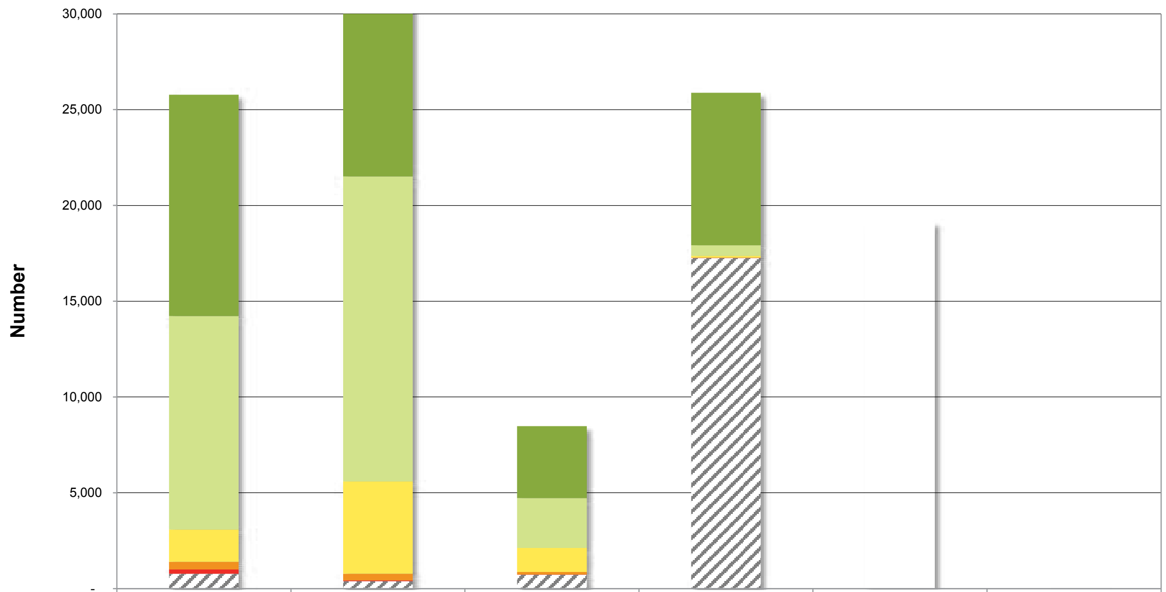
Table 4.11-4 Signs confidence

Data attribute	Very uncertain	Uncertain	Reliable	Highly reliable
Asset quantity			■	
Asset age		■		
Condition		■		
Performance		■		

Table 4.11-5 Inventory data completeness
Source: RAMM database (April 2012)

Asset group	Inventory data completeness (%)		
	Measure	Age	Condition
Regulatory and warning signs and ADS	100	71	80

Figure 4.11-1 Signs condition
Source: Auckland Transport's RAMM database (April 2012)



	North	Central	West	South	Total (number)	% of total
Very Good	11,555	13,279	3,758	7,961	36,553	39%
Good	11,153	15,923	2,602	551	30,229	32%
Moderate	1,682	4,819	1,254	94	7,849	8%
Poor	393	348	131	16	888	1%
Very Poor	226	44	13	4	287	0%
Unknown	773	383	720	17,253	19,129	20%
% of total	27%	37%	9%	27%	100%	
Total (number)	25,782	34,796	8,478	25,879	94,935	100%

High performance road marking has a longer life (at two to five years) and is replaced as a capital renewal. The condition information for the high performance road marking will be managed in a database rather than by ad-hoc systems. This should be achieved by uploading road marking data received from the contractor. This has been identified as a future improvement.

Signs

Of the 94,935 signs, 79 per cent are in moderate to very good condition, as shown in Figure 4.11-1. 20 per cent have an unknown condition grade. The planned condition assessment will improve the understanding of actual asset condition over time (refer to Section 4.11.6). Franklin, Papakura and Manukau areas all have large quantities of unknown condition information and this has been identified as a future improvement.

The current technical LOS target is 95 per cent of sign assets to be in moderate or better condition. Currently signs do not meet this target (79 per cent actual performance). Auckland Transport's focus is to replace sign assets that are in condition grade 5 or very poor.

Condition assessment programme

A formal condition assessment programme is being developed for the signs network along with other road assets. The overall programme started in July 2012. Detailed ADS sign inspections will be undertaken every two to three years (still being refined).

The detailed inspections will:

- Assign a condition rating and confidence
- Assign a risk factor in terms of public safety and sign operation and confidence
- Identify residual life (physical life left)
- Determine a replacement cost and confidence.

Routine condition assessments will be undertaken periodically between detailed inspections.

4.11.7 Asset performance and capacity

Performance

The asset performance for signs and road markings is summarised as follows:

All signs	Material selection for poles is important for road safety. Frangible poles help reduce the impact with incidents and therefore improve road safety Reflectivity reduces and colours fade with age Moss and lichen can grow on signs in shaded areas and this may obscure them
Regulatory and warning signs	Enforcement and safety signs should last eight years but historically have not been capitalised. This was based on the high replacement rate of signs due to vandalism, vehicle impact damage, and their low individual value
ADS signs	ADS signs have steel posts that should last up to 20 years. Their facings should last 10 years but they are often replaced sooner due to vandalism and vehicle impact damage
Pedestrian crossings	Pedestrian crossings must conform to warrants in terms of vehicle-pedestrian traffic flows at any certain location. Their signage and markings must conform to Manual of Traffic Signs and Markings (MOTSAM) standards. Lighting and signalising for pedestrian crossings is covered under Section 4.9, street lighting and Section 4.10, traffic systems and operations
Bus lanes and cycleways	Only signs and markings indicate bus lanes and cycleways. Marking lengths in comparison to footpaths and carriageway lengths cannot be determined as there is no inventory Markings are worn away by daily traffic and need renewing. They also require renewing after remedial pavement or footpath works have occurred

4.11.8 Asset risks and criticality

Asset risks

Asset risks across the transport network, identified through a formal risk analysis review, appear in Section 8, Risk Management. Risk for the signs and road markings network is summarised in Table 4.11-6.

Additional risks identified through the development of this AMP are summarised in Table 4.11-7.

Critical assets

The following signs and markings are considered critical to network safety:

- Stop and give way intersections
- Pedestrian crossings
- Speed advisory signs in high-speed rural areas
- Clearways
- Bus lanes
- No overtaking and passing lanes
- One lane bridge
- Speed circles
- Keep left.

Signs and markings have different functions. For enforcement, regulatory signs and markings and bus lane and cycleways signs and markings are necessary. In terms of safety, warning signs and markings are critical. For safety, capacity and efficiency, ADS signs are critical.

Auckland Transport's action plans for managing these critical assets are:

- Complete condition assessments of signs and road markings assets on a regular basis, detailed in Section 4.11.6, asset condition
- Respond to asset failures in a timely manner as detailed in Section 2, Levels of Service
- Regularly inspect and maintain critical signs and road markings assets to minimise impact of poor maintenance.

Table 4.11-6 Signs and road markings risk analysis
Source: Auckland City Council Transport Risk Analysis 2008

Risk	Net risk factor	Management options
Safety – Inadequate lane separation / redundant or inappropriate markings or definition which may lead to vehicle accidents	High risk	• Monitor and improve current practices • Ensure that safety measures / temporary traffic measures are implemented as part of all road works • Review standards (MOTSAM, NZTA specs etc) and audit controls and control works • Conduct ongoing crash reduction studies (in conjunction with police and NZTA) • Manage continual safety audits in-house

Table 4.11-7 Additional signs and road markings risk summary

Risk	Management options
Safety – Public safety with ongoing theft of signs associated with stops and give way intersections	Make regular inspections and identify hot-spot areas for closer monitoring
Safety – Trees obscuring signs for road users	Respond to service requests for trimming trees obscuring signs
Regulatory – Incorrect or non-compliant signs and markings	Inspect regularly and respond to service requests for incorrect or non-compliant signs and markings

Table 4.11-8 Key signs and road markings issues

No.	Key issues with signs and road marking	Action plans for managing these issues	Outcomes
1	The number of missing signs is unknown. (This is for locations where a sign should be but has never been there)	Undertake a missing sign needs survey as a pro-active contract renewal where forward programmes can be considered	Complete signs inventory
2	Insufficient ADS at intersections and regional and arterial roads.	Review the long-term plan for directing goods and people from local networks to regional and strategic locations with adequate ADS or street signage	People can easily navigate through intersections and regional and arterial roads
3	No inventory information for high performance markings in RAMM. The information is currently held in various spreadsheets by contractors or not at all	Implement data capture for high performance markings. This can be implemented as re-marking work progresses, from conversion from various spreadsheets, or by the acquisition of the road marking database from Auckland Transport's road marking contractor	Complete inventory for high performance marking assets
4	Inadequate provision of street name blades in some areas such as Orewa.	Undertake a missing sign needs survey as a pro-active contract renewal where forward programmes can be considered	Street blades provided in all areas

4.11.9 Key issues

Key lifecycle issues that affect signs and road marking assets are summarised in Table 4.11-8.

4.11.10 Operations and maintenance needs

Operations and maintenance plan

Auckland Transport keeps the signs and road markings network suitable, accessible, safe and well maintained through an ongoing maintenance programme. The programme addresses defects identified through inspections, customer complaints about missing or vandalised signs, or arising from health and safety issues. Maintenance is either scheduled or responsive.

Signs and road markings are maintained to achieve technical LOS relating to accuracy of placement, visibility and conformance with NZTA's MOTSAM. The standard covers appropriate reflectivity standards and all marking, including RRPM and ceramic studs.

Auckland Transport's operations work includes the following:

Reactive response	Responding to customer faults	Such as missing, graffiti damaged, faded, worn or vandalised signs that do not affect public safety
Emergency response	Responding within minimum response times	Events that may affect network safety and integrity, and/or public safety, such as missing or vandalised signs
Routine operations	Periodic inspection and cleaning	Ensures effective operational service of sign and road marking assets. This includes day and night time inspections to be carried out at six monthly intervals. The inspections are to identify general condition, maintenance and replacement needs The work involves both repainting existing markings, removal of substandard markings, and reinstating markings removed as a result of routine maintenance (including patch sealing)

Auckland Transport's maintenance work includes:

- Maintain to a plan; most maintenance consists of planned works though network inspection
- Inspect for condition and performance rating to determine forward works programmes; work programmes are produced that prioritise works based on safety and need
- Report on maintenance activities to enable asset analysis
- Maintain reactively; responding to faults to repair damaged assets and make safe works
- Undertake planned maintenance, with all road markings (except thermoplastic) re-painted once a year, except for arterials that are repainted twice a year. The majority of road marking paint used is chlorinated rubber, with some thermoplastic.

The frequency of the routine and detailed inspections is summarised in Table 4.11-9 based on road hierarchy. Routine inspections are visual inspections by driving the road and recording any traffic safety issues (such as missing or damaged signs) to users. Detailed inspections are field assessments to identify any defects including condition and performance at individual asset type level. The new road corridor maintenance contracts are based on the contractor meeting output specifications rather than prescriptive frequencies.

Night time inspections are also undertaken periodically to ensure 24-hour network safety. These include visibility of traffic signs, road markings, and RRPMs.

The response times of the physical maintenance works are summarised in Table 4.11-10. Routine physical works is the maintenance required to repair the fault identified by the routine operation inspections.

Operations and maintenance 10-year expenditure forecast

The recommended 10-year operational expenditure forecast is shown in Figure 4.11-2 with $117 million forecast over the next 10 years. The forecast is based primarily on historical trends but

Table 4.11-9 Routine operations frequencies
Source: Draft Technical Specifications Volume 5, RCM South Contract (8 February 2012)

Road hierarchy	Routine inspection frequency	Detailed inspection frequency
Regional and district arterial routes, collector route, local and collector routes (5,000 to 10,000 vpd)	Weekly	Three monthly
Generally local sealed roads (1,000 to 5,000 vpd)	Two weekly	Three monthly
Generally local sealed roads (<1,000 vpd), unsealed roads, accessways and car parks	Two monthly	Six monthly
Frangible sign bases		Six monthly

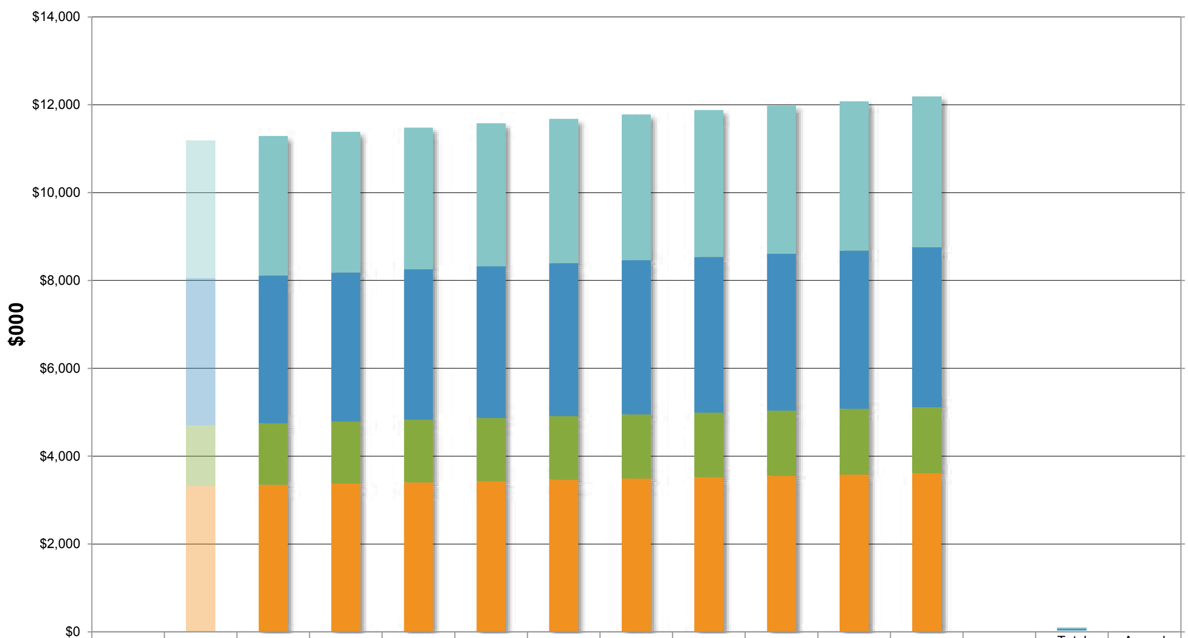
Table 4.11-10 Physical maintenance works response times
Source: Draft Technical Specifications Volume 5, RCM South Contract (8 February 2012)

Maintenance activity	Urgent	Routine
Regulatory signs	1 day	one day
Street name blades	NA	two weeks
Permanent warning signs	NA	two weeks
Destination signs	NA	four weeks
Other signs (including advisory)	NA	two weeks
New signage supply and installation	NA	two weeks
Road marking reinstatement	one day	one week

also includes the revised activities detailed above and levels of service to be achieved to some extent. This recommendation has also taken into account current funding constraints being experienced by Auckland Transport and the Auckland Council.

Note, however, that the actual plan that will be approved by Auckland Transport and the Auckland Council may yet differ from these network needs because of the impact of funding constraints.

Figure 4.11-2 Planned signs and road markings operations and maintenance expenditure
Source: LTP Budget Model 12 April 2012 after Refresh for AMP



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	Total (signs) (no)	Annual average $/(unit)
North	28%	3,150	3,177	3,204	3,231	3,258	3,286	3,314	3,342	3,370	3,399	3,428	33,008	25,782	$128
Central	30%	3,340	3,369	3,397	3,426	3,455	3,485	3,514	3,544	3,574	3,605	3,635	35,004	34,796	$101
West	12%	1,387	1,399	1,410	1,422	1,435	1,447	1,459	1,471	1,484	1,497	1,509	14,533	8,478	$171
South	30%	3,317	3,346	3,374	3,403	3,432	3,461	3,490	3,520	3,550	3,580	3,611	34,766	25,879	$134
Total		11,194	11,289	11,385	11,482	11,580	11,678	11,777	11,877	11,978	12,080	12,183	117,311	94,935	$124

Table 4.11-11 Signs and road markings operations and maintenance
Source: LTP Budget Model 12 April 2012 after Refresh for AMP

Expenditure Type ($000s)	2011/12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013 to 2022
Roads signs	6,491	6,546	6,602	6,658	6,715	6,772	6,829	6,887	6,946	7,005	7,064	68,024
Road marking	4,703	4,743	4,783	4,824	4,865	4,906	4,948	4,990	5,033	5,075	5,118	49,287
Total O&M	11,194	11,289	11,385	11,482	11,580	11,678	11,777	11,877	11,978	12,080	12,183	117,311

The average annual expenditure for operations and maintenance signs and road markings over the next 10 years is approximately $7 million and $5 million respectively, which is approximately 88 per cent of the total expenditure as shown in Table 4.11-11. This shows that road signs is 58 per cent of total operations and maintenance expenditure.

4.11.11 Renewal needs

Renewal strategy

ADS signs are currently renewed reactively, generally when they are knocked down. It is expected that there will be more planned renewals as the new condition assessments become available. Signs associated with motorway interchanges are relatively new (less than five years old) so are in reasonably good condition.

Renewal plan

10-year renewal plan

Auckland Transport's long-term renewal plan is based on analysing the sign data extracted from the RAMM database. Renewals are developed using age and condition-based analysis. A simple tool is used to model the 10-year renewal profiles for both methods. Some validation is undertaken with RCM, otherwise the analysis is mainly desktop. Currently, criticality is not considered in the renewal analysis. The resulting 10-year renewal profiles are used for asset management purposes.

Annual and three-year renewals plan

Auckland Transport also prepares a short-term renewal programme for delivering the forward works programme for the next one to three years. This programme development also includes site walkovers, confirmation of asset ownership and coordination with other work programmes.

Renewal analysis

The sign renewals have been analysed by the following four methods (in decreasing maturity). The effectiveness of each method hinges on the amounts of known and unknown information.

Condition-based method – signs

The following analysis of renewals is based on the current condition of the assets and uses whole-of-life deterioration to identify indicative renewal needs. 20 per cent of signs have an unknown condition grade. 79 per cent of signs are in moderate to very good condition (refer to Section 4.11.6). The condition-based method is less effective with significant amounts of unknown information. This analysis will improve over time as more robust condition information becomes available as an input.

The 10-year condition-based renewal profile for signs is given in Figure 4.11-3. This shows that there is an initial peak in 2012/13 to address condition grade 5 assets. This then reduces to about 5,000 renewals per year for the remaining years.

Age-based method – signs

The 10-year age-based renewal profile for signs is given in Figure 4.11-4. This shows that there are relatively constant renewals (about 3,000 to 6,000 per year) in the first six years with a peak in 2018-19 and later in 2021-22. Renewals are expected only in North and Central areas in the first six years. Only 71 per cent of the age data is known, which makes this renewal method less effective. The analysis will improve over time as more robust age information becomes available as an input.

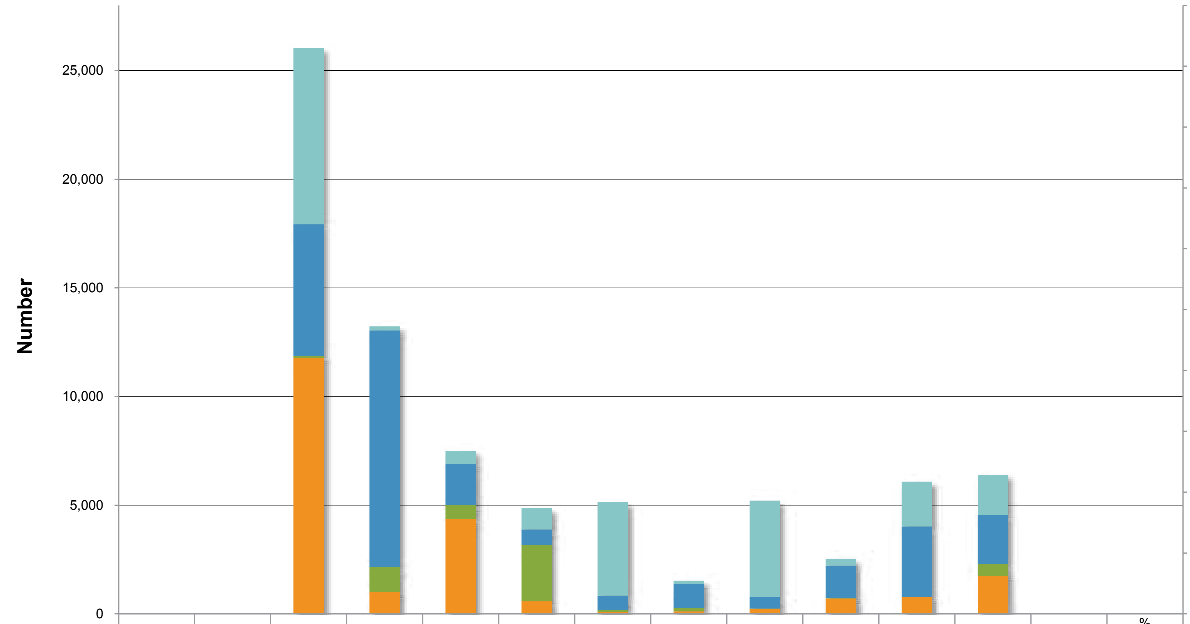
Operational priorities

ADS signs are renewed mainly reactively so the programme is budget driven. These renewal quantities are expected to be better understood as new maintenance contracts are put in place, which identify defects. Region-wide, consistent condition information will help develop robust renewal programmes.

Historical trends

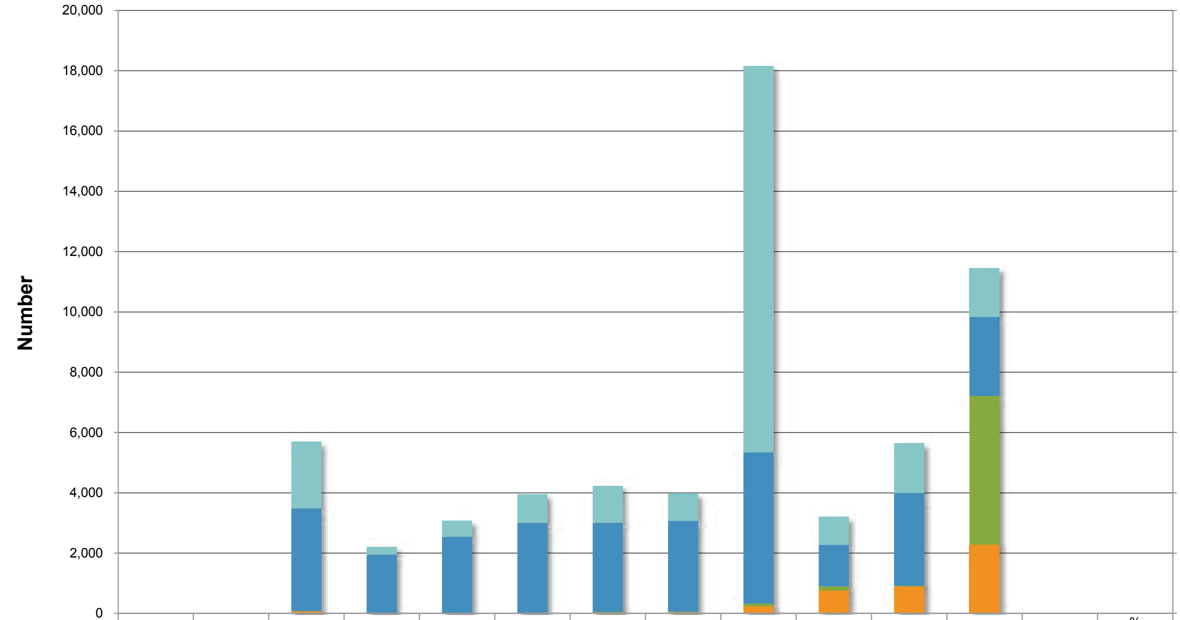
There is currently insufficient commonality between legacy data sets to provide a reliable regional view of historical expenditure trends. A future asset management improvement is to implement consistent tracking of expenditure by asset type and expenditure type over time. This will enable robust analysis of expenditure trends in future.

Figure 4.11-3 Signs condition-based renewal results
Source: Auckland Transport RAMM database (2 February 2012)



	No. of Components	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	% Components renewed 2013-22
North	25,782	0	8,108	182	608	983	4,292	152	4,430	315	2,057	1,821	22,948	89.0%
Central	34,796	0	6,063	10,896	1,887	714	663	1,111	538	1,504	3,250	2,272	28,898	83.0%
West	8,478	0	99	1,153	636	2,589	92	151	17	7	2	572	5,318	62.7%
South	25,879	0	11,767	1,000	4,367	578	86	116	226	712	774	1,730	21,356	82.5%
TOTAL (number)	94,935	0	26,037	13,231	7,498	4,864	5,133	1,530	5,211	2,538	6,083	6,395	78,520	82.7%

Figure 4.11-4 Signs age-based renewal results
Source: Auckland Transport RAMM database (2 February 2012)



	No. of Components	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	% Components renewed 2013-22
North	25,782	0	2,220	253	538	951	1,224	920	12,821	941	1,655	1,615	23,138	89.7%
Central	34,796	0	3,404	1,942	2,528	2,987	2,957	3,009	5,011	1,373	3,075	2,624	28,910	83.1%
West	8,478	0	0	0	0	9	20	19	98	139	28	4,934	5,247	61.9%
South	25,879	0	79	13	13	7	31	40	233	757	892	2,274	4,339	16.8%
TOTAL (number)	94,935	0	5,703	2,208	3,079	3,954	4,232	3,988	18,163	3,210	5,650	11,447	61,634	64.9%

Table 4.11-12 Road signs depreciation forecasts

Source: Auckland Transport infrastructure depreciation profiles (25 April 2012)

Profile	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Depreciation ($ millions)	2.2	2.2	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	25

Depreciation profile

The annual depreciation for road signs rises from $2.2 million to $2.3 million over the next 10 years as indicated in Table 4.11-12.

Renewals 10-year work and expenditure forecast

The analyses given provide varying levels of indicative renewal work for the future. This demonstrates the current difficulty of forecasting future renewal needs.

Considering the above renewal analyses and the current funding constraints being experienced by Auckland Transport and the Auckland Council, the recommended 10-year renewals needs are shown in Figure 4.11-5. Note however that the actual renewals plan that will be approved by Auckland Transport and the Auckland Council may yet differ from these network needs because of the impact of funding constraints.

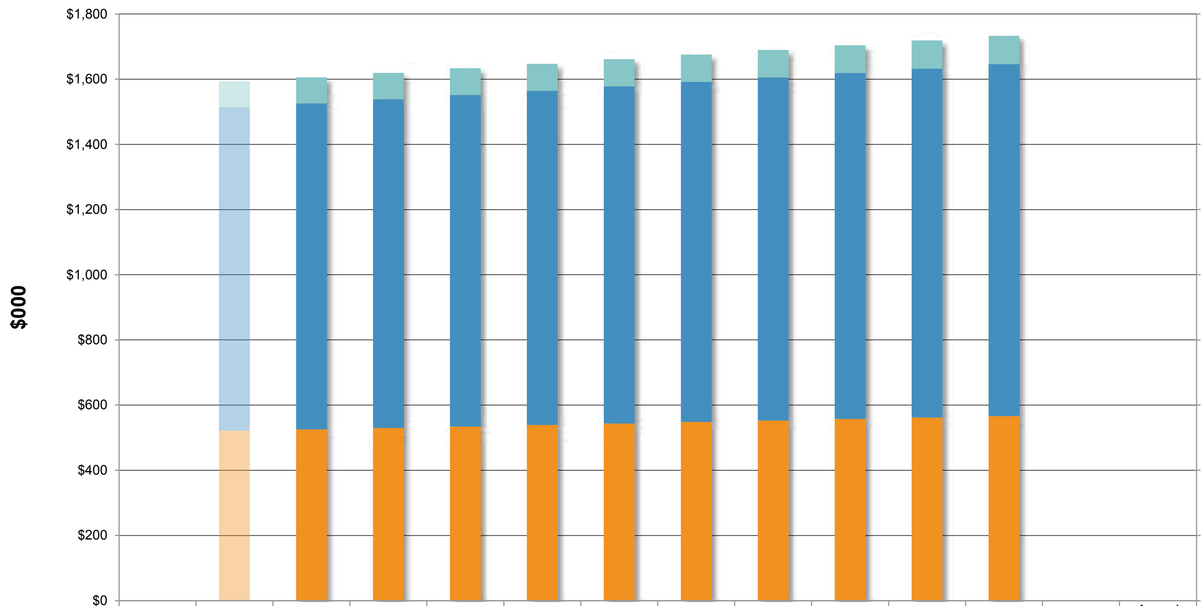
Figure 4.11-5 shows that renewals increase slightly from $1.6 million to $1.8 million per annum. There is a total of $17 million for road signs and markings renewals for the next 10 years, $10.4 million of which is allocated to the Central area. These forecasts will be refined as a consistent renewal strategy is implemented regionally over time.

Renewal projects

Separate sign renewal projects are not listed in this AMP as they are prepared within the one-year detailed work programme with multiple small projects. Many of the legacy councils did not prepare planned renewals for sign assets. There will be planned sign renewals identified across all areas regionally for a consistent approach. This is identified as a future improvement. Signs renewals tend to be reactive or undertaken with network changes. ADS signs will be renewed on the basis of 'network needs', because of their relatively high cost per site.

Figure 4.11-5 Planned signs and road markings renewal expenditure

Source: LTP Budget Model 12 April 2012 after Refresh for AMP



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	Annual Average $ / area network
North	5%	80	81	81	82	83	83	84	85	85	86	87	837	$3
Central	62%	992	1,000	1,009	1,017	1,026	1,035	1,043	1,052	1,061	1,070	1,079	10,392	$30
West	0%													$-
South	33%	521	525	530	534	539	544	548	553	557	562	567	5,460	$21
Renewals (no)		0	0	0	0	0	0	0	0	0	0	0	0	
TOTAL	100%	1,593	1,606	1,620	1,633	1,647	1,661	1,675	1,690	1,704	1,719	1,733	16,689	$18

4.11.12 New works needs

New works plan

New works for additional signs are mainly driven by safety from NZTA audits and programmes to improve road safety and accessibility around schools. There are no new works dedicated for the signs LCMP as these are generally provided as part of the community transport programme.

New works programmes

There are signs and road markings new works associated with programmes such as safety minor works. Signs are also installed as part of road upgrades and major new works projects. Motorway interchanges also include sign assets in their scope and budget.

Growth-related new works

In the development of this AMP, no growth-related new works for signs and road markings were identified.

Levels of service new works

No LOS related new works for signs and road markings were identified in the development of this AMP.

4.11.13 Disposal plan

The regular maintenance and renewal programme includes disposal of damaged assets and assets in very poor condition. Sustainability practices could include recycling of wooden and metal signposts or other sign-facing materials from demolition.

4.11.14 Summary of 10-year network needs

The total amount of expenditure for operations and maintenance and renewals over the next 10 years is $134 million, as shown in Figure 4.11-6.

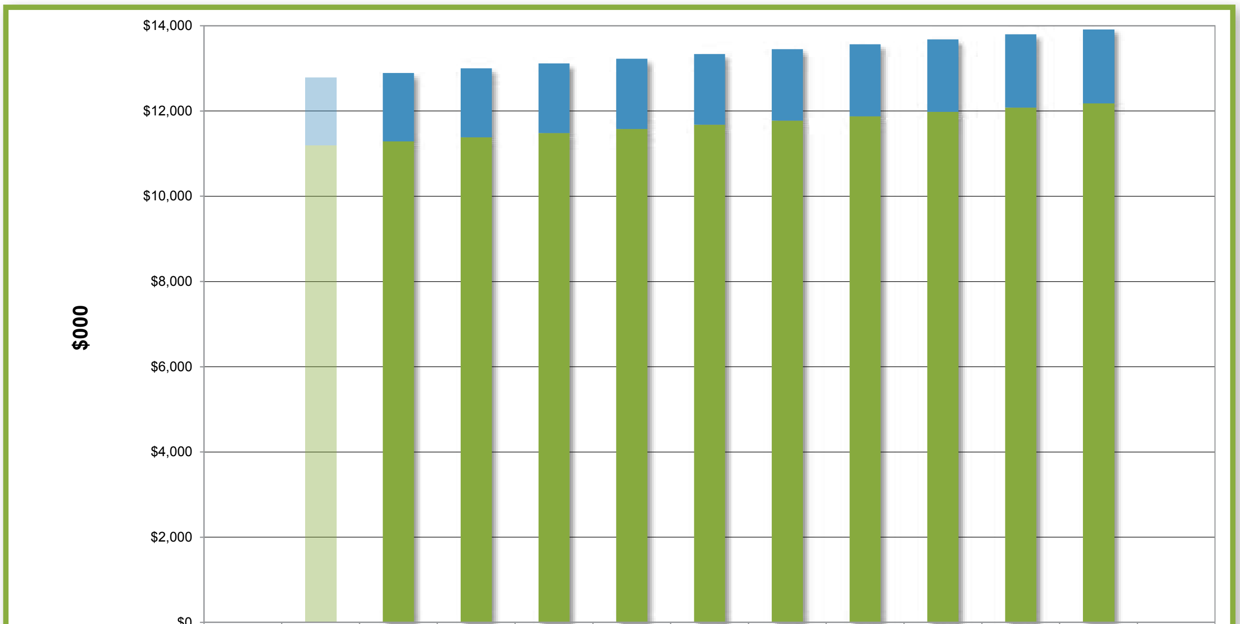
Average annual expenditure for operations and maintenance and renewals on signs and road markings over the next 10 years is approximately $14 million, of which $12 million (88 per cent) is for operations and maintenance, and $2 million (12 per cent) is for renewals.

The operations and renewal forecasts are summarised in Figure 4.11-6 and show total annual costs increasing from $13 million to $14 million per year. There are no new works dedicated for the signs and road markings LCMP.

Notes on the expenditures in Figure 4.11-6:

- The proposed 10-year expenditures for OPEX and renewals include an annual growth factor of +0.85 per cent to allow for consequential OPEX and consequential renewals from growth in the network and growth in demand for services
- Renewal total costs include professional costs.

Figure 4.11-6 Summary of signs and road markings forecasts
Source: LTP Budget Model 12 April 2012 after Refresh for AMP



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total
CAPEX New Works	0%	000	000	000	000	000	000	000	000	000	000	000	000
Renewals	12%	1,593	1,606	1,620	1,633	1,647	1,661	1,675	1,690	1,704	1,719	1,733	16,689
Operations & Maintenance	88%	11,194	11,289	11,385	11,482	11,580	11,678	11,777	11,877	11,978	12,080	12,183	117,311
TOTAL	100%	12,787	12,895	13,005	13,116	13,227	13,339	13,453	13,567	13,683	13,799	13,916	134,000

4.11.15 Approved Long Term Plan envelope

The approved Long Term Plan

This section compares the approved LTP envelope for OPEX and renewals with the signs and markings network needs as determined by this AMP at a regional level and identifies the likely impacts of any variances. Revenue and funding incomes to Auckland Transport (from Auckland Council ratepayers and NZTA government subsidies and the like) are allocated through the approved Long Term Plan budgets. The LTP was adopted on 28 June 2012.

OPEX impacts

Based on the information in Table 4.11-13 signs and markings operational expenditure shows no variance between the LTP allocated budgets and the AMP needs. However, it is anticipated that the LTP will require further efficiency savings and therefore a funding gap for street lighting operational expenditure may eventuate.

Renewals impacts

Based on the information above, signs and markings renewals expenditure shows no variance between the LTP allocated budgets and the AMP needs. The apparent variance of +$2.2 million shown above is not an increase in renewals, but rather a re-allocation from parking signs and markings to signs and road markings.

Further efficiency savings

As required by the approved LTP, a further reduction in OPEX of $18.6 million per year, reducing to nil by 2016/17, will need to be allocated against asset related operational budgets. The impact of this reduction on signs and markings operational budgets is yet to be assessed and finalised.

Monitoring and management of Long Term Plan consequences

The consequences resulting from these variances will be monitored and reported as appropriate.

Table 4.11-13 Variance between LTP approved budget and AMP network needs for signs and road markings (all un-inflated)

Source: LTP Budget Model 12 April 2012 after refresh for AMP and revised LTP Budget Model 28 June 2012

Signs and marking	10-year total LTP approved budget ($000s un-inflated)	10-year total AMP network needs ($000s un-inflated)	Variance 10-year total ($000s un-inflated)
Operations and maintenance	117,311	117,311	0
Renewals	18,879	16,689	2,190
Signs and marking total	136,190	134,000	2,190

Table 4.11-14 Un-inflated and inflated signs and road markings AMP needs

Source: LTP Budget Model 12 April 2012 after refresh for AMP and revised LTP Budget Model 28 June 2012

UN-INFLATED expenditure ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M		11,289	11,385	11,482	11,580	11,678	11,777	11,877	11,978	12,080	12,183	117,311
Renewal		1,606	1,620	1,633	1,647	1,661	1,675	1,690	1,704	1,719	1,733	16,689
Signs and marking total		12,895	13,005	13,115	13,227	13,339	13,452	13,567	13,682	13,799	13,916	134,000
AC Inflator	OPEX	3.30%	3.30%	3.30%	3.30%	3.50%	3.60%	3.10%	3.10%	3.30%	3.60%	n/a
AC Inflator	CAPEX	3.90%	3.40%	2.80%	2.90%	3.10%	3.30%	3.50%	3.70%	4.00%	4.00%	n/a
INFLATED expenditure ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M		11,662	12,149	12,657	13,211	13,803	14,352	14,923	15,546	16,243	16,970	141,515
Renewal		1,669	1,740	1,804	1,872	1,947	2,028	2,117	2,214	2,322	2,435	20,147
Signs and markings total		13,331	13,889	14,461	15,083	15,750	16,380	17,040	17,760	18,565	19,405	161,662

Table 4.11-15 Un-inflated and inflated signs and road markings LTP budgets
Source: LTP Budget Model 12 April 2012 after refresh for AMP and revised LTP Budget Model 28 June 2012

UN-INFLATED expenditure ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M		11,289	11,385	11,482	11,580	11,678	11,777	11,877	11,978	12,080	12,183	117,311
Renewal		1,806	1,824	1,842	1,860	1,878	1,896	1,915	1,934	1,953	1,972	18,879
Signs and markings total		13,095	13,209	13,324	13,439	13,556	13,674	13,792	13,912	14,033	14,155	136,190
AC Inflator	OPEX	3.30%	3.30%	3.30%	3.30%	3.50%	3.60%	3.10%	3.10%	3.30%	3.60%	n/a
AC Inflator	CAPEX	3.90%	3.40%	2.80%	2.90%	3.10%	3.30%	3.50%	3.70%	4.00%	4.00%	n/a
INFLATED expenditure ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M		11,662	12,149	12,657	13,211	13,803	14,352	14,923	15,546	16,243	16,970	141,515
Renewal		1,876	1,959	2,034	2,113	2,200	2,295	2,399	2,512	2,638	2,771	22,799
Signs and marking total		13,538	14,108	14,691	15,324	16,003	16,647	17,321	18,058	18,881	19,741	164,314

CAPEX new works

CAPEX new works contained in this AMP are derived from draft LTP listings as at April 2012 and are produced in section 4.11-12.

The capital new works programme has been further refined and adopted in late June 2012. Details of this adopted programme are contained in the LTP.

AMP inflation effects

Un-inflated and inflated signs and marking needs for the AMP are shown in Table 4.11-14.

LTP inflation effects

Un-inflated and inflated signs and marking budgets from the LTP are shown in Table 4.11-15.

4.11.16 Revenue sources

Revenue and funding incomes to Auckland Transport's SAP financial management system although the transparency and completeness of allocations require review and confirmation.

Operations and maintenance revenue

Signs and road markings operations and maintenance is normally subsidised at a base rate of 43 per cent (from July 2012) by NZTA. There are some non-traffic signs that are not subsidised and are ratepayer funded.

Capital renewals revenue

Signs and road markings renewal costs are normally subsidised at a base rate of 43 per cent (from July 2012) by NZTA.

Capital new works revenue

There are no signs and road markings capital new works identified in this plan. Signs and road markings capital new works to cater for growth are generally funded and provided by developers of new subdivisions.

4.11.17 Key improvement initiatives

Key improvement initiatives relating to signs and road markings are shown in Table 4.11-16.

Table 4.11-16 Key improvement initiatives

Improvement Initiative Number	Description	AMP Section	Priority
Road markings 1	Assess the benefit and costs of maintaining the road marking assets not stored in the RAMM database such as centre lines and pedestrian crossings	4.11.4	Low
Road markings 2	Assess road marking condition regionally and store in RAMM database for high performance assets only	4.11.6	Medium
Signs 3	Assess sign condition in Waitakere, Franklin, Papakura and Manukau areas where there is large quantities of unknown condition information	4.11.6	Medium
Signs 4	Start tracking historical expenditure trends of signs and road marking operation and maintenance, and renewal costs	4.11.10	Medium
Signs 5	Develop a planned sign renewal project across all areas regionally for a consistent approach	4.11.11	High

4.12 Contents

4.12 Drainage

4.12.1 The service Auckland Transport provides

Drainage is an essential component of the transport network and helps deliver an effective and efficient transport system. An Auckland Transport objective is that the drainage network will protect adjacent land use and contribute to the resilience of the transport network by protecting the road edge and substructure from stormwater erosion and damage. This is made possible by efficiently diverting stormwater run-off into the main stormwater system. The road drainage network also treats stormwater to mitigate the environmental effects of the transport system.

The purpose of road drainage is to:

- Prevent ponding of water on the road or footpath
- Prevent saturation of pavement layers.

The drainage levels of service most relevant to that delivery are:

- Quality – the assets are maintained in good condition
- Responsiveness – how quickly flooding events are cleared
- Environmental sustainability – network protection of the receiving environment.

The details of the drainage levels of service (LOS) being measured are provided in Section 2. Several of these measures and targets are yet to be confirmed (TBC) or developed (TBD) and will be included in the improvement plan. The measures outlined in 4.12-1 are representative for drainage operational performance.

4.12.2 Network overview

Auckland Transport has ownership responsibilities for and manages the region's road drainage, which includes approximately 86,107 catchpits, 2,541 manholes and 7,409km in kerb and channel. Road drainage provides facilities to remove stormwater from the road network. The system discharges into Auckland Council's stormwater network. There is water quality treatment prior to discharge.

The culverts in the drainage network are classified into small and large culverts based on diameter/size as follows:

Small culvert	<600mm
Large culvert	>600mm but <3.4m^2
Major culvert	>3.4m^2

Major culverts are covered separately in Section 4.3, Bridges and structures.

Road drainage assets are owned and funded by Auckland Transport but will be maintained and renewed by Auckland Council's Stormwater Unit (excluding kerb and channel). The details of this new management regime are still being defined. This is a new management arrangement implemented with the Auckland governance

Table 4.12-1 Drainage levels of service

Service value	Level of service	Service measure	Current performance	Target performance (indicative / to be developed and agreed)
Quality	Assets are maintained in good condition	Percentage of soakholes in moderate (condition grade 3) or better	75%	95%
		Percentage of catchpits in moderate (condition grade 3) or better	80%	95%
Responsiveness	Improve or maintain timelines for clearance of network blockages	Percentage compliance with drainage maintenance repair response timeframes	100%	95%
Environmental sustainability	Eliminate prosecutions for RMA non-compliance	Percentage compliance with regulatory environmental standards for water pollution	TBD	TBD
	Minimise network water pollution	Percentage coverage of environmentally significant catchments with appropriate treatment	TBD	TBD

changes. It allows for a more holistic approach to stormwater management and eliminates work activity boundaries. Collaboration is important as the stormwater service needs to be managed effectively regardless of asset ownership and represents significant asset risk for the transport network.

The council's Stormwater Unit is the asset owner for the stormwater reticulation network. The combined system in the old part of the Auckland area is owned and managed by Watercare Services Ltd. The combined network conveys stormwater and wastewater in the same pipe, and behaves as a stormwater system when it is raining and as a wastewater system at all other times.

There are different definitions for surface water channels draining rural roads, sometimes referred to as watercourses and other times as unlined channels. Consistency of terminology will improve with regional harmonisation. Watercourses have only been recorded for Manukau and Rodney areas but there will also be watercourses (or unlined channels) in rural parts of Waitakere, Papakura, Hauraki Gulf Islands and Franklin. The accurate identification of unlined channels regionally has been identified as a future improvement initiative.

4.12.3 Network valuation

The value of the drainage network is shown in Table 4.12-2. (Refer to the appendices for the full valuation.)

4.12.4 Network asset details

Auckland Transport has stewardship responsibilities for road drainage and manages approximately 86,107 catchpits, 2,541 manholes and 7,409km in kerb and channel. This is summarised in Table 4.12-3.

Notes on Table 4.12-3:

- The catchpit numbers are from Auckland Council's GIS and not from Auckland Transport's RAMM database. Information is incomplete in RAMM so is not a true reflection

Table 4.12-2 Road drainage valuation
Source: Auckland Transport asset revaluation (30 June 2011)

Asset	Optimised replacement cost (ORC) $000s	Optimised depreciated replacement cost (ODRC) $000s	Annual depreciation (ADR) $000s
Road drainage (excluding swales and watercourses)	1,918,933	1,216,745	29,607

Table 4.12-3 Road drainage asset data
Source: Various as listed

Asset	Unit	North	Central	West	South	Total	Data source and date
Surface water channels	km	1,740	2,239	901	2,531	7,409	RAMM (2 February 2012)
Catchpits	no	17,556	27,368	11,503	29,680	86,107	Council's GIS (2011 asset revaluation)
Catchpit leads	m	35,600	196,840	122,004	17,000	371,444	Asset consolidation (14 February 2011)
Manholes	No	526	530	381	1,104	2,541	RAMM (2 February 2012)
Soakholes	No		2,276		18	2,294	RAMM (2 February 2012)
Small culverts (< 600 dia)	m	60,004	18,494	12,993	80,168	171,660	RAMM (2 February 2012)
Large culverts (>600<1.6m dia)	m	9,185	4,767	1,490	17,516	32,958	RAMM (2 February 2012)
Subsoil drainage	km	9,552	911	32	7,703	18,198	Asset consolidation (14 February 2011)
Swales						Not identified	
Treatment devices	no	175	36	0	53*	264	Asset consolidation (14 February 2011) and South Maintenance Contract (March 2012)
Watercourses	km	1,746	0	0	61	1,807	Asset consolidation (14 February 2011)

of the catchpit network. Improving the asset information will be addressed as the planned condition assessment gets underway (refer to Section 4.12.6, condition assessment programme). This has been identified as a future improvement. The RAMM information has been used for renewal analysis purposes

- The treatment device numbers are known to be out of date. The total for the South area is from the development of the south maintenance contract documents as at March 2012
- There is currently no complete swale inventory. The capturing of a swale asset inventory has been identified as a future improvement.

The useful asset life for drainage assets based on the 2011 revaluation is assumed to be:

- 60 to 80 years for culverts
- 80 years for manholes and catchpits
- 65 to 80 years for surface water channels
- 60 years for soakholes and treatment devices.

4.12.5 Asset data confidence

The RAMM database holds asset information for the drainage network, including condition rating information. The assessment of data confidence is based on the data confidence grading system and methodology described in Section 2.4.5 of the International Infrastructure Management Manual 2011.

Data confidence relates to both the accuracy and completeness of data. Table 4.12-4 illustrates Auckland Transport's confidence (in the accuracy and completeness) in its asset data.

The current overall confidence level of asset data in terms of quantity, condition and performance of the drainage network is 'uncertain'. Condition data sets are not complete for catchpits, manholes and culverts and are discussed further in Section 4.12.6. The current confidence level of asset data in terms of asset age is very uncertain. This will improve over time with planned condition surveys identified as a future initiative.

Table 4.12-5 shows the completeness of inventory data by asset type. This shows that, apart from soakholes, overall there is poor data completeness for drainage assets. Auckland Transport intends to improve the data completeness with the planned condition assessment programme and with the planned improvement initiatives. Note that catchpits and small culverts completeness has been adjusted to reflect incomplete datasets in RAMM.

4.12.6 Asset condition

Condition rating

The frequency of the current drainage condition surveys are summarised in Table 4.12-6. The standard RAMM inspection and condition reporting system is followed for drainage assets.

Table 4.12-4 Road drainage confidence data

Data attribute	Very uncertain	Uncertain	Reliable	Highly reliable
Asset quantity				
Asset age				
Condition				
Performance				

Table 4.12-5 Completeness of inventory data
Source: RAMM database (March 2012)

Asset group	Inventory data completeness (%)		
	Measure	Age	Condition
Surface water channels	100	37	33
Catchpits	60	15	48
Manholes	100	43	44
Soakholes	100	94	99
Small culverts	70	7	23
Large culverts	100	19	47

There was a variety of drainage condition assessment programmes by the legacy councils including frequency and survey coverage. A consistent drainage condition assessment programme regionally has been identified as a future improvement.

Note that in most cases drainage defects have been recorded during the road condition rating process. The data from this assessment only appears in the treatment length table in RAMM and not in the drainage tables.

The condition of subsoil drains, catchpit leads, swales and watercourses is normally not assessed. Treatment device condition still needs to be assessed and this has been identified as a future improvement.

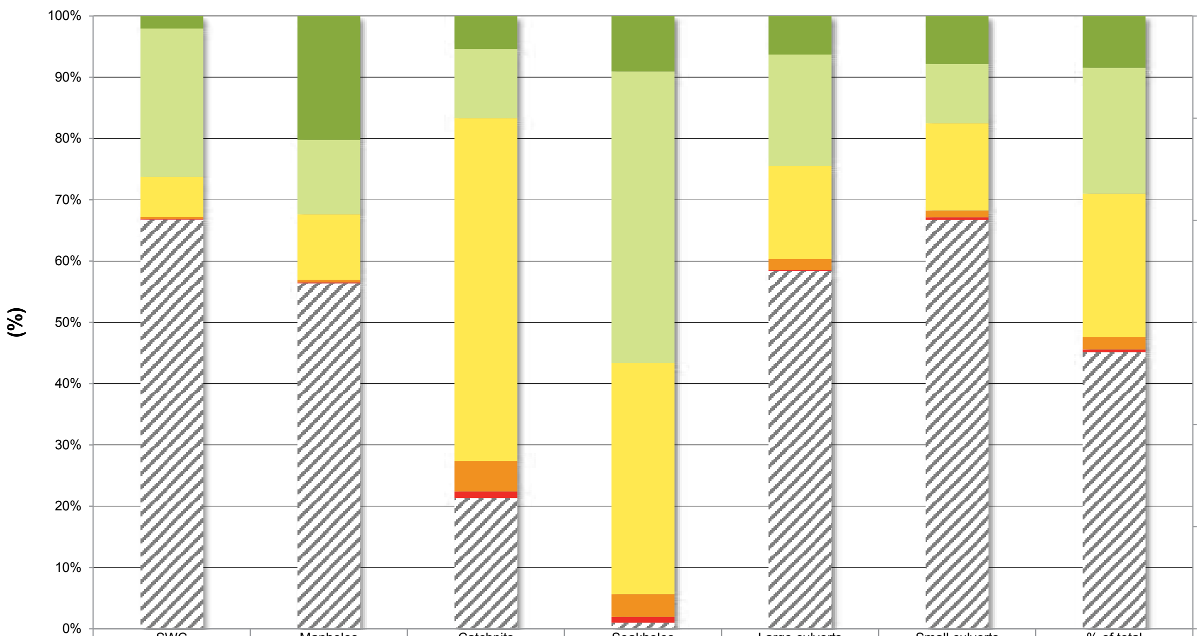
Drainage overview

The overall condition for drainage is presented in Figure 4.12-1. This shows that 51 per cent are in moderate to very good condition, while 45 per cent are in an unknown condition.

Table 4.12-6 Drainage condition surveys
Source: Asset Systems and Monitoring (28 February 2012)

Drainage asset group	Current condition survey frequency	Future condition survey frequency
Kerb and channel	Undertaken at the same time as road carriageway condition surveys. Frequency depends on road hierarchy	Same as current
Catchpits, soakholes and manholes	Every two years	Stormwater Unit will manage these condition surveys in future but likely every two years
Small and large culverts	Every two years (same as bridge structures)	Stormwater Unit will manage these condition surveys in future but likely every two years
Rural culverts	Managed under RCM maintenance contracts if less than 1m in diameter Every two years (same as bridge structures) if greater than 1m in diameter	Same as current

Figure 4.12-1 Overall drainage condition
Source: Auckland Transport RAMM database (February 2012)



	SWC	Manholes	Catchpits	Soakholes	Large culverts	Small culverts	% of total
Very Good	2%	20%	5%	9%	6%	8%	8%
Good	24%	12%	11%	48%	18%	10%	20%
Moderate	7%	11%	56%	38%	15%	14%	23%
Poor	0%	0%	5%	4%	2%	1%	2%
Very Poor	0%	0%	1%	1%	0%	0%	0%
Unknown	67%	56%	21%	1%	58%	67%	45%
Total	100%	100%	100%	100%	100%	100%	100%

Surface water channels

Surface water channel includes different types of kerb and channel as follows:

- Kerb and channel
- Kerb only
- Mountable kerb only
- Mountable kerb and channel
- Dish channel.

Concrete is the main material for surface water channel assets. Other materials such as basalt kerb and channel are mainly found in the old parts of the Auckland area such as Parnell, Herne Bay and Ponsonby.

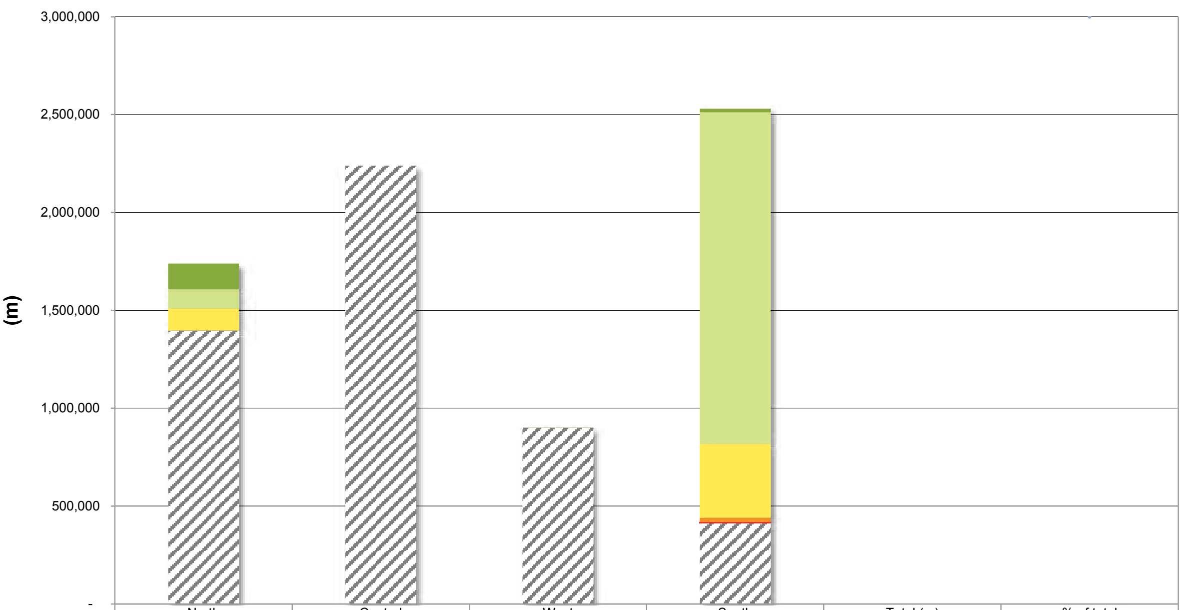
There is also 1,807km of watercourses currently identified and these are sometimes known as unlined channels which drain rural roads. Unlined channels have an important role in draining rural roads effectively to ensure road integrity.

Kerb and channel is important for the life of the adjacent pavement as it collects and channels run-off to a safe discharge point, ensuring that water does not infiltrate and damage the road base. It is an important feature adjacent to road carriageway to ensure pavement functionality and to minimise lifecycle costs.

There are additional costs with renewing the stone kerb and channel in the old Auckland areas (identified by Auckland City Council). NZTA does not pay for this additional cost as it is deemed a matter of amenity value.

33 per cent of kerb and channel is in moderate to very good condition (grades 1 to 3) as shown in Figure 4.12-2, and 67 per cent is in an unknown condition grade. Defects are picked up with routine road carriageway inspections but these are not associated with an individual kerb and channel asset and therefore have not been used for this analysis.

Figure 4.12-2 Surface water channel condition
Source: Auckland Transport RAMM database (February 2012)



	North	Central	West	South	Total (m)	% of total
Very Good	132,323	0	399	18,800	151,522	2%
Good	98,981	0	0	1,693,964	1,792,945	24%
Moderate	110,842	0	0	377,479	488,321	7%
Poor	1,496	0	0	20,768	22,264	0%
Very Poor	0	0	0	6,514	6,514	0%
Unknown	1,395,807	2,238,680	900,318	412,869	4,947,674	67%
% of total	23%	30%	12%	34%	100%	
Total (m)	1,739,449	2,238,680	900,717	2,530,394	7,409,240	100%

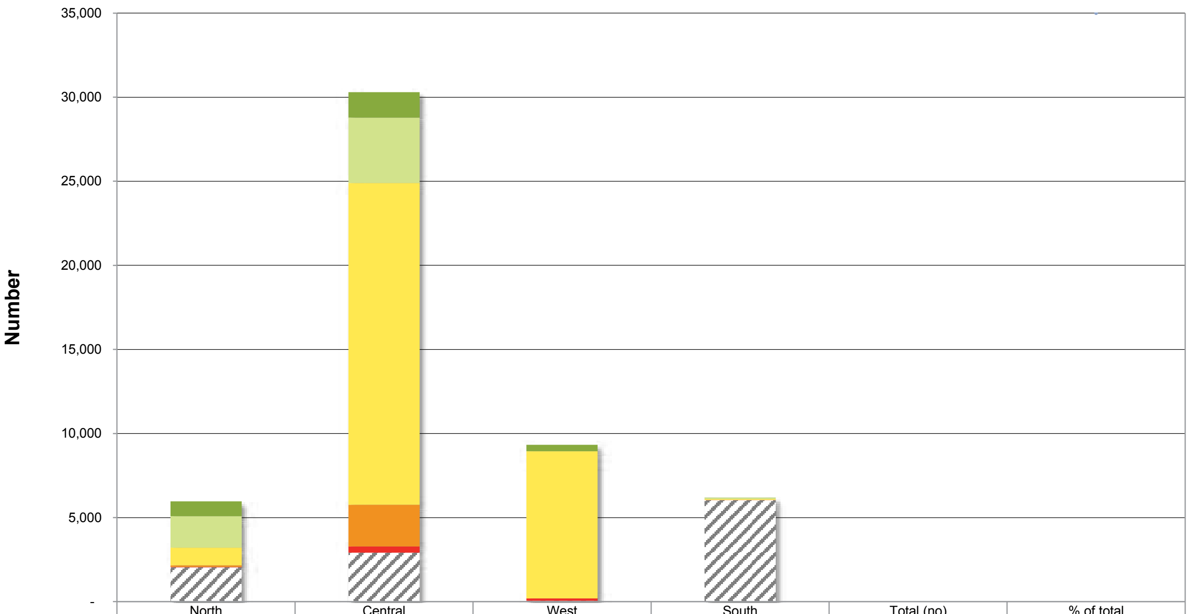
Auckland Transport's technical LOS target is for 95 per cent of drainage assets to be in moderate or better condition. Currently surface water channels do not meet this target. The focus is to replace surface water channel assets that are in condition grade 5 or very poor.

Catchpits

Catchpits are important for receiving surface water from the pavement and draining it through the catchpit that leads to the public stormwater network. Catchpits also act as a quality treatment device with the silt dropping in the pit and being emptied periodically. Subsoil drainage is installed where applicable under kerb and channel to discharge to groundwater from road base, and drain to the catchpits.

There are 51,782 catchpits (based on RAMM information) and 73 per cent of the catchpits are in moderate to very good condition as shown in Figure 4.12-3. 21 per cent have an unknown condition grade. The planned condition assessment will improve the understanding of actual asset condition over time (refer to Section 4.12.6, condition assessment programme.)

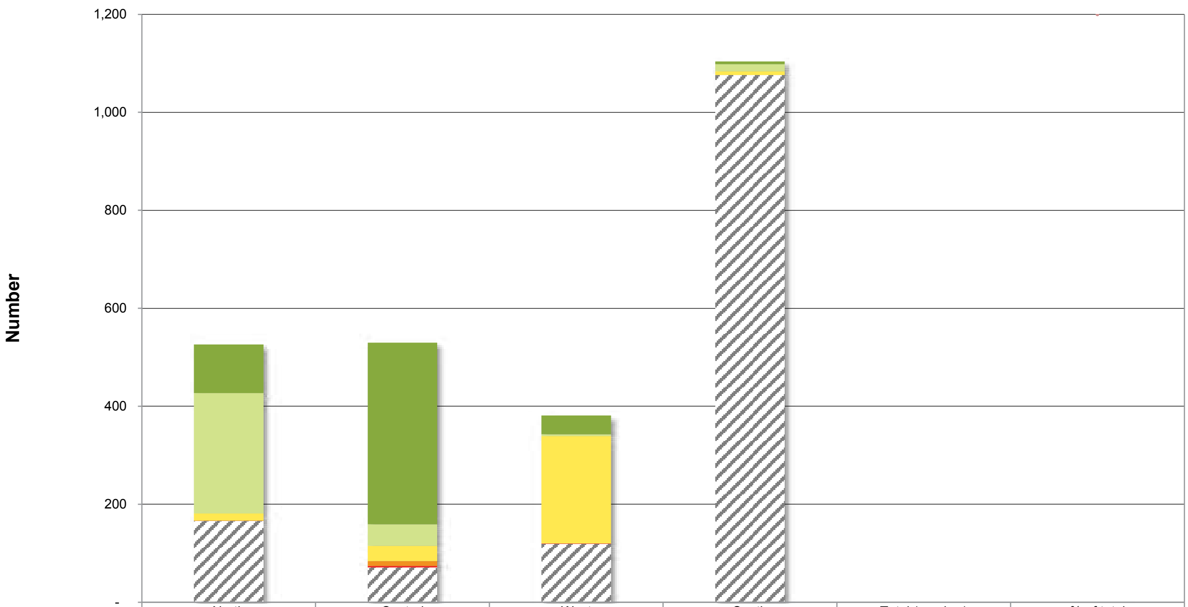
Figure 4.12-3 Catchpit condition
Source: Auckland Transport RAMM database (February 2012)



	North	Central	West	South	Total (no)	% of total
Very Good	885	1,518	385	12	2,800	5%
Good	1,870	3,881	2	85	5,838	11%
Moderate	1,043	19,133	8,744	47	28,967	56%
Poor	97	2,483	1	6	2,587	5%
Very Poor	19	367	147	1	534	1%
Unknown	2,050	2,915	51	6,040	11,056	21%
% of total	12%	59%	18%	12%	100%	
Total (no)	5,964	30,297	9,330	6,191	51,782	100%

Figure 4.12-4 Manhole condition

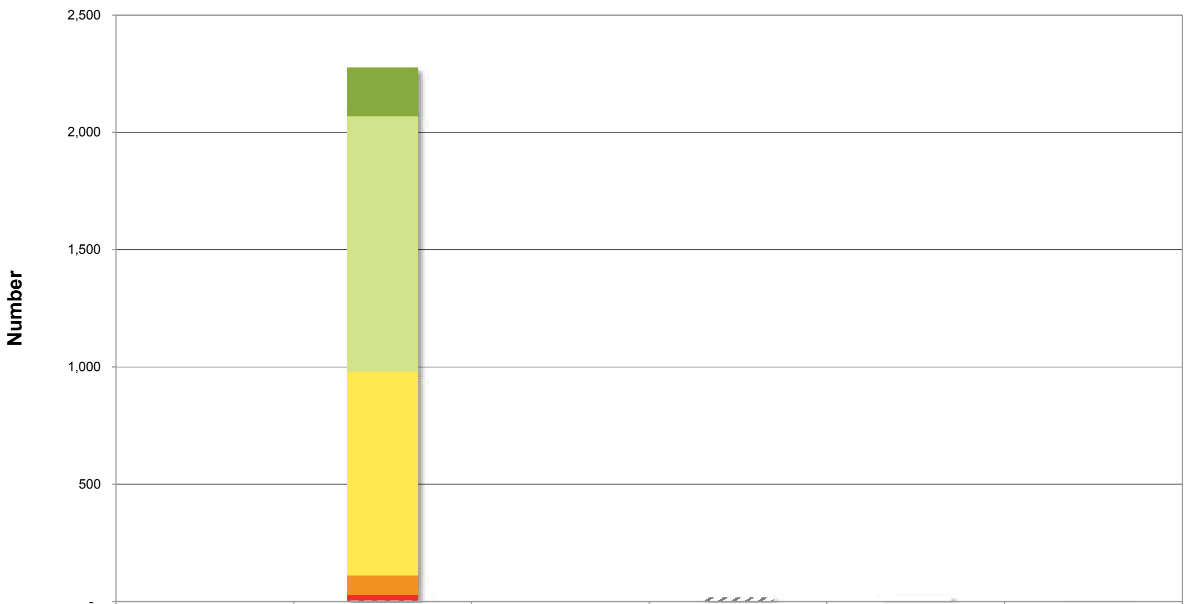
Source: Auckland Transport RAMM database (2 February 2012)



	North	Central	West	South	Total (number)	% of total
Very Good	99	371	38	6	514	20%
Good	246	44	4	14	308	12%
Moderate	14	31	219	8	272	11%
Poor	1	10	0	0	11	0%
Very Poor	0	3	1	0	4	0%
Unknown	166	71	119	1,076	1,432	56%
% of total	21%	21%	15%	43%	100%	
Total (number)	526	530	381	1,104	2,541	100%

Figure 4.12-5 Soakhole condition

Source: Auckland Transport RAMM database (2 February 2012)



	North	Central	West	South	Total (number)	% of total
Very Good	0	208	0	0	208	9%
Good	0	1,090	0	0	1,090	48%
Moderate	0	866	0	0	866	38%
Poor	0	85	0	0	85	4%
Very Poor	0	22	0	0	22	1%
Unknown	0	5	0	18	23	1%
% of total	0%	99%	0%	1%	100%	
Total (number)	0	2,276	0	18	2,294	100%

Manholes

Auckland Transport maintains 2,541 manholes and 43 per cent are in moderate to very good condition as shown in Figure 4.12-4. About half (56 per cent) of the manhole condition is unknown, particularly in the South area.

Asset ownership of manholes was treated differently by the various legacy councils. Some road manholes may in fact be stormwater manholes or vice versa. A review is required to confirm ownership with a consistent regional approach. This review is important to ensure transparent costs as road drainage assets will progressively be managed by the Stormwater Unit.

Soakholes

Soakholes are large pits in the road carriageway that dispose of stormwater to the aquifer. They are mainly located on the Auckland isthmus in the volcanic soil areas of Epsom, Mt Eden and Onehunga. These large soakholes are for disposing of stormwater from the road carriageway and are interlinked with the public stormwater network. There is often a gross pollutant trap before the large soakholes to trap the gross sediment before it enters the soakhole. This acts as a first treatment device and helps reduce soakhole clogging.

There are 2,294 soakholes in total and almost all of them are located in the Central area, with only 18 in the South area.

There are five soakhole types defined as follows:

Type 1	**Precast or cast in situ manhole riser with open base and/or sides into scoria / rock**
Type 2	**Precast or cast in situ manhole riser with lined bore holes and syphon into fractured rock**
Type 3	**Large cavity with open base to scoria / rock, with manhole cover**
Type 4	**Natural cavern or tunnel into rock with manhole cover**
Type 5	**Type 1 but with filter liner**

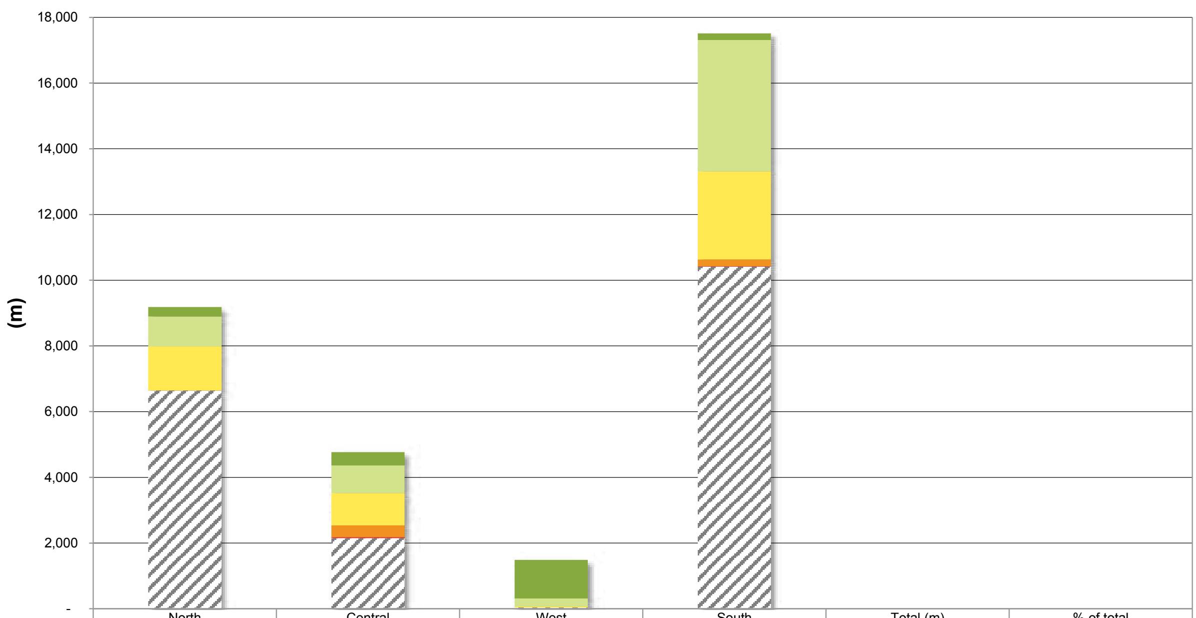
Most soakholes or 94 per cent are in moderate to very good condition as shown in Figure 4.12-5. Condition has been assessed for only known soakholes in the Auckland area.

Culverts

There are 32,958m of large culverts, most of which are located in the South area at 17,516m. 58 per cent of large culverts have unknown surveyed condition information, as presented in Figure 4.12-6. This is a sizable proportion and has been identified as a future improvement. 40 per cent of large culverts with known surveyed condition are in moderate to very good condition.

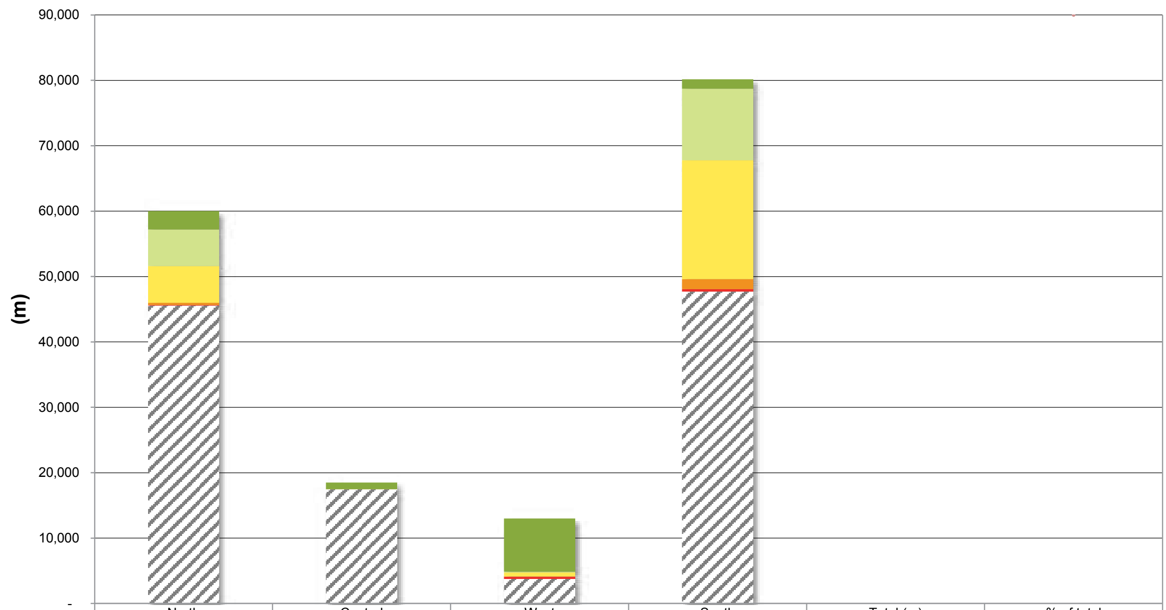
Figure 4.12-6 Large culvert condition

Source: Auckland Transport RAMM database (2 February 2012)



	North	Central	West	South	Total (m)	% of total
Very Good	290	403	1,173	206	2,072	6%
Good	911	844	239	3,999	5,993	18%
Moderate	1,334	979	37	2,678	5,028	15%
Poor	9	359	0	207	574	2%
Very Poor	0	28	0	14	41	0%
Unknown	6,641	2,154	41	10,414	19,250	58%
% of total	28%	14%	5%	53%	100%	
Total (m)	9,185	4,767	1,490	17,516	32,958	100%

Figure 4.12-7 Small culvert condition
Source: Auckland Transport RAMM database (2 February 2012)



	North	Central	West	South	Total (m)	% of total
Very Good	2,824	1,000	8,146	1,455	13,424	8%
Good	5,589	10	98	10,925	16,622	10%
Moderate	5,626	0	606	18,184	24,416	14%
Poor	327	12	44	1,538	1,920	1%
Very Poor	76	0	335	357	768	0%
Unknown	45,564	17,473	3,765	47,709	114,510	67%
% of total	35%	11%	8%	47%	100%	
Total (m)	60,004	18,494	12,993	80,168	171,660	100%

There are 171,660m in length of small culverts, mostly located in the South area at 80,168m. 67 per cent of small culverts have unknown surveyed condition information which is a sizable proportion and has been identified as a future improvement. 32 per cent of small culverts with known condition are in moderate to very good condition.

Historically, small culverts were generally managed reactively so there is likely to be more of them than actually recorded in the RAMM database. Similarly, asset condition was not always collected proactively. The planned condition assessments will address this over time.

Condition assessment programme

Auckland Transport has developed a formal condition assessment programme for the road network which began in July 2012. Kerb and channel assets will be surveyed at the same time as the road network depending on the road hierarchy. It is expected that this condition information will provide a robust basis for future renewals profiles. Other road drainage assets will be managed by the Stormwater Unit, including planned condition assessments.

14.12.7 Asset performance and capacity

Performance

Factors such as siltation, blockage by debris and vegetation, and incorrect placement of assets can affect road drainage performance in some cases. Asset performance is generally understood through responding to faults and flooding incidences after significant rain events.

Aquifers are an important part of the stormwater network for stormwater disposal. Areas have been prioritised and are being investigated further by Auckland Council's Stormwater Unit to better understand soakage performance, including aquifer depth, soakage potential, and options for soakage location to reduce flooding.

Impeded surface water channels particularly at driveway crossings present a significant functional issue. They can affect serviceability and safety because of blockages and uneven surfaces.

There was a mixture of ownership, materials and standards for driveway culverts (typically small culverts). These factors increase the risk of watercourse blockages, which may in turn cause flooding.

Capacity

Historically, knowledge of asset capacity arose from flooding incidences. Auckland City Council started to address flooding more proactively with the development of management plans as tools to manage the network more effectively. Waitakere City Council defined capacity for kerb and channel in relation to flood protection of a five-year storm return period. There is currently no consistent flood protection standard for road drainage assets regionally.

The Stormwater Unit will be managing the drainage road assets and this will enable stormwater issues in both networks to be managed more holistically. It is expected that the Stormwater Unit's catchment management planning process will be the main tool for long-term planning to address capacity. It is important that catchment planning considers Auckland Transport's objectives and evaluates capacity according to these criteria:

- Safety – in terms of depth and velocity, so public safety is not compromised
- Serviceability – particularly in significant rainfall events, so that arterials are available for safe movement including access for emergency services
- Recovery – assets function after significant rainfall events.

Auckland Transport identifies these points as future improvements.

14.12.8 Asset risks and criticality

Asset risks

Asset risks across the transport network, identified through a formal risk analysis review, appear in the Section 8, Risk Management. Risks for the drainage network are summarised in Table 4.12-7.

Additional risks identified through the development of this AMP are summarised in Table 4.12-8.

Table 4.12-7 Drainage risk analysis
Source: Auckland City Council Transport Risk Analysis 2008

Risk	Net risk factor	Management options
Flooding affecting roads due to under-capacity drainage, poor location, or blocked drainage assets, causing inaccessibility or unsafe driving conditions	High risk – requires remedial planning and action via the AMP	Monitor and review current practices.
Surface-water contamination during normal operation of the network caused by lack of environmental controls	High risk – requires remedial planning and action via the AMP	Identify known problem areas and extents of treatment devices to implement upgrade programme within existing projects. Monitor discharges via consent conditions and through liaising with Auckland Council. Improve design of stormwater-quality devices.

Table 4.12-8 Additional drainage risk summary

Risk	Management options
Flooding affecting roads due to under-capacity drainage, poor location or blocked drainage assets	• Identify at-risk assets • Check critical / known problem assets prior to significant rain event • Review LOS in problem areas • Review LOS in accordance with seasonal changes (leaf dropping) • Review customer complaints and plan improvement works
Overtopped table drain causing surface flooding	• Increase auditing of contractor performance. • Identify at-risk drains and carry out options assessments • Review LOS in problem areas
Surface water contamination during normal operation of the network caused by lack of environmental controls	• Identify known problem areas and implement upgrade programme within existing projects • Monitor discharges via consent conditions and liaise with Auckland Council • Future possible central government legislation
Flooding affecting properties off road networks due to the condition/performance of drainage assets	Renew and upgrade poor and very poor condition drainage facilities across the region
Ownership of problems between different entities managing stormwater	Implement improved communication and liaison with other groups including Stormwater Unit and Watercare Services Ltd
Risk to road base flooding due to inadequate road drainage	• Identification of flooding incidences • Monitoring of road base conditioning and performance for signs of deterioration • Renew very poor road drainage through road rehabilitation projects or with localised measures such cut-off drains

Critical assets

Critical assets are those parts of the road drainage network that are vital to providing service continuity and have unacceptable consequences in the event of failure. Although there have been no formal asset criticality analyses undertaken, critical road drainage assets are likely to be those which may cause significant flooding if they fail, namely:

- Drainage assets associated with regional arterial roads with high traffic volumes, as they would likely be the most disrupted by flooding
- Drainage structures located in high-risk flood areas such as soakholes and catchpits, identified through the frequency of flooding data and damage costs.

The action plans for managing these critical assets are to:

- Undertake condition assessments of regional road drainage assets on a regular basis
- Respond to flooding incidences in a timely manner
- Regularly inspect and maintain critical road drainage assets to minimise flooding risk due to poor maintenance
- Undertake planned mitigation of poor condition or aged assets that carry essential services such as the renewal of the Wolverton / Tiverton culvert.

Flooding risk could be further reduced with the following operations and maintenance practices, identified as future improvements:

- Monitor the performance of road drainage assets through fault records and failures during major storms; the cleaning frequency for managing these assets may need to be increased
- Identify critical assets and schedule those that need proactive pre-storm management.

14.12.9 Key issues

Key lifecycle issues that affect drainage assets are summarised in Table 4.12-9.

Table 4.12-9 Key drainage issues

No.	Key issues with drainage	Action plans for managing these issues	Outcomes
1	Greater public awareness and higher stakeholder expectations for sustainability of stormwater quality, particularly road run-off and environmental impacts	Liaise with the council's Stormwater Unit and other authorities and entities responsible for stormwater management, to ensure their reticulation systems operate adequately Develop region-wide stormwater management plans or similar to manage stormwater impacts on the roading network	Stormwater impacts on the roading network managed proactively
2	Significant growth in non-traditional drainage systems, such as rain gardens in new developments which will have higher maintenance costs than conventional systems. In future the growth areas will use source treatment and these assets have consequential OPEX	• Develop relationships with the council's regulatory arm to understand the drainage systems that will be vested in future and likely maintenance costs • Provide technical input into design manuals. • All options consider whole-of-life cost, particularly from developers, as Auckland Transport then becomes responsible for the operational costs • Develop forecasts based on the Auckland Plan and understand these effects	Forecasts of non-traditional stormwater assets (vested from developers) are available and up to date Options considered whole-of-life costs in decision making
3	Frequency and timing of street sweeping and cleaning not adequately coordinated, resulting in increased customer enquiries	Regular coordination meetings between Auckland Transport, Auckland Council and contractors	Coordinated and optimised street sweeping and cleaning
4	Risk to road base from flooding due to inadequate road drainage	Identification of flooding incidences and monitoring of road base conditioning and performance Flood reduction through the provision of adequate subsoil drainage	Road base adequately protected from flooding
5	With climatic change, the potential increase in storms / rainfall resulting in greater overland flows and customer complaints of flooding	Ongoing monitoring of stormwater complaints of flooding from the road network Consider capacity issues at the time of renewal	Proactive monitoring of stormwater complaints of flooding from the road network
6	Reduced performance of drainage assets due to blockage from leaf drop and increased debris and sediment deposition	• Planned maintenance programmes for targeted areas with significant deciduous trees to remove leaf drop in autumn • Planned maintenance programmes for targeted areas with significant pine trees to remove pine needles in summer storms • Ongoing reviews of the frequency and effectiveness of these planned maintenance programmes	Optimised maintenance programmes for targeted areas with significant deciduous and pine trees
7	Effect of rural development on Auckland Transport's right to discharge surface water from road carriageway onto private land in rural areas	Develop bylaw to address issue if required	Auckland Transport lawfully discharges surface water from road carriageway onto private land in rural areas

14.12.10 Operations and maintenance needs

Operations and maintenance plan

Auckland Transport keeps the drainage network well maintained through an ongoing maintenance programme that addresses defects identified through inspections, or arising from health and safety issues and public complaints. This work can be either planned maintenance or responsive maintenance.

The scope of road drainage operations and maintenance activities includes:

- Cleaning catchpits, soakholes, and kerb and channel
- Cyclic maintenance of stormwater treatment devices in accordance with operations and maintenance plans
- Emergency response and works
- Removal of vegetation and blockages in watercourses
- Repair of damaged road drainage assets.

Definitions of operations and maintenance works for road drainage assets are:

Operational works	Regular or cyclic repairs	Minor work that helps maintain the condition and functionality of the drainage structure and reduces the need for other (normally more expensive) maintenance work, e.g. cleaning catchpits and soakholes, emergency works, kerb and channel cleaning, removal of vegetation and blockages in watercourses particularly at culvert inlets. Effective vegetation control is important in maintaining the function and integrity of unlined channels
Maintenance works	Mostly spot repair	Repair of drainage assets such as cracked kerb and channel or damaged pipe.

Auckland Transport's operational actions include the following:

Reactive response	Respond to customer faults	Faults, such as nuisance flooding and removal of blockages, do not affect public safety
Emergency response	Respond with minimum response times	Events that may affect network safety and integrity, and/or public safety. This can fluctuate depending on adverse weather conditions and traffic accidents/incidents and other factors
Routine operations	Periodically inspect and clean	This includes periodic cleaning of catchpits and soakholes with more frequent cleaning of the critical ones. Routine network inspections by contractors to identify defects as defined in the key results schedules. The results are used to plan the contractor's routine maintenance activities

Maintenance actions include:

- Reporting on maintenance activities to enable asset analysis. This includes analysing the faults and flooding incidences and changing the operations and maintenance strategy as appropriate to improve system performance
- Reactive maintenance – repair damaged assets, typically spot repairs, e.g. less than 20m in length for kerb and channel. These are normally identified from planned inspections or customer faults and flooding complaints
- Cyclic maintenance of stormwater treatment devices such as gross pollutant traps, filter medium change, rain-garden mulch and sand filter cartridge, in accordance with operations and maintenance plans.

Catchpit and soakhole pollutant trap devices are used in action plans to deal with pollution from the city's roads. A proactive approach has led to the design and development of the 'TetraTrap' catchpit pollutant device and soakhole filter cage. The devices significantly increase capture of sediments and litter and improve the quality of stormwater discharging to streams and waterways. The Enviropod filtration system is also being used in Takapuna for pollution control. There are ongoing operational costs with these quality devices.

There are various stormwater treatment devices each with different operations and maintenance plan requirements. The devices include swales, rain gardens, storm filters, sand filters, bio retention devices, and gross pollutant traps. The number and location of devices has largely been driven by new developments. Going forward, it is planned to standardise the operations and maintenance plans as much as practicably possible.

Table 4.12-10 Routine operational frequencies
Source: Draft Technical Specifications Volume 5, RCM South Contract (8 February 2012)

Road hierarchy	Routine inspection frequency	Detailed inspection frequency
Regional and district arterial routes, collector route, local and collector routes (5,000 to 10,000 vpd)	Weekly	Three monthly
Generally local sealed roads (1,000 to 5,000 vpd)	Two weekly	Three monthly
Generally local sealed roads (<1,000 vpd), unsealed roads, accessways and car parks	Two monthly	Six monthly

Impervious paving is being installed with new subdivisions and parking bays. These assets require cyclic vacuum sweeping and, as more of them become road drainage assets, their inclusion in the maintenance plan is important.

The frequency of the routine and detailed inspections are summarised in Table 4.12-10, based on road hierarchy. Routine inspections are visual inspections undertaken by driving the road and recording any traffic safety issues (such as blocked catchpit grate) to users. Detailed inspections are field assessments to identify any defects including condition and performance at individual asset type level. The new RCM contracts are based on the contractor meeting output specifications rather than prescriptive frequencies.

The response times of the physical maintenance works are summarised in Table 4.12-11, based on road hierarchy. Routine physical works is the maintenance required to repair the fault identified by the routine operation inspections.

As the RCM contracts are implemented progressively across the region, catchpit sump and soakhole cleaning will be undertaken by the Stormwater Unit (although the budget remains with Auckland Transport). In rural areas, catchpit and leads are maintained by Auckland Transport and in urban areas assets from grate downwards are the responsibility of the Stormwater Unit.

Contractor performance on delivering the maintenance works and related outputs is linked to the operational LOS of the transport network. Catchpit cleaning is linked to the catchment outcomes to be achieved. These will vary regionally and over time be aligned to network discharge consent requirements.

Historical levels of operations and maintenance expenditure have provided the current levels of service of the network. It is expected that this current level of service will be maintained in the future and is the basis of long-term lifecycle management strategies of this AMP. This position may change in the future as a result of Auckland Council and Auckland Transport adopting a different level of service in view of the funding and budgetary constraints.

Operations and maintenance 10-year expenditure forecast

The recommended 10-year operational expenditure forecast is shown in Figure 4.12-8 with $199.2 million forecast over the next 10 years. It is based primarily on historical trends but also includes the revised activities detailed above and LOS to be achieved to some extent. This recommendation has also taken into account current funding constraints being experienced by Auckland Transport and Auckland Council. Note, however, that the actual plan to be approved by Auckland Transport and Auckland Council may yet differ from these network needs because of the impact of funding constraints.

The average annual expenditure for operations and maintenance on drainage over the next 10 years is approximately $19.9 million, approximately 59 per cent of the total expenditure. Overall, there is an increase from $19.1 million to $20.7 million over the next 10 years resulting from growth of the roading network and drainage assets, and in order to improve stormwater quality. About two-thirds of the planned operational expenditure is for the Central area.

Table 4.12-11 Physical maintenance works response times
Source: Draft Technical Specifications Volume 5, RCM South Contract (8 February 2012)

Road hierarchy	Catchpit grate clearing response times	Catchpit sumps and maintenance response times	Drainage response times
Regional and arterial routes, generally collector route, accessways and car parks	2 days	2 days	2 weeks
Local and collector routes (5,000 to 10,000 vpd) and generally local sealed roads (1,000 to 5,000 vpd)	2 days	3 days	3 weeks
Generally local sealed roads (<1,000 vpd) and unsealed roads	2 days	4 weeks	4 weeks

Consequential OPEX are the new ongoing operational costs required due to the acquisition of new complex assets such as treatment devices. It is expected that consequential operational costs will increase over time as more treatment devices and soakholes are installed through:

- Growth areas as identified in the Auckland Plan
- Network discharge consent requirements for each catchment
- State highway revocations.

4.12.11 Renewal needs

Renewal strategy

Auckland Transport's current renewal strategy is either whole asset replacement or renewal of specific components. Drainage assets are generally renewed following structural defects and minor collapses, identified through planned condition surveys and operational inspections. The technical LOS target is for 95 per cent of drainage assets to be in moderate or better condition.

The intervention threshold for renewing drainage assets is quite high as they can still function even in relatively poor condition with the rate of degradation being very low. Higher priority is given to channels which leak stormwater or are cracked as this may potentially affect pavement structural integrity.

Priority is given to assets such as treatment devices that require replacement to satisfy network discharge consent requirements.

Renewal plan

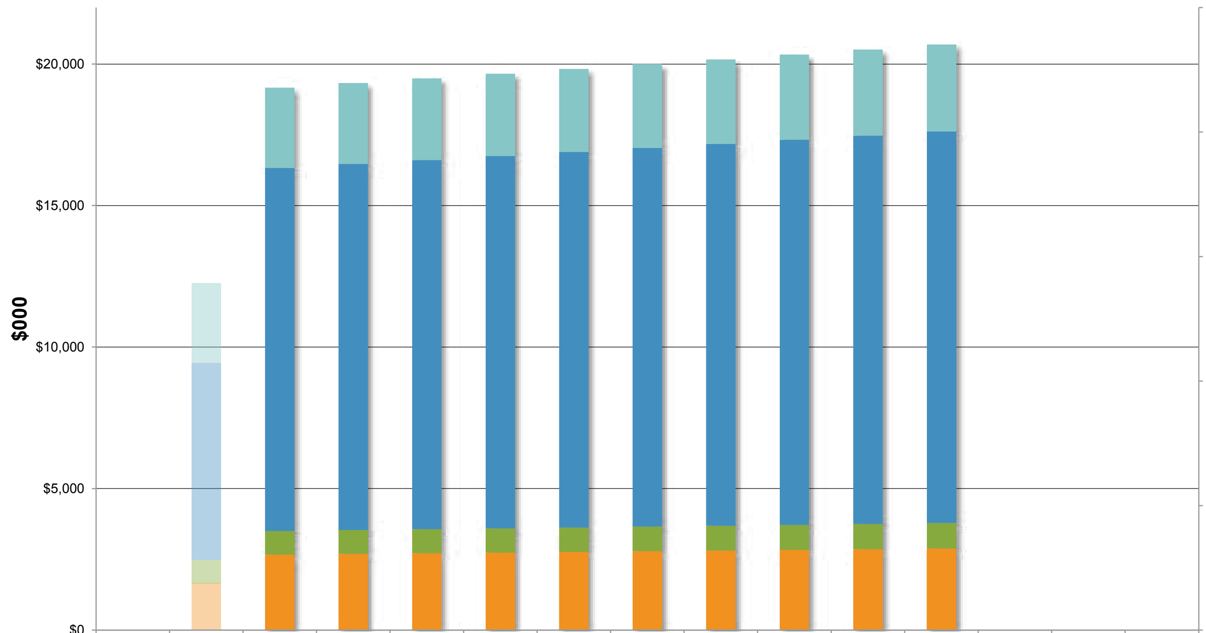
10-year renewal plan

Auckland Transport's long-term renewal plan uses the analysis of data extracted from the RAMM database. Renewals are developed that utilise both age- and condition-based analysis. A simple tool is used to model the 10-year renewal profiles for both methods. Some validation is undertaken with RCM, otherwise the analysis is mainly desktop based. Currently, criticality is not considered in the renewal analysis. The resulting 10-year renewal profiles are used for asset management purposes.

Annual and three-year renewal plan

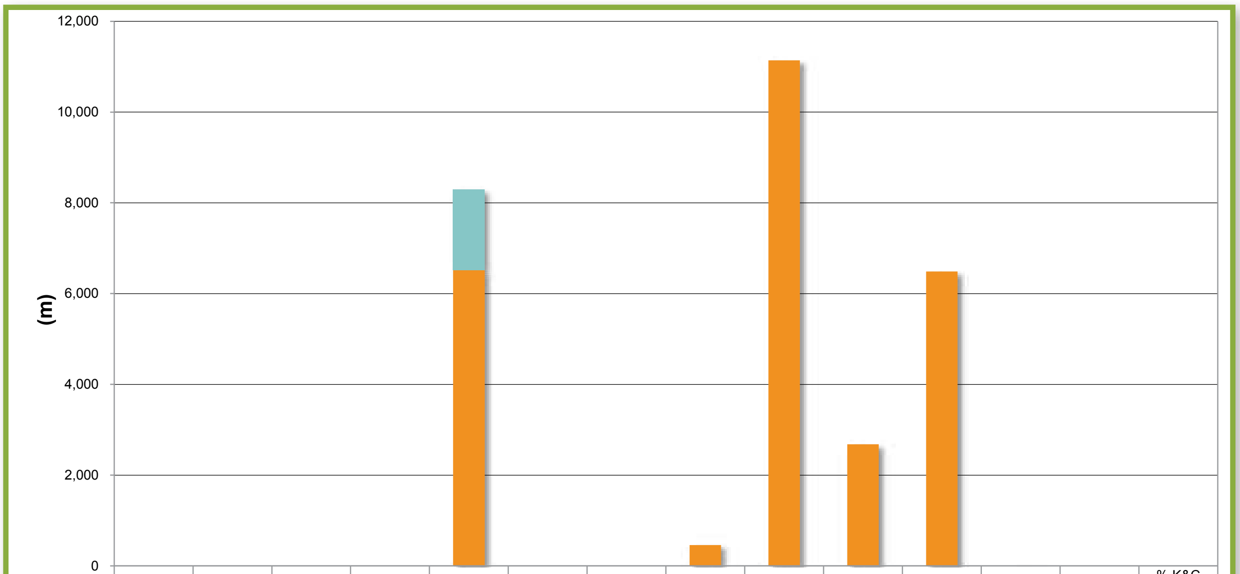
Auckland Transport also prepares a short-term renewal programme for delivering the forward works programme for the next one to three years. This programme development also includes site walkovers, confirmation of asset ownership and coordination with other work programmes.

Figure 4.12-8 Drainage operations and maintenance expenditure forecast
Source: LTP Budget Model 12 April 2012 after refresh for AMP
Note: for simplicity, only the SWC asset unit is shown (six drainage asset groups in total)



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	Total (SWC) (m)	Annual average $/(unit)
North	15%	2,816	2,840	2,864	2,888	2,913	2,938	2,963	2,988	3,013	3,039	3,065	29,510	1,740	$1,696
Central	67%	6,961	12,826	12,935	13,045	13,156	13,268	13,380	13,494	13,609	13,725	13,841	133,278	2,239	$5,953
West	4%	827	834	841	849	856	863	870	878	885	893	900	8,670	901	$962
South	14%	1,655	2,669	2,691	2,714	2,737	2,761	2,784	2,808	2,832	2,856	2,880	27,731	2,531	$1,096
Total	100%	12,259	19,169	19,332	19,496	19,662	19,829	19,998	20,168	20,339	20,512	20,686	199,190	7,409	$2,688

Figure 4.12-9 Kerb and channel condition-based renewals
Source: Auckland Transport RAMM database (2 February 2012)



	Length (m)	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	% K&C length renewed 2013-22
North	1,739,449	0	0	0	1,776	0	0	0	0	0	0	0	1,776	0.1%
Central	2,238,680	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
West	900,717	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
South	2,530,394	0	0	0	6,514	0	0	460	11,141	2,678	6,489	0	27,282	1.1%
TOTAL (m)	7,409,240	0	0	0	8,290	0	0	460	11,141	2,678	6,489	0	29,058	0.4%

Renewal analysis

The drainage renewals have been analysed by the following four methods (in decreasing maturity). Each method is less effective when there are significant amounts of unknown information. Soakholes is the only drainage asset group with adequate data completeness for condition and age.

Condition-based method – surface water channels

The following analysis of renewals is based on the current condition of the assets and uses whole-of-life deterioration to identify indicative renewal needs. 67 per cent of kerb and channel have an unknown condition grade. 33 per cent of kerb and channel is in moderate to very good condition. The condition-based method is less effective with significant amounts of unknown information. This analysis will improve over time as more robust condition information becomes available as an input into the renewal analysis.

The 10-year condition-based renewal profile for kerb and channel is shown in Figure 4.12-9. This shows that renewals are expected mainly in the South area in the first 10 years. Renewals in other areas are expected from 2026 (not shown in the graph).

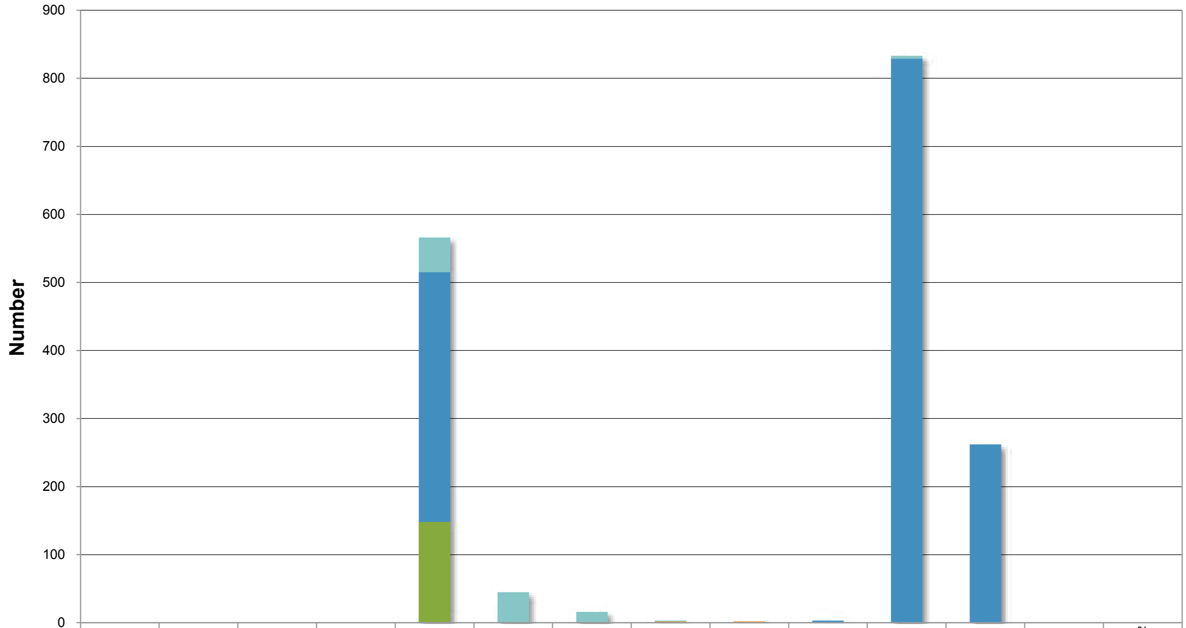
Condition-based method – catchpits

21 per cent of catchpits have an unknown condition grade. 73 per cent of catchpits are in moderate to very good condition. The 10-year condition-based renewal profile for catchpits is shown in Figure 4.12-10. This shows that renewals are expected in the Central and West areas in 2014-15, and in the Central area only in 2020-21 and 2021-22. Renewals in other areas are expected from 2029 (not shown in the graph).

Condition-based method – manholes

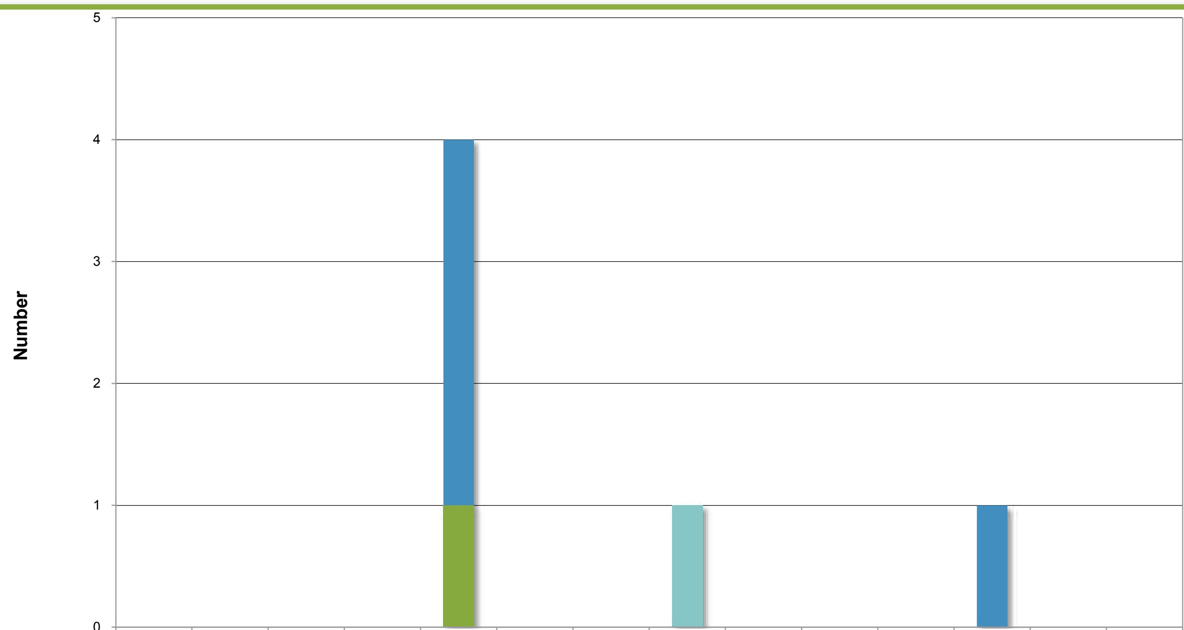
56 per cent of manholes have an unknown condition grade. 43 per cent of manholes are in moderate to very good condition. The 10-year condition-based renewal profile for manholes is shown in Figure 4.12-11. This shows that there are renewals expected in the Central and West areas in 2014-15. Renewals in other areas are expected from 2028 (not shown in graph).

Figure 4.12-10 Catchpit condition-based renewals
Source: Auckland Transport RAMM database (2 February 2012)



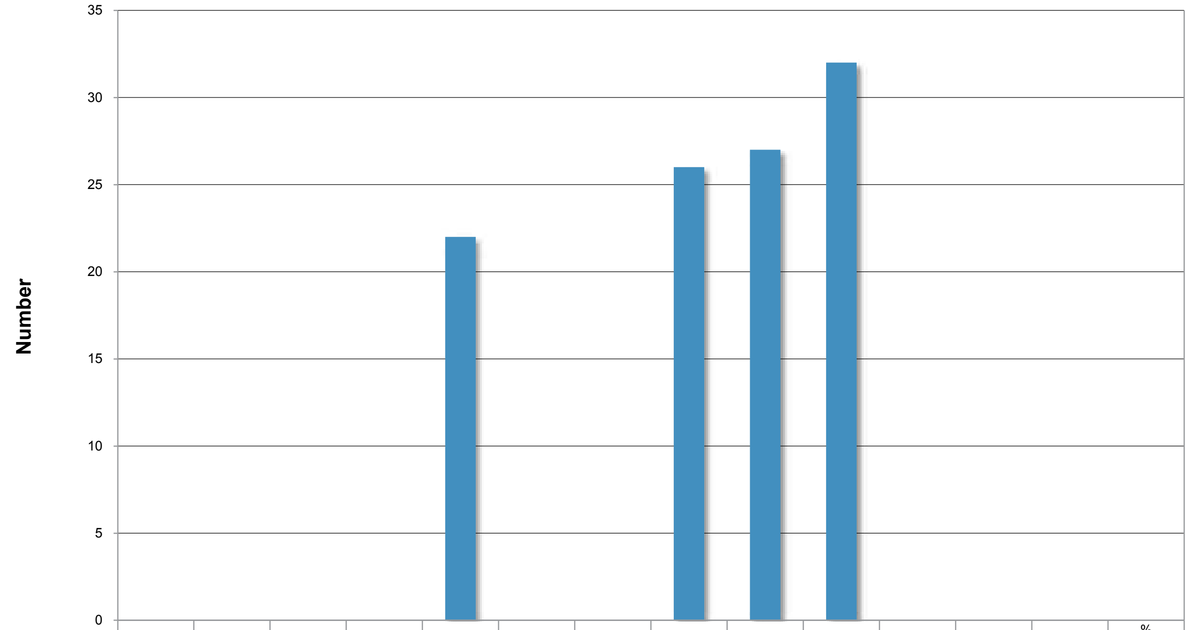
	No. of Components	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	% Components renewed 2013-22
North	5,964	0	0	0	51	45	16	1	0	0	4	0	117	2.0%
Central	30,297	0	0	0	367	0	0	0	0	2	829	261	1,459	4.8%
West	9,330	0	0	0	147	0	0	0	0	0	0	0	147	1.6%
South	6,191	0	0	0	1	0	0	2	2	1	0	1	7	0.1%
TOTAL (no)	51,782	0	0	0	566	45	16	3	2	3	833	262	1,730	3.3%

Figure 4.12-11 Manhole condition-based renewal results
Source: Auckland Transport RAMM database (2 February 2012)



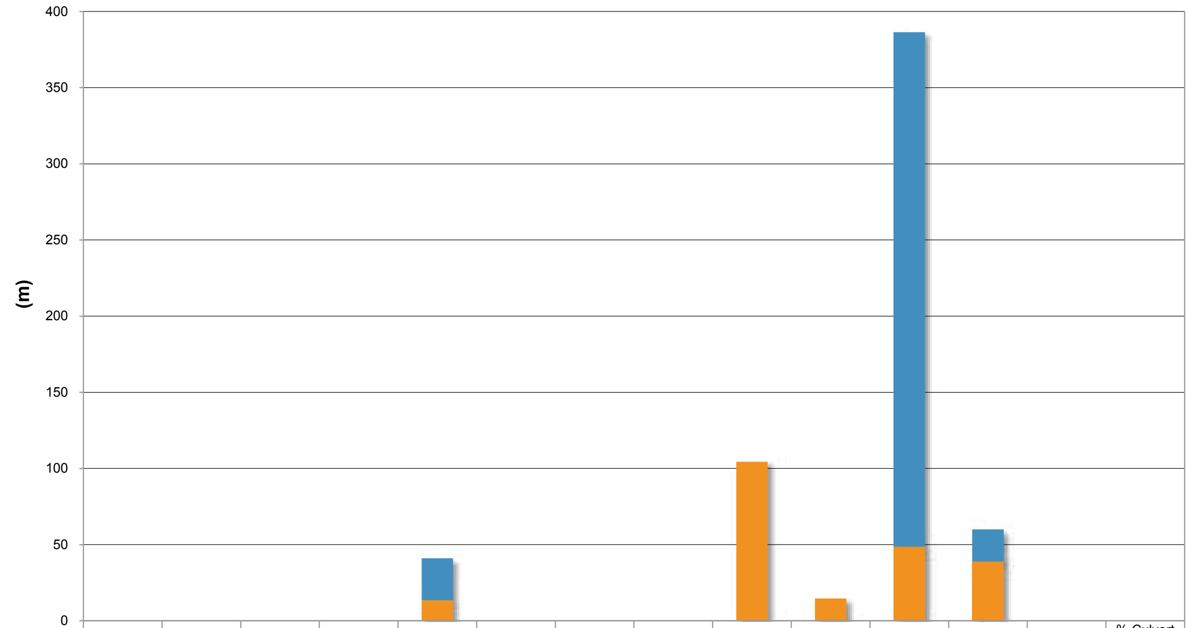
	No. of Components	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	% Components renewed 2013-22
North	526	0	0	0	0	0	0	1	0	0	0	0	1	0.2%
Central	530	0	0	0	3	0	0	0	0	0	0	1	4	0.8%
West	381	0	0	0	1	0	0	0	0	0	0	0	1	0.3%
South	1,104	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
TOTAL (number)	2,541	0	0	0	4	0	0	1	0	0	0	1	6	0.2%

Figure 4.12-12 Soakhole condition-based renewals
Source: Auckland Transport RAMM database (2 February 2012)



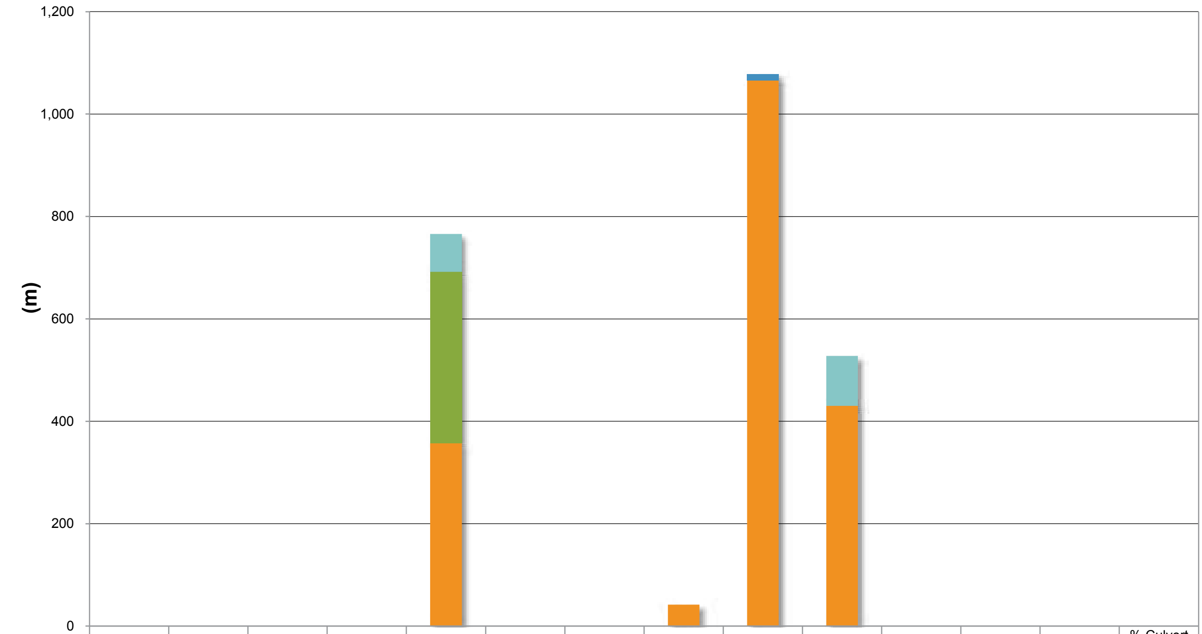
	No. of Components	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	% Components renewed 2013-22
North	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
Central	2,276	0	0	0	22	0	0	26	27	32	0	0	107	4.7%
West	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
South	18	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
TOTAL (number)	2,294	0	0	0	22	0	0	26	27	32	0	0	107	4.7%

Figure 4.12-13 Large culvert condition-based renewals
Source: Auckland Transport RAMM database (2 February 2012)



	Length (m)	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	% Culvert length renewed 2013-22
North	9,185	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
Central	4,767	0	0	0	28	0	0	0	0	0	338	21	386	8.1%
West	1,490	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
South	17,516	0	0	0	14	0	0	0	104	15	49	39	220	1.3%
TOTAL (m)	32,958	0	0	0	41	0	0	0	104	15	386	60	607	1.8%

Figure 4.12-14 Small culvert condition-based renewals
Source: Auckland Transport RAMM database (2 February 2012)



	Length (m)	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	% Culvert length renewed 2013-22
North	60,004	0	0	0	74	0	0	0	0	98	0	0	172	0.3%
Central	18,494	0	0	0	0	0	0	0	12	0	0	0	12	0.1%
West	12,993	0	0	0	335	0	0	0	0	0	0	0	335	2.6%
South	80,168	0	0	0	357	0	0	42	1,066	430	0	0	1,895	2.4%
TOTAL (m)	171,660	0	0	0	766	0	0	42	1,078	528	0	0	2,413	1.4%

Condition-based method – soakholes

99 per cent of soakholes have a known condition grade and 94 per cent of soakholes are in moderate to very good condition. The 10-year condition-based renewal profile for soakholes is shown in Figure 4.12-12. This shows that there is a large amount of renewals expected in the Central area in 2014-15 and from 2017-18 to 2019-20.

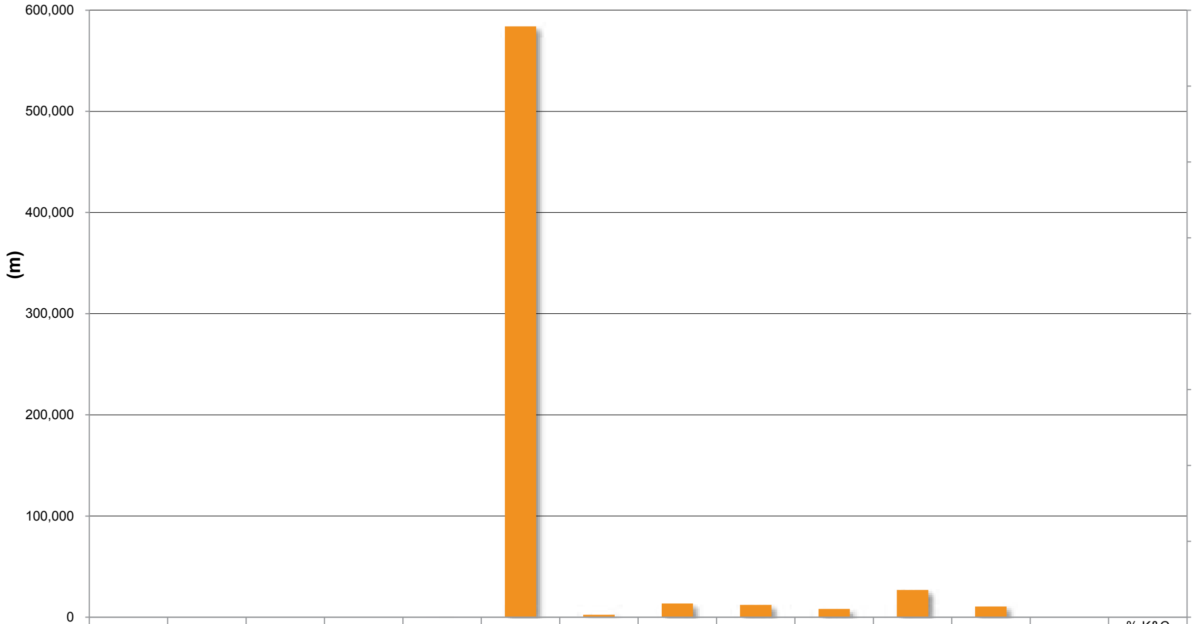
Condition-based method – large culverts

58 per cent of large culverts have an unknown condition grade. These have been assigned a default condition grade of 3.40 per cent of large culverts in moderate to very good condition. The 10-year condition-based renewal profile for large culverts is shown in Figure 4.12-13. This shows that there is a large amount of renewals expected in the South and Central areas in 2020-21.

Condition-based method – small culverts

There is a large amount (67 per cent) of small culverts with an unknown condition grade. These have been assigned a default condition grade of 3.32 per cent of small culverts in moderate to very good condition. The 10-year condition-based renewal profile for small culverts is shown in Figure 4.12-14. This shows a large amount of renewals expected in the South area in 2018-19 and 2019-20.

Figure 4.12-15 Surface water channel age-based renewals
Source: Auckland Transport RAMM database (2 February 2012)



	Length (m)	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	% K&C length renewed 2013-22
North	1,739,449	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
Central	2,238,680	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
West	900,717	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
South	2,530,394	0	0	0	524	584020	2517	13643	12244	8139	26946	10397	658,430	26.0%
TOTAL (m)	7,409,240	0	0	0	524	584,020	2,517	13,643	12,244	8,139	26,946	10,397	658,430	8.9%

Age-based method

Aged-based – surface water channels

The 10-year age-based renewal profile for surface water channels is shown in Figure 4.12-15. This shows that renewals are expected only in the South area in the first 10 years, mainly in 2015-16. Only half of the age data is known, making this renewal method less effective. This analysis will improve over time as more robust age information becomes available as an input into the renewal analysis.

Many surface water channels are the original assets and believed to be about 70 years old from operational knowledge (except new areas such as Manurewa). It is expected that many of these original assets will need replacing in the medium term (i.e. after 2022).

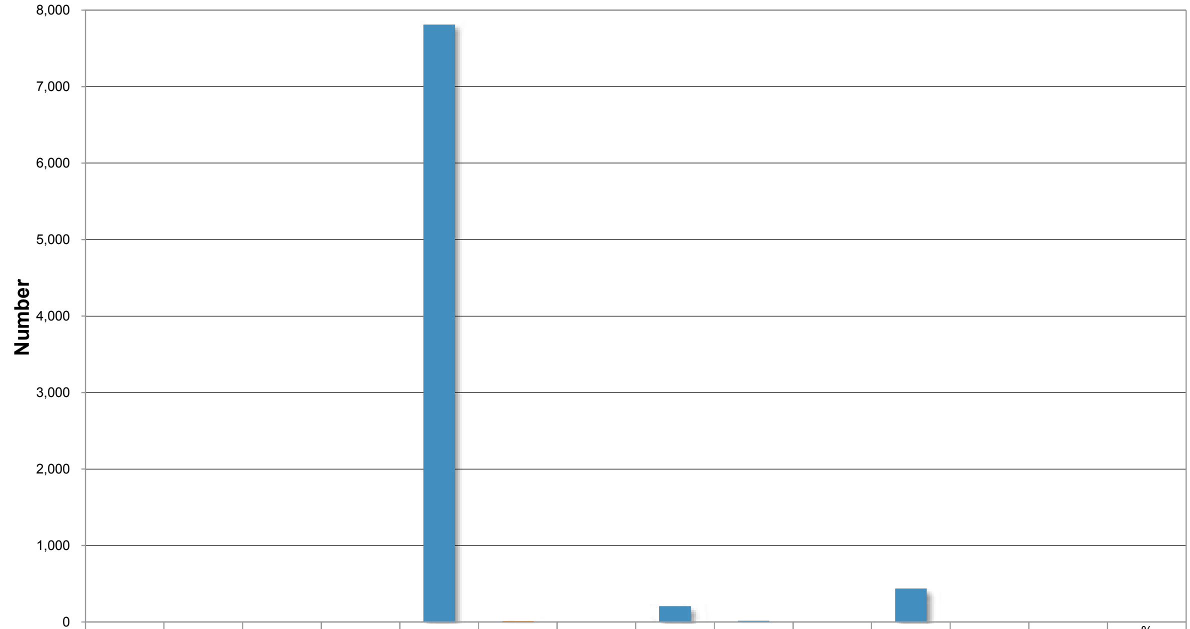
Age-based – catchpits

The 10-year age-based renewal profile for catchpits is shown in Figure 4.12-16. This shows that significant renewals are expected only in the Central area in the first 10 years, mainly in 2014-15. Only 58 per cent of the age data is known, making this renewal method less effective.

Aged-based – manholes

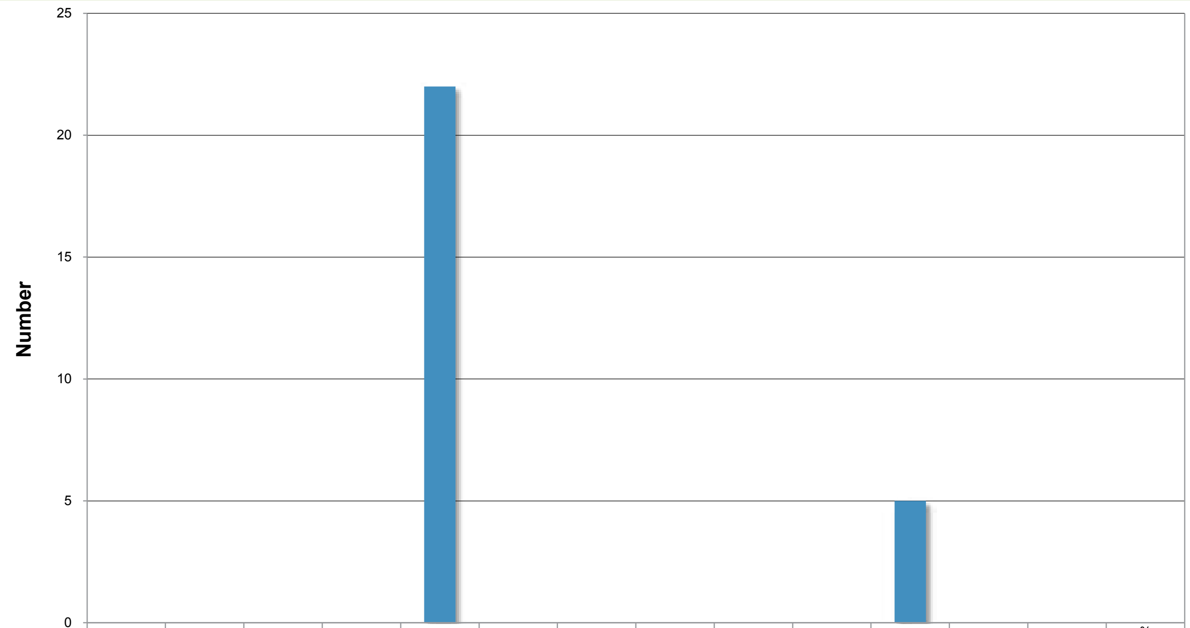
The 10-year age-based renewal profile for manholes is shown in Figure 4.12-17. This shows that renewals are expected only in the Central area in the first 10 years, mainly in 2014-15. Only 43 per cent of the age data is known, making this renewal method less effective.

Figure 4.12-16 Catchpit age-based renewals
Source: Auckland Transport RAMM database (2 February 2012)



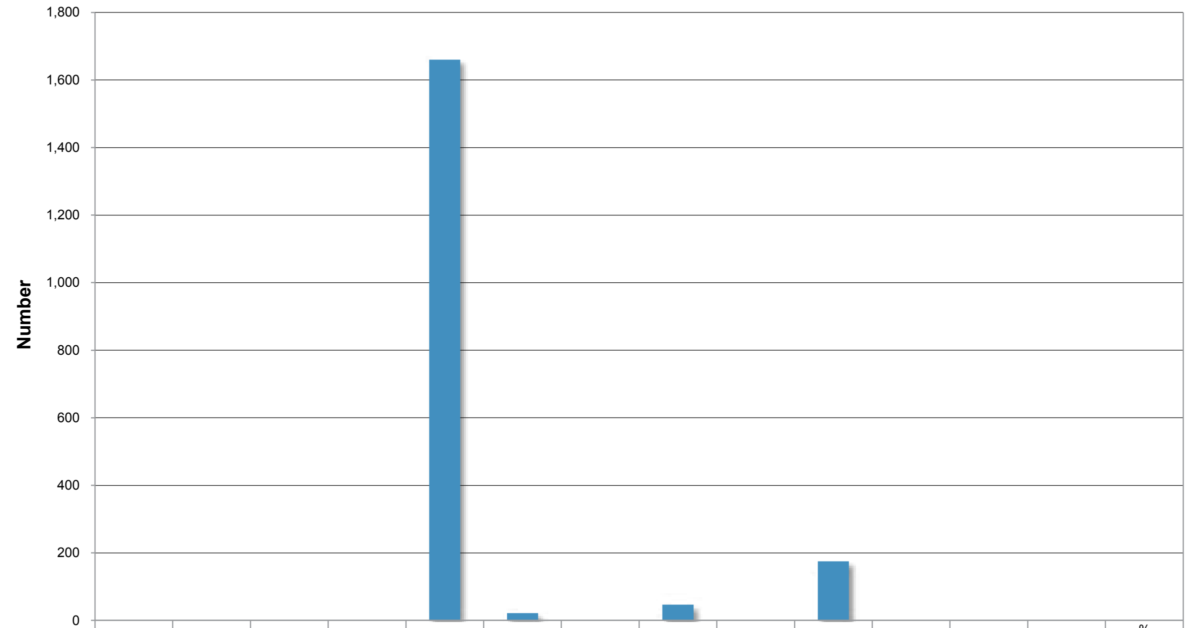
	No. of Components	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	% Components renewed 2013-22
North	5,964	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
Central	30,297	0	0	0	7,812	0	0	207	17	0	440	3	8,479	28.0%
West	9,330	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
South	6,191	0	0	0	0	15	0	0	0	0	0	0	15	0.2%
TOTAL (no)	51,782	0	0	0	7,812	15	0	207	17	0	440	3	8,494	16.4%

Figure 4.12-17 Manhole age-based renewals
Source: Auckland Transport RAMM database (2 February 2012)



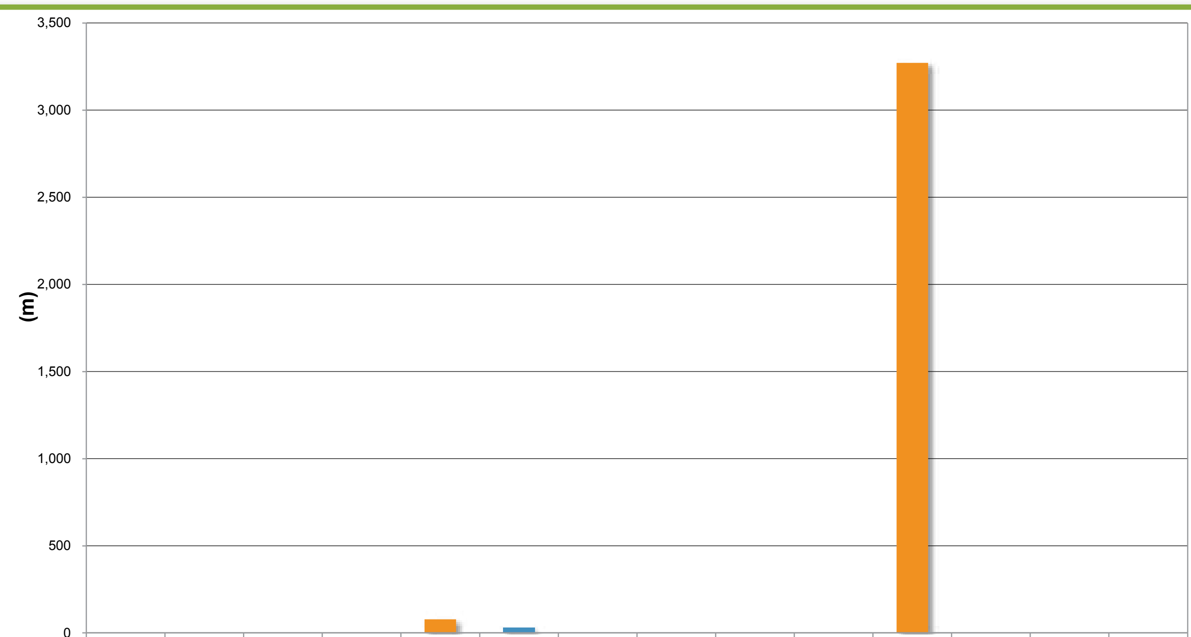
	No. of Components	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	% Components renewed 2013-22
North	526	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
Central	530	0	0	0	22	0	0	0	0	0	5	0	27	5.1%
West	381	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
South	1,104	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
TOTAL (no)	2,541	0	0	0	22	0	0	0	0	0	5	0	27	1.1%

Figure 4.12-18 Soakhole age-based renewal results
Source: Auckland Transport RAMM database (2 February 2012)



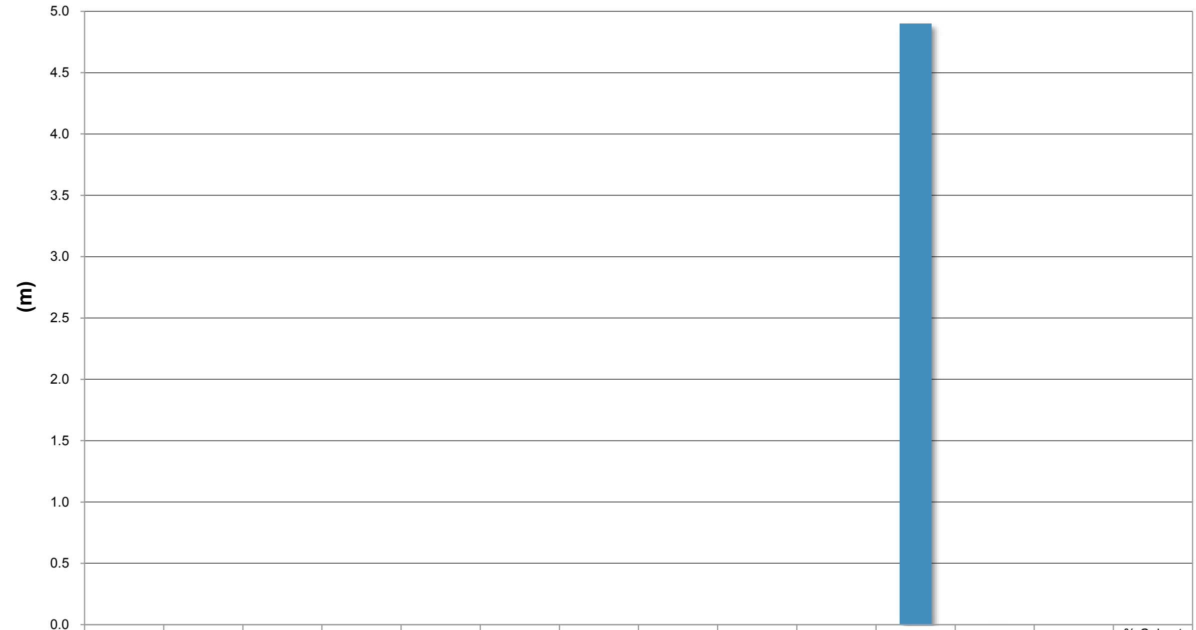
	No. of Components	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	% Components renewed 2013-22
North	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
Central	2,276	0	0	0	1,660	22	0	47	0	175	0	0	1,904	83.7%
West	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
South	18	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
TOTAL (unit)	2,294	0	0	0	1,660	22	0	47	0	175	0	0	1,904	83.0%

Figure 4.12-19 Large culvert age-based renewals
Source: Auckland Transport RAMM database (2 February 2012)



	Length (m)	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	% Culvert length renewed 2013-22
North	9,185	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
Central	4,767	0	0	0	0	30	0	0	0	0	0	0	30	0.6%
West	1,490	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
South	17,516	0	0	0	78.1	0	0	0	0	0	3270.7	0	3,349	19.1%
TOTAL (m)	32,958	0	0	0	78	30	0	0	0	0	3,271	0	3,379	10.3%

Figure 4.12-20 Small culvert age-based renewal results
Source: Auckland Transport RAMM database (2 February 2012)



	Length (m)	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	% Culvert length renewed 2013-22
North	60,004	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
Central	18,494	0	0	0	0	0	0	0	0	0	4.9	0	5	0.0%
West	12,993	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
South	80,168	0	0	0	0	0	0	0	0	0	0	0	0	0.0%
TOTAL (m)	171,660	0	0	0	0	0	0	0	0	0	5	0	5	0.0%

Aged-based – soakholes

The 10-year age-based renewal profile for soakholes is shown in Figure 4.12-18. This shows that, in the first 10 years, renewals are expected mainly in 2014-15. 94 per cent of the age data is known so it makes this renewal method effective.

Aged-based – large culverts

The 10-year age-based renewal profile for large culverts is shown in Figure 4.12-19. This shows that, in the next 10 years, renewals are expected mainly in 2021-21 in the South area. Only 19 per cent of the age data is known, making this renewal method less effective.

Aged-based – small culverts

The 10-year age-based renewal profile for small culverts is shown in Figure 4.12-20. This shows that, in the first 10 years, renewals are expected only in 2020-21 in the Central area for one culvert replacement. Future renewals are expected beyond this 10-year period. All age data is known, making this renewal method effective.

Table 4.12-12 Indicative renewal quantities
Source: Road Corridor Maintenance (24 October 2011)

Management area	Estimated kerb and channel length for 2012-13 (km)
Central	32
North	4
South	6
West	9

Operational priorities

The preliminary renewal programme for 2012-13 has identified the following renewal quantities for kerb and channel with this AMP, as shown in Table 4.12-12. This programme has been prepared by the RCM team based on local priorities. The quantities are based on historical patterns of responding to kerb and channels damage by vehicle, displacement from sensitive clays, or planned renewals based on condition data in RAMM. There is a large renewal quantity planned in the Central area to match the footpath renewal programme where the kerb and channel is replaced at the same time.

These quantities represent an indicative programme that is still being refined. Auckland Transport expects these renewal quantities will be better understood as new maintenance contracts are put in place and as consistent condition information becomes available regionally to develop robust renewal programmes (refer to Section 4.12.6, condition assessment programme.)

Historical trends

There is currently insufficient commonality between legacy data sets to provide a reliable regional view of historical expenditure trends. A future asset management improvement is to implement consistent tracking of expenditure by asset type and expenditure type over time. This will enable robust expenditure trends analysis in future.

Depreciation profile

The annual depreciation for road drainage rises from $30 million to $31 million over the next 10 years as indicated in Table 4.12-13.

10-year renewal work and expenditure forecast

The analyses given above provide varying levels of indicative renewal work for the future. This demonstrates the current difficulty of forecasting future renewal needs.

Considering the above renewal analyses and the current funding constraints being experienced by Auckland Transport and the Auckland Council, the recommended 10-year renewal needs are shown in Figure 4.12-21. Note, however, that the actual renewals plan to be approved by Auckland Transport and the Auckland Council may yet differ from these network needs because of the impact of funding constraints.

Figure 4.12-21 shows that renewals increase slightly from $13.1 million to $14.1 million each year. This has been based on the existing renewal capital plans from the legacy councils, which did not split drainage renewals into sub groups such as manholes, kerb and channel, soakholes and catchpits.

There is a total of $136.1 million for drainage renewals for the next 10 years, with most of this located in the central area ($92.8 million), followed by $21.6 million for the South area. These forecasts will be better refined as a consistent renewal strategy is implemented regionally over time.

Renewal projects

Separate renewal projects are not listed in this AMP as they are prepared as a one-year detailed work programme with multiple small projects. There are no significant drainage renewal projects identified in this AMP.

Contribution process

Frequently road drainage renewals are coordinated with catchment management plan improvement objectives and projects such as the Otahuhu improvements. Sometimes assets are replaced before they are expired or improved, such as catchpit filters. Development of a formal process for the contribution regime between Auckland Transport and the Stormwater Unit has been identified as a future improvement initiative. This formal process will detail the cost sharing arrangements and procurement process (currently two processes as different organisations are involved).

4.12.12 New works needs

New works plan

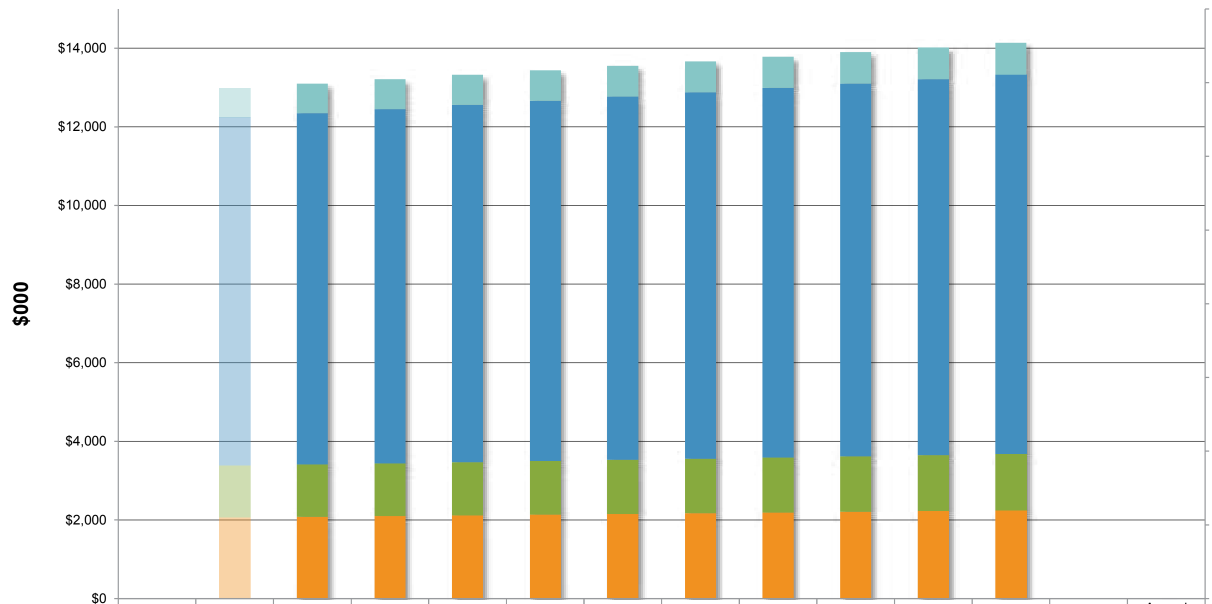
There are currently new works for TetraTrap installation in catchpits only in the Central area for the Drainage LCMP. There is a total of $1.62 million for the next 10 years as shown in Figure 4.12-22.

Table 4.12-13 Drainage depreciation forecasts
Source: Auckland Transport infrastructure depreciation profiles (25 April 2012)

Profile	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Depreciation ($ millions)	30	30	30	30	30	30	31	31	31	31	31	384

Figure 4.12-21 Planned drainage renewals expenditure

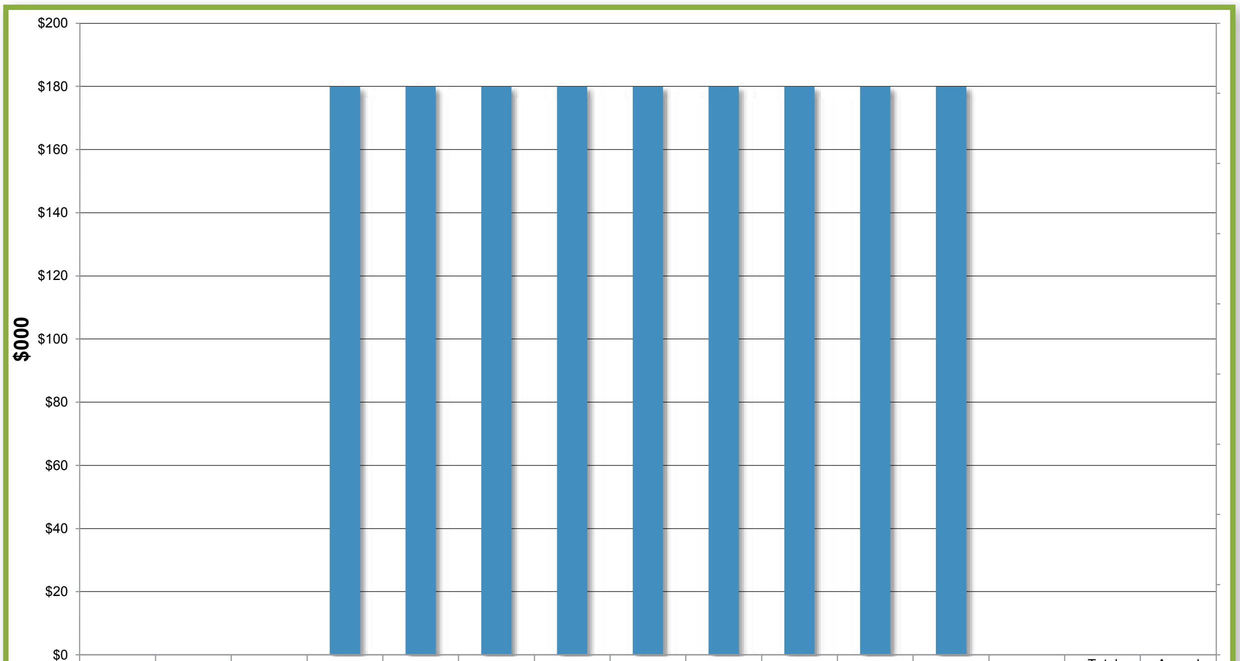
Source: LTP Budget Model 12 April 2012 after refresh for AMP



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	Annual Average $ / area network
North	6%	749	755	761	768	774	781	788	794	801	808	815	7,844	$0
Central	68%	8,859	8,935	9,011	9,087	9,165	9,242	9,321	9,400	9,480	9,561	9,642	92,844	$4
West	10%	1,319	1,331	1,342	1,353	1,365	1,376	1,388	1,400	1,412	1,424	1,436	13,827	$2
South	16%	2,063	2,081	2,098	2,116	2,134	2,152	2,171	2,189	2,208	2,226	2,245	21,620	$1
Renewals (m)		51,000	51,000	51,000	51,000	51,000	51,000	51,000	51,000	51,000	51,000	51,000	510,000	
TOTAL	100%	12,990	13,101	13,212	13,325	13,438	13,552	13,667	13,783	13,901	14,019	14,138	136,135	$2

Figure 4.12-22 Drainage capital new works forecast by area

Source: LTP Budget Model 12 April 2012 after Refresh for AMP



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	Total (catchpits) (number)	Annual average $/(unit)
North	0%	00	00	00	00	00	00	00	00	00	00	00	00	17,556	$-
Central	100%	00	00	180	180	180	180	180	180	180	180	180	1,620	27,368	$6
West	0%	00	00	00	00	00	00	00	00	00	00	00	00	11,503	$-
South	0%	00	00	00	00	00	00	00	00	00	00	00	00	29,680	$-
Total		00	00	180	180	180	180	180	180	180	180	180	1,620	86,107	$2

Generally larger new capital projects such as new roads include drainage assets in their scope and budget.

New works drainage is required to overcome drainage deficiencies such as minor works and road safety, and to provide flood risk mitigation to reduce Auckland Transport's liability. Although there is currently limited budget allocated for drainage new works, funding is required in future to address deficiencies and risks. Funding will also be required to meet network discharge consent conditions and developers contributions as discussed below.

New works programmes

There are road drainage new works associated with other programmes. Drainage works are also installed as part of road upgrades and major new works projects. It is assumed that approximately 10 per cent of these large budgets are for drainage new works such as kerb and channelling and/or swales. Road upgrade projects are about $2.2 billion in total and include projects such as Weiti Toll Road, NorSGA, AMETI and the Dominion Road upgrade, as well as safety projects and town centre upgrades.

There are about 54km of state highways that NZTA intends to revoke the state highway designation from. These roads will then become local authority roads under Auckland Transport's control. All of these roads with the possible exception of SH18A will remain arterial roads. These will all be part of the over-dimension bypass routes. From an initial assessment, there are two large culverts included in these revocations. Their age and condition needs to be better understood to manage these assets going forward.

Growth-related new works

No growth-related new works for road drainage were identified with the development of this AMP.

Road drainage funding for new works is required in future to meet developers' contributions in new growth areas from time to time.

Levels of service new works

No LOS related new works for road drainage were identified with the development of this AMP.

Road drainage funding for new works is required in future to address deficiencies and risks and meet network discharge consent conditions.

4.12.13 Disposal plan

The formal asset disposal process is part of the project completion process and any abandoned drainage assets are recorded as part of the completion of new assets. The disposal of kerb and channel material as a result of the renewal programme is to designated sites.

4.12.14 Summary of 10-year network needs

The total amount of expenditure for operations and maintenance, renewals and new works over the next 10 years is $337 million, as shown in Figure 4.12-23. Average annual expenditure for operations and maintenance and renewals on drainage over the next 10 years is approximately $33.7 million, of which $19.9 million (or 59 per cent) is for operations and maintenance, $13.6 million (or 40 per cent) is for renewals, and $162,000 (or one per cent) is for new works.

The operations, renewal and new works forecasts are summarised in Figure 4.12-23. This shows that total annual costs are increasing from about $32 million to $35 million each year over 10 years.

Notes on the expenditures in Figure 4.12-23:

- The proposed 10-year expenditures for OPEX and renewals includes an annual growth factor of +0.85 per cent to allow for consequential OPEX and consequential renewals from growth in the network and growth in demand for services
- Professional costs are included in renewal total costs.

4.12.15 Approved Long Term Plan envelope

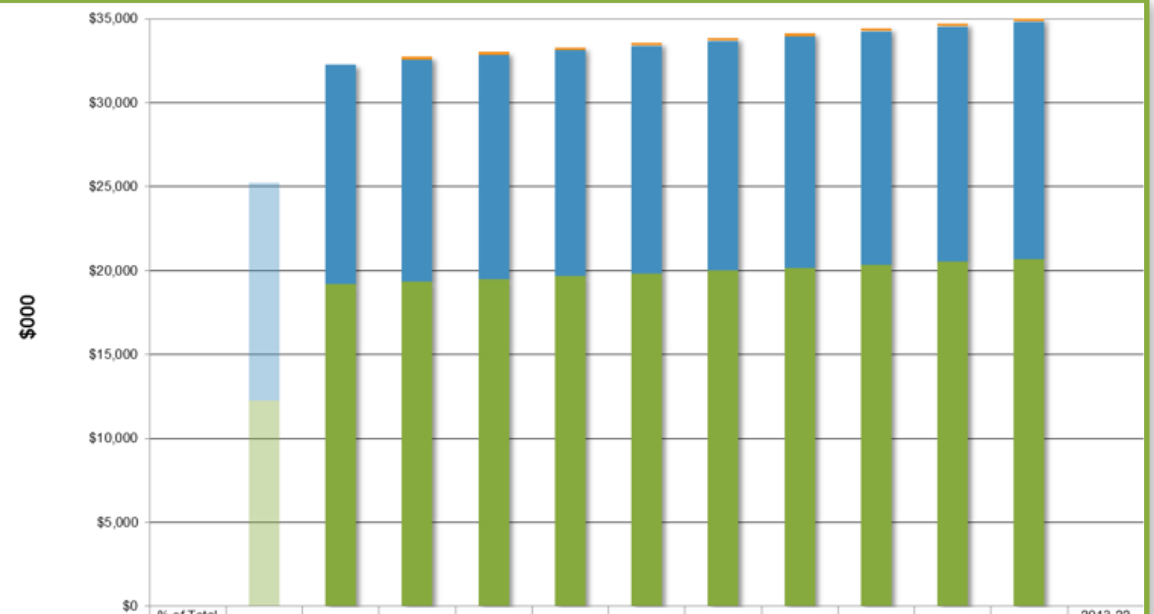
The approved Long Term Plan

This section compares the approved LTP envelope for OPEX and renewals with the drainage network needs as determined by this AMP at a regional level and identifies the likely impacts of any variances. Revenue and funding incomes to Auckland Transport (from Auckland Council ratepayers and NZTA government subsidies and the like) are allocated through the approved Long Term Plan budgets. The LTP was adopted on 28 June 2012.

OPEX impacts

Based on the information in Table 4.12-14, drainage operational expenditure shows variance between the LTP allocated budgets and the AMP needs. The LTP allocated budget for drainage OPEX has a 10-year shortfall of $82.9 million (42 per cent reduction) compared to the network needs determined by this AMP.

Figure 4.12-23 Summary of drainage 10-year expenditure forecast
Source: LTP Budget Model 12 April 2012 after Refresh for AMP



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total
CAPEX New Works	0%	000	000	180	180	180	180	180	180	180	180	180	1,620
Renewals	40%	12,990	13,101	13,212	13,325	13,438	13,552	13,667	13,783	13,901	14,019	14,138	136,135
Operations & Maintenance	59%	12,259	19,169	19,332	19,496	19,662	19,829	19,998	20,168	20,339	20,512	20,686	199,190
TOTAL	100%	25,249	32,270	32,724	33,001	33,280	33,561	33,845	34,131	34,419	34,710	35,004	336,944

This requires compromising of proposed maintenance and operations activities. It will have an impact on the condition and service potential of road drainage assets. Reduction in drainage maintenance may also have effect on the appearance of road channels and catchpits and their ability to drain stormwater from road carriageways. This could result in more road surface flooding and associated consequences on road users and adjacent properties.

It is anticipated that the LTP will require further efficiency savings and as a result, this funding gap may be increased.

Renewals impacts

Based on the information above, drainage capital renewals expenditure shows no variance between the LTP allocated budgets and the AMP needs.

Further efficiency savings

As required by the approved LTP, a further reduction in OPEX of $18.6 million per year, reducing to nil by 2016/17, will need to be allocated against asset-related operational budgets. The impact of this further reduction on drainage operational budgets is yet to be assessed and finalised.

Table 4.12-14 Variance between LTP approved budget and AMP network needs for drainage (all un-inflated)
Source: LTP Budget Model 12 April 2012 after refresh for AMP and revised LTP Budget Model 28 June 2012

Drainage	10-year total LTP approved budget ($000s un-inflated)	10-year total AMP network needs ($000s un-inflated)	Variance 10-year total ($000s un-inflated)
Operations and maintenance	**116,302**	**199,190**	**-82,888**
Renewals	**136,135**	**136,135**	**0**
Drainage total	**252,437**	**335,325**	**-82,888**

Table 4.12-15 Un-inflated and inflated drainage AMP needs

Source: LTP Budget Model 12 April 2012 after refresh for AMP and revised LTP Budget Model 28 June 2012

UN-INFLATED expenditure ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M		19,169	19,332	19,496	19,662	19,829	19,998	20,168	20,339	20,512	20,686	199,190
Renewal		13,101	13,212	13,325	13,438	13,552	13,667	13,783	13,901	14,019	14,138	136,135
Drainage total		32,270	32,544	32,821	33,100	33,381	33,665	33,951	34,240	34,531	34,824	335,325
AC Inflator	OPEX	3.30%	3.30%	3.30%	3.30%	3.50%	3.60%	3.10%	3.10%	3.30%	3.60%	n/a
AC Inflator	CAPEX	3.90%	3.40%	2.80%	2.90%	3.10%	3.30%	3.50%	3.70%	4.00%	4.00%	n/a
INFLATED expenditure ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M		19,801	20,629	21,491	22,432	23,437	24,369	25,338	26,397	27,579	28,815	240,287
Renewal		13,612	14,194	14,716	15,271	15,878	16,542	17,266	18,057	18,939	19,864	164,340
Drainage total		33,413	34,823	36,207	37,703	39,315	40,911	42,604	44,454	46,518	48,679	404,627

Table 4.12-16 Un-inflated and inflated drainage LTP budgets

Source: LTP Budget Model 12 April 2012 after refresh for AMP and revised LTP Budget Model 28 June 2012

UN-INFLATED expenditure ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M		11,155	11,258	11,362	11,467	11,573	11,680	11,788	11,896	12,006	12,117	116,302
Renewal		13,101	13,212	13,325	13,438	13,552	13,667	13,783	13,901	14,019	14,138	136,135
Drainage total		24,255	24,470	24,687	24,905	25,125	25,347	25,571	25,797	26,025	26,254	252,437
AC Inflator	OPEX	3.30%	3.30%	3.30%	3.30%	3.50%	3.60%	3.10%	3.10%	3.30%	3.60%	n/a
AC Inflator	CAPEX	3.90%	3.40%	2.80%	2.90%	3.10%	3.30%	3.50%	3.70%	4.00%	4.00%	n/a
INFLATED expenditure ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M		11,523	12,013	12,524	13,083	13,679	14,233	14,810	15,440	16,143	16,878	140,325
Renewal		13,612	14,194	14,716	15,271	15,878	16,542	17,266	18,057	18,939	19,864	164,340
Drainage total		25,134	26,207	27,240	28,354	29,557	30,775	32,076	33,497	35,082	36,742	304,665

Monitoring and management of Long Term Plan consequences

The consequences resulting from these variances will be monitored and reported as appropriate.

CAPEX new works

CAPEX new works contained in this AMP are derived from draft LTP listings as at April 2012 and are produced in section 4.12.12.

The capital new works programme has been further refined and adopted in late June 2012. Details of this adopted programme are contained in the LTP.

AMP inflation effects

Un-inflated and inflated drainage needs for the AMP are shown in Table 4.12-15.

LTP inflation effects

Un-inflated and inflated drainage budgets from the LTP are shown in Table 4.12-16.

4.12.16 Revenue sources

Revenue and funding incomes to Auckland Transport are contained in Auckland Transport's SAP financial management system, although the transparency and completeness of allocations require review and confirmation.

Operations and maintenance revenue

Road drainage assets, including sweeping associated with drainage channel, are normally subsidised by NZTA. Street sweeping not associated with drainage channels is not subsidised by NZTA.

Capital renewals revenue

Road drainage renewals associated with drainage channels are normally subsidised by NZTA.

The function of the renewals budget is to maintain a LOS of an asset by intervening prior to either the end of the useful life of the asset, or the condition of the asset falling below an agreed level. The additional cost of stone kerb and channel in the old parts of Auckland is not subsidised by NZTA as it is deemed to relate to amenity value.

Capital new works revenue

There are no drainage capital new works identified in this plan. Drainage capital new works to cater for growth are generally funded and provided by developers of new subdivisions.

4.12.17 Key improvement initiatives

Key improvement initiatives relating to road drainage are shown in Table 4.12-17.

Table 4.12-17 Key improvement initiatives

Improvement initiative	Description	AMP section	Priority
Drainage 1	Accurately identify catchpits asset information regionally and store information in the RAMM database	4.12.4	High
Drainage 2	Accurately and consistently identify unlined channels in rural areas regionally	4.12.2	Low
Drainage 3	Monitor the performance of road drainage assets through fault records and failures during major storms	4.12.7	Medium
Drainage 4	Develop and implement consistent drainage condition assessments including frequency and survey coverage	4.12.6	High
Drainage 5	Assess treatment device condition	4.12.6	Medium
Drainage 6	Assess condition for all manholes	4.12.6	Medium
Drainage 7	Assess condition for all small and large culverts	4.12.6	Medium
Drainage 8	Address asset capacity issues in the road drainage network through Stormwater Unit's catchment management planning processes and through considering transport's objectives	4.12.7	High
Drainage 9	Identify critical assets to recognise those that need proactive pre-storm management	4.12.8 critical assets	High
Drainage 10	Start tracking historical expenditure trends of road drainage operation and maintenance, and renewal costs	4.12.14	High
Drainage 11	Understand the complete asset portfolio of the large culverts that are to be revoked to Auckland Transport from NZTA	4.12.12	High
Drainage 12	Start capturing a swale asset inventory	4.12.4	Medium
Drainage 13	Undertake review to confirm manhole ownership with a consistent regional approach	4.12.6 manholes	Medium
Drainage 14	Develop a formal process for the contribution regime between Auckland Transport and the Stormwater Unit for coordinated improvement projects	4.12.11	Medium
Drainage 15	Allocate road drainage new works funding in future to address deficiencies and risks, meet network discharge consent conditions and developers contributions	4.12.12 new works plan	High

4.13 Contents

4.13 Street vegetation

4.13.1 The service Auckland Transport provides

Street vegetation visually enhances the region and provides an attractive environment to encourage people to walk, cycle and use shared transport spaces. Focus is given to areas near schools, commercial and recreational areas, public transport centres and other areas of high usage.

The levels of service (LOS) most relevant to street vegetation management are:

- Amenity quality – the visual appearance of the road and pedestrian corridors
- Safety – the degree to which a safe network environment is maintained with respect to clear sightlines for road and footpath users; response to fallen or overgrown trees or vegetation; and reducing hazards from overgrown vegetation.

The service level of street vegetation is affected by:

- The quantity and quality of maintenance, such as weeding, mowing and plant replacement
- Local environmental conditions, such as the quality of soil beds, sun, wind, water supply, and the presence of vandalism.

Street vegetation management is a maintenance service only. Detailed performance measures for street vegetation are yet to be confirmed.

4.13.2 Network overview

Auckland Transport has stewardship responsibilities for and manages street vegetation associated with the transport network of footpaths and roads. Street vegetation includes all green elements such as street trees, street gardens, grassed areas, weeds and noxious weeds. These elements are not considered to be infrastructure assets.

The activities and works associated with the street vegetation network are managed by integrated cooperation between:

- Auckland Transport's development and maintenance staff and representatives
- Auckland Council's parks and arboreal development and maintenance staff and representatives
- Various contractors and power and utility companies across the region.

4.13.3 Network valuation

There is no requirement to value or depreciate street vegetation elements.

4.13.4 Network asset details

Street vegetation elements

The street vegetation associated with the transport network of approximately 6,879km of footpaths and 7,227km of roads. This street vegetation consists of the following elements shown in Table 4.13-1.

Table 4.13-1 Street vegetation portfolio
Source: Auckland Transport RAMM database March 2012

Regional total quantity (approximate, based on current information)		North	Central	West	South
Footpath vegetation control length (km)	6,879	1,493	2,172	957	2,257
Road vegetation control length (km)	7,227 (4,416 urban)	2,443 (1,007 urban)	1,480 (1,324 urban)	805 (652 urban)	2,499 (1,433 urban)
Street trees (unlisted)	163,945	15,000	72,797	22,741	53,407
Street trees (listed)	6,884	6,884	TBC	TBC	TBC
Street gardens (no.)	TBC	TBC	TBC	TBC	TBC

Table 4.13-2 Street vegetation data confidence and reliability
Source: Auckland Transport RAMM database March 2012

Data attribute	Data confidence			
	Very uncertain	Uncertain	Reliable	Highly reliable
Asset descriptors and quantity				
Asset age				
Condition				
Performance				

4.13.5 Asset data confidence

Asset data confidence relates to both the accuracy and completeness of data. In the case of the street vegetation network, the RAMM database does not hold green element information, including condition rating information.

Table 4.13-2 illustrates Auckland Transport's confidence in its street vegetation asset data.

Table 4.13-3 assesses only the completeness of street vegetation data by asset type.

The current confidence level of street vegetation data in terms of quantity, age, condition and performance of the street vegetation network is 'uncertain'.

4.13.6 Asset condition

Condition rating

Vegetation management standards are maintained through the network contracts and associated specifications. These specifications allow limitations on the height of weeds and/or the frequency and methods of weed control treatment.

Typically the weed control condition on footpaths, kerbs, channels and carriageways is measured on a scale of very good (grade 1) to very poor (grade 5).

Weed control condition fluctuates seasonally and monthly. The measurements of condition information, although managed by the contracts operational teams, are not currently stored in Auckland Transport's asset management systems.

4.13.7 Asset performance and capacity

The management of street vegetation is measured against condition as described above, rather than against performance or capacity.

4.13.8 Asset risks and criticality

Criticality

Critical elements identified through the development of this AMP include:

- Street vegetation that obscures traffic signs and signals
- Street trees that grow too close to power lines
- Street trees that constitute impact hazards close to carriageways
- Trees falling onto roads and footpaths.

Risks

Detailed risks across the transport network, identified through a formal risk analysis review, appear in Section 8, Risk Management. Risks for the street vegetation network are shown in Table 4.13-4.

4.13.9 Key issues

Key issues surrounding street vegetation are shown in the risk analysis Table 4.13-4.

Table 4.13-3 Completeness of data
Source: Auckland Transport RAMM database March 2012

Asset	Completeness of data		
	Measure	Age	Condition
Footpaths and roadside lengths of vegetation	95%	n/a	(Weed condition gradings monitored by maintenance contracts)
Street trees (unlisted)	0%	0%	0%
Street trees (listed)	0%	0%	0%
Street gardens	0%	0%	0%

Table 4.13-4 Street vegetation risk analysis
Source: Auckland City Council transport risk analysis 2008

Risk	Net risk factor	Management options
Serious injury and fatal accidents could result where street vegetation obscures driver visibility of traffic speed signs, warning markers, signals and/or driver visibility around corners	High	Proactive and quick-response reactive inspections and maintenance, signage inspections and safety audits
Trees falling on roads, berms, footpaths or properties may be hazardous and could lead to serious injury and fatal accidents	High	Proactive and quick-response reactive inspections and maintenance
Chemical herbicide may be harmful or adversely affect chemically sensitive people and waterways	Moderate	Respect and follow the protocols agreed with stakeholders in each of the different legacy councils, confirm with current local boards
Street trees that grow too close to power lines could cause electric shocks and costs of wasted power	Moderate	Proactive and safe maintenance of trees in the vicinity of power lines, working to power company and OSH requirements
Street trees that are impact hazards and are too close to carriageways could lead to serious injury and fatal accidents	Moderate	Proactive and quick-response reactive inspections and maintenance

Table 4.13-5 Key issues – street vegetation

No.	Key issues	Action plan	Outcomes
1	Auckland Transport has greater responsibility for green elements than the transport departments of the legacy councils had. Trees, gardens and arboreal issues have to be carefully managed	Review and reallocate funds and responsibilities for the operations, maintenance, renewals and new works associated with street vegetation. Upcoming legislation may ease arboreal requirements	OPEX expenditure allowance for green elements, weed and vegetation control for the Central and West areas of the region is being managed by Auckland Transport from 1 July 2012
2	Weed control is at different levels of service, and willingness to pay costs across the legacy councils and region is inconsistent. For example, North Shore legacy council used hot water non-chemical controls, whereas other legacy councils used glyphosate or organic chemicals	Review and consolidate the weed control policies and strategies and standards from the legacy councils into new regional (and local if appropriate) forms	New policies and strategies and standards developed for the region
3	Chemical herbicides may be harmful or adversely affect chemically sensitive people and waterways. This has been a highly public issue with a strong chemically sensitive lobby group	(see Risks 4.13.8)	Agreement or resolution on the use or non-use of chemical herbicides in every area of the region
4	Trees, gardens and other green elements are not in RAMM	Confirm and implement a regional approach to the collection and storage of data for trees, gardens and other green elements	Trees, gardens and other green elements data in RAMM
5	Trees, gardens and other green elements are not valued. Remaining useful lives of street vegetation elements do not appear to have been assessed	Confirm and implement a regional approach to the valuation of green elements, including trees, gardens and other green elements such as hydroponic elements.	Valuations and assessment of remaining useful lives for trees, gardens and other green elements
6	Street trees that grow too close to power lines and tree maintenance in the vicinity of power lines	Proactive and safe maintenance of trees in the vicinity of power lines, working to power company and OSH requirements	Street trees clear from power lines
7	Compliance with environmental legislation, including resource consents and arboreal requirements	(see Risks 4.13.8)	Compliance with environmental legislation, including resource consents and arboreal requirements
8	Trees falling on roads, berms, footpaths or properties may be hazardous	(see Risks 4.13.8)	No trees hazards on roads, berms, footpaths or properties
9	Street vegetation that obscures traffic speed signs and warning markers reduces visibility around corners on higher speed roads. As well, trees that are impact hazards near carriageways	Proactive and quick-response reactive inspections and maintenance, signage inspections and safety audits	No visibility obstruction and no impact hazards from street vegetation near carriageways
10	There is substantial physical works capital expenditure in delivering streetscape upgrade programmes; as a result, the consequential OPEX and renewals could be quite significant	Allow for consequential OPEX from streetscape projects, for example maintenance and renewals of garden beds	All consequential OPEX relating to vegetation maintenance is allowed for

4.13.10 Operations and maintenance needs

Scope of operations and maintenance

The operations and maintenance activities and works associated with the street vegetation network are managed by integrated cooperation between:

- Auckland Transport's network maintenance staff and service providers
- Auckland Council's parks and arboreal maintenance staff and representatives
- Various contractors and power and utility companies across the region.

Responsibilities are yet to be confirmed for each of the sub-regional areas, although current practice is to continue with existing contractual arrangements that have been carried over from each legacy council until current contracts expire.

For some legacy councils, street vegetation and weed control contractors are managed and funded by Auckland Council's parks and arboreal development and maintenance staff and representatives. In other cases the street vegetation and weed control contractors are managed and funded by Auckland Transport's maintenance staff and representatives. Unfortunately this has led to a situation where funding and roles for the management of street vegetation are not clear or not allocated to Auckland Transport budgets. A review of these issues is required and confirmation made of the roles and budgets for the operations, maintenance, renewals and new works associated with street vegetation.

Auckland Transport's street vegetation policies and strategies outline the maintenance considerations for street vegetation to ensure the asset management plan:

- Recognises the lifecycle needs of street vegetation elements
- Provides adequate funding for maintenance and renewal programmes.

These considerations drive the operations and maintenance plan:

- Street vegetation maintenance is a combination of planned and unplanned work based around a rolling programme of work so that non-urgent work is bundled into areas to minimise disruption
- Timeframes for responsive repairs
- Urgent response: be on site and restore within one day
- Emergency response: be on site and commence work within one hour of notification (includes a half hour for mobilisation); offer one hour updates to Auckland Transport representative
- Alignment to service level requirements
- Response to public complaints
- Legacy ARC guidelines and resource consent conditions
- Use of 'Hoggin' protection around tree roots
- Use of environmentally friendly herbicides, including trials of innovative techniques and materials in a small area to determine suitability for general usage
- Minimisation of deferred maintenance.

Operations and maintenance plan

Operations and maintenance plans for street vegetation include call centre operation and response systems, inspections, reporting, data collections and the use of the RAMM asset management system.

Routine network inspections are carried out by contractors to identify defects as defined in the key results schedules. The results of these are not stored in RAMM but are used to plan the contractor's routine maintenance activities.

Operational expenditure for street vegetation includes costs associated with call centre operation and response systems, inspections, reporting, data collections and the use of the RAMM asset management system. Some of these expenditures, such as for call centre operation and response, may be under other asset types or overheads and not assigned to street vegetation.

Maintenance expenditure for street vegetation includes:

- Weed control
- Making safe and minor (expensed) repairs and maintenance to the street garden beds, plants and trees
- Other works required on the green elements and weed and vegetation control.

Maintenance and making safe is carried out reactively in response to call centre requests for service. Such requests for service include emergency responses to fallen trees across roads, footpaths and berms, and emergency responses to street trees fallen into private properties.

These plans are documented in the various legacy councils' internal practice notes and strategies. In other cases, they are embodied in the various network operations and maintenance contracts. Some protocols are also contained in service level agreements with power and utility companies.

A full inventory and cross-referencing of these various operational plans is expected to be contained in the next version of the Transport AMP.

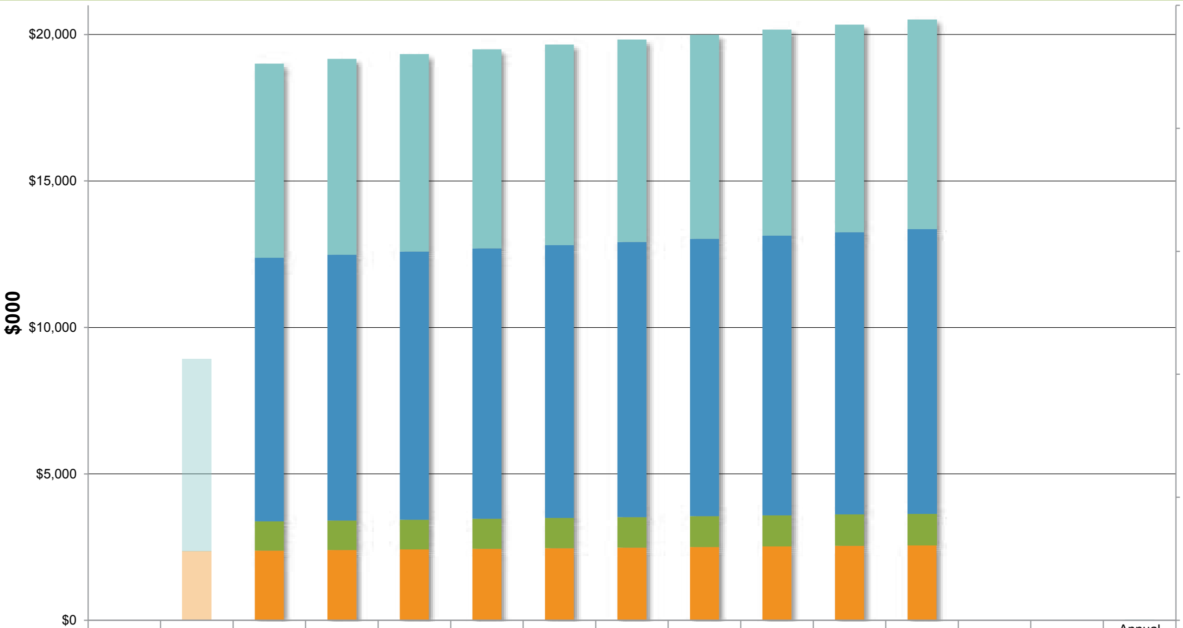
Historical levels of operations and maintenance expenditure have provided the current LOS of the network. It is expected that this current LOS will be maintained in the future; the LOS provides the basis of the long-term lifecycle management strategies of this AMP. This position may change in the future as a result of Auckland Council and Auckland Transport adopting a different LOS in view of the funding and budgetary constraints.

Operations and maintenance 10-year expenditure forecast

The only expenditure for street vegetation is for operations and maintenance activities. There is no capital expenditure for renewals or new works relating to the street vegetation elements.

The recommended 10-year operational expenditure forecast is shown in Figure 4.13-1. It is based primarily on historical trends but also includes for, to some extent, the revised activities detailed above and the LOS to be achieved. This recommendation has also taken into account current funding constraints being experienced by Auckland Transport and the Auckland Council. Note, however, that the actual plan approved by Auckland Transport and the Auckland Council may differ from these network needs because of the further impact of funding constraints.

Figure 4.13-1 Street vegetation operations and maintenance 10-year expenditure forecast
Source: LTP Budget Model 12 April 2012 after refresh for AMP



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	Urban road length (km)	Annual average $/km
North	35%	6,570	6,626	6,683	6,739	6,797	6,854	6,913	6,971	7,031	7,091	7,151	68,856	1,007	$6,838
Central	47%		9,000	9,077	9,154	9,231	9,310	9,389	9,469	9,549	9,631	9,712	93,522	1,324	$7,064
West	5%		1,000	1,009	1,017	1,026	1,034	1,043	1,052	1,061	1,070	1,079	10,391	652	$1,594
South	13%	2,359	2,379	2,399	2,419	2,440	2,461	2,482	2,503	2,524	2,545	2,567	24,719	1,433	$1,725
Total	100%	8,929	19,005	19,167	19,330	19,494	19,660	19,827	19,995	20,165	20,337	20,509	197,487	4,416	$4,472

Consequential OPEX will be required to cover the increased future maintenance costs associated with capital new works. Such capital new works include gardens and planting in the city centre and in sub-regional and town centres, traffic medians and roundabouts, public transport facilities and parking areas. Capital new works may also include vested assets from new subdivisions, and other special higher specification streetscape projects, such as specialised water supply and hydroponic systems and features. Substantial physical works capital expenditure is required in delivering streetscape upgrade programmes and as a result the consequential OPEX may be significant.

New street vegetation in new subdivisions is associated with growth and is typically taken over by Auckland Transport after the subdivision is vested to the Auckland Council. Consequential OPEX will be required for ongoing maintenance of these new street vegetation elements.

The 54km of state highway that NZTA has revoked designation have become local authority roads owned and maintained by Auckland Transport. They require additional annual operations and maintenance expenditure.

The average annual expenditure for the maintenance of street vegetation over the next 10 years is budgeted at approximately $19.8 million. A regional summary of operations and maintenance expenditure for street vegetation (including green elements, weed and vegetation control) is shown in Figure 4.13-1.

Prior to 30 June 2012, there appeared to be no expenditure allowance for green elements, weed and vegetation control for the Central, West and some South areas of the region. This is because legacy councils had different roles and responsibilities for these areas. Auckland Council appears to have had stewardship of the vegetation management activity in the Central, West and far South areas of Papakura. However, from 1 July 2012, these activities were transferred to Auckland Transport from the Auckland Council and its other council-controlled organisations. The associated forecasted costs are included in the expenditure and shown in Figure 4.13-1.

4.13.11 Renewals needs

There is no separately identified works or budget allocation for renewals for street vegetation.

4.13.12 New works needs

There is no separately identified works or budget allocation for new works for street vegetation. New works in street vegetation are generally completed and funded as a part of other special streetscape capital improvements by either of the following:

- Auckland Council streetscapes, parks, public transport or other departments
- Auckland Transport roading and public transport projects, including landscaping and street gardens.

Vested assets

New street vegetation in new subdivisions is associated with growth and is typically taken over by Auckland Transport after the subdivision is vested with the Auckland Council. In such cases it is assumed that development contributions have been calculated and obtained. Consequential OPEX will be required for ongoing maintenance of the new street vegetation.

4.13.13 Disposal plan

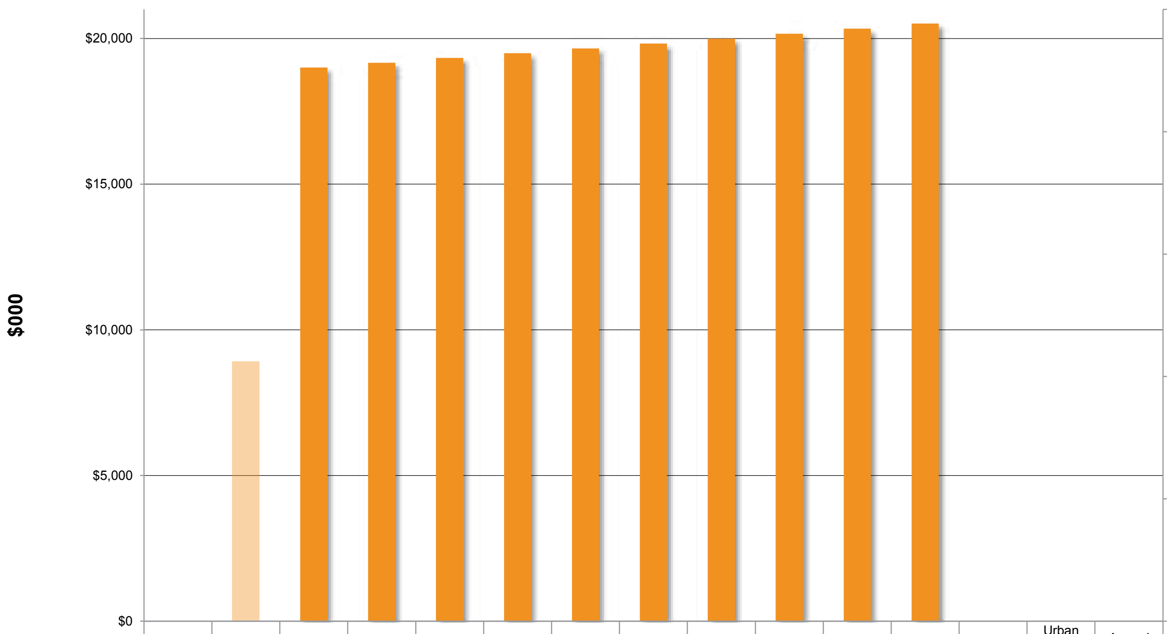
There is no separately identified works or budget allocation for disposal of street vegetation assets.

4.13.14 Summary of 10-year network needs

The only expenditure and works programme associated with street vegetation is from operations and maintenance. Therefore the summary of 10-year network needs is the same as that previously shown in the operations and maintenance section of this LCMP.

The summary of forecast expenditure for street vegetation over the next 10 years is shown in Figure 4.13-2.

Figure 4.13-2 Street vegetation 10-year expenditure summary
Source: LTP Budget Model 12 April 2012 after refresh for AMP



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	Urban road length (km)	Annual average $/km
O & M	100%	8,929	19,005	19,167	19,330	19,494	19,660	19,827	19,995	20,165	20,337	20,509	197,487	4,416	$4,472
Renewals	0%												0		$-
CAPEX New Works	0%												0		$-
Total	100%	8,929	19,005	19,167	19,330	19,494	19,660	19,827	19,995	20,165	20,337	20,509	197,487	5,296	$3,729

4.13.15 Approved Long Term Plan envelope

The approved Long Term Plan

This section compares the approved LTP envelope for OPEX and renewals with the street vegetation network needs as determined by this AMP at a regional level and identifies the likely impacts of any variances. Revenue and funding incomes to Auckland Transport (from Auckland Council ratepayers and NZTA government subsidies and the like) are allocated through the approved Long Term Plan budgets. The LTP was adopted on 28 June 2012.

OPEX impacts

Based on the information in Table 4.13-6, street vegetation operational expenditure shows a variance between the LTP allocated budgets and the AMP needs. The LTP allocated budget for street vegetation OPEX has a 10-year shortfall of $104 million (53 per cent reduction) compared to the network needs determined by this AMP.

This requires compromising of proposed operations and maintenance activities. It will have an impact on the condition and service potential of road berms. Reduction in street vegetation maintenance may also have effect on the appearance of road berms and encroachment of vegetation may obscure traffic signs and cause deterioration to kerbing, channels and the edge of road carriageways.

It is anticipated that the LTP will require further efficiency savings and as a result, this funding gap may be increased.

Renewals impacts

Based on the information above, street vegetation capital renewals expenditure shows no variance between the LTP allocated budgets and the AMP needs.

Further efficiency savings

As required by the approved LTP, a further reduction in OPEX of $18.6 million per year, reducing to nil by 2016/17, will need to be allocated against asset related operational budgets. The impact of this further reduction on street vegetation operational budgets is yet to be assessed and finalised.

Monitoring and management of Long Term Plan consequences

The consequences resulting from these variances will be monitored and reported as appropriate.

CAPEX new works

CAPEX new works contained in this AMP are derived from draft LTP listings as at April 2012 and are produced in section 4.13.12.

The capital new works programme has been further refined and adopted in late June 2012. Details of this adopted programme are contained in the LTP.

AMP inflation effects

Un-inflated and inflated street vegetation needs for the AMP are shown in Table 4.13-7.

LTP inflation effects

Un-inflated and inflated street vegetation budgets from the LTP are shown in Table 4.13-8.

Table 4.13-6 Variance between LTP approved budget and AMP network needs for street vegetation (all un-inflated)
Source: LTP Budget Model 12 April 2012 after refresh for AMP and revised LTP Budget Model 28 June 2012

Street vegetation	10-year total LTP approved budget ($000s un-inflated)	10-year total AMP network needs ($000s un-inflated)	Variance 10-year total ($000s un-inflated)
Operations and maintenance	93,574	197,487	-103,913
Renewals	0	0	0
Street vegetation total	93,574	197,487	-103,913

Table 4.13-7 Un-inflated and inflated street vegetation AMP needs

Source: LTP Budget Model 12 April 2012 after refresh for AMP and revised LTP Budget Model 28 June 2012

UN-INFLATED expenditure ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M		19,005	19,167	19,330	19,494	19,660	19,827	19,995	20,165	20,337	20,509	197,487
Renewal		0	0	0	0	0	0	0	0	0	0	0
Street vegetation total		19,005	19,167	19,330	19,494	19,660	19,827	19,995	20,165	20,337	20,509	197,487
AC Inflator	OPEX	3.30%	3.30%	3.30%	3.30%	3.50%	3.60%	3.10%	3.10%	3.30%	3.60%	n/a
AC Inflator	CAPEX	3.90%	3.40%	2.80%	2.90%	3.10%	3.30%	3.50%	3.70%	4.00%	4.00%	n/a
INFLATED expenditure ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M		19,632	20,452	21,307	22,240	23,237	24,161	25,121	26,171	27,344	28,569	238,234
Renewal		0	0	0	0	0	0	0	0	0	0	0
Street vegetation total		19,632	20,452	21,307	22,240	23,237	24,161	25,121	26,171	27,344	28,569	238,234

Table 4.13-8 Un-inflated and inflated street vegetation LTP budgets

Source: LTP Budget Model 12 April 2012 after refresh for AMP and revised LTP Budget Model 28 June 2012

UN-INFLATED expenditure ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M		9,005	9,082	9,159	9,237	9,315	9,394	9,474	9,555	9,636	9,718	93,574
Renewal		0	0	0	0	0	0	0	0	0	0	0
Street vegetation total		9,005	9,082	9,159	9,237	9,315	9,394	9,474	9,555	9,636	9,718	93,574
AC Inflator	OPEX	3.30%	3.30%	3.30%	3.30%	3.50%	3.60%	3.10%	3.10%	3.30%	3.60%	n/a
AC Inflator	CAPEX	3.90%	3.40%	2.80%	2.90%	3.10%	3.30%	3.50%	3.70%	4.00%	4.00%	n/a
INFLATED expenditure ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M		9,302	9,691	10,096	10,538	11,010	11,448	11,903	12,400	12,956	13,537	112,881
Renewal		0	0	0	0	0	0	0	0	0	0	0
Street vegetation total		9,302	9,691	10,096	10,538	11,010	11,448	11,903	12,400	12,956	13,537	112,881

4.13.16 Revenue sources

Only a portion of this activity is subsidised by NZTA. The maintenance of street vegetation and green assets, including weed and vegetation control, is subsidised only if it is on the kerb or road carriageway or alongside state highways. The majority of expenditure on street vegetation is unsubsidised and therefore funded by Auckland Council ratepayers.

4.13.17 Key improvement initiatives

Opportunities to improve the way Auckland Transport manages its assets include ongoing monitoring of maintenance and renewal expenditure trends.

Priority of service goes to areas within the network where street vegetation can visually enhance the region and provide an attractive environment to encourage people to walk, cycle, drive and use the shared transport spaces. Focal points include areas near schools, commercial and recreational areas, public transport centres and areas of high usage.

Key improvement initiatives relating to street vegetation are shown in Table 4.13-9.

Table 4.13-9 Key improvement initiatives

Improvement initiative	Description	Priority
Street vegetation 1	Manage the new reallocation of funds and responsibilities for the street vegetation management in the Central and West areas after 30 June 2012, which was previously managed by the Auckland Council	High
Street vegetation 2	Review and confirm the service levels and weed control methods across the region, for example use of non-chemical methods Review and consolidate new regional policies and strategies	High

4.14 Contents

4.14 Corridor Fixtures

4.14.1 The service Auckland Transport provides

Corridor fixtures encourage and promote the use of the transport corridors by providing an important level of amenity and function within the streetscape. They comprise the street furniture and other supporting elements in the streetscape for pedestrians and cyclists as well as the weigh stations for heavy vehicle monitoring. They are important to the Auckland Council, Auckland Transport and to other interested organisations.

The corridor fixtures levels of service (LOS) most relevant to that delivery are:

- Quality – the suitability of the corridor fixtures design and the standard of their maintained condition.

The details of the measures of LOS for corridor fixtures are in Section 2, Levels of Service. The measure in Table 4.14-1, against key LOS, is shown for indicative purposes. The measure of current condition is yet to be confirmed and will be included in the improvement plan.

4.14.2 Network overview

Auckland Transport manages and has stewardship responsibilities for the region's network of corridor fixtures, which includes all street furniture and conveniences in the road corridor.

Corridor fixtures include the following assets associated with the transport network:

- Street furniture such as benches
- Litter bins
- Bicycle stands (not associated with public transport facilities)
- Weigh stations.

The following assets are the responsibility of the Auckland Council and not Auckland Transport:

- Art works, clock towers, monuments
- Public toilets on roads or car parks.

All furniture and conveniences in and associated with bus, rail and ferry public transport facilities are included in those public transport AMPs.

Table 4.14-1 Corridor fixtures levels of service

Key service value	Level of service	Service measure	Current performance	Target performance (indicative / to be developed and agreed)
Quality	Footpaths and streetscape elements are maintained in good condition	Percentage of corridor fixtures in moderate condition or better	TBC	95%

Table 4.14-2 Corridor fixtures replacement value
Source: Auckland Transport valuation (30 June 2011)

Corridor fixture asset	Total quantity (RAMM)	Optimised replacement cost (ORC) $000s	Optimised depreciated replacement cost (ODRC) $000s	Annual depreciation (ADR) $000s
Litter bins	1,420	1,191	604	52
Street benches and seats	1.909	3,318	1,384	122
TOTAL	4,510	4,510	1,988	174

Table 4.14-3 Road corridor fixtures quantities
Source: RAMM April 2011

Asset	Regional total quantity (approx)	North	Central	West	South
Street benches and seats	1,319	945	183		191
Litter bins	1,704	825	480	268	131
Bicycle stands	21	6		15	
Weigh stations	1				

4.14.3 Network valuation

The valuation of corridor fixtures has been developed based on information within the RAMM database and is shown in Table 4.12-2 by sub-class.

4.14.4 Network asset details

Auckland Transport manages and has stewardship responsibilities for the corridor fixtures shown in Table 4.14-3 (not associated with public transport facilities).

Note that the quantities in Table 4.14-3 from RAMM April 2012 differ from the quantities assumed in the 2011 valuation. Anecdotal evidence indicates that the regional quantities may be three or four times those recorded in RAMM and detailed above. This issue will be resolved as data collection results are input into RAMM over the coming years.

4.14.5 Asset data confidence

The RAMM database holds the asset information for the corridor fixtures network, including some condition rating information. This is Auckland Transport's master information store. Data confidence relates to both the accuracy and completeness of data.

Table 4.14-4 illustrates Auckland Transport's confidence in the reliability of the asset and condition information currently held in its asset database.

The current overall confidence level of asset data of the corridor fixtures network assets is 'very uncertain'. Some data for litter bins and seats is in RAMM.

This issue is to be reviewed as an ongoing management improvement.

4.14.6 Asset condition

Condition rating

The estimated condition rating profile of the region's major types of corridor fixtures surfaces is to be confirmed.

Remaining useful life

The effective lives of corridor fixtures assets are yet to be confirmed:

Asset failure modes

The most common identified reasons for corridor fixtures failure are:

- Deterioration and weakening due to ageing of materials
- Damage caused by vandalism
- Damage caused by impacts.

4.14.7 Asset performance and capacity

Performance

Factors that affect the performance and hence service level of corridor fixtures include age, rust, and dents and defects.

Capacity

Factors that affect the capacity and hence service level of corridor fixtures include overflowing litter bins, and insufficient numbers or frequency of seats, litter bins or cycle racks to meet public demand.

Table 4.14-4 Road corridor fixtures data confidence
Source: RAMM April 2011

Data Attribute	Very uncertain	Uncertain	Reliable	Highly reliable
Asset quantity				
Asset age				
Condition				
Performance				

Table 4.14-5 Completeness of data
Source: RAMM April 2012

Asset	Completeness of data		
	Measure	Age	Condition
Street benches and seats	25%	10%	0%
Litter bins	25%	10%	0%
Weigh stations	25%	0%	0%

4.14.8 Asset risks and criticality

Asset risks

Asset risks across the transport network, identified through a formal risk analysis review, appear in Section 8, Risk Management. Risks for the corridor fixtures assets are to be confirmed.

Critical assets

No corridor fixtures are considered to be critical assets.

Asset safety

Potential hazards and safety issues associated with corridor fixtures are yet to be confirmed.

4.14.9 Key issues

Key lifecycle issues that affect corridor fixtures are included in Table 4.14-6.

4.14.10 Operations and maintenance needs

10-year operations and maintenance plan

Auckland Transport keeps the corridor fixtures network well maintained through an ongoing maintenance programme that addresses corridor fixtures' defects resulting from damage due to age, inclement weather, willful damage, or arising from health and safety issues and public complaints. This is can be either planned maintenance or responsive maintenance.

The operations and maintenance activities associated with the corridor fixtures network are managed by an integrated cooperation between:

- Auckland Council's call centre
- Auckland Transport's operations and maintenance staff and representatives
- The various contractors across the legacy areas of the region who are responsible for routine and emergency response and maintenance.

Operations and maintenance plan

Operations

Historically, there have been many changes in scope, roles and responsibilities in the stewardship and management of the region's infrastructure assets and networks in the transition from the legacy councils to the Auckland Council, Auckland Transport, Watercare and the other council-controlled organisations. This makes it difficult and in some cases misleading to compare historical legacy council expenditures with those going forward for the new organisations.

As a general statement however, operations and maintenance activities are given a high priority for funding and expenditures. Auckland Transport is expected to reflect historical expenditure by the legacy councils over the last 10 years, with due allowance for inflation and other external escalations.

Historical expenditure trends will be shown in future versions of the Transport AMP as information becomes available.

Operations plans for corridor fixtures include call centre operation and response systems, inspections, reporting, data collections and the use of the RAMM asset management system, including:

- Routine network inspections of corridor fixtures carried out by contractors to identify defects as defined in the key results schedules. The results of these are not stored in RAMM but are used to plan the contractor's routine maintenance activities
- Recording of all future corridor fixtures upgrade or renewal works on a Geographic Information System (GIS) to improve monitoring and programming of future corridor fixtures works.

Table 4.14-6 Key issues with corridor fixtures

No.	Key issues with corridor fixtures	Action plan	Outcomes
1	Lack of clarity concerning stewardship responsibilities for the various corridor fixtures between Auckland Transport and Auckland Council. For example, litter bins may be the responsibility of Auckland Council and not Auckland Transport	Review the scope, roles and responsibilities in the stewardship and management of the region's corridor fixtures in the transition from the legacy councils to Auckland Council, Auckland Transport, Watercare and the other council-controlled organisations. Examples include bins, seats, toilets, public art works, monuments, street artworks, clock towers, weigh stations, especially in the vicinity of parks and public transport facilities	Confirmed scope of corridor fixtures and management responsibilities
2	Most legacy councils had apparently not allocated separately coded expenditures for corridor fixtures operations and maintenance, renewals or new works These non-allocated items are likely to be included as part of other work categories, for example general road network, commercial areas or special streetscapes budgets or have not been included in Auckland Transport's budget at all	The transparency and completeness of allocations requires review and confirmation This issue requires review and a re-allocation or further addition of funds if necessary	Confirmed allocations of expenditures for corridor fixtures operations and maintenance, renewals or new works
3	The current overall confidence level of asset data of the corridor fixtures network assets is 'uncertain'	This issue is to be reviewed as an ongoing management improvement	Adequate completeness and quality of asset data for corridor fixtures to be available in RAMM

These plans are documented in the various internal practice notes from legacy councils and strategies or are embodied in the various network operations and maintenance contracts.

A full inventory and cross-referencing of these various operational plans is expected to be contained in the next version of the Transport AMP.

Maintenance

Maintenance plans for corridor fixtures include cleaning, and making safe and minor repairs to the corridor fixtures networks. Tasks include:

- Patrol and inspect the network
- Undertake proactive planned maintenance
- Make reactive unplanned emergency responses
- Undertake reactive unplanned responses for fixing defects
- Bundle non-urgent work into areas; integrate planned and unplanned maintenance to minimise disruption to the public; that is, undertake items of work in one vicinity at the same time
- Align maintenance activities to service level requirements
- Substitute minor corridor fixture elements that wear out and which can no longer be replaced due to obsolescence and consequential OPEX arising from renewals.

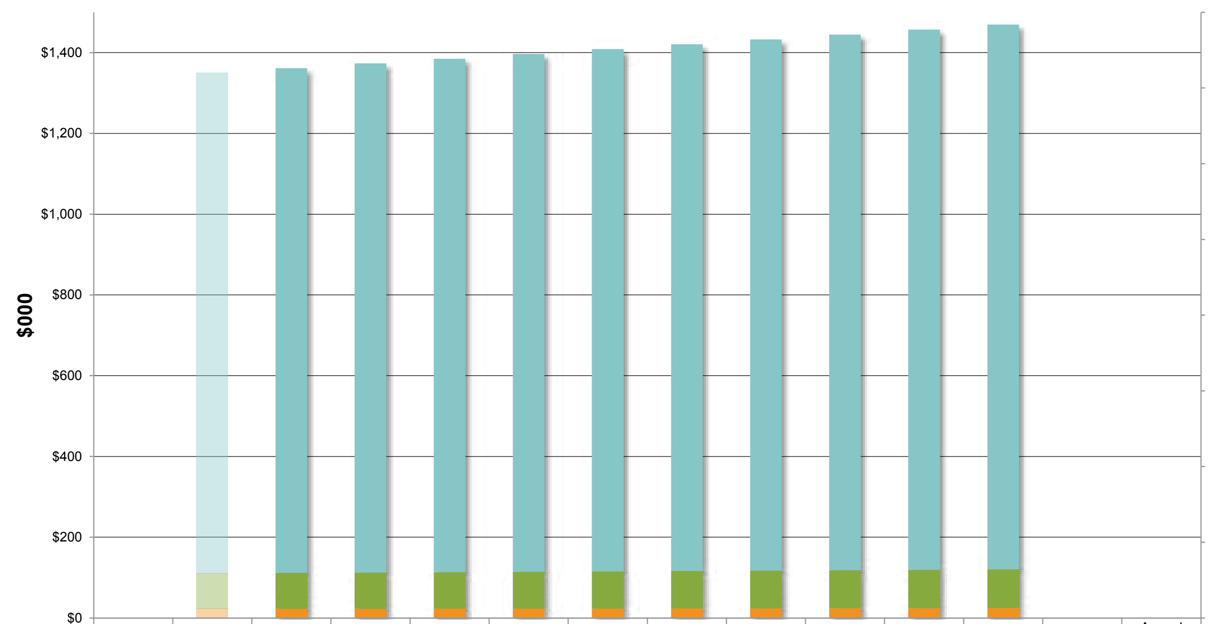
The maintenance budgets provided for ongoing routine maintenance are required to maintain corridor fixtures in a safe condition. Often minor maintenance and 'making safe' is carried out reactively in response to call centre requests for service.

10-year expenditure forecast

The recommended 10-year operational expenditure forecast is shown in figure 14.14-1. It is based primarily on historical trends but also includes the revised activities detailed above and the LOS to be achieved to some extent. This recommendation has also taken into account current funding constraints being experienced by Auckland Transport and the Auckland Council. Note, however, that the actual plan that will be approved by Auckland Transport and Auckland Council may yet differ from these network needs because of the impact of funding constraints.

A comparison of operations and maintenance proposed spends across the region is shown in Figure 4.14-1.

Figure 4.14-1 Operations and maintenance forecast for street furniture
Source: LTP Budget Model 12 April 2012 after refresh for AMP



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	Annual Average $ / area network
North	92%	1,240	1,250	1,261	1,271	1,282	1,293	1,304	1,315	1,326	1,338	1,349	12,990	$532
Central	0%													$-
West	7%	88	89	90	90	91	92	93	94	94	95	96	925	$115
South	2%	22	23	23	23	23	23	24	24	24	24	24	235	$9
TOTAL	100%	1,350	1,362	1,373	1,385	1,397	1,409	1,421	1,433	1,445	1,457	1,469	14,150	$196

Most legacy councils had apparently not allocated separately coded expenditure for corridor fixtures operations and maintenance. These items are likely to be included as part of other work categories, such as general road network, commercial areas or special streetscapes budgets, or have not been included in the Auckland Transport's budget at all. This issue requires review and a re-allocation or further addition of funds if necessary.

Consequential OPEX

Consequential OPEX will be required to cover the increased future maintenance costs associated with new corridor fixtures assets from capital new works such new subdivisions, city centre, sub-regional, town centre and other special streetscape projects.

There is substantial corridor fixtures capital expenditure in delivering streetscape upgrade programmes, and as a result, the consequential OPEX may be quite significant.

Also, new corridor fixtures in new subdivisions are associated with growth and are typically taken over by Auckland Transport after the subdivision is vested with the Auckland Council. Consequential OPEX will be required for ongoing maintenance of these new corridor fixture assets.

4.14.11 Renewal needs

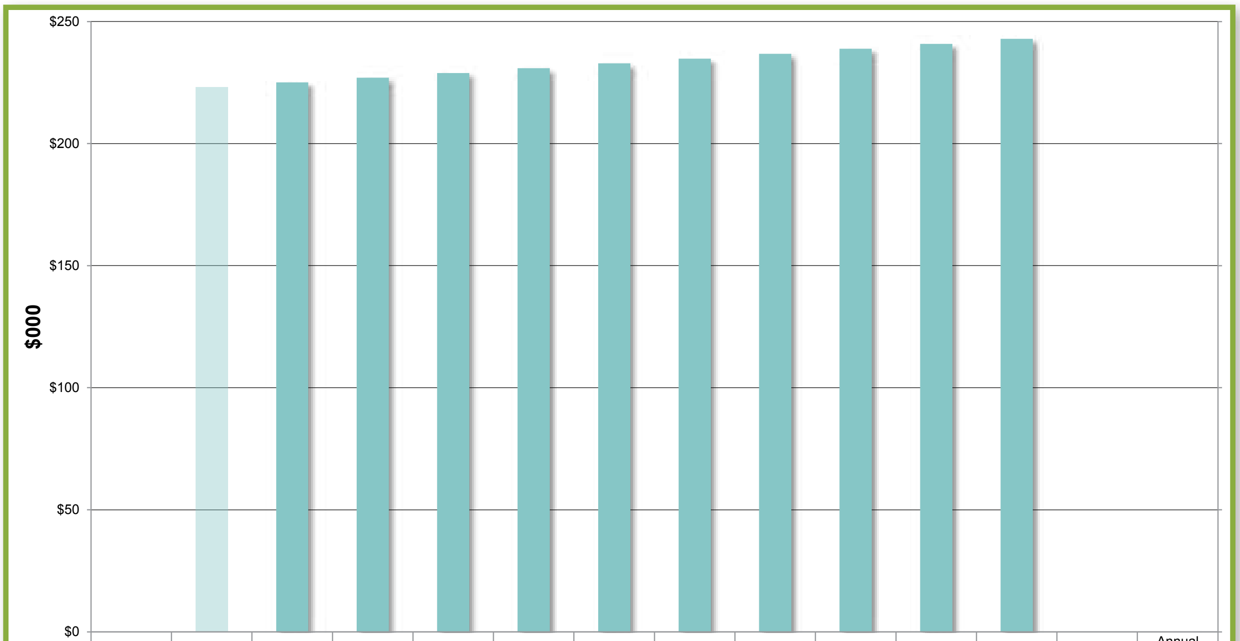
Renewals 10-year work and expenditure forecast

Considering the renewal analyses and the current funding constraints being experienced by Auckland Transport and the Auckland Council, the recommended 10-year renewal needs are shown in Figure 4.14-2. Note, however, that the actual renewal plan that will be approved by Auckland Transport and the Auckland Council may yet differ from these network needs because of the impact of funding constraints.

The very poor quality of asset information means that there is uncertainty as to whether the proposed renewals expenditure and activities detailed above will meet the needs of the corridor fixtures.

Most legacy councils had not allocated a separately coded expenditure for corridor fixtures renewals. This is likely to be included as part of a general road network, commercial areas or special streetscapes renewals budgets, or has not been included in Auckland Transport's budget at all. This issue requires review and a re-allocation or further addition of funds if necessary.

Figure 4.14-2 Renewals forecast for street furniture
Source: LTP Budget Model 12 April 2012 after Refresh for AMP



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	Annual Average $ / area network
North	100%	223	225	227	229	231	233	235	237	239	241	243	2,339	$96
Central	0%													$-
West	0%													$-
South	0%													$-
TOTAL	100%	223	225	227	229	231	233	235	237	239	241	243	2,339	$32

Lifecycle profile

The lifecycle characteristics and profiles of corridor assets are to be determined once a more accurate inventory of corridor assets is established.

4.14.12 New works needs

None of the legacy councils had allocated a separately coded expenditure for corridor fixtures new works. This is likely to be included as part of a general road network, commercial areas or special streetscapes new works or improvement budgets, or has not been included in the Auckland Transport's budget at all. This issue requires review and a re-allocation or further addition of funds if necessary.

Vested assets

New corridor fixtures in new subdivisions are associated with growth and are typically taken over by Auckland Transport after the subdivision is vested with the Auckland Council. In these cases it is assumed that development contributions have been calculated and obtained.

Consequential OPEX will be required for ongoing maintenance of these new corridor fixtures.

New corridor fixtures data is typically transferred from 'as-built' plans to the RAMM database and GIS systems.

4.14.15 Disposal plan

With an increasing drive for sustainability there is an emerging practice across the region of crushing, recycling and re-using old materials where suitable. Material for recycling and re-use is stored in specifically designated sites.

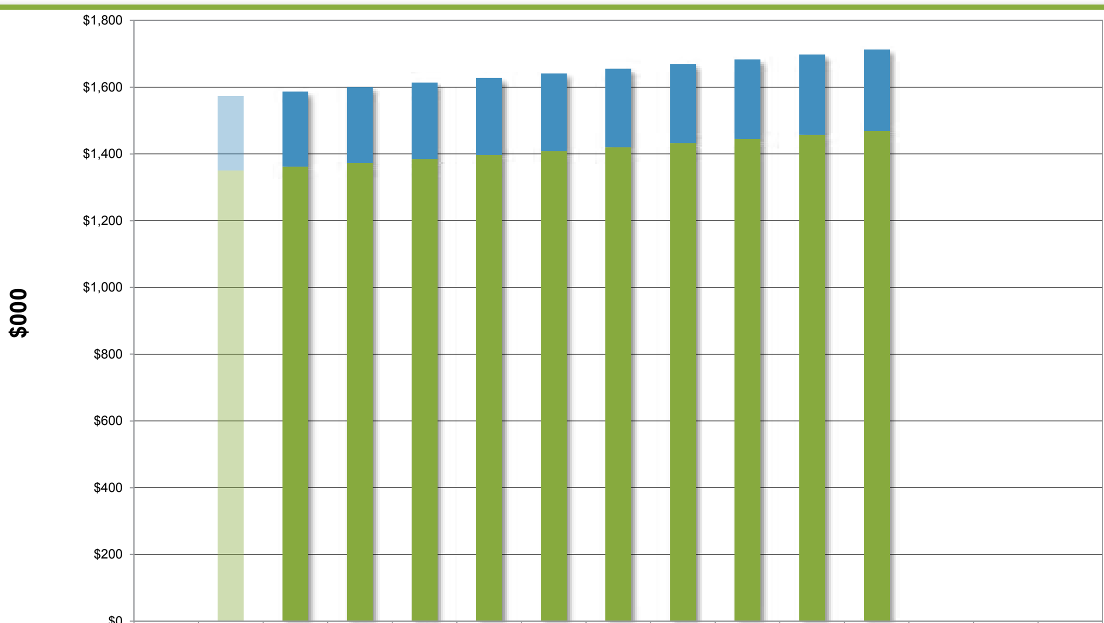
4.14.16 Summary of 10-year network needs

All values in this AMP allow for expected growth in demand but do not allow for market price fluctuations over time. Current and projected expenditure trends are shown in Figure 4.14-3.

Notes on the expenditures in Figure 4.14-3:

1. The proposed 10-year capital new works expenditures contained in the above source file are those of the Auckland Transport financial management system (SAP), as at April 2012. Auckland Transport has reviewed and prioritised the projects for provisional new works expenditure allocations subject to approval from the Auckland Council.
2. The proposed 10-year base expenditure for operations, maintenance and renewals includes an annual growth factor of +0.85 per cent to allow for consequential OPEX and consequential renewals from growth in the network and growth in demand for services.

Figure 4.14-3 Summary of street furniture 10-year expenditure forecast
Source: LTP Budget Model 12 April 2012 after Refresh for AMP



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	Total network (km)	Annual average $/km
New Works	0%	0	0	0	0	0	0	0	0	0	0	0	0	7,227	$-
Renewals	14%	223	225	227	229	231	233	235	237	239	241	243	2,339	7,227	$32
Operations & Maintenance	86%	1,350	1,362	1,373	1,385	1,397	1,409	1,421	1,433	1,445	1,457	1,469	14,150	7,227	$196
TOTAL	100%	1,573	1,587	1,600	1,614	1,628	1,641	1,655	1,669	1,684	1,698	1,712	16,489	7,227	$228

3. Additional to the 10-year expenditure that has been dedicated to corridor fixtures, there are other combined projects such as footpaths, commercial areas and road corridor improvement projects that may add to the maintenance, renewal or new works of corridor fixture assets.

4.14.15 Approved Long Term Plan envelope

The approved Long Term Plan

This section compares the approved LTP envelope for OPEX and renewals with the corridor fixtures network needs as determined by this AMP at a regional level and identifies the likely impacts of any variances. Revenue and funding incomes to Auckland Transport (from Auckland Council ratepayers and NZTA government subsidies and the like) are allocated through the approved Long Term Plan budgets. The LTP was adopted on 28 June 2012.

OPEX impacts

Based on the information in Table 4.14-7, corridor fixtures operational expenditure shows no variance between the LTP allocated budgets and the AMP needs. The apparent variance of $925,000 shown above is not a reduction in OPEX, but rather a re-allocation from corridor fixtures to corridor structures. However it is anticipated that the LTP will require further efficiency savings and therefore a funding gap for corridor fixtures operational expenditure may eventuate.

Renewals impacts

Based on the information above, corridor fixtures capital renewals expenditure shows no variance between the LTP allocated budgets and the AMP needs.

Table 4.14-7 Variance between LTP approved budget and AMP network needs for corridor fixtures (all un-inflated)
Source: LTP Budget Model 12 April 2012 after refresh for AMP and revised LTP Budget Model 28 June 2012

Corridor fixtures	10-year total LTP approved budget ($000s un-inflated)	10-year total AMP network needs ($000s un-inflated)	Variance 10-year total ($000s un-inflated)
Operations and maintenance	13,225	14,150	-925
Renewals	2,339	2,339	0
Corridor fixtures total	15,564	16,489	-925

Table 4.14-8 Un-inflated and inflated corridor fixtures AMP needs
Source: LTP Budget Model 12 April 2012 after refresh for AMP and revised LTP Budget Model 28 June 2012

UN-INFLATED expenditure ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M		1,362	1,373	1,385	1,397	1,409	1,421	1,433	1,445	1,457	1,469	14,150
Renewal		225	227	229	231	233	235	237	239	241	243	2,339
Corridor fixtures total		1,587	1,600	1,614	1,628	1,642	1,656	1,670	1,684	1,698	1,712	16,489
AC Inflator	OPEX	3.30%	3.30%	3.30%	3.30%	3.50%	3.60%	3.10%	3.10%	3.30%	3.60%	n/a
AC Inflator	CAPEX	3.90%	3.40%	2.80%	2.90%	3.10%	3.30%	3.50%	3.70%	4.00%	4.00%	n/a
INFLATED expenditure ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M		1,407	1,465	1,527	1,593	1,665	1,731	1,800	1,875	1,959	2,047	17,069
Renewal		234	244	253	262	273	284	297	310	325	341	2,824
Corridor fixtures total		1,641	1,709	1,780	1,855	1,938	2,015	2,097	2,185	2,284	2,388	19,893

Table 4.14-9 Un-inflated and inflated corridor fixtures LTP budgets
Source: LTP Budget Model 12 April 2012 after refresh for AMP and revised LTP Budget Model 28 June 2012

UN-INFLATED expenditure ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M		1,273	1,284	1,294	1,305	1,317	1,328	1,339	1,350	1,362	1,373	13,225
Renewal		225	227	229	231	233	235	237	239	241	243	2,339
Corridor fixtures total		1,498	1,511	1,523	1,536	1,549	1,563	1,576	1,589	1,603	1,616	15,564
AC Inflator	OPEX	3.30%	3.30%	3.30%	3.30%	3.50%	3.60%	3.10%	3.10%	3.30%	3.60%	n/a
AC Inflator	CAPEX	3.90%	3.40%	2.80%	2.90%	3.10%	3.30%	3.50%	3.70%	4.00%	4.00%	n/a
INFLATED expenditure ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M		1,315	1,370	1,427	1,489	1,556	1,618	1,682	1,753	1,831	1,913	15,954
Renewal		234	244	253	262	273	284	297	310	325	341	2,824
Corridor fixtures total		1,549	1,614	1,680	1,752	1,829	1,902	1,979	2,063	2,156	2,254	18,777

Further efficiency savings

As required by the approved LTP, a further reduction in OPEX of $18.6 million per year, reducing to nil by 2016/17, will need to be allocated against asset related operational budgets. The impact of this reduction on corridor fixtures operational budgets is yet to be assessed and finalised.

Monitoring and management of Long Term Plan consequences

The consequences resulting from these variances will be monitored and reported as appropriate.

CAPEX new works

CAPEX new works contained in this AMP are derived from draft LTP listings as at April 2012 and are produced in section 4.14.12.

The capital new works programme has been further refined and adopted in late June 2012. Details of this adopted programme are contained in the LTP.

AMP inflation effects

Un-inflated and inflated corridor fixtures needs for the AMP are shown in Table 4.14-8.

LTP inflation effects

Un-inflated and inflated corridor fixtures budgets from the LTP are shown in Table 4.14-9.

4.14.16 Revenue sources

The maintenance, renewal and new works for corridor fixtures is not normally subsidised by NZTA, therefore these are funded by Auckland Council ratepayers.

4.14.17 Key improvement initiatives

Key improvement initiatives relating to corridor fixtures are shown in Table 4.14-10.

Table 4.14-10 Key improvement initiatives

Improvement area	Description	Priority
Corridor fixtures 1	Review the scope, roles and responsibilities in the stewardship and management of the region's corridor fixtures in the transition from the legacy councils to Auckland Council, Auckland Transport, Watercare and the other council-controlled organisations Assets include bins, seats, toilets, public art works, monuments, clock towers, weigh stations, especially in the vicinity of parks and public transport facilities	High
Corridor fixtures 2	Improve the current 'very uncertain' confidence level of asset data of the corridor fixtures network assets	Medium
Corridor fixtures 3	Review and re-allocate funds if necessary for corridor fixtures operations and maintenance, renewals or new works	Medium

4.15 Contents

4.15 Community Transport

4.15.1 The service Auckland Transport provides

Community Transport service activities work across all transport asset groups with a focus on travel demand management (TDM) and road safety. Community Transport is not an asset group but a transport function. It develops and implements programmes to change people's behaviour relating to travel and safety. Community Transport works collaboratively with other infrastructure-focused areas to implement these programmes and, in areas such as walking and cycling, is project sponsor.

Community Transport service activity covers the following four areas:

- Road safety education and promotion
- School safety
- Travel plans and travel planning
- Cycling and walking.

Auckland Transport is committed to making a step change and contribution to road safety within the Auckland region as well as achieving its road safety goals. Community Transport plays an important role in helping achieve Auckland Transport's road safety goals and supports the government's Safer Journeys Strategy.

Management for growth includes maximising use of the existing transport assets and reducing demand before building new capacity. Community Transport has a direct role in developing and implementing TDM regionally.

The details of the Community Transport levels of service (LOS) are provided in Section 2, Levels of Service. Several of these measures and targets are yet to be confirmed and will be included in the improvement plan. The following measures are representative for Community Transport operational performance.

Some key facts about Community Transport activity:

- 278 travel plans in place
- More than 4,000 children regularly use walking school buses
- 8,417 fewer vehicle trips in the morning peak period (6:30am to 9am) for the 2010/11 year
- Over 100 road safety campaigns involving over 55,000 participants a year
- 14 million vehicle trip kilometres reduction in 2011 due to travel planning projects i.e. businesses, universities and schools
- Personal journey planning has shown a reduction of 395,904km on single-occupant vehicle kilometres in the morning peak (7-9am) for the 2010/11 year. This equates to a 7 per cent reduction in daily single-occupant vehicle kilometres and a reduction in morning peak trips of 24 per cent of those on programme.
- Bikewise month in 2012 included 30 events across the region
- 2,500 people have attended cycle training events.

4.15.2 Current services

Community Transport provides the following services:

Road safety education and promotion

Auckland Transport, in partnership with national agencies, is committed to working with the community to improve road safety and to reduce the number of people killed or injured on the region's roads. The most recent road safety statistics from NZTA reported 399 urban casualties and 213 rural casualties in the Auckland region in 2009. Alcohol, night time crashes, vulnerable road users and intersections are the key road safety issues.

Table 4.15-1 Community Transport levels of service

Service value	Level of service	Service measure	Current performance	Target performance (indicative / to be developed and agreed)
Efficient	Reduce road peak congestion	Number of morning peak (7-9am) car trips avoided through travel-planning initiatives	8,417	9,600 (2013/14)
		Number of travel plans in place (schools, workplaces)	278	300
Safety	Minimise fatal and serious injuries	Crash reductions on local roads associated with crash reduction programme	27%	20%
	Improve community road safety	Number of pupils participating in walking school buses	>4,000	TBC
		Percentage on-time completion of Safety Around Schools Programme (Travel Plans)	TBC	100%

New initiatives and programmes aim at protecting the region's most vulnerable road users. The initiatives include providing school speed zones and adding cycle lanes to busy roads. Other new programmes are aimed at changing road-user behaviour through driver education. Community Transport works with Corridor Operations to implement road safety education as a whole package through programmes and physical infrastructure works.

Community Transport develops regional road safety education programmes to raise awareness of high-risk driving behaviour. These programmes often support and complement NZTA national campaigns.

School safety

School travel plans and walking school buses (in the TravelWise programme) are Auckland Transport's two main programmes to improve safety around schools. School travel causes major traffic congestion in Auckland and reducing casualties around schools has been identified as a priority area. TravelWise schools have achieved 48 per cent fewer crashes involving pedestrians.

Auckland Transport provides assistance to schools in setting up and maintaining these programmes, ensuring a 'whole of school' approach is used. Community Transport engages with the wider community in the development and delivery of these programmes and also works with New Zealand Police to provide enforcement of regulations.

In the TravelWise programme, participating schools examine existing travel choices and explore alternatives to car travel to school. Options may include walking, cycling or public transport. The programme helps reduce travel-related crashes as fewer cars are at the school gate. Other traffic changes are made using engineering improvements or enforcement.

Students, parents and teachers develop a school safety plan using a whole-school approach with support from Auckland Transport. School communities are asked for their views on barriers to safe and active travel to school. These surveys form the basis of a customised school travel plan and may include setting up walking school buses and installing safe pedestrian crossings. Ongoing support from Community Transport ensures the travel plan for each school is sustainable within the school community.

The walking school bus involves children walking to and from school under the supervision of adult volunteers, making the journey to school safer. Adults are rostered as conductors to walk with and supervise the children, who are collected from stops along a planned route and dropped off at the school gate. Over 4,000 children regularly walk on a walking school bus in the Auckland region, thus cutting down on traffic around schools. Walking accounts for around 37 per cent of trips to school for TravelWise schools. Walking school buses provide a safe, active and healthy way to get to school.

Travel plans and travel planning

Because they reduce demands on the system, travel planning and plans are key TDM tools. They help ensure the best use of existing transport assets. Over 50 per cent of morning peak traffic is made up of people driving to work, frequently with just one person in each car. This contributes to congestion as well as creating parking problems. It also adds to air pollution.

Through increased use of public and active transport modes, the travel planning approach promotes travel choice. With a focus on businesses, the programme also provides regional carpooling programmes and personal journey planning for both business and communities.

Workplace travel plans

Through workplace travel plans, Community Transport investigates solutions to a workplace's transport issues, exploring options such as public transport, walking, cycling and carpooling. Community Transport uses an outcome-based approach, developing packages and providing tools and products for businesses, with a focus on developing a business portal.

Currently 44 workplaces, areas, and tertiary institutes are signed up to the travel plan programme. Some of the areas include large clusters of businesses, such as the North Harbour Business Estate with over 1,300 businesses. There are approximately 63,000 employees on the programme and 90,000 staff/students from tertiary institutes. Community Transport works in partnership with these companies and institutions to deliver travel-planning outcomes.

Community Transport is now focusing on travel plans for specific business areas such North Harbour, Greater East Tamaki and Wynyard Quarter. Community Transport also works in partnership with a number of different organisations such as Auckland Tourism Events and Economic Development (ATEED) and the Sustainable Business Network.

A regional carpooling programme operates under the management of Community Transport. The programme utilises carpooling software through the Rideshare website. It is supported by other programmes, events and marketing to businesses, business areas and by communities.

Personal journey planning

A further initiative, personal journey planning, offers a travel behaviour change programme that provides a one-to-one service to support travel options. This is a relatively new initiative, trialled with the Lake Road upgrade works (local residents were offered transport options on the Devonport peninsular). Personal journey planning is being used with the Albany Highway road upgrade programme to change behaviour at the project start. Results show that the programme provides a step change in shifting travel demand. It is currently being developed for implementation across the region.

Many journeys involve the use of more than one transport mode. This makes whole-of-journey transport planning and the active travel component so important. Whole-of-journey planning will also become more important as the longer-term direction of the Public Transport Network Plan envisages fewer bus routes with a more frequent service. This may result in longer walking and cycling trips to those higher frequency services. The quality of these links may require further improvements.

Cycling and walking

The Auckland region has comprehensive cycling and walking networks. The regional cycleway map is presented in Section 4.8, Cycleways Lifecycle Management Plan. Some of these networks are dedicated to just cyclists or pedestrians, while some are shared. Sometimes these networks are also shared with other transport modes such as buses and private vehicles.

The network quality in respect of its attractiveness to pedestrians and cyclists varies from attractive to hostile. Likewise, the network safety for pedestrians and cyclists also varies. The quality and safety (real and perceived) of these networks influence the network use and the percentage of people who walk and cycle, as opposed to using other modes of transport. The mode share for cycling across the region is low compared with similar cities overseas.

Community Transport provides safety and promotional material covering the cycling and walking networks. This supports Auckland Transport's commitment to developing a safe city regardless of the transport mode. Community Transport manages a cycle training programme including education and promotion to schools, businesses and communities. Community Transport is also the project sponsor for cycle schemes being progressed through Auckland Transport.

The Sustainable Transport Plan (STP) includes the Regional Cycleway Network Map. Auckland Transport is now reviewing and updating both these documents. The updated STP will provide information on how routes are identified for inclusion on the map. It will also provide guidance for project prioritisation, taking into account the input of Auckland Council, NZTA, local boards, advocate groups and other stakeholders.

In terms of departure and destination points, the number of walking and cycling trips made to and within the city centre is expected to be the highest in the region. The development of walking and cycling infrastructure is generally directed to unsafe areas and areas where the most significant increase of walking and cycling trips is expected. The draft 2012 Active Transport Plan sets out the strategic intent and the 10-year programme for the delivery of Auckland Transport's cycling, walking, travel planning and TDM initiatives. This plan includes the proposed walking, cycling and travel planning initiatives to improve whole-of-journey integration for walking and cycling.

Auckland Council's draft City Centre Masterplan recognises access to and from the city centre as a key factor. A shift to a pedestrian-first hierarchy within the city centre will dramatically enhance the area's liveability. A key outcome is a walkable and pedestrian-friendly city centre, well connected to its urban villages.

Auckland Transport has identified a number of key projects to move ahead on. These include the Waterview Shared Path Connection, Tamaki Drive improvements, Hobson Bay link and Beach Road. There will also be a focus on integrating public transport with other transport forms, creating improved cycle parking at interchanges, public bike hire schemes, and bikes on buses. Work will also continue on connecting the cycle network and progressing projects previously identified by legacy councils.

Infrastructure forming part of the regional network and supporting local networks is also delivered and supported through other arms of Auckland Transport, including major projects (e.g. AMETI), Road Corridor Operations, and Road Corridor Maintenance. Community Transport works closely with these departments to achieve walking and cycling networks and facilities that are safe, attractive, connected and accessible.

4.15.3 Key issues

Key issues that affect Community Transport are summarised in Table 4.15-2.

4.15.4 Operations and maintenance needs

Operations and maintenance plan

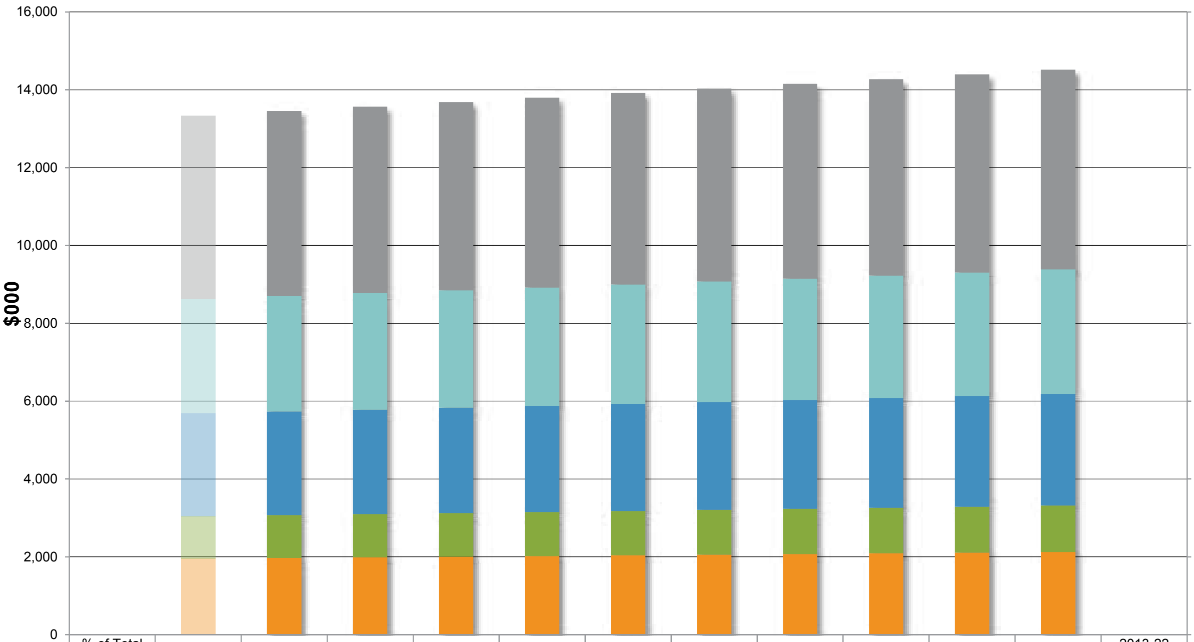
Operational expenditure for Community Transport services includes the costs associated with providing:

- Cycling and walking expertise for network planning and prioritisation of the regional programme
- Project sponsorship for the cycling and walking programme
- Cycle training and development of the programme, including community engagement and partnership development
- Road safety education and promotion through local and regional campaigns and events
- School safety programme through TravelWise school travel plans and walking school buses
- Travel planning for businesses and communities including engagement, promotions, travel planning expertise and development of tools and products.

Table 4.15-2 Key Community Transport issues

No.	Key issues with Community Transport	Strategies for managing these issues
1	Increasing congestion on the transport network, particular for commute trips in the morning peak	Focus travel planning on areas of greatest congestion. Develop regional programmes and local delivery for travel planning and products
2	Footpaths and cycleway facilities will become more significant as active transport choices become more popular	Develop programmes and packages to support travel choices, including greater opportunities for training, education and promotion. Support regional prioritisation of the infrastructure programme aligned with growth areas
3	Linkages to and integration of travel planning with new transport infrastructure, to provide transport choices to ratepayers	Implement behaviour change programmes associated with the new works programme (see 4.15-5) and regional tools to support the operation of the network
4	Addressing the key road safety needs of the community	Work with community groups to provide targeted education and promote programmes. Ensure programmes align with the Regional Road Safety Plan and national programmes
5	Engagement with key stakeholders	Maintain and grow recognised and successful programme. For example, develop a 'whole-of-school' approach to promote safety through a partnership with schools
6	Development of LOS is important for targeting key cycle user groups	The review of the regional cycle network will lead to the development of a number of cycle network tiers, each with its own level of service. These will range from cycle superhighways aimed at longer distance commuters to local routes to schools and community facilities. A condition audit of the existing cycle network will provide better understanding of what is already offered and where improvements are needed to comply with agreed LOS

Figure 4.15-1 Community Transport operations and maintenance expenditure forecast
Source: LTP Budget Model 12 April 2012 after refresh for AMP



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total
Region	35%	4,714	4,754	4,794	4,835	4,876	4,917	4,959	5,001	5,044	5,087	5,130	49,397
North	22%	2,941	2,966	2,991	3,016	3,042	3,068	3,094	3,120	3,147	3,173	3,200	30,817
Central	20%	2,636	2,659	2,681	2,704	2,727	2,750	2,774	2,797	2,821	2,845	2,869	27,627
West	8%	1,095	1,104	1,113	1,123	1,132	1,142	1,152	1,162	1,171	1,181	1,191	11,473
South	15%	1,953	1,970	1,987	2,003	2,020	2,038	2,055	2,072	2,090	2,108	2,126	20,469
Total	100%	13,339	13,452	13,566	13,682	13,798	13,915	14,033	14,153	14,273	14,394	14,517	139,783

Operations and maintenance 10-year expenditure forecast

The recommended 10-year operational expenditure forecast is shown in Figure 4.15-1, with $140 million forecast over the next 10 years. Based primarily on historical trends, the forecast also includes the revised activities detailed above and, to some extent, LOS to be achieved. This recommendation takes into account current funding constraints being experienced by Auckland Transport and the Auckland Council. Note, however, that the actual plan which Auckland Transport and the Auckland Council approve may yet differ from these network needs because of the impact of funding constraints.

The average annual expenditure for operations and maintenance on Community Transport over the next 10 years is approximately $14 million, which is about 59 per cent of the total expenditure.

Note that Community Transport aims to implement a programme of initiatives to improve the integration of cycling and public transport, including a public bike hire scheme, bikes on buses, cycle parking and infrastructure links to public transport nodes. The programme will include extensive promotion and education.

4.15.5 New works needs

New works plan

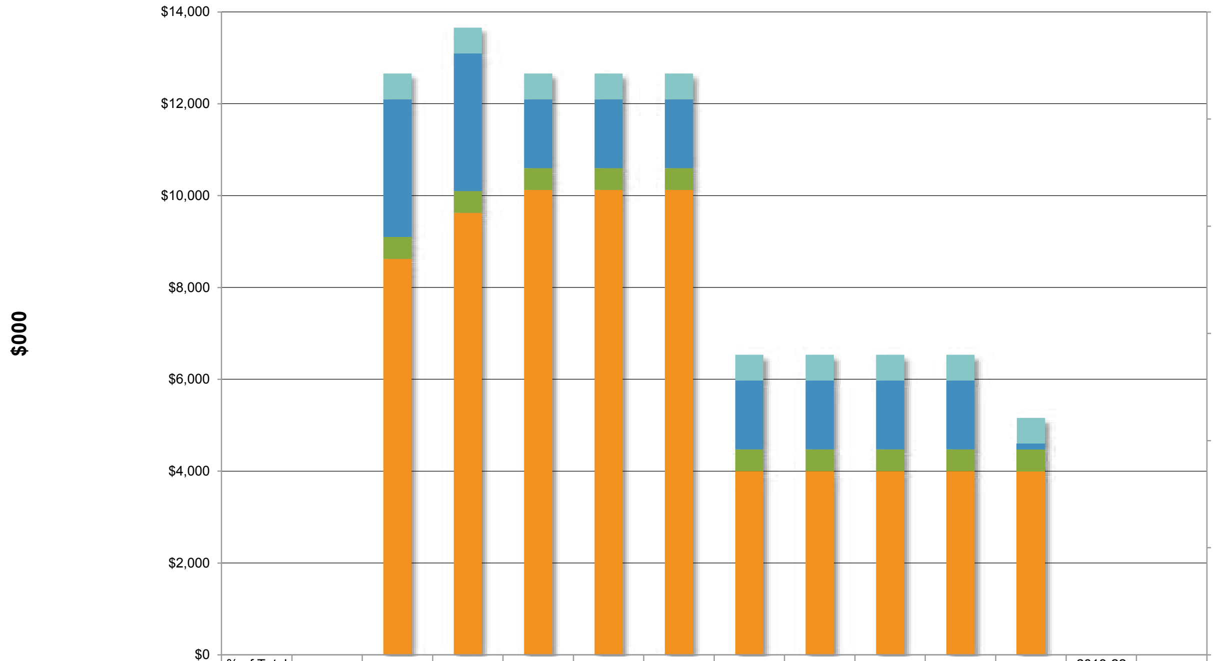
The new works strategy mainly focuses on infrastructure works to improve safety around schools. Note that maintenance and renewal of related assets are managed under Signs and Road Markings and Corridor Structures LCMPs (refer to Sections 4.11 and 4.5 respectively).

The regional summary of new works expenditure for Community Transport is presented in Figure 4.15-2. This shows that the annual total forecast is $13 million for the first five years, reducing to $7 million for the remaining years through to 2022. There is $96 million for Community Transport new works for the next 10 years, with 72 per cent for the safety around schools programme.

Growth-related new works

No growth-related new works for Community Transport have been identified with the development of this AMP.

Figure 4.15-2 Community Transport capital new works forecast
Source: LTP Budget Model 12 April 2012 after refresh for AMP



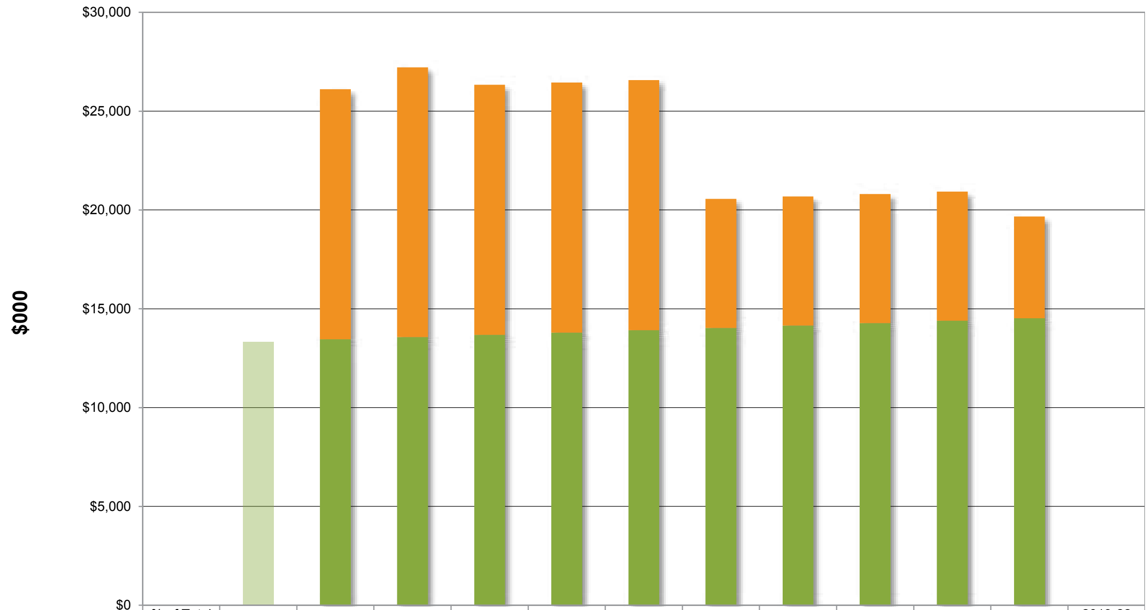
	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total
Safety speed management	6%		559	559	559	559	559	559	559	559	559	559	5,587
Regional safety programme	17%		3,000	3,000	1,500	1,500	1,500	1,500	1,500	1,500	1,500	127	16,627
Crash reduction implementatio-	5%		474	474	474	474	474	474	474	474	474	474	4,742
Safety around schools	72%		8,624	9,624	10,124	10,124	10,124	4,000	4,000	4,000	4,000	4,000	68,620
TOTAL	100%		12,657	13,657	12,657	12,657	12,657	6,533	6,533	6,533	6,533	5,160	95,576

Levels of service new works

All the new works for Community Transport are safety improvement programmes and therefore LOS driven. The main programme is the school safety programme, which includes infrastructure works to improve safety for school children. This is a regional programme integrated with the school TravelWise programme. Both programmes use school-based engineering interventions to improve road safety and operational deficiencies within the transport network. Planning is driven by cost-effective, evidenced-based solutions at prioritised high-risk locations, and the programme also supports the ability to service Local Board and customer service requests. Typical projects include pedestrian refuges, signage and road markings.

Separate projects are not listed in this AMP as they are prepared as a one-year detailed work programme with multiple small projects less than or equal to $250,000. The preliminary safety around schools programme for 2012/13 involves advanced design and delivery (CAPEX) and consultation (CAPEX) with the programme still being refined.

Figure 4.15-3 Summary of Community Transport O&M and new works forecast
Source: LTP Budget Model 12 April 2012 after refresh for AMP



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total
CAPEX New Works	41%	000	12,657	13,657	12,657	12,657	12,657	6,533	6,533	6,533	6,533	5,160	95,576
Renewals	0%	000	000	000	000	000	000	000	000	000	000	000	000
Operations & Maintenance	59%	13,339	13,452	13,566	13,682	13,798	13,915	14,033	14,153	14,273	14,394	14,517	139,783
TOTAL	100%	13,339	26,109	27,223	26,339	26,455	26,572	20,566	20,686	20,806	20,927	19,677	235,359

4.15.6 Summary of 10-year network needs

The total expenditure for operations and maintenance and new works over the next 10 years is $236 million as shown in Figure 4.15-3. Total annual costs are about $27 million for the first five years, dropping to about $20 million per year for the remaining years.

Average annual expenditure for operations and maintenance and new works on Community Transport over the next 10 years is approximately $24 million, of which $14 million (or 59 per cent) is for operations and maintenance, and $10 million (or 41 per cent) is for new works.

Notes on the expenditures in Figure 4.15-3:

- The proposed 10-year expenditures for OPEX and renewals include an annual growth factor of +0.85 per cent to allow for consequential OPEX and consequential renewals from growth in the network and growth in demand for services.

4.15.7 Approved Long Term Plan envelope

The approved Long Term Plan

This section compares the approved LTP envelope for OPEX and renewals with the Community Transport network needs as determined by this AMP at a regional level and identifies the likely impacts of any variances. Revenue and funding incomes to Auckland Transport (from Auckland Council ratepayers and NZTA government subsidies and the like) are allocated through the approved Long Term Plan budgets. The LTP was adopted on 28 June 2012.

OPEX impacts

Based on the information in Table 4.15-3, community transport operational expenditure shows a variance of +$12.4 million between the LTP allocated budgets and the AMP needs.

$5 million of this variance is not an increase but rather a re-allocation in the AMP from traffic systems and operations. The remaining net variance of +$7.4 million (5 per cent) represents an increase in funding for community safety programmes such as safety around schools, alcohol education, young driver education and walking and cycling programmes.

Table 4.15-3 Variance between LTP approved budget and AMP network needs for community transport (all un-inflated)
Source: LTP Budget Model 12 April 2012 after refresh for AMP and revised LTP Budget Model 28 June 2012

Community Transport	10-year total LTP approved budget ($000s un-inflated)	10-year total AMP network needs ($000s un-inflated)	Variance 10-year total ($000s un-inflated)
Operations and maintenance	152,190	139,783	12,407
Renewals	0	0	0
Community Transport total	152,190	139,783	12,407

However, it is anticipated that the LTP will require further efficiency savings and therefore the funding for Community Transport operational expenditure may be reduced.

Renewals impacts

Based on the information above, Community Transport capital renewals expenditure shows no variance between the LTP allocated budgets and the AMP needs.

Further efficiency savings

As required by the approved LTP, a further reduction in OPEX of $18.6 million per year, reducing to nil by 2016/17, will need to be allocated against asset-related operational budgets. The impact of this reduction on Community Transport operational budgets is yet to be assessed and finalised.

Monitoring and management of Long Term Plan consequences

The consequences resulting from these variances will be monitored and reported as appropriate.

CAPEX new works

CAPEX new works contained in this AMP are derived from draft LTP listings as at April 2012 and are produced in section 4.15.5.

The capital new works programme has been further refined and adopted in late June 2012. Details of this adopted programme are contained in the LTP.

AMP inflation effects

Un-inflated and inflated Community Transport needs for the AMP are shown in Table 4.15-4.

Table 4.15-4 Un-inflated and inflated community transport AMP needs
Source: LTP Budget Model 12 April 2012 after refresh for AMP and revised LTP Budget Model 28 June 2012

UN-INFLATED expenditure ($000s)	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M	13,452	13,566	13,682	13,798	13,915	14,033	14,153	14,273	14,394	14,517	139,783
Renewal	0	0	0	0	0	0	0	0	0	0	0
Community Transport total	13,452	13,566	13,682	13,798	13,915	14,033	14,153	14,273	14,394	14,517	139,783
AC Inflator OPEX	3.30%	3.30%	3.30%	3.30%	3.50%	3.60%	3.10%	3.10%	3.30%	3.60%	n/a
AC Inflator CAPEX	3.90%	3.40%	2.80%	2.90%	3.10%	3.30%	3.50%	3.70%	4.00%	4.00%	n/a
INFLATED expenditure ($000s)	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M	13,896	14,476	15,081	15,742	16,447	17,101	17,781	18,524	19,354	20,221	168,624
Renewal	0	0	0	0	0	0	0	0	0	0	0
Community Transport total	13,896	14,476	15,081	15,742	16,447	17,101	17,781	18,524	19,354	20,221	168,624

Table 4.15-5 Un-inflated and inflated Community Transport LTP budgets

Source: LTP Budget Model 12 April 2012 after refresh for AMP and revised LTP Budget Model 28 June 2012

UN-INFLATED expenditure ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M		14,182	14,402	14,627	14,855	15,087	15,321	15,561	15,803	16,050	16,301	152,190
Renewal		0	0	0	0	0	0	0	0	0	0	0
Community Transport total		14,182	14,402	14,627	14,855	15,087	15,321	15,561	15,803	16,050	16,301	152,190
AC Inflator	OPEX	3.30%	3.30%	3.30%	3.30%	3.50%	3.60%	3.10%	3.10%	3.30%	3.60%	n/a
AC Inflator	CAPEX	3.90%	3.40%	2.80%	2.90%	3.10%	3.30%	3.50%	3.70%	4.00%	4.00%	n/a
INFLATED expenditure ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M		14,650	15,369	16,123	16,948	17,832	18,671	19,551	20,510	21,581	22,706	183,940
Renewal		0	0	0	0	0	0	0	0	0	0	0
Community Transport total		14,650	15,369	16,123	16,948	17,832	18,671	19,551	20,510	21,581	22,706	183,940

LTP inflation effects

Un-inflated and inflated Community Transport budgets from the LTP are shown in Table 4.15-5.

4.15.8 Revenue sources

Auckland Transport's SAP financial management system contains revenue and funding incomes, although the transparency and completeness of allocations require review and confirmation.

Operations and maintenance revenue

Community Transport operations are normally subsidised by NZTA at 53 per cent (from July 2012).

Capital renewals revenue

There are no renewals associated with the Community Transport service.

Capital new works revenue

Community Transport new works are normally subsidised by NZTA at 53 per cent (from July 2012).

4.15.9 Key improvement initiatives

Key improvements relating to Community Transport service activity shown in Table 4.15-6.

Table 4.15-6 Key improvement initiatives

Improvement Initiative	Description	AMP Section	Priority
Community Transport 1	Prioritise investment for a regional approach for connecting the cycle network	4.15.2	High
Community Transport 2	Develop holistic approach for school safety and school travel plans	4.15.4	High

Network Management and Planning Activities
4.16 Contents

Auckland Transport
An Auckland Council Organisation

4.16 Network Management and Planning Activities

4.16.1 The service Auckland Transport provides

Details of the levels of service being measured are provided in Section 2, Levels of Service. Several of these measures and targets are yet to be confirmed and will be included in the improvement plan. The following measures are representative for planning activities' operational performance.

4.16.2 Activity overview

Network management and planning activities covers the following four areas:

- Activity management planning
- Asset management systems
- Transport planning
- Corridor access management.

4.16.3 Current management and planning activities

Activity management planning

Activity management planning is a statutory requirement, undertaken in accordance with Schedule 10 of the Local Government Act 2002.

Asset Management Plans provide essential details for the long-term plans of Auckland Transport. These plans also provide evidence to justify programmes and projects for NZTA funding.

Under this activity the following tasks will be completed:

- Preparing Asset Management Plans once every three years
- Updating Asset Management Plans every year
- Preparing and updating risk management strategies including safety and environmental management strategies
- Supporting Auckland Council with community consultation related to the development of Asset Management Plans
- Developing levels of service and key performance indicators
- Analysing asset performance and service gap
- Asset valuations
- Financial forecasts
- Continuous improvement programmes related to asset and activity management.

Asset management systems

Asset management systems provide and maintain vital information about the transport network including its condition, inventories and other asset attributes needed for planning and management. RAMM is the primary asset management system being used for the road network.

Activity management planning relies heavily on the information provided by asset systems and therefore a high level of data integrity is required. This is essential for asset inventory, treatment history, condition data, cost data and traffic data.

Under this activity the following tasks will be completed:

- Administering and managing RAMM and other asset management systems
- Updating asset management systems
- Condition rating surveys of the asset network
- Inspections of bridges, retaining walls and other significant structures
- Traffic counting surveys
- Data analysis and generation of reports
- Reporting
- Deterioration modelling and option analysis
- Continuous data and system improvement tasks.

Transport planning

Transport planning is the activity required to deliver transport plans, policies and the Regional Land Transport Programme. It also covers transport input to the Auckland Council, Local Boards and national transport planning and includes the following:

- Developing the Integrated Transport Plan
- Transport infrastructure planning including network plans and policies

Table 4.16-1 Network management and planning levels of service

Service value	Level of service	Service measure	Current performance	Target performance (indicative/ to be developed and agreed)
Efficient	Improve or maintain resolution rate for Requests for Service	CARs processed within 15 days (%)	96%	95%
		CARs processed within 5 days (%)	89%	80%

- Preparing corridor management plans
- Monitoring of KPIs and reporting through SOI and RMA
- Transport input to major development proposals and plan changes
- Prepare integrated implementation plan for all land transport in Auckland
- Transport modelling and GIS services.

Corridor access management

Corridor access management is the activity required to ensure asset integrity is maintained and disruption to road users and residents is minimised when work is undertaken or third party access is required. This includes:

- Permitting and monitoring corridor access requests for third-party work within the corridor
- Permitting and monitoring temporary activities within the transport corridors including events and associated temporary traffic management plans
- Managing HPMV access on the network
- Managing overweight/oversize access on the network
- Managing the Request for Services online system.

4.16.4 Operations and maintenance needs

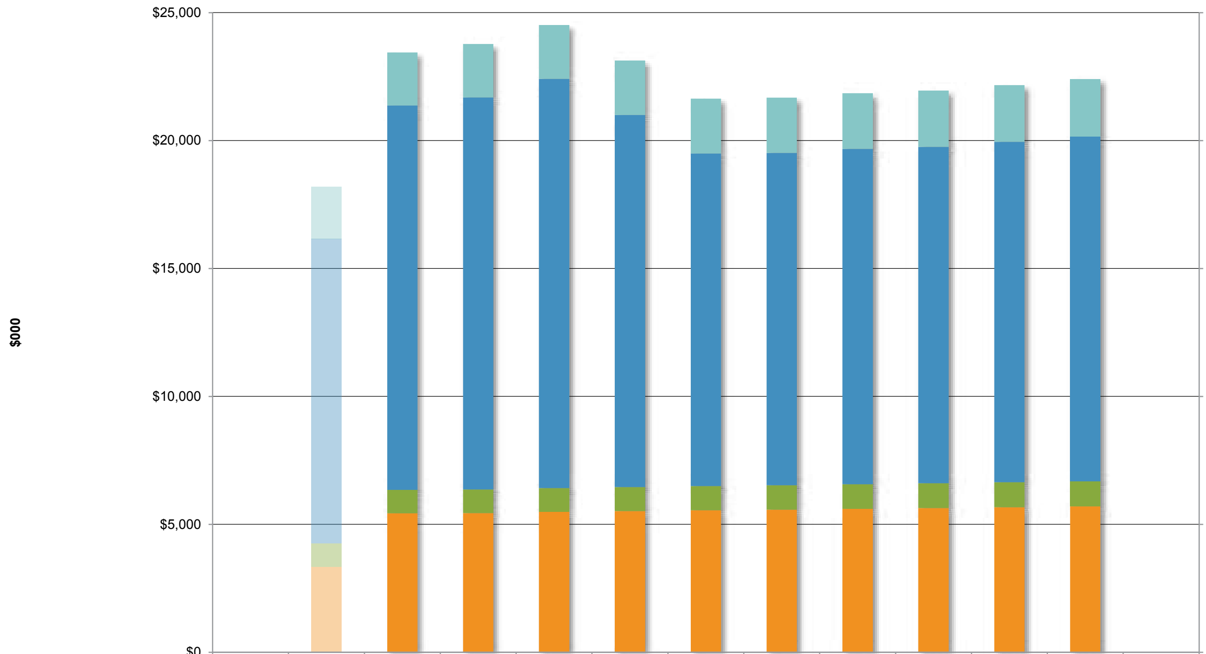
Scope of operations and maintenance

Operational expenditure for network management and planning activities is based on the tasks outlined above under each area. The future financial needs of this activity are based on the tasks currently planned for the year 2012/13. These requirements may change over time as the responsibilities and requirements of the new organisation are still evolving.

Operations and maintenance expenditure forecast

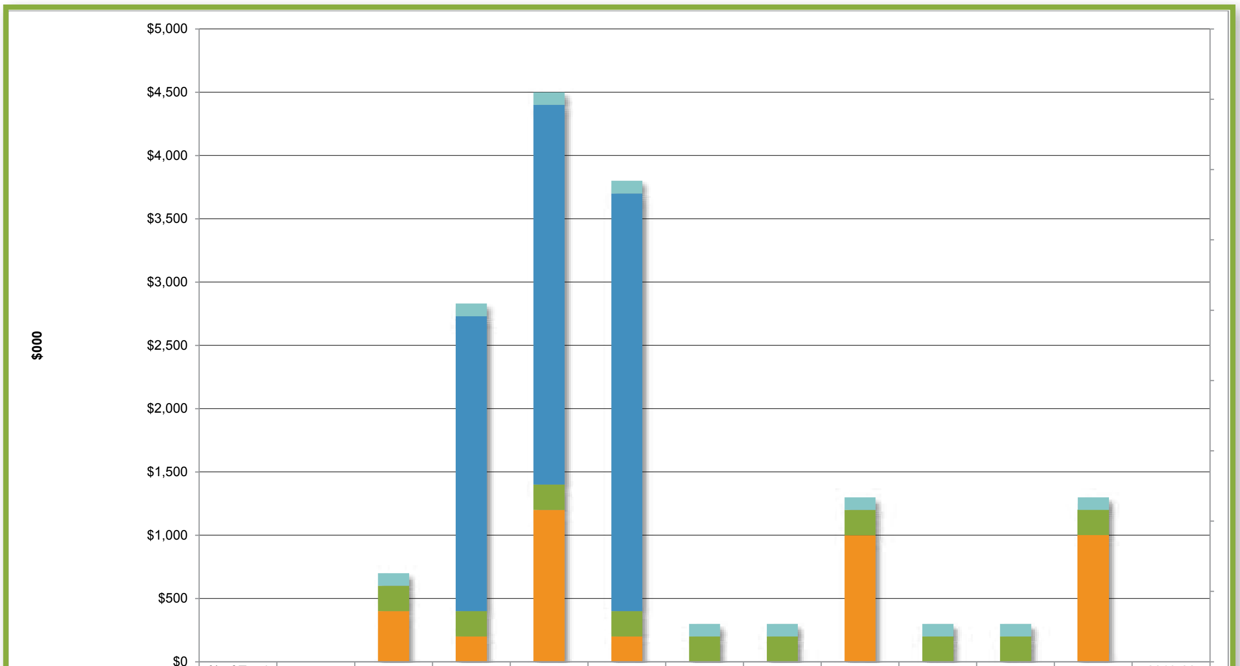
The recommended 10-year operational expenditure forecast is shown in Figure 4.16-1 with $227 million forecast over the next 10 years. This recommendation has also taken into account current funding constraints being experienced by Auckland Transport and the Auckland Council. Note, however, that the actual plan that will be approved by Auckland Transport and the Auckland Council may yet be different from these network needs because of the impact of funding constraints.

Figure 4.16-1 Network management operations and maintenance expenditure forecast
Source: LTP Budget Model 12 April 2012 after Refresh for AMP



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total
Corridor access management	9%	2,054	2,071	2,089	2,106	2,124	2,142	2,160	2,179	2,197	2,216	2,235	21,520
Transport planning	62%	11,905	15,025	15,322	15,993	14,547	13,001	12,987	13,102	13,148	13,307	13,471	139,903
Systems	4%	907	915	923	930	938	946	954	962	971	979	987	9,505
Activity management planning	25%	3,341	5,429	5,441	5,489	5,518	5,547	5,577	5,607	5,637	5,667	5,698	55,612
Total		18,207	23,441	23,774	24,518	23,127	21,637	21,679	21,850	21,953	22,169	22,391	226,540

Figure 4.16-2 Network management capital new works forecast
Source: **LTP Budget Model 12 April 2012 after Refresh for AMP**



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total
GIS asset capability	6%		100	100	100	100	100	100	100	100	100	100	1,000
HPMV routes	55%			2,330	3,000	3,300							8,630
AM Improvements	13%		200	200	200	200	200	200	200	200	200	200	2,000
Database improvements	26%		400	200	1,200	200			1,000			1,000	4,000
TOTAL	100%		700	2,830	4,500	3,800	300	300	1,300	300	300	1,300	15,630

The average annual expenditure for the operations and maintenance on network management and planning activities over the next 10 years is approximately $23 million which is approximately 94 per cent of the total expenditure.

4.16.5 New works needs

New works plan

The regional summary of new works expenditure for network management and planning activities is presented in Figure 4.16-2. There is $16 million for network management and planning activities new works over the next 10 years. The peak from 2013/14 to 2015/16 is mainly due to HPMV routes and database improvements. Note that $8.63 million is planned for HPMV routes and this includes some bridge strengthening. (Refer to Section 4.3 for further details on HPMV routes.)

4.16.6 Summary of 10-year network needs

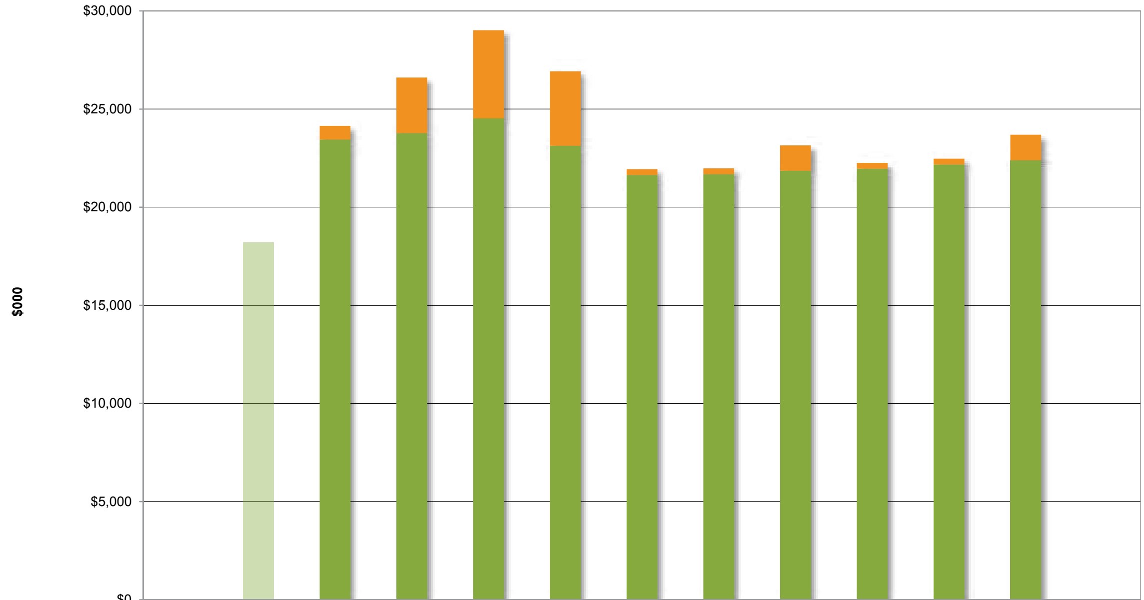
The total amount of expenditure for operations and maintenance and new works over the next 10 years is $242 million as shown in Figure 4.16-3. This shows that total annual costs peak in the first four years at $29 million then drop to about $22 million each year for the remaining years.

Average annual expenditure for operations and maintenance and new works on network management over the next 10 years is approximately $24 million, of which $23 million (or 94 per cent) is for operations and maintenance, and $1 million (or 6 per cent) is for new works.

Note that the proposed 10-year expenditures for OPEX and renewals includes an annual growth factor of +0.85 per cent to allow for consequential OPEX and consequential renewals from growth in the network and growth in demand for services.

Figure 4.16-3 Summary of network management operations and new works forecast

Source: LTP Budget Model 12 April 2012 after Refresh for AMP



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total
CAPEX New Works	6%	000	700	2,830	4,500	3,800	300	300	1,300	300	300	1,300	15,630
Renewals	0%	000	000	000	000	000	000	000	000	000	000	000	000
Operations & Maintenance	94%	18,207	23,441	23,774	24,518	23,127	21,637	21,679	21,850	21,953	22,169	22,391	226,540
TOTAL	100%	18,207	24,141	26,604	29,018	26,927	21,937	21,979	23,150	22,253	22,469	23,691	242,170

4.16.7 Approved Long Term Plan envelope

The approved Long Term Plan

This section compares the approved LTP envelope for OPEX and renewals with the network management and planning network needs as determined by this AMP at a regional level and identifies the likely impacts of any variances. Revenue and funding incomes to Auckland Transport (from Auckland Council ratepayers and NZTA government subsidies and the like) are allocated through the approved Long Term Plan budgets. The LTP was adopted on 28 June 2012.

OPEX impacts

Based on the information in Table 4.16-2, network management and planning expenditure shows variance between the LTP allocated budgets and the AMP needs. The LTP allocated budget for network management and planning OPEX has a 10-year shortfall of $29.1 million (13 per cent reduction) compared to the network needs determined by this AMP.

It is anticipated that the LTP will require further efficiency savings and as a result, this funding gap may increase.

Table 4.16-2 Variance between LTP approved budget and AMP network needs for network management and planning (all un-inflated)

Source: LTP Budget Model 12 April 2012 after refresh for AMP and revised LTP Budget Model 28 June 2012

Network management and planning	10-year total LTP approved budget ($000s un-inflated)	10-year total AMP network needs ($000s un-inflated)	Variance 10-year total ($000s un-inflated)
Operations and maintenance	**197,453**	**226,540**	**-29,087**
Renewals	**0**	**0**	**0**
Network management and planning total	**197,453**	**226,540**	**-29,087**

Renewals impacts

Based on the information above, network management and planning capital renewals expenditure shows no variance between the LTP allocated budgets and the AMP needs.

Further efficiency savings

As required by the approved LTP, a further reduction in OPEX of $18.6 million per year, reducing to nil by 2016/17, will need to be allocated against asset related operational budgets.

The impact of this further reduction on network management and planning operational budgets is yet to be assessed and finalised.

Monitoring and management of Long Term Plan consequences

The consequences resulting from these variances will be monitored and reported as appropriate.

Table 4.16-3 Un-inflated and inflated network management and planning AMP needs
Source: LTP Budget Model 12 April 2012 after refresh for AMP and revised LTP Budget Model 28 June 2012

UN-INFLATED expenditure ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M		23,441	23,774	24,518	23,127	21,637	21,679	21,850	21,953	22,169	22,391	226,540
Renewal		0	0	0	0	0	0	0	0	0	0	0
Network management and planning total		23,441	23,774	24,518	23,127	21,637	21,679	21,850	21,953	22,169	22,391	226,540
AC Inflator	OPEX	3.30%	3.30%	3.30%	3.30%	3.50%	3.60%	3.10%	3.10%	3.30%	3.60%	n/a
AC Inflator	CAPEX	3.90%	3.40%	2.80%	2.90%	3.10%	3.30%	3.50%	3.70%	4.00%	4.00%	n/a
INFLATED expenditure ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M		24,214	25,369	27,027	26,385	25,574	26,418	27,452	28,492	29,808	31,189	271,928
Renewal		0	0	0	0	0	0	0	0	0	0	0
Network management and planning total		24,214	25,369	27,027	26,385	25,574	26,418	27,452	28,492	29,808	31,189	271,928

Table 4.16-4 Un-inflated and inflated network management and planning LTP budgets
Source: LTP Budget Model 12 April 2012 after refresh for AMP and revised LTP Budget Model 28 June 2012

UN-INFLATED expenditure ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M		21,642	21,047	21,359	20,315	18,712	19,091	18,694	18,679	19,114	18,801	197,453
Renewal		0	0	0	0	0	0	0	0	0	0	0
Network management and planning total		21,642	21,047	21,359	20,315	18,712	19,091	18,694	18,679	19,114	18,801	197,453
AC Inflator	OPEX	3.30%	3.30%	3.30%	3.30%	3.50%	3.60%	3.10%	3.10%	3.30%	3.60%	n/a
AC Inflator	CAPEX	3.90%	3.40%	2.80%	2.90%	3.10%	3.30%	3.50%	3.70%	4.00%	4.00%	n/a
INFLATED expenditure ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M		22,356	22,459	23,544	23,177	22,117	23,264	23,487	24,242	25,700	26,189	236,534
Renewal		0	0	0	0	0	0	0	0	0	0	0
Network management and planning total		22,356	22,459	23,544	23,177	22,117	23,264	23,487	24,242	25,700	26,189	236,534

CAPEX new works

CAPEX new works contained in this AMP are derived from draft LTP listings as at April 2012 and are produced in section 4.16.5.

The capital new works programme has been further refined and adopted in late June 2012. Details of this adopted programme are contained in the LTP.

AMP inflation effects

Un-inflated and inflated network management and planning needs for the AMP are shown in Table 4.16.3.

LTP inflation effects

Un-inflated and inflated network management and planning budgets from the LTP are shown in Table 4.16.4.

4.16.8 Revenue sources

Revenue and funding incomes to Auckland Transport are contained in Auckland Transport's SAP financial management system.

Operations and maintenance revenue

Network management and planning activities operations are normally subsidised by NZTA as follows:

- At 43 per cent (from July 2012) for operational activities associated with road corridor maintenance such as administration and management of RAMM database
- At 53 per cent (from July 2012) for special studies and strategies such as AMP development and asset valuations.

Capital renewals revenue

There are no network management and planning activities capital renewals identified in this plan.

Capital new works revenue

There are no network management and planning activities capital new works identified in this plan.

4.16.9 Key improvement initiatives

Key improvements have been identified relating to network management and planning activities. These are listed in the following separate sections:

- Section 9, Asset Management Practices for systems initiatives
- Section 3, Growth and Demand for transport planning initiatives such as corridor management plans
- Section 10, Improvement Plan and Monitoring for asset management plan initiatives.

5 Sustainability

Contents

Auckland Transport
An Auckland Council Organisation

5 Sustainability

5.1 Overview

Auckland Transport has a primary responsibility for managing and controlling all assets and activities within Auckland's urban and rural road network. The road corridor does not exist in isolation from its users and wider transport matters, nor do Auckland Transport's accountabilities sit apart from the communities both served and shaped by these networks.

In this context, Auckland Transport has both the opportunity and the responsibility to adopt a holistic and integrated approach to its asset management and operations. Inherently, this requires a longer term and sustainable view.

However, 'sustainability' operates at several levels and is considered in terms of the practices, methods, designs, devices and approaches adopted. If embedded and seamlessly integrated into the organisation, sustainability can provide a powerful and positive difference to the way Auckland Transport operates and serves its stakeholders and communities.

5.1.1 Purpose

The purpose of this section is to provide an overview of sustainability as it relates to asset management roles and responsibilities, and list current legislation, strategies, plans and key performance indicators (KPIs) and their progress.

This section sets out how sustainability is embedded in Auckland Transport processes, projects, and culture so that outcomes are more robust and sustainable over the longer term. Current sustainability initiatives are highlighted to demonstrate how Auckland Transport is going beyond business as usual whilst managing its assets. These initiatives provide exemplars for how future projects may evolve and further actions to reflect the key result area – a sustainable network, future levels of service, asset management KPIs and key asset issues.

5.1.2 Approach and management of effects

Auckland Transport's assets are complex and are interwoven with many other aspects, so there is not one 'thing' that can be implemented to adopt a sustainable approach; instead a multi-faceted and multi-disciplinary response is required.

Effects associated with transport activities can be both positive and negative. On the positive side, improved traffic flows reduce environmental impacts, the transport network contributes to a more liveable city, and the road corridor contributes to our sense of place.

Table 5.1-1 shows a range of the common negative effects associated with the organisation's activities and assets as identified in Section 1, Introduction. A transport activity that has a negative effect may also have an associated positive effect for transport users, which can provide opportunities and offer a more balanced representation of transport activities. For example, travel disruption and congestion due to construction and maintenance of transport infrastructure is identified as a negative effect of transport activity. Balanced against this is the positive impact that an action such as sealing an unsealed road has for traffic and emergency services to access destinations far more quickly than previously. An opportunity to communicate this benefit to transport users is a useful way of providing a balanced view of transport activities.

Some of these opportunities, or accelerated actions that hasten an opportunity or the benefits of mitigation, may have already been adopted. Negative effects are frequently beyond Auckland Transport's direct control (for example, environmental impacts such as air pollution rely on emissions standards). This does not mean that Auckland Transport can or should dismiss its responsibility to act. It means instead looking at what can be controlled (e.g. specifying emission standards for public transport operators), what can be influenced (e.g. lobbying central government or other agencies with direct control of the matter) and encouraging sustainable transport modes through providing an effective network.

Asset Management's ability within Auckland Transport to directly control negative effects is limited further in that projects relate only to maintenance and renewals. That said, Asset Management can still influence projects outside of the department's remit.

The range of effects associated with the organisation is dynamic and can change over time in size or because of greater awareness and improved information about how activities are affecting the four well-beings. Being aware of, and able to anticipate and capitalise on, change is important.

Table 5.1-1 Summary of significant negative effects and associated opportunities

Negative effect	Social	Economic	Environmental	Cultural	Mitigation measures	Accelerated action / opportunity
Travel disruption and congestion due to construction and maintenance of transport infrastructure	✓	✓			Measures such as programming the timing of works as fast as practicable at times to minimise disruption, ensuring the work is managed in a way that minimises disruption and ensures the safety of the public, and by communicating effectively with travellers and communities likely to be affected	Communicate to transport users that there will be new or well-maintained infrastructure Collaborate with community regarding construction scheduling to compress construction duration and disruption to neighbours
Environmental impacts, such as air pollution and water pollution	✓	✓	✓	✓	Specifying standards relating to the emissions of public transport vehicles provided by commercial and contracted operators	Communicate to transport users the value of low emissions public transport vehicles Advocate for change Encourage and maintain water sensitive urban design
Traffic crashes and resulting injuries and deaths	✓	✓			Incorporating good road safety practice on roads, addressing crash black spots through appropriate engineering and regulation measures, and through community road safety programmes	Proactively address issues with black spots and communicate to transport users how lives are saved by safety programmes
Disruption to communities affected by increased traffic flows and undesirable traffic behaviour	✓	✓	✓	✓	Identifying locations where traffic characteristics are inappropriate to the function of the road and introducing measures such as traffic calming and traffic regulation to improve traffic behaviour	Create community cohesion. Add amenity value; provide a valuable pedestrian and/or cycle environment Encourage water sensitive urban design or transport-orientated design Integrate with wider Auckland Council spatial planning initiatives to create cohesive communities
Noise from transport activities disturbing communities	✓		✓		Complying with District Plan rules and consent conditions, and actively implementing noise reduction measures on major transport projects	Influence planning mechanisms to reduce the risk of reverse sensitivity
Major transport corridors divide communities	✓				Introducing pedestrian-friendly features and urban design features where possible	Create community cohesion. Add amenity value to area with urban design features and create pedestrian access Integrate with wider Auckland Council spatial planning initiatives to create cohesive communities
Waterway contamination by stormwater run-off from road surfaces			✓	✓	Installation of contaminant trapping devices at sensitive locations and implementing innovative design solutions on new developments to treat stormwater run-off at source (where practicable)	Communicate to the public innovative measures that deal with contaminants and have an amenity value Encourage water sensitive urban design and amend maintenance and asset management mechanisms to adapt to 'green engineering'

5.2 Overarching sustainability management

Sustainability encapsulates the four well-beings – social, cultural, economic and environmental, which are all interrelated. So what does this mean for Auckland Transport, particularly as a new organisation?

Typically, an organisation or project moves through a progressive approach to sustainability (Figure 5.2-1).

Auckland Transport has an opportunity to evolve through to a fully integrated and 'mature' approach to sustainability (stage 3). How embedded sustainability might be achieved through its asset management is addressed in Section 5.3.

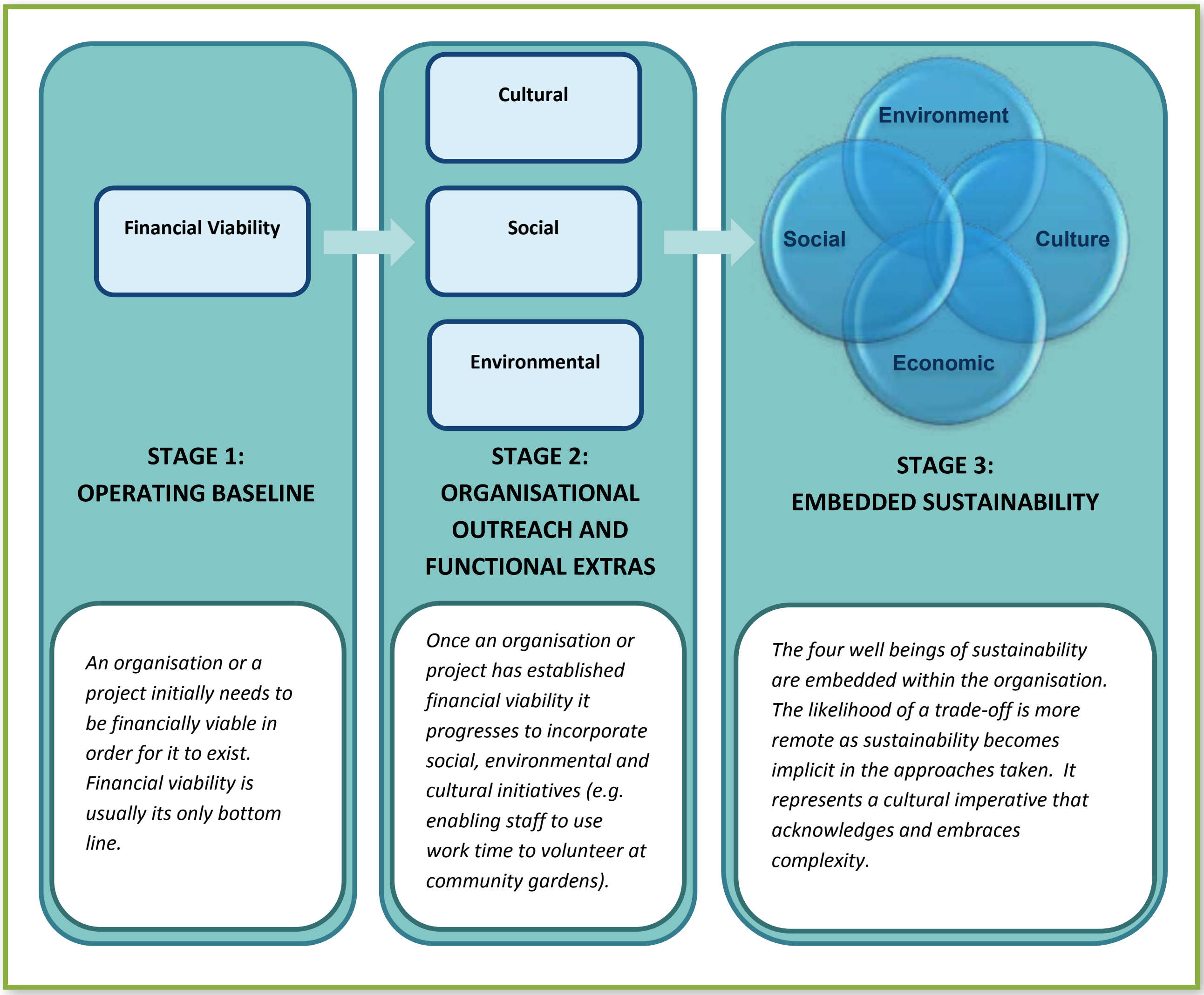
5.3 Overarching drivers

5.3.1 Legislation

The Land Transport Management Act 2003 (LTMA) is the principal legislation that governs the land transport planning and funding system. Sustainability is embedded in the purpose of the LTMA, which is to:

> *"Contribute to the aim of achieving an affordable, integrated, safe, responsive, and sustainable land transport system. To contribute to that purpose, this Act... improves social and environmental responsibility in land transport funding, planning, and management."*[1]

Figure 5.2-1: Sustainability: Progress of an organisation or project
Source: Anguillid Consulting Engineers and Scientists Ltd



The LTMA highlights that in order to achieve part of its purpose – a sustainable land transport system – transport projects at the funding, planning and management stages need to incorporate social and environmental responsibility. Essentially, this requires a quadruple bottom line approach (i.e. across all the four well-beings) because just as financial matters are part of the wider LTMA, cultural aspects can be viewed as an inherent part of social and environmental responsibility.

The Local Government Act 2002 (LGA) recognises the need for local government authorities to be autonomous and respond to the differing needs of their communities. The LGA offers local government a devolved role in which they can develop their own sustainable development approach. This is highlighted in the LGA which has the stated purpose to:

> *"provide for democratic and effective local government that recognises the diversity of New Zealand communities and, to that end, this Act…*
>
> *(d) "provides for local authorities to play a broad role in promoting the social, economic, environmental, and cultural well-being of their communities, taking a sustainable development approach."(s3(d) Local Government Act, 2002)*.

Central Government is currently considering the reform of s3(d) of the LGA. It is proposed that references to the "social, economic, environmental and cultural well-being of communities"[2] be replaced with "providing good quality local infrastructure, public services and regulatory functions at the least possible cost to households and business."[3] Whilst the current draft of the reform (which will be progressed in Parliament after this document is finalised) excludes any explicit mention of the well-beings, these will remain relevant to Auckland Transport as the well-beings represent the underlying principle and well understood principles of sustainability. They are reflected in other relevant legislation, including the LTMA and the RMA, both of which apply to Auckland Transport.

5.3.2 Strategies and plans

Every three years, the National Land Transport Programme (NLTP) gives effect to the Government Policy Statement (GPS) and identifies the transport activities that are likely to be funded. With a 10-year outlook, the programme is influenced by the Regional Land Transport Strategy (RLTS) and asset management plans.

[1] s3, Land Transport Management Act, 2003.
[2] Department of Internal Affairs, Better Local Government, 2012.
[3] Department of Internal Affairs, Better Local Government, 2012.
[4] Auckland Council, Auckland Plan, 2012.
[5] Auckland Council, Auckland Plan, 2012.

The Auckland RLTS identifies several objectives that relate to sustainability's four well-beings:

- Assisting economic development
- Assisting safety and personal security
- Improving access and mobility
- Protecting and promoting public health
- Ensuring environmental sustainability
- Achieving economic efficiency.

An analysis of the Auckland Plan highlights that Auckland Transport may be managing assets in the future that are complex, serve multiple purposes, have a broader context and incorporate different design elements. Some of the environmental design principles emphasised in the Auckland Plan include stormwater disposal, such as low impact design, swales, soakage pits, rain gardens and the use of recycled or reused materials.[4]

Auckland Council's Unitary Plan will be developed to replace the District and Regional plans and will be the key way of implementing the Auckland Plan. The council also identified principles to achieve the vision and outcomes of the Auckland Plan; these are:

- Work together
- Check progress and adapt to improve
- Be sustainable
- Make the best use of every dollar spent
- Value te Ao Maori
- Act fairly.

These principles reflect sustainability, where people, economy and the environment are interlinked; preserving the environment also sustains society and the economy. This approach is also consistent with te Ao Maori where the understanding of sustainability includes a strong focus on the natural environment but is also linked with society, culture and the economy.

The principles, along with a discussion of each, are listed as follows:

1. ***Work together*** *– "Work collaboratively and as partners on the priorities identified in the Auckland Plan. Recognise the interdependence of projects, programmes and initiatives."*[5]

Auckland Transport's Statement of Intent (SOI) highlights the important relationship between the organisation, Auckland Council, and other council-controlled organisations. In particular, Auckland Transport provides input into the development of council plans, such as the Auckland Plan, the Long-term Plan (LTP), the Unitary Plan and the Annual Plan. Alignment of infrastructure and service-level investments with other agencies and organisations allows for better use of existing assets and better allocation of new investments.

The SOI also identifies major road construction projects, planned public transport initiatives and Auckland Transport's contribution to other external agency-led projects. A strong relationship between internal Auckland Transport departments, Auckland Council and other agencies is important in order to provide input into the projects at the design stage and also to gather information for the lifetime management of the assets after their completion.

Involving asset managers at the design stage of a project can also put Auckland Transport in a stronger position to meet its KRAs of delivering efficient, effective, safe and sustainable networks.[6]

Since asset managers have influenced the earlier project phases, they:

- May have influenced the design to better reflect operational needs
- Should have a better understanding of community issues and ideally an existing relationship with the communities our assets will serve
- Can plan for the assets and ensure they have all the relevant asset information to deliver against all of the asset performance requirements (including non-financial and non-engineering requirements).

2. ***Check progress and adapt to improve*** – *"Monitor and evaluate every initiative to ensure we move in the right direction. Adapt accordingly and continually improve the way we are working to achieve Auckland's vision."*[7]

Identifying how Auckland Transport is progressing towards meeting its objectives and KRAs, as well as community expectations is imperative. This assessment of progression recognises project performance while evaluating how Auckland Transport can continue to improve, and may also result in a project moving beyond business as usual.

There is an opportunity to go beyond some of asset management's conventional concepts and to embed emerging and leading-edge asset management practices that reference sustainability concepts, including:

- **Infrastructure equity development:** This goes beyond established lifecycle management approaches with the aim of building knowledge equity within infrastructure management processes (of which asset management is a key part). This innovative framework is particularly relevant where design integrity and higher performance outcomes have been sought or required
- **Place-based management – the community-oriented results / co-ordinated operating requirements (CORe):**[8] All four well-beings are represented in this approach. KPIs for maintenance specifications that concern the community and cultural aspirations are included. A combined approach to infrastructure management can lead to economic efficiencies and finally an environmental benefit, where assets achieve their desired environmental outcome due to methods appropriate for asset management and operations.[9]

Asset managers have a role in influencing how assets are both delivered into the asset management process, and in turn, how these assets function and create a sense of place. The community is not generally concerned with what they see as an arbitrary asset, department, operating, or organisational division; they interact with their space, the environment and each other within this context. It is these interactions that contribute to achieving the Auckland Plan's vision of the world's most liveable city, and the ability for the asset management process to influence other parts of the greater organisation is key to that.

3. ***Be sustainable*** – *"Take a long-term view and have the resilience and flexibility to adapt to changing conditions that affect our communities, our economy, our environment and our infrastructure. Do more with less."*[10]

By managing assets sustainably, we meet the users and/or the communities' expectations and their needs for the future and address one of Auckland Transport's KRAs – a sustainable network. Auckland Transport's Levels of Service framework is included in Section 2.6.

Given that change is constant and can occur in many different forms, assets designed, managed and maintained to be robust and resilient should be able to respond and adapt to these changes in the surrounding environment over time. Areas relevant to Auckland Transport include:

- Civil defence events/natural disasters
- Climate change
- Population
- Technology.

[6] Asset Management has a role to contribute towards this sustainability KRA that is discussed later in section 5.4.
[7] Auckland Council, Auckland Plan, 2012.
[8] Co-ordinated Operating Requirements and Community Orientated Results.
[9] For additional information about the CORe please refer to the White Paper CORe Services: A Step Change Opportunity (Anguillid Consulting Engineers and Scientists Ltd, April 2011).
[10] Auckland Council, Auckland Plan, 2012.
[11] Auckland Council, Auckland Plan, 2012.
[12] New Zealand Transport Agency's, Procurement Manual, November 2009.

Civil defence scenarios, such as an earthquake or a major flood, pose a threat to the transport network with the risk that key lifeline links could be disabled. To build resilience, asset managers can manage the design and specify the durability of an asset at the development stage. This information can also be used to maintain and renew lifeline link routes and therefore reduce negative impacts on assets during a civil defence event.

Climate change and the associated predicted sea level rise present a need to adapt and manage assets in a way that minimises impacts. Failure of structures such as sea walls and wharves has potential to cause a major disruption to the transport network. Identifying asset condition and performance will therefore become increasingly important as additional factors that could undermine asset integrity become more prevalent or frequent.

Given rapid population growth trends in Auckland, asset managers will be operating in an environment of increased demand and pressure on the transport network. Figure 5.3-1 highlights the likelihood of a significant increase in use of trains and buses; so anticipating the maintenance and renewals needs of the network is particularly relevant.

Auckland Transport is operating with an increasing – and an increasingly diverse – asset base. It is important to understand and fill any knowledge gaps about how these diverse assets operate optimally.

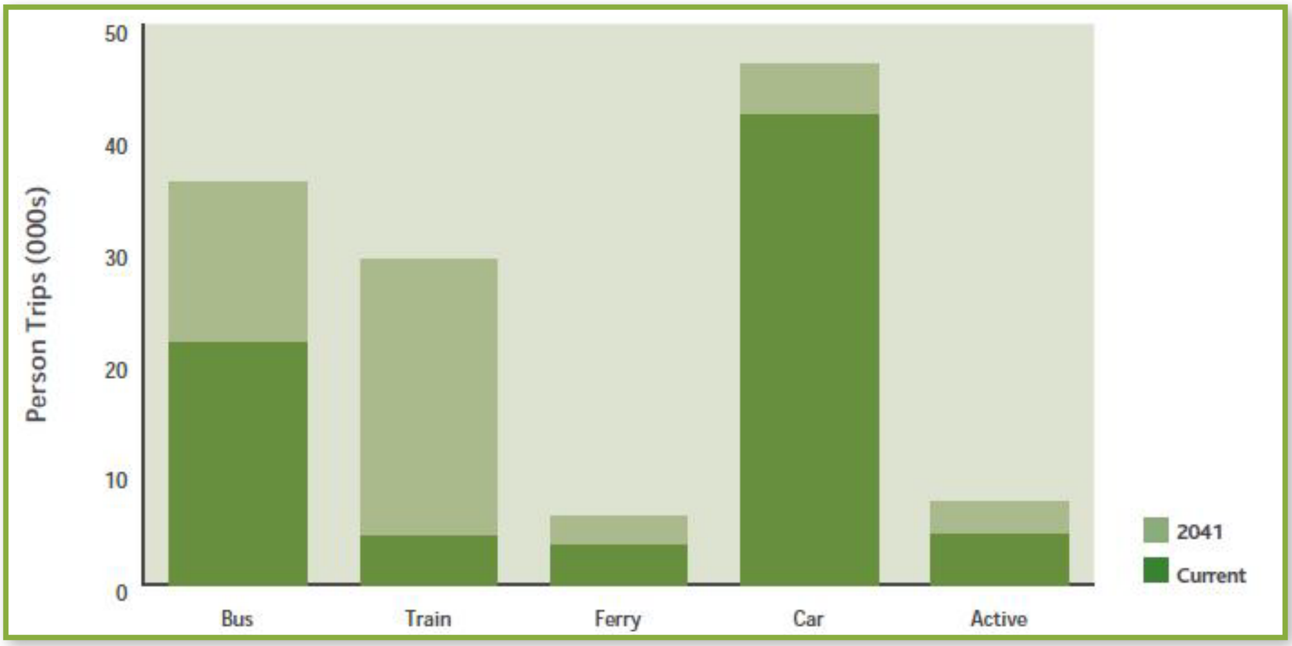
4 ***Make the best use of every dollar spent*** – *"Act prudently and commit to projects and initiatives that achieve the best value result without compromising quality, or stifling creativity and innovation. Focus on achieving long-term benefits and intergenerational equity."*[11]

The Ministry of Transport has highlighted three main concepts that guide NZTA and local government when making funding decisions; these are effectiveness, efficiency, and safety. NZTA in turn has identified financial and non-financial attributes associated with efficiency and economy:

"Non-financial attributes may include:

- Quality (e.g. of the supplier or product)
- Impact on communities and the environment (e.g. positive or negative impacts on connectivity, disruption and pollution)
- Design integrity (e.g. arising from capable and skilled suppliers)
- Innovation (e.g. meeting LTMA outcomes via an agreed output variation from that originally specified)
- Whole-of-life considerations (e.g. when considering the longevity of value against maintenance costs of different materials over the life of the asset)
- Training and development opportunities (e.g. by valuing suppliers that invest in workforce capability)
- Health and safety practices (e.g. by valuing suppliers that meet certain specified standards)
- Capital invested."[12]

Figure 5.3-1 Modal person trips in Auckland – current and 2041
Source: The Auckland Plan Discussion Document version 1.1 2011



Auckland Transport's SOI shows that there is space for non-financial measures as well as financial measures which offers a broad assessment of activities and aligns with the need to take a broader view of 'value for money'. This also means there is an opportunity (and in fact a need) to record non-financial measures that include sustainability features of projects and report to both the public and respond to the Auditor General's Auditing Standard 4 (AG-4) regarding Auckland Transport's sustainability progress.[13]

Clearly then, making the best use of every dollar spent is not just delivering more for less money; there is a broad variety of non-financial attributes ranging from internal organisational practices through to consideration of the actual asset.

Creating assets that do not balance these needs (e.g. design life, expectations and/or environmental outcomes) means that rework is likely to be required. Creating assets that are right the first time is therefore optimal as it is economically efficient, and socially and environmentally expedient.

5 ***Value te Ao Maori –*** *"Acknowledge the special place of Mana Whenua and enable their participation in decision making. Build lasting and reciprocal relationships with Auckland's Maori."*[14]

Te Ao Maori has been illustrated as "how Maori perceive their environment and the inter-relationship of the spiritual world, the living world and the natural world."[15] It represents a holistic worldview with interlinkages and connections between the wider environments. Recognising this is a useful way of understanding and valuing the dynamic relationship Maori have with the world and how this relates to Auckland Transport.

Taking a holistic approach to sustainability and embedding it within the organisation creates an opportunity for asset management to influence and give real effect to valuing te Ao Maori. Incorporating a te Ao Maori perspective into transport projects at the concept and design stage will ensure te Ao Maori is valued from the project's outset – although giving value to te Ao Maori means going beyond consultation at the design stage.

[13] AG-4 requires consideration of non-financial performance, which is particularly important with regard to sustainability as it provides Auckland Transport with an opportunity to display their sustainability performance and show how well they are performing.
[14] Auckland Council, Auckland Plan, 2012.
[15] Ministry of Justice, *He Hinatore ki te Ao Maori A Glimpse into the Maori World*, March 2001.
[16] *The Journal of the Polynesian Society*, Kaitiakitanga: A Maori Anthropological Perspective of the Maori Socio-environmental Ethic of Resource Management, 2000.

The document *Te Toi Roa: Towards an Evaluation Methodology for Mana Whenua and Mātaawaka Wellbeing in Tāmaki Makaurau* was developed for Auckland Council's Independent Maori Statutory Board.

The document identifies that iwi groups have requested the council to provide:

- "Equal access to high quality local services and facilities. There are many communities that experience financial, transport, locality barriers and are unable to gain access to Council facilities, and...
- Manage resources in accordance with iwi management plans."

Te Ao Maori resonates well with a place-based approach to asset management and sustainability principles as a whole. This approach encompasses community, economic, cultural and environmental aspects, and is couched in an environment or an area. Also, because the environment as a whole is being perceived, it is being monitored meaning any new interactions or issues can be anticipated or identified at the outset, and therefore represents a proactive approach to asset management.

Kaitiakitanga is a practice of guardianship and resource management that "embraces social and environmental dimensions. Human, material and non-material elements are all to be kept in balance."[16] Kaitiakitanga is continually changing and "adapting to new circumstances created by law, policy, infrastructural development, shifts in human, bio-physical and capital resources."[17] This highlights the opportunity for Mana Whenua to participate in the ongoing stewardship of Auckland's transport assets.

Auckland Transport's approach to stewardship differs from the Resource Management Act 1991 (RMA) interpretation of kaitiakitanga. Instead, given that the concept of kaitiakitanga has many dimensions, a broad literal definition has been taken that represents a commonality between asset management and Maori in order to facilitate understanding and progress forward.

Asset management also relates to guardianship and as a discipline it is continually evolving due to legislative changes and the emergence of new types of assets.

6 ***Act fairly –*** *"Consider the needs of all groups in the community to ensure that all Aucklanders can participate equally."*[18]

[17] *The Journal of the Polynesian Society*, Kaitiakitanga: A Maori Anthropological Perspective of the Maori Socio-environmental Ethic of Resource Management, 2000.
[18] Auckland Council, Auckland Plan, 2012.

Auckland Transport has a responsibility to provide assets in an equitable manner throughout the Auckland region across the following areas:

- Quality over geographical areas
- Generations
- Asset types – roads, public transport, footpaths.

A range of assets has been created in different geographical areas – urban, rural and suburban – over the wider Auckland region. Equitable quality of these assets is important as it displays a consistent approach without apparent preferential treatment. This standard of assets can also reflect willingness to pay (not ability to pay) and the relative priorities of a given community. It provides for another aspect – communities' aspirations or decisions – to be included when developing asset management priorities.

Approximately "90 per cent of the land mass of the Auckland region is rural (this includes rural townships), with transport needs that are often different from the needs of urban communities"[19]. However, the majority of the population lives in urban areas, which presents an obvious tension and means maintenance and renewals decisions need to be made with that in mind. Socio-economic performance varies and as a result assets may need to be managed differently within particular locations.

Intergenerational asset equity is strongly associated with managing assets in a way that will allow their continual use by future generations, aligning with the original Brundtland definition of sustainable development: "development which meets the needs of current generations without compromising the ability of future generations to meet their own needs."[20] Therefore when assets operate to their whole-of-life design intent, intergenerational equity is provided.

Providing intergenerational equity relates to lifecycle management and asset purpose over its whole life, rather than at an immediate point within its lifecycle. This approach facilitates anticipatory decisions; thereby encouraging a proactive response to asset management.

Acting fairly across the asset types is also important, and managing complexity is key to this. Beyond hard infrastructure, Auckland Transport needs to be mindful of also managing:

- Assets linked to statutory compliance. Many assets are linked to consent or designation conditions which require certain outcomes or performance (e.g. noise baffling glass panelling, swales and stormwater treatment devices)
- Assets that require high service levels (e.g. town centre paving, street furniture, public transport facilities), where architectural or higher levels of maintenance frequency and performance outcomes are required for amenity reasons
- Green infrastructure. Plants and vegetation may often be used as part of the engineering controls, especially in water sensitive urban design or low impact design developments. Vegetation needs to be maintained to retain this engineering function rather than just the aesthetic component.

For Auckland Transport to adopt an integrated and embedded view of sustainability, it will need to critically review its existing asset management framework and expand and adjust this over time to accommodate and care for the complexity within its asset base. This is the underlying concept of the asset management CORe approach outlined in Section 5.4 and represents a step change for industry, let alone Auckland Transport. Whilst such an initiative will take time to both roll out and embed, it has the potential to result in organisational efficiencies and effective, sustainable performance.

5.4 Implementing sustainability

Some of Auckland Transport's recently implemented projects represent a sustainable approach that has progressed beyond business as usual in terms of sustainability. These projects are highlighted in this section. Each project is described and an additional explanation around how each project addresses the four well-beings (social, cultural, economic and environmental) is provided. Lastly, each of the projects addresses various aspects within the AMP including key asset management issues, future LOS and/or risk or asset performance measures. In so doing, the ability of these sustainability projects to influence and enhance Auckland Transport's performance on many levels is explained, which adds value to these projects and the concepts of sustainability in general.

[19] Auckland Council The Auckland Plan Discussion Document, version 1.1, 2011.
[20] United Nations Report of the World Commission on Environment and Development: Our Common Future, 1987.

Figure 5.4-1 Rain garden – Albany Lakes Precinct
Source: Internet

5.4.1 Projects

Integrated Asset Management Plan

The Albany Lakes Precinct (ALP) comprises two complex developments – Albany Lakes and Civic Crescent where water sensitive urban design (WSUD) features heavily in the asset base, as shown in Figure 5.4-1. The assets were developed to meet community expectations as well as provide for environmental sustainability. However, over a period of several years issues were identified with the long-term operational, maintenance and whole-of-life cost issues associated with WSUD assets. Many of these concerns were centred on roads within the ALP, as conventional maintenance contracts were not always an effective approach for maintaining these multi-functional assets. The Integrated Asset Management Plan for the ALP was developed to address these issues.

The plan provides a framework to assist managers and should make it easier to create and maintain 'green' infrastructure to the original intended standard or to protect existing natural systems. It also promotes greater accountability across non-financial performance indicators. The framework aligns well with the AG4 for Auckland Council long-term plans and integrates asset management requirements for stormwater, streetscapes, parks and transportation assets.

In section 3.2 of the Road Network Asset Management Plan, WSUD is identified as a technological change offering the inherent environmental benefit of reducing the impact on the surrounding ecosystem. The Integrated Asset Management Plan for the ALP transcended this technological change by developing an innovative approach to managing low impact design (LID) assets, allowing the assets' full potential to be attained over their design life.

The plan represents a place-based approach to managing transport infrastructure in the ALP. As a result the approach responds to this key issue associated with drainage:

> *"Significant growth in non-traditional drainage systems such as rain gardens in new developments which will have higher maintenance costs than conventional systems."*

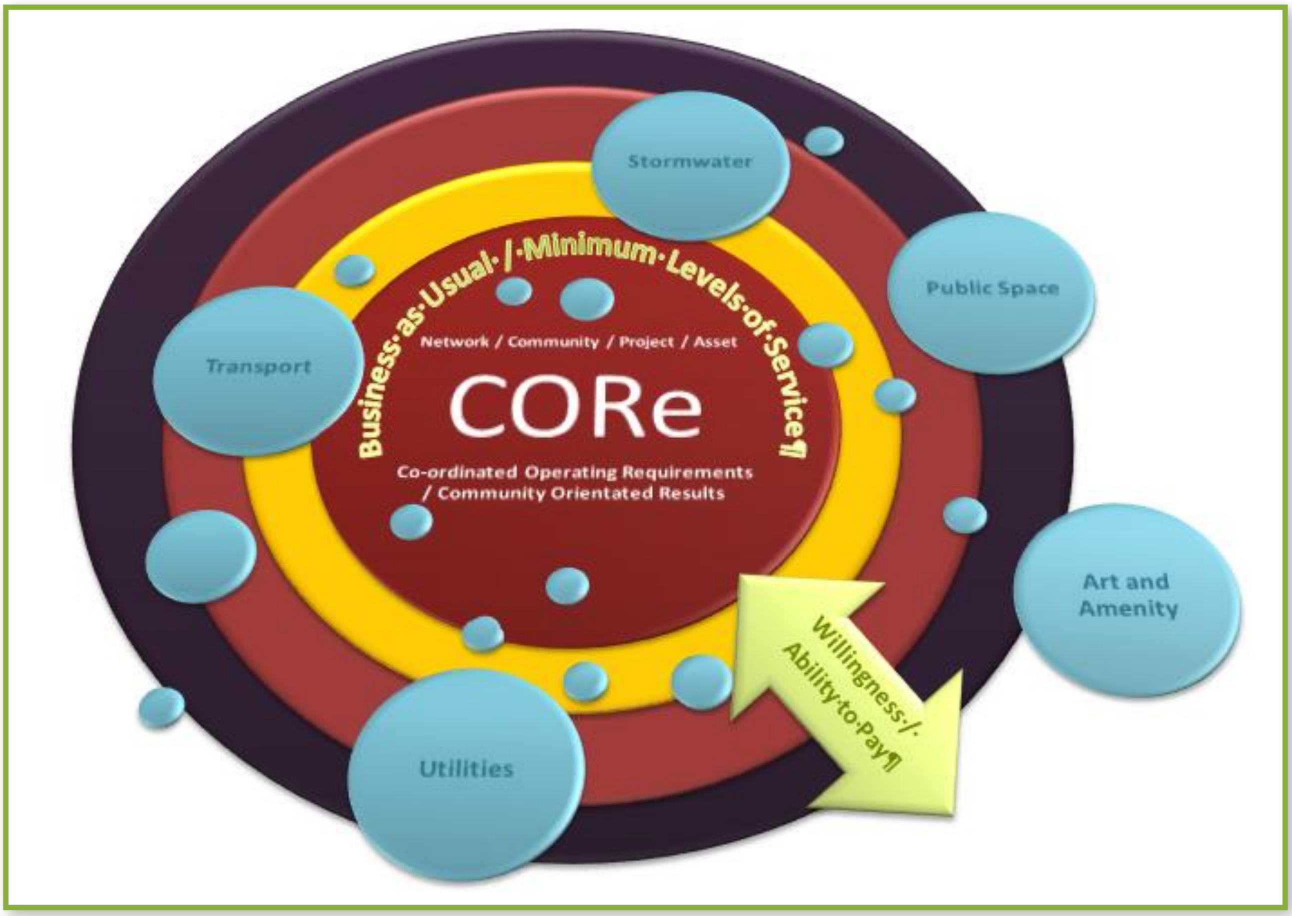
The plan enables some of the stormwater LOS to be achieved, by managing assets in a more effective way so they are operating at their optimum. The future LOS associated with the drainage network is "remove stormwater efficiently from the road surfaces" and the quality level of service, is that "assets are maintained in good condition".

Additionally the plan relates to a future road LOS, which is "improve road user satisfaction to greater than 70% regionally". Within the plan is a focus on Auckland Transport's customer satisfaction and community expectations with the assets it is managing. This represents the idea of community orientated results / co-ordinated operating requirements or the CORe, as shown in Figure 5.4-2.

Table 5.4-1 Sustainability aspects within the Integrated Asset Management Plan

Integrated Asset Management Plan			
Social	Economic	Environmental	Cultural
✓	✓	✓	✓
The plan includes KPIs for maintenance specifications that include community interaction, disruption and retention of amenity. Included within the plan is an asset management framework for the CORe, which is summarised in Figure 5.4-2	It is expected that a combined approach to infrastructure management, where asset management requirements are integrated across departments will lead to operational efficiencies and an associated reduction in operating costs. Monitoring is proposed to enable this aspect to be further assessed	Low impact design (LID) features were not achieving the environmental outcomes originally intended during their operational life. Given that these assets typically have a design life of 20 to 50 years this is a significant risk. The asset management and operational specifications now include environmental outcomes, which were not in the original specifications	Cultural aspects have been incorporated into the plan as specifications. Even though these aspects are limited they would not have been included in a conventional maintenance approach

Figure 5.4-2 CORe Asset Management Framework
Source: Anguillid



Sediment Traps

Auckland Transport has continued the work that Auckland City Council began, which was addressing the water quality of stormwater run-off from the road network.

A series of catchpit pollutant trap devices, called TetraTraps, were installed across the central Auckland area; particularly at sites situated near beaches used for recreational activities. The low maintenance cost filter was inserted into street catchpits over the outlet pipe (as shown in figure 5.4-3) to trap gross pollutants, such as sediment and litter that is washed from the carriageway. These pollutants are captured whilst the TetraTrap remains hydraulically effective.

Testing has shown that the TetraTrap can significantly increase the capture of gross pollutants which reduces pollution and enhances Auckland's stormwater assets.[21]

When combined with an effective road sweeping and catchpit cleaning programme water quality has been found to improve significantly.[22]

[21] New Zealand Local Government, August 2011.
[22] New Zealand Local Government, August 2011.

Figure 5.4-3 TetraTrap
Source: Auckland City Council

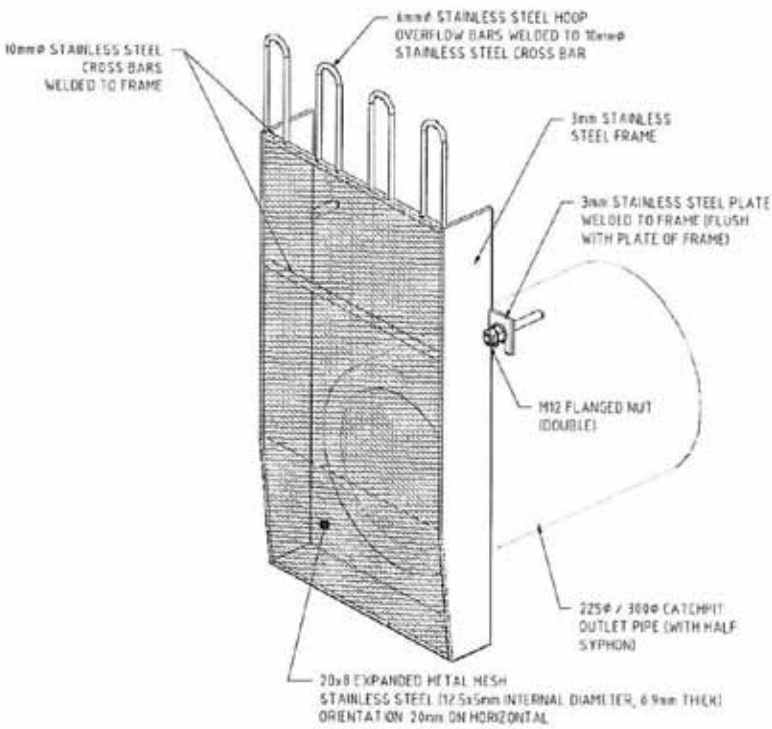


Table 5.4-2 Sustainability aspects of the sediment traps

Sediment Traps			
Social	**Economic**	**Environmental**	**Cultural**
✓	✓	✓	✓
The catchpit traps facilitate communities enjoying the use of local beaches, streams, rivers and/ or estuaries	Whilst there is a cost associated with installing the trap the cost of maintenance is relatively low and the trap can capture litter that could become a maintenance issue within the stormwater system. Also there is a cost associated with degrading the environment that is more difficult to assess	The catchpit trap captures sediment and litter and thus improves the water quality of the streams, waterways and the sea	By improving the water quality, the mauri (lifeforce) of the water is acknowledged. Also Auckland Transport is practising guardianship (kaitiakitanga) over the drainage network, shellfish and the water it uses

There are substantial sustainability benefits associated with this initiative as shown in Table 5.4-2.

This project addresses one of the key issues of the drainage network – “improving stormwater quality and the potential need for treatment of stormwater before discharge to natural watercourses”.

The Transport Network Activity Management Plan also highlights a key LOS for the drainage network, which is “minimise network water pollution through compliance with regulatory standards”. This project has exceeded this LOS through the installation of catchpit pollutant traps voluntarily (i.e. gone beyond regulatory standards) to improve stormwater quality.

The TetraTrap also helps to address a key issue with drainage, that being “greater public awareness and higher stakeholder expectations for sustainability of stormwater quality particularly road run-off and environmental impacts”.

Energy efficient lighting systems

Prior to amalgamation, Waitakere City Council installed light fittings and 20-watt light emitting diodes (LEDs) along seven kilometres of the Project Twin Stream Walk and Cycleways network with the aim of pursuing energy efficiency.[23] Figures 5.4-4 and 5.4-5 show sections of the walk and cycleways with energy efficient lighting.

The LEDs use approximately half the electricity when compared with standard lighting products and are expected to provide more than 100,000 hours of operation. So far energy use, maintenance, spill light and sky glow have all reduced significantly.[24]

Lighting design was also considered within this project as the walk and cycleways is situated within residential areas. District Plan rules regarding spill light were adhered to, whilst also providing adequate levels of lighting. An optimal solution was reached where reducing the spacing between poles to no greater than 35 metres increased the lighting levels considerably, but with minimal additional cost.

Figure 5.4-4 Energy efficient lighting along the Project Twin Streams walk and cycleways
Source: IES Lighting Design Awards Application

This project addresses the future LOS to “reduce power costs through innovative energy efficient technologies” by incorporating energy efficient lighting into the design and as a result decreasing lighting costs.

The Road Network Asset Management Plan identifies several key issues which are addressed by this project:

- “Considerable electricity usage and costs from streetlights...
- Street lighting quality is a key issue for customers and a relatively high proportion of call centre requests for service are received for street lighting. Implement cost-effective ways to improve the level of service and efficiency of street lighting...
- Additional street lighting to walkways.”

Table 5.4-3 Sustainability aspects of energy efficient lighting systems

Energy efficiency lighting systems			
Social	**Economic**	**Environmental**	**Cultural**
✓	✓	✓	
The project has reduced maintenance, so it is assumed that interruptions to the community using the walkway and cycleway will reduce. Also the spill light and sky glow have reduced, so nearby residents will not be so affected by light pollution as a result of this project	The whole-of-life costs of this project were considered at the outset. As a result the project delivered a reduction in energy and maintenance costs and a high level of resistance to vandalism, over the life of the assets	Reducing the demand for electricity (and hence CO_2 emissions) and pressure on the electricity network has been achieved through the use of energy efficient lighting technology	

Figure 5.4-5 Energy efficient lighting along the Project Twin Streams walk and cycleways
Source: IES Lighting Design Awards Application

There are substantial sustainability benefits associated with this initiative as shown in Table 5.4-3.

The project also addresses an aspect of the general decision-making strategy for renewals identified in Section 4.9.1 of the Road Network Asset Management Plan which is to "reduce energy cost of the street lighting network".

Another key improvement initiative is to "adopt best appropriate practices going forward" and this relates to promoting innovations in street lighting technology that reduce energy costs and improve the reliability of the asset.

[23] IES Lighting Design Awards Application, 2010.
[24] IES Lighting Design Awards Application, 2010.
[25] Interlocking blocks as a sealed surface are discussed in Section 4.2.13.3 of the Road Network Asset Management Plan. However, it could be termed as a semi-sealed surface.

Permeable paving on Birkdale Road

Roads inherently generate an environmental issue in that they are an impermeable surface; so when it rains, water washing over the road puts pressure on the stormwater system and degrades water quality.

To address these issues, a permeable paving project was trialled on a section of Birkdale Road for North Shore City Council, a legacy council. The permeable pavement consists of interlocking concrete blocks, arranged with a gap between pavers designed to adsorb stormwater and reduce contaminants that flow to our waterways, streams and harbours.[25]

The permeable pavement was intentionally trialled on a section of Birkdale Road that is on a bus route, experiences regular local through traffic and is located at the entrance to a school – so it is subject to high pavement stress due to traffic turning movements. Figures 5.4-6 and 5.4-7 shows the area of permeable pavement (foreground) and asphalt (background) that was used as a control.

Figure 5.4-6 Close up of permeable pavement
Source: Internet

Table 5.4-4 Sustainability features of permeable paving

Permeable paving			
Social	**Economic**	**Environmental**	**Cultural**
✓	✓	✓	✓
A reduction in water quantity can help to protect communities from flooding over the long term. Also improvements in water quality preserve the communities' use of streams, rivers and harbours	Under conventional cost benefit analysis the permeable paving project is more expensive than a standard asphalt surface. However, the benefits of permeable paving are not incorporated into the costing analysis. These benefits are financial "savings due to less pressure on stormwater reticulation systems [and] reduced environmental impacts, including hydrologic and water quality (pollution) impacts etc."[27] A shift in cost benefit analysis may be required before permeable paving's true cost (and benefits) are identified	The trial was effective at improving the water quality of the run-off and reducing the quantity of the run-off. Water quantity and quality are two key stormwater issues that affect the environment, so this project addressed both of these	By improving the water quality of the stormwater run-off we are maintaining the mauri (lifeforce) of the water for Maori and other cultures. Furthermore the water in our harbours is less likely to become contaminated, which would affect the ability of local iwi to harvest healthy seafood

Figure 5.4-7 Permeable pavement section on Birkdale Road
Source: Yung et al, 2008

The sustainability features of this project are shown in Table 5.4-4.

This project was independently trialled under challenging conditions for a two-year period over which the effectiveness of the surface was monitored. Stormwater run-off at peak flow decreased by an average of 75 per cent during most storms and the volume of total run-off was reduced by about 40 per cent in comparison to run-off from the asphalt on the same section of road.[26]

[26] Yung, C.Y.S, Kodippily, S, Henning, T.F.P, and Fassman, E. 2008. The Sustainability of permeable Road Pavement – The North Shore Experience. Blueprints for Sustainable Infrastructure Conference, Auckland.
[27] Yung, C.Y.S, Kodippily, S, Henning, T.F.P, and Fassman, E. 2008. The Sustainability of permeable Road Pavement – The North Shore Experience. Blueprints for Sustainable Infrastructure Conference, Auckland.

The permeable pavement was also effective at removing pollutants from the run-off. Total suspended solids, copper and zinc were all efficiently removed from the run-off.[27]

The application of permeable paving to part of the road network to address stormwater issues recognises the interconnectedness of the transport network. As a result, this project achieved two of the future LOS within the drainage network section of the Transport Activity Management Plan:

- "Remove stormwater efficiently from the road surfaces
- Minimise network water pollution through compliance with regulatory standards"

In the Transport Network Activity Management Plan there are two key issues that the project partially, if not fully, addresses:

- "Risk to road base from flooding due to inadequate road drainage
- Improving stormwater quality and the potential need for treatment of stormwater before discharging to natural watercourses".

The pavement performed well under challenging conditions and it is expected to exceed its design life. A project of this type contributes to achieving the LOS associated with a sustainable network which is:

- "Deliver a properly connected arterial road and State Highway network without compromising the environment for future generations."

Figure 5.4-8 An example of a permeable paving product
Source: www.projecttwinstreams.com

Green Road Project

On a section of Church Street (between Avenue Road and High Street) in Otahuhu, Auckland City Council and Fulton Hogan collaborated to reconstruct a road using recycled materials. The lower portion (the sub-base) of the road pavement was formed using recycled crushed concrete (RCC), which was sourced from buildings demolished within Auckland. The upper portion of the pavement was constructed using a combination of millings from existing pavements.

The sustainability features of this project are shown in Table 5.4-5.

This was then strengthened. Finally, the pavement was sealed with asphalt that contained recycled asphalt pavement (RAP). The construction materials were tested and then the road was constructed and completed in June 2008.

The project aimed to recycle RCC and the millings from existing pavements by incorporating them into the rehabilitation of the pavement. As a result, this process of creating a 'green' road reduces the need for new bitumen and aggregates.

Figure 5.4-9 Recycled asphalt pavement
Source: www.sustainableli.org

Table 5.4-5 Sustainability features of a green road project

Green road project			
Social	**Economic**	**Environmental**	**Cultural**
✓	✓	✓	✓
Reduces pressure on the need for landfill space and impacts on adjacent communities	Given the general rising cost of construction materials, these recycled materials offer a cost effective alternative for future projects	RCC and millings from existing pavements were being recycled, which means they were diverted from landfill. As a consequence the need for new materials (aggregate and bitumen) was reduced	Reduces the need for additional landfill and impacts on the land and adjacent communities

Auckland City Council identified that up to 15 per cent RAP could be included in roading projects. Prior to amalgamation contractors had only been using between 5 per cent and 10 per cent due to a lack of suitable RAP. Incorporating recycled materials into projects helps to generate more of a market and therefore helps to expand the supply of RAP.

With the use of recycled materials, this project anticipates the high risk associated with the development of roading assets that is identified in the Road Network Asset Management Plan as “availability and cost of road materials and quality aggregate – economic viability and sustainability of the region”. Bitumen and ready mix concrete are significant inputs into the construction of our roads for which prices are expected to rise.

Not only does this project address a risk, it also responds to the asset performance measures used when reporting to Auckland Transport’s key stakeholder, Auckland Council. In particular, the Road Network Asset Management Plan identifies Auckland Transport and Contractor Performance. This is measured by:

> *“volume of recycled material used, percentage of recycled material used in pavement reconstructions and new pavements, a proportion of the total volume of material used for those works in the year.”*

In responding to an asset performance measure it also represents a technological change, which is envisaged to help manage the demand on the transport network. Reuse and recycling of road materials is identified as a technological change and the likely future impact will be a double positive where waste and the cost of completing the work are both reduced.

Facilities management framework

Auckland Transport is currently developing a facilities management framework for the rail stations, ferry terminals, Northern Busway stations as well as some parking facilities.

The sustainability features of this project are shown in Table 5.4-6.

The framework aims to develop and identify information that is relevant to each facility and retain this information within a central repository. This includes high level documents around governance roles, KPIs and LOS, through to the as built drawings, specifications and emergency management strategies for each facility.

The project will produce an integrated framework for each facility, enabling any maintenance and renewals projects to be performed based on the relevant as built drawings and specifications and consequently maintaining the integrity of the asset over the long term.

An approach of this nature supports some of the operational, maintenance and renewals strategies across the rail, Northern Busway, parking and ferry terminals, which are highlighted in the Public Transport Network Asset Management Plan and the Road Network Asset Management Plan.

A LOS that relates to the quality key service value for wharves and buses is “provide public transport facilities in a maintained condition”.

Figure 5.4-10 Passengers at Onehunga Station
Source: www.bettertransport.org.nz

Table 5.4-6 Sustainability features of the facilities management framework

Facilities management framework			
Social	**Economic**	**Environmental**	**Cultural**
✓	✓	✓	
Community expectations can be included within the Framework. Also the aim is to maintain the asset to the level it was built	More efficient for operational and facilities managers keeping all information in central place for easy access and quick response to maintenance issues	Asset is maintained to original level – better maintained so less likely to need as frequent renewals	

The framework also anticipates a future rail network LOS within the Transport Network Activity Management Plan:

> *"Enhance performance measurement and asset management to achieve enhanced outcomes and increased value for money"*

It relates to the asset management governance risk area where the mitigation measure is "continuous improvement initiatives identified to ensure changing demands and evolving practices are met." The framework will enable effective and efficient operation of the facilities to ensure that the needs of the users are met over the long term.

Manukau Integrated Transport Hub

Manukau Station is now completed and further work to create an integrated transport hub is continuing with the project being fully complete in 2013. Figure 5.4-11 shows how the interior of the transport hub may look.

The project represents a joint development between Auckland Transport and Manukau Institute of Technology; originally developed by Manukau City Council and the Auckland Regional Transport Authority (ARTA). The station was constructed in line with a whole-of-life approach, so the design incorporated materials with a significant design life, as well as materials that function well in an operations and maintenance context.

The majority of the station is constructed using concrete, and steel, as can be seen in Figure 5.4-12. The approach to the building's construction provided environmental benefits as less earthworks were required around the structure compared to an open cut construction. To develop the main structure and tension piles an aggregate mix was combined with fly ash (residue from the combustion of coal). This diverted a by-product from the waste stream. The aggregate mix also enabled the main structure and tension piles to have an extended 100-year design life.

Figure 5.4-11 Artist's impression of the interior of the Manukau Integrated Transport Hub
Source: Auckland Transport

Figure 5.4-12 Concrete surfaces at Manukau Rail Station (under construction)
Source: sustainableconcrete.org.nz

A series of precast concrete panels were used in the station and the panel surfaces were designed to produce a reflective shine. These exposed panels produce 'visual noise' and have been specially coated. Both of these features deter tagging and will simplify the removal of graffiti in the future. In addition the surface is non-abrasive to skin and clothing, so it is an effective material to use given that it is a space expected to be used by approximately 600,000 passengers every year.[28]

The Public Transport Network Asset Management Plan highlights the purpose of some of the operational activities, which includes maintaining the station in a neat and tidy condition through the removal of graffiti.

Within the Transport Network Activity Management Plan a future LOS is "enhance performance measurement and asset management to achieve enhanced outcomes and increased value for money". The construction of Manukau rail station worked towards achieving value for

[28] Auckland Transport, Annual Report, 2011.

money over the lifetime of the asset by reducing the maintenance budget required to maintain it. This enabled Auckland Transport to meet the LOS whilst minimising whole-of-life costs with effective planning in terms of renewal programmes. From an operational viewpoint it responds to the idea that the asset risk (in this case graffiti) is incorporated into the build of the asset and therefore managed from the outset.

5.5 Performance

5.5.1 Stocktake

Auckland Transport is a new organisation so it is working on projects it has inherited from the legacy councils as well as developing new initiatives. The SOI lists a number of major transport initiatives planned for the next three years, such as AMETI and the electrification of Auckland's rail network. An opportunity exists for Auckland Transport to review these projects against its sustainability initiatives before they are completed and transferred to the operational teams.

The Asset Management team will undertake a stocktake of legacy and currently planned projects to make sure these are also foreshadowed in its systems. It will also begin to look at its zones of influence and work with the other parts of Auckland Transport on shared future projects and assets.

5.5.2 Key result areas and key performance indicators

'Sustainable networks' is one of the key result areas for which key performance indicators (KPIs) have been developed. The KPIs and measures identified below are specific to Asset Management and reflect different assets, including stormwater, street lighting and roads. Each KPI relates to several (often all four) of the four well-beings of sustainability, so they represent a broad approach.

Some of the measures reflect the sustainability projects discussed in section 5.4. Just as these projects pushed the boundaries and required innovation, the measures below are intended to be aspirational and provide for growth or development over time, to influence future decisions and progress the organisation forward; therefore they are quite different from monitoring, which tends to be quite passive in terms of influencing decisions. The measures are aimed to be indicators of part of Auckland Transport's performance rather than complete measures of its work on projects.

Asset Management's sustainability KPIs and measures are:

KPI 1 Resource efficiency of Auckland Transport's existing and new infrastructure

- Measure 1 – Resource efficiency factor
- Measure 2 – Increase in street lighting energy efficiency improvements
- Measure 3 – Maximise the economic value of recycled materials
- Measure 4 – Provide assets and services at least whole-of-life cost

KPI 2 Resilience to climate change and civil defence events

- Measure 5 – Resilience to climate change and civil defence events
- Measure 6 – Manage the network is to minimise carbon emissions
- Measure 7 – Minimise carbon footprints

KPI 3 Contribution of the network to Auckland's biodiversity

- Measure 8 – Proportion of network with stormwater treatment and quality of treatment
- Measure 9 – Proportion of network that positively contributes to biodiversity
- Measure 10 – Minimise network air, water pollution / pollution control

KPI 4 Consistency of Asset Management's own sustainability behaviour

- Measure 11 – Improvement in Asset Management's own sustainability performance

Overall KPI – Asset Management's project sustainability performance

- Measure 12 – Sustainability of Asset Management's projects

It is intended that these KPIs and measures will drive behaviour within Asset Management and other parts of the organisation, as in order to achieve them Auckland Transport will need to work across the entire organisation. Additional information about the KPIs and measures are included in the report, Development of Sustainability KPIs.

5.5.3 Performance measures and feedback

An overarching sustainability strategy needs to be developed, along with a sustainability scorecard that looks not only at incremental improvement and the KPIs, but the effectiveness of these in directing change and outcomes in the sustainability area. The scorecard should also provide valuable feedback for asset managers, the rest of Auckland Transport, external organisations and the community. Feedback from the scorecard can be used to influence future asset management projects and facilitate the development of future sustainability KPIs and measures.

6 Value Management

6 VALUE MANAGEMENT

Contents

6 Value Management

6.1 Introduction

6.1.1 Overview

Planning for defined Levels of Service (LOS) and cost effective asset management are key features of Auckland Transport's asset management practices. Through this approach, asset management can achieve high quality outcomes for stakeholders and for the communities that use and interact with the transport assets.

Value management as a concept is very well aligned with asset management. It offers Auckland Transport an established process and mechanism to deliver value for money (VFM) and LOS, which are some of the key tenets of asset management.

6.1.2 Purpose

The purpose of this value management section is to:

- Define what is meant by value management in the context of Auckland Transport, and more particularly asset management
- Recognise the New Zealand Standards for value management and how Auckland Transport can go beyond these
- Discuss the application of value management at the different stages of asset management
- Identify Auckland Transport's current value management practices, future opportunities and how these respond to gaps within current value management practices
- Highlight how value management could be used to generate further improvements to asset management practices.

6.2 Value management

6.2.1 Definition

Value management offers a decision-making approach that is couched within the concept of value for money and achieving the relevant LOS or levels of quality. Standards New Zealand defines value management as a "structured and analytical process which seeks to achieve value for money by providing all the necessary functions at the lowest total cost consistent with required levels of quality and performance".

For Auckland Transport, value management can have a broader meaning that is beyond cost alone. Because of statutory drivers there is also a need to balance fiscal requirements against broad sustainability principles and community expectations. Value management involves considering these multiple factors. This is discussed further in section 6.2.3 in terms of value for money.

6.2.2 Value management and Auckland Transport

From a high level perspective, amalgamating the legacy councils and forming Auckland Council, as well as Auckland Transport, has provided for efficiency gains. Amalgamation offers a more co-ordinated approach to delivering an effective and efficient transport system across the Auckland region that should be of value to the Auckland transport users. The process of amalgamation represents a very high level application of value management to organisational structures.

As a CCO, Auckland Transport has the remit from Auckland Council to implement new transport projects as well as maintain and renew existing transport assets. Strategic directives and objectives need to align with the decisions that Auckland Transport makes at the operational level as well as at the funding level. The incorporation of value management into Auckland Transport's processes ensures that the best use of resources can be achieved, recognising opportunities for improvement and developing innovative projects and concepts.

The Infrastructure division of Auckland Transport contains a central management committee. The value added committee (dVAC and pVAC) was set up to ensure that, among other matters, value concepts are considered at every possible step of the decision-making processes.

Auckland Transport, as controlling authority of a large transport network, is also bound by the requirements of the Land Transport Management Act. This Act heavily emphasises value management concepts as a means to ensure VFM for all transport activities.

6.2.3 Value management and asset management

More specifically, value management is a central principle of the asset management discipline. Both approaches seek to achieve assets that meet an agreed standard or LOS, while realising VFM.[1]

[1] Infrastructure asset management is defined in the Auckland Transport Asset Management Framework as "the application of management, financial, economic and engineering principles to infrastructure assets in order to provide an agreed level of service in the most cost-effective manner.

[2] New Zealand Standards, Australian/New Zealand Standard for Value Management AS/NZS 4183:1994, 1994.

Elsewhere within this document asset management highlights the current and future LOS for the various transport assets under its stewardship. Value management is also considered within the context of VFM. For all involved, it is necessary to understand what VFM means, as the principle may be interpreted differently by Auckland Transport's various stakeholders – between those that fund the projects and the communities that interact with the transport assets. Some of the following concepts may contribute to what is considered to be VFM for a stakeholder such as NZTA:

- First time right policy
- Collaboration or partnership
- Risk identification
- Clear identification of objectives
- Environmental / product stewardship
- Alignment of delivery with objectives and outcomes
- Quality
- Whole-of-life approach.

In contrast, the communities that use the assets may take an alternative view of VFM. A broader view of VFM that also considers the communities' perspectives is relevant and could consider:

- Performance versus expectation
- Perception
- Values and cultural association
- Association or contribution to a place or experience.

Ideally, asset management maximises delivery in accord with the organisational objectives, vision, and community aspirations. To this end, as part of the improvement plan discussed in section 6.5.3, there may be a need to review the concept of VFM (as identified in asset management) in relation to the perspectives listed above.

Unfortunately, assets may bear traits that make maximising VFM inherently difficult for asset managers. This occurs because of factors such as:

- A poor understanding of operations or maintenance needs
- Lack of consideration of whole-of-life matters.

Lack of processes to ensure adequate communication of maintenance needs or specifications to the asset manager.

Auckland Transport is addressing these potential risks during the asset development stage and in its handover and maintenance cycles. For example, project handover information and effective and complete owner's manuals will ensure asset managers are well positioned to ensure delivery.

6.3 New Zealand standards

New Zealand Standard 4183:1994 Value Management (NZS 4183:1994) provides a useful guide and platform from which organisations can develop a constructive and collaborative value-management process that achieves value for money while delivering the necessary functions. The standard highlights the flexibility of value management as an approach, which enables it to be applied to any stage in the lifecycle of a project, asset or system. Typically the greatest potential benefit from value management is harnessed at the beginning of a project.

The Standards identify that value management can usually be applied to the following stages, each of particular relevance to asset management:

- Construction – design proposals, material selection, construction programmes and methods, and facility maintenance
- Systems, services and processes – design proposals, implementation, monitoring and maintenance procedures, and strategic planning
- Management decision making – policy formulation, maintenance management and programming development
- Value management incentive clauses.

Asset Management may only be accountable for some aspects of these but it is vital that it extends its influence into other parts of Auckland Transport in order to manage value during the maintenance and renewal cycle.

Regarding the final application of value management, contractors and asset management interface frequently and there is potential to involve contractors in the value management process through the use of value management incentive clauses within contracts. These clauses offer contractors a financial incentive to make changes to the contract specifications, scope of work, or methodology that would generate shared savings between the contractor and asset management.

This application of value management as included in NZS 4183:1994 can foster a culture where contractors strive for economical approaches while providing assets that meet their function and LOS.

According to NZS 4183:1994, there are three elements that are essential to creating the best possible outcome. These are: the core methodology, commitment of participants, and management of the process.[2]

The core methodology provides asset management with an approach that can be applied to any of the stages identified above. Adherence to the following phases is recommended:

- Information – collect all relevant information including specifications, details of any constraints, relevant policy decisions and costs
- Analysis – list significant functions and determine costs of functions
- Creativity – list numerous alternative ideas or options for performing existing or proposed functions
- Judgement – apply analytical judgement to the ideas or options to identify alternatives that provide VFM and meet LOS
- Development – consider problems of implementing the alternatives and how they can be overcome.

Obviously this process requires commitment from the participants, which means Asset Management needs to operate a culture of co-operative behaviour, free exchange of ideas, and openness to change. Furthermore management needs to be committed to the process and its implementation, which will ensure that Auckland Transport can provide the resources in terms of time and staff availability.

Auckland Transport has a requirement to consult, and NZS 4183:1994 also identifies the need for communities to be involved in the consultation process. Given that there is a spectrum of public participation it is crucial to clarify with the community the extent to which they can influence the value management processes of asset management. Auckland Transport's consultation framework provides guidance on the appropriate approach for including communities in the value management process.

6.4 Application of value management

Asset management considers how assets are managed at the strategy and planning level through to the tactical and operational levels so as to achieve the best value for money for the established LOS at every level. Applying value management to the strategy and planning level, in particular, offers an opportunity for asset management to evaluate non-asset solutions (i.e. strategies and plans). To achieve VFM, sometimes the strategy, plan or general approach under which an asset is managed needs to change, rather than forcing change on the asset itself.

An example of this is the incorporation of travel demand management (TDM) as a non-asset solution that enables existing assets to achieve greater VFM and efficiencies.

Through TDM the need to increase the capacity of roads is reduced and thereby limited funding can be diverted to maintenance and renewals and perhaps to capital projects where the existing capacity is truly limited.

6.5 Auckland Transport value management practice

6.5.1 Current value management approaches

A number of initiatives are in place to ensure value management.

Integrated asset management

Asset Management has initiated the development of high level strategic and planning documents in cases where some assets were not achieving VFM and non-asset solutions needed to be considered.

The award winning Albany Lakes Precinct (ALP) Integrated Asset Management Strategy challenged the application of a conventional maintenance approach, given that the assets being maintained were complex. The conventional maintenance approach was not meeting the design expectations over the lifetime of the assets.

The assets were not realising their full value and the application of value management helped to attain this value. An alternative framework capable of accommodating the intricacies at play was developed with the aim of maintaining environmental integrity, community aspirations and design intent over the long term and to capture operational and asset management efficiencies. This approach is now in the process of being embedded and rolled out through asset management's policies and processes. Figure 6.5-1 shows one of the non-standard assets within the ALP.

Facilities management

The development of a Facilities Management Framework has become a necessity because appropriate information about maintaining public transport and parking facilities has not been readily available.[3] Lacking this information compromises Auckland Transport's ability to maintain assets to their original specification and attain the various LOS and VFM over the life of the assets. The intended facilities management Framework has the potential to offer an effective means for collaboration between Asset Management, Property, Public Transport Operations and Parking. Such collaboration will allow priorities and needs across Auckland Transport's departments to be properly considered; with the result of a positive impact on achieving the defined LOS and VFM.

[3] Project handover notes for new capital works have also been developed by Asset Management. These notes will support the Facilities Management Framework by enabling the asset managers to easily access information about the assets and include this within their existing systems.

Figure 6.5-1 Low impact design feature – grass swale at the ALP
Source: Anguillid Consulting Engineers and Scientists Ltd

Optimised decision-making framework

Auckland Transport continues to use the legacy Councils' Optimised Decision Making (ODM) frameworks that follow the New Zealand Asset Management Support (NAMS) ODM Guidelines. These frameworks are being used for decision-making about the operations and maintenance, renewal and development of new assets. Generally the frameworks are based on identifying:

- The asset strategy or project that will minimise long term costs and maximise outcomes for the organisation and its customers
- Optimal decisions using benefit-cost analysis and multi-criteria analysis
- Social, economic, cultural and environmental benefits for each project or strategy.

In essence, these frameworks represent the application of value management at the programme development and programme delivery stages as a process is undertaken to identify different options, trade-offs and financial outcomes.

The following frameworks are used by asset management:

- Specialised modelling
- Refined ODM renewal
- Project prioritisation.

Since these frameworks have been inherited from a number of legacy councils, going forward Auckland Transport needs to rationalise and add value to them, which could mean aligning them with the organisations KPAs and Asset Managements KPIs. This will be discussed further in section 6.5.3, where improvements are considered.

6.5.2 Future value management opportunities

There are a number of future opportunities that Asset Management can consider which support value management and VFM. The opportunities suggested below begin to address the gaps that exist within Auckland Transport's current value management approach.

Figure 6.5-2 Inside Britomart Transport Centre
Source: flickr.com

There are some initial processes that need to be completed as a precursor to developing future value management opportunities. One such process is to ensure that asset registers are complete and that they reflect conventional assets as well as multi-functional assets. Such multi-functional assets include facilities such as rail stations and ferry terminals, which themselves contain many assets: including public spaces, retail facilities and a transport service. An example of such a facility is Britomart, shown in Figure 6.5-2.

The current ODM frameworks are from some of the legacy councils and therefore are not specific to Auckland Transport. There is an opportunity to develop new frameworks or adjust existing frameworks to better reflect Auckland Transport's status as a CCO assigned with the task of delivering Auckland's transport network. The development of the refined ODM framework has already been identified as a high priority item within section 10.5, key improvement programmes, of this document.

During the review of the current ODM frameworks, Asset Management can draw on Auckland Council's initiatives that align with value management. Projects already under way include:

- Project Genesis – identifies significant early opportunities to generate efficiency gains as a result of the transition
- Project management framework – enables council projects to maximise customer value form investment
- Prioritisation framework – considers compliance, strategic fit, risks, benefits and opportunities to leverage for projects that exceed $1m
- Peer review programme – a Finance department programme that includes an independent review of the robustness of major proposals.

Future value management approaches used by asset management will increasingly need to provide for climate change and civil defence events within the analysis of different solutions. Into the future, if particular assets are to provide VFM over the long term then the transport network assets will need to be resilient. This may involve foresighting what a resilient asset will be.

Application of zones of influence across Auckland Transport is another value management principle that can be applied across departments and projects and generate opportunities for improvement. Zones of influence recognise that departments do not operate in isolation and neither does the transport system.

How assets are developed at the design stage will affect Asset Management and then also affect the communities that use the assets. Often Asset Management is at the interface trying to reconcile community expectations around the constraints of the inherited assets. Enabling Asset Management to operate within the zones of influence provides a platform for invaluable feedback about maintenance and renewals at the design stage and can lead to the development of innovative ideas and optimal solutions.

Where asset managers use the zones of influence to impact the design and capital works process, the outcome can be a better integrated management and VFM of the asset. For example, currently architectural preferences and the lack of a common specification frequently results in a high degree of variability in lighting and fittings across the region, which impacts the stock of spare parts and response times. If asset managers are involved in the specification of street lighting for new projects, they could specify fittings and bulbs to meet the required standards, but also offer VFM in terms of maintenance and renewals in the future, and perhaps energy efficiency.

6.5.3 Improvement plan

A number of improvement tasks, as indicated in section 6.5.2 above, are included in the future asset management improvement programme.

The details of these are given in Section 10, Improvement Plan and Monitoring of this document.

7 Financial Summary

Contents

Auckland Transport
An Auckland Council Organisation

7 Financial Summary

7.1 Introduction

The long-term works programmes and financial needs in this Asset Management Plan are based on the lifecycle needs of the assets in order for them to meet the required levels of service. The key programmes are detailed in the LCMPs (refer to Section 4). These programmes will be sufficient to deliver the current agreed levels of service for transport activity.

7.2 Summary of financial information

7.2.1 Financial needs summary

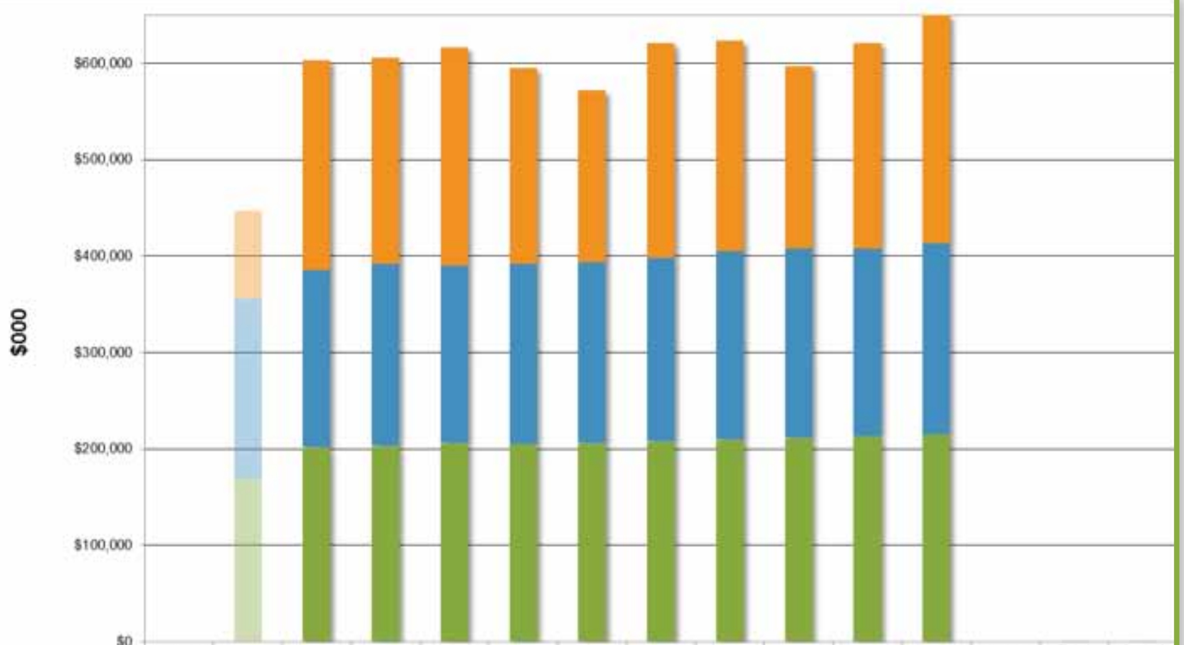
The long-term financial needs are given in this section.

All values in this AMP allow for expected growth in demand but do not allow for escalation or market price fluctuations over time.

Future financial needs (un-inflated) over the next 10 years for the road network are as follows:

Average annual road network financial needs	$610 million per year
• OPEX operations and maintenance (O&M)	$208 million per year
• CAPEX renewals	$191 million per year
• CAPEX new works	$212 million per year
Total 10-year financial needs 2012/13 to 2021/22	$6.1 billion

Figure 7.2-1 Financial needs by expenditure type
Source: LTP budget model 12 April 2012 after refresh for AMP



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	Total network (km)	Annual average $/km
CAPEX New Works	35%	91,836	217,172	213,638	226,764	203,103	178,172	222,620	218,507	189,453	213,412	236,696	2,119,538	7,227	$29,328
Renewals	31%	185,684	184,674	188,770	184,047	186,291	187,846	190,244	195,514	196,607	194,387	198,111	1,906,490	7,227	$26,380
Operations & Maintenance	34%	169,362	201,175	203,051	205,698	205,524	205,681	207,754	209,219	211,001	213,326	214,875	2,077,304	7,227	$28,744
TOTAL	100%	446,882	603,021	605,459	616,509	594,918	571,699	620,618	623,240	597,061	621,125	649,682	6,103,332	7,227	$84,452

A regional summary of total road network financial needs ($000s) over the next 10 years by expenditure type, percentage comparison and annual average spend per kilometre is shown in Figure 7.2-1. Notes on financial needs in Figure 7.2-1:

1. The annual growth factor is generally:
    - +0.85 per cent for roads
    - +2.0 per cent for parking
    - To allow for consequential OPEX and consequential renewals from growth in the network and growth in demand for services.
2. The above financial needs include state highway revocation (51km) costs of $2.6 million per year for OPEX and $2.4 million per year for renewals starting 1 July 2012.
3. The above financial needs exclude corporate and IT support overheads.
4. The order of priority or call on funds by Auckland Transport is generally:
    - Operations
    - Maintenance
    - Renewals
    - New works for growth
    - New works for service level improvement.
5. Historically, the transition from the legacy councils to Auckland Transport, the Auckland Council and other council-controlled organisations led to many changes in scope, role and responsibility in the stewardship and management of the region's infrastructure assets and networks. It is therefore not possible to accurately compare historical legacy council financial needs with that of the new organisations going forward. However, the future network needs in this AMP are consistent with the historical expenditure trends of legacy councils.
6. Historical expenditure trends will be shown in future versions of the Transport AMP as information becomes available.

7.2.2 Financial needs detail

A regional comparison of total financial needs (renewals and OPEX $000s) by network area and percentage is shown in Table 7.2-1.

Table 7.2-1 Comparison of total financial needs by network area and percentage
Source: LTP budget model 12 April 2012 after refresh for AMP

Network area ($000s)	% of total O&M	% of total renewals	% of total new works	% of total financial needs	% of sealed road length
General	22%	5%	38%	22%	0%
Central	31%	37%	21%	29%	22%
North	20%	21%	22%	21%	27%
South	18%	22%	11%	17%	39%
West	9%	15%	7%	10%	12%
Totals	100%	100%	100%	100%	100%

Table 7.2-2 Total by expenditure type, network area and year
Source: LTP budget model 12 April 2012 after refresh for AMP

Network area ($000s)	2011 -12	2012 -13	2013 -14	2014 -15	2015 -16	2016 -17	2017 -18	2018 -19	2019 -20	2020 -21	2021 -22	10-year total 2013-22
OPEX												
General	33,128	44,903	45,376	46,589	44,967	43,662	44,260	44,234	44,512	45,319	45,333	449,155
Central	45,570	61,135	61,734	62,357	62,986	63,621	64,264	64,913	65,570	66,233	66,903	639,716
North	39,714	41,514	41,867	42,222	42,582	42,944	43,310	43,679	44,052	44,428	44,808	431,406
South	34,608	36,271	36,575	36,881	37,190	37,502	37,817	38,134	38,454	38,777	39,102	376,702
West	16,343	17,353	17,500	17,649	17,799	17,951	18,104	18,258	18,413	18,570	18,728	180,325
Total O&M	169,362	201,176	203,052	205,698	205,524	205,680	207,755	209,218	211,001	213,327	214,874	2,077,304
RENEWALS												
General	4,671	10,522	13,071	6,789	7,459	7,427	8,225	11,881	11,346	7,485	9,552	93,756
Central	76,575	67,224	67,873	68,529	69,189	69,856	70,528	71,205	71,889	72,578	73,273	702,143
North	38,104	38,943	39,269	39,599	39,931	40,266	40,604	40,945	41,288	41,635	41,984	404,464
South	39,022	40,041	40,378	40,717	41,060	41,405	41,753	42,105	42,459	42,817	43,177	415,912
West	27,312	27,944	28,178	28,414	28,652	28,892	29,134	29,379	29,625	29,873	30,124	290,216
Total renewals	185,684	184,674	188,769	184,048	186,291	187,846	190,244	195,515	196,607	194,388	198,110	1,906,490
NEW WORKS												
General	1,067	79,906	86,204	89,749	87,620	87,359	77,994	76,397	75,540	75,417	75,683	811,868
Central	33,923	57,687	49,283	45,594	34,972	30,579	43,072	60,769	28,032	39,815	58,153	447,956
North	14,884	29,590	42,818	32,947	31,771	19,812	53,938	57,434	62,073	67,990	77,578	475,951
South	21,717	14,191	16,746	25,567	34,953	26,365	30,692	11,493	20,558	26,439	24,333	231,337
West	20,246	35,799	18,588	32,907	13,787	14,058	16,923	12,414	3,250	3,750	950	152,426
Total new works	91,836	217,173	213,639	226,764	203,103	178,173	222,619	218,507	189,453	213,411	236,697	2,119,538
ALL OPEX AND CAPEX	446,882	603,023	605,460	616,510	594,918	571,699	620,618	623,240	597,061	621,126	649,681	6,103,332

Details of expenditure types, network area and year are shown in Table 7.2-2.

7.3 Operations expenditure needs summary

7.3.1 Operations and maintnance costs

Future expenditure needs

Generally, operations and maintenance activities will have the first call on funds in Auckland Transport.

The expenditure needs for operations and maintenance activities are combined to a single operational expenditure (OPEX) category called 'operations and maintenance' (O&M) for the purposes of this AMP.

Operations costs generally include:

- Inspections
- Reporting
- Data collections
- The use of asset management systems such as RAMM and SPM
- Call centre operation and response systems
- Various other expenses such as electricity to keep the network assets operating.

Maintenance costs include physical works such as:

- "Making safe"
- Minor repairs (that are expensed and not capitalised)
- Cleaning.

Expenditure needs forecast

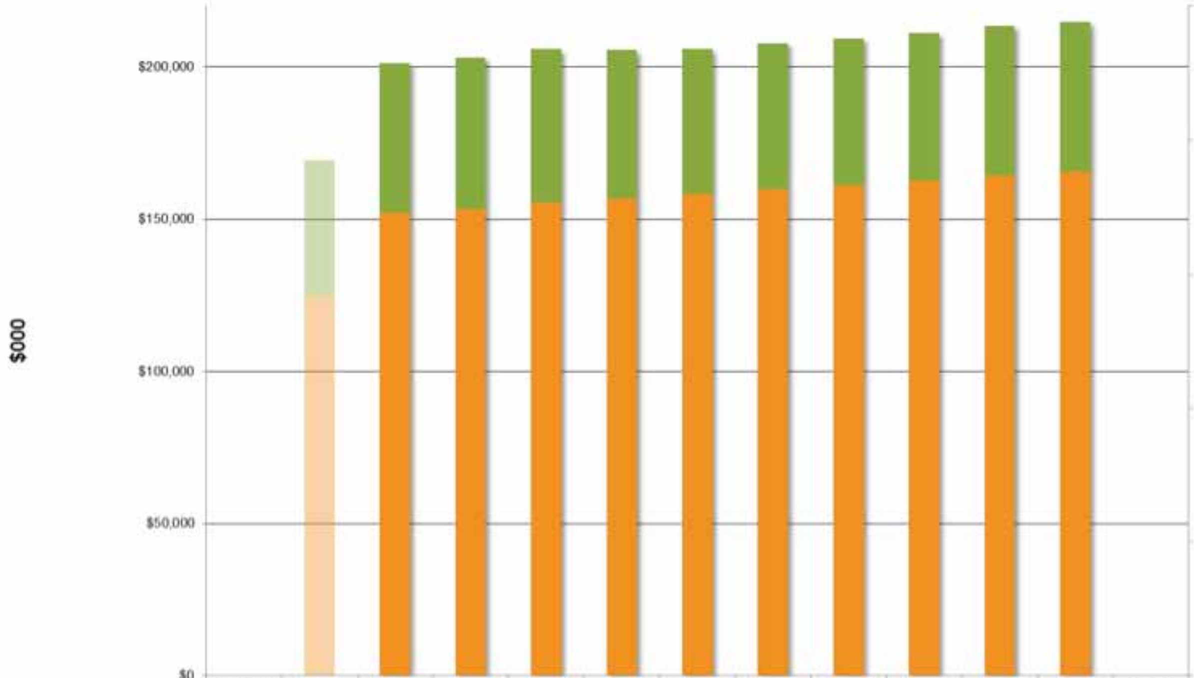
A comparison of proposed O&M expenditure needs by mode type and percentage is given in Figure 7.3-1.

Note that in the expenditure needs given in Figure 7.3-1, OPEX professional costs make up 23 per cent of the total OPEX costs.

A comparison of proposed O&M expenditure needs by activity type is given in Figure 7.3-2.

Figure 7.3-1 Forecast O&M expenditure needs by expenditure type

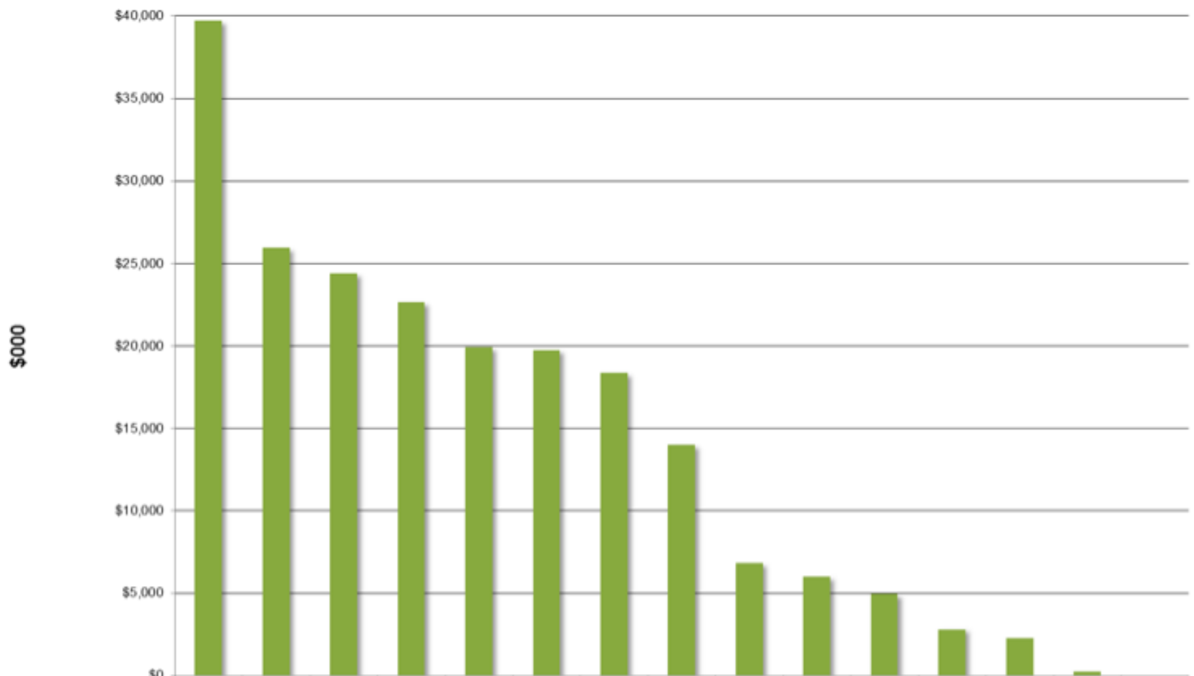
Source: LTP budget model 12 April 2012 after refresh for AMP



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total
O&M (professional)	23%	44,242	49,230	49,726	50,313	48,782	47,463	47,986	48,019	48,294	48,992	49,075	487,881
O&M (operational & physical)	77%	125,120	151,945	153,325	155,385	156,742	158,217	159,768	161,199	162,707	164,335	165,800	1,589,423
Total	100%	169,362	201,175	203,051	205,698	205,524	205,681	207,754	209,219	211,001	213,326	214,875	2,077,304

Figure 7.3-2 O&M expenditure needs by activity type

Source: LTP budget model 12 April 2012 after refresh for AMP



	Carriage way	Parking	Traffic Systems	NM planning	Drainage	Vegetation	Street lighting	Demand mgt safety	Signs	Footpaths	Marking	Bridges & Structures	General other	Cycleways	Total
Per cent (%)	18%	13%	12%	11%	10%	10%	9%	7%	3%	3%	2%	1.4%	1.1%	0.1%	100%
Annual average ($000s)	39,702	25,937	24,406	22,654	19,919	19,749	18,357	13,978	6,802	5,985	4,929	2,787	2,267	259	207,730

7.3.2 Consequential operations costs

Consequential OPEX will be required to cover the increased future maintenance costs associated with capital new works such as new subdivisions, city centre, sub-regional, town centre and other improvement or upgrade projects.

There is substantial physical works capital expenditure in delivering capital new works and improvement programmes and as a result the consequential OPEX is significant.

Consequential OPEX is allowed for in the regional annual growth factors, under increases in operational expenditure needs from growth or demand.

More details of O&M by asset type and 10-year forecast are shown in Section 4, Lifecycle Management Plans.

A comparison of O&M expenditure needs by network area, percentage and annual average spend per kilometre is shown in Figure 7.3-3.

7.4 Capital investment needs summary

7.4.1 Capital investment needs overview

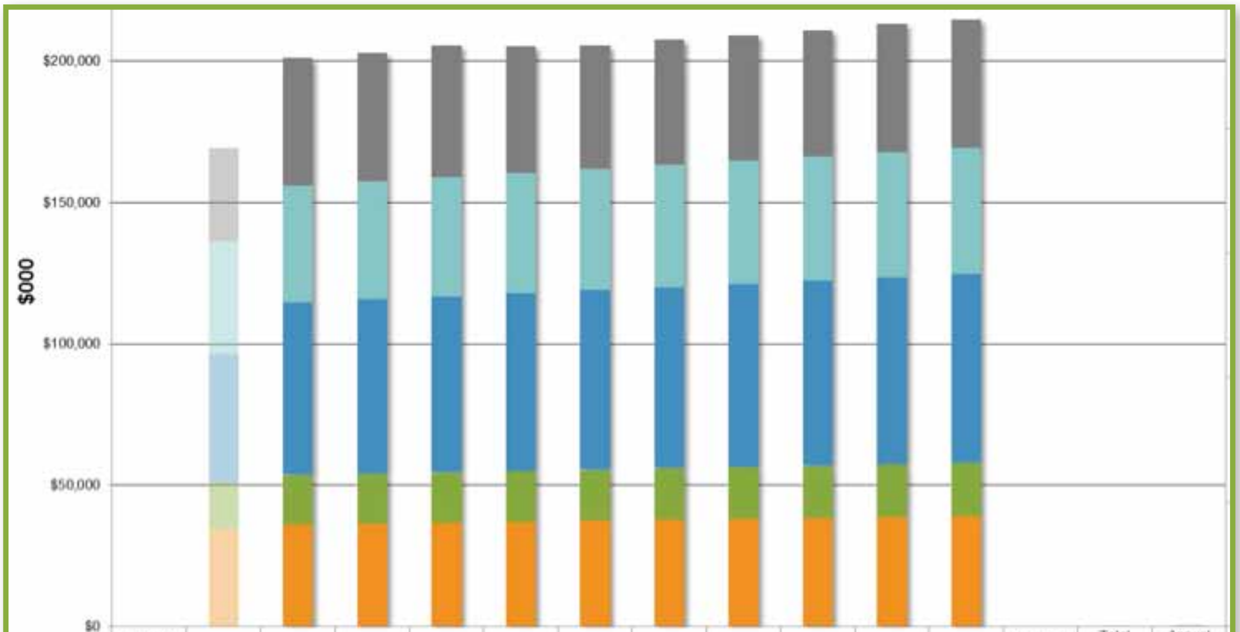
A comparison of proposed capital expenditure (CAPEX) by expenditure type, year and percentage is given in Figure 7.4-1.

7.4.2 Renewals capital investment needs

A comparison of renewals investment needs by activity type and percentage is given in Figure 7.4-2

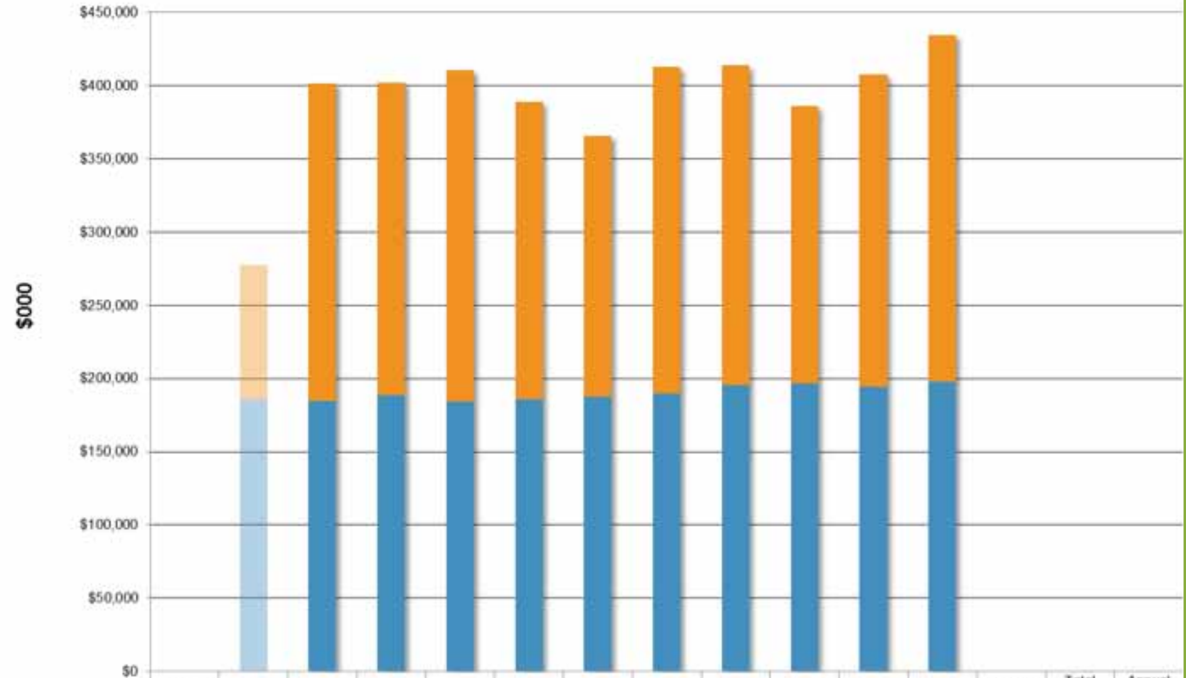
More details of renewals by asset type and a 10-year forecast are shown in the renewals programme later in this section as well as in the lifecycle management plan sections.

Figure 7.3-3 Forecast by O&M expenditure needs by network area
Source: LTP Budget Model 12 April 2012 after Refresh for AMP



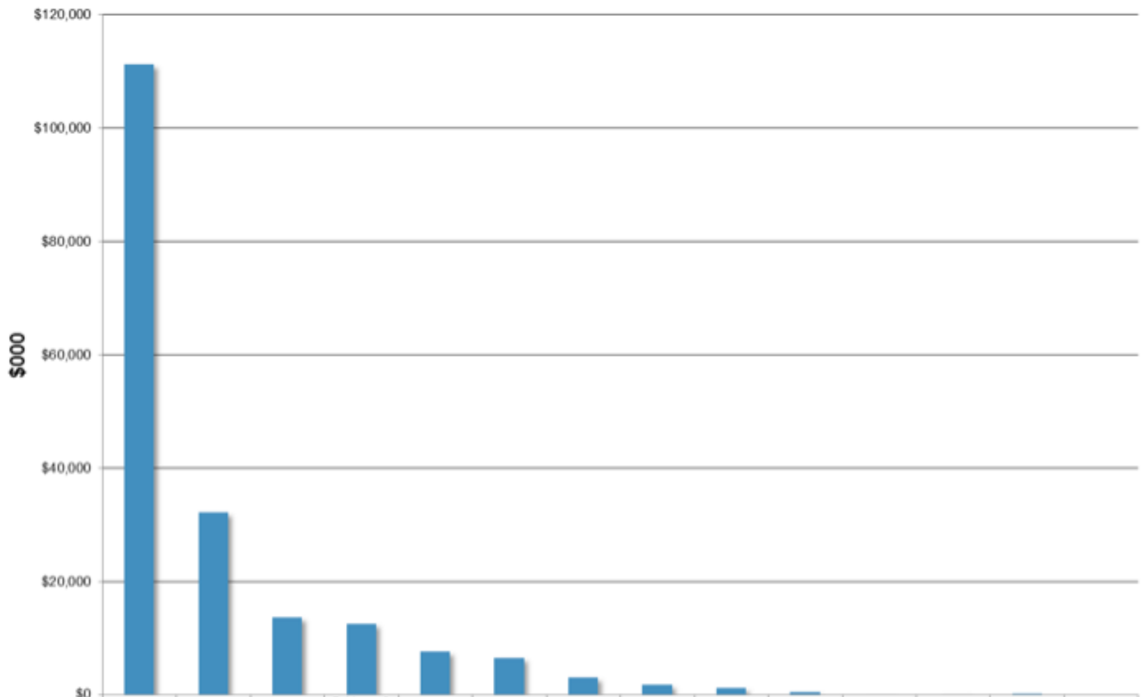
	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	Total network (km)	Annual average $/km
General	22%	33,128	44,903	45,376	46,589	44,967	43,662	44,260	44,234	44,512	45,319	45,333	449,155	7,227	$6,215
North	21%	39,714	41,514	41,867	42,222	42,582	42,944	43,310	43,679	44,052	44,428	44,808	431,406	2,443	$17,660
Central	31%	45,570	61,135	61,734	62,357	62,986	63,621	64,264	64,913	65,570	66,233	66,903	639,716	1,480	$43,219
West	9%	16,343	17,353	17,500	17,649	17,799	17,951	18,104	18,258	18,413	18,570	18,728	180,325	805	$22,404
South	18%	34,608	36,271	36,575	36,881	37,190	37,502	37,817	38,134	38,454	38,777	39,102	376,702	2,499	$15,075
Total	100%	169,362	201,175	203,051	205,698	205,524	205,681	207,754	209,219	211,001	213,326	214,875	2,077,304	7,227	$28,744

Figure 7.4-1 Capital investment needs by expenditure type
Source: LTP budget model 12 April 2012 after refresh for AMP



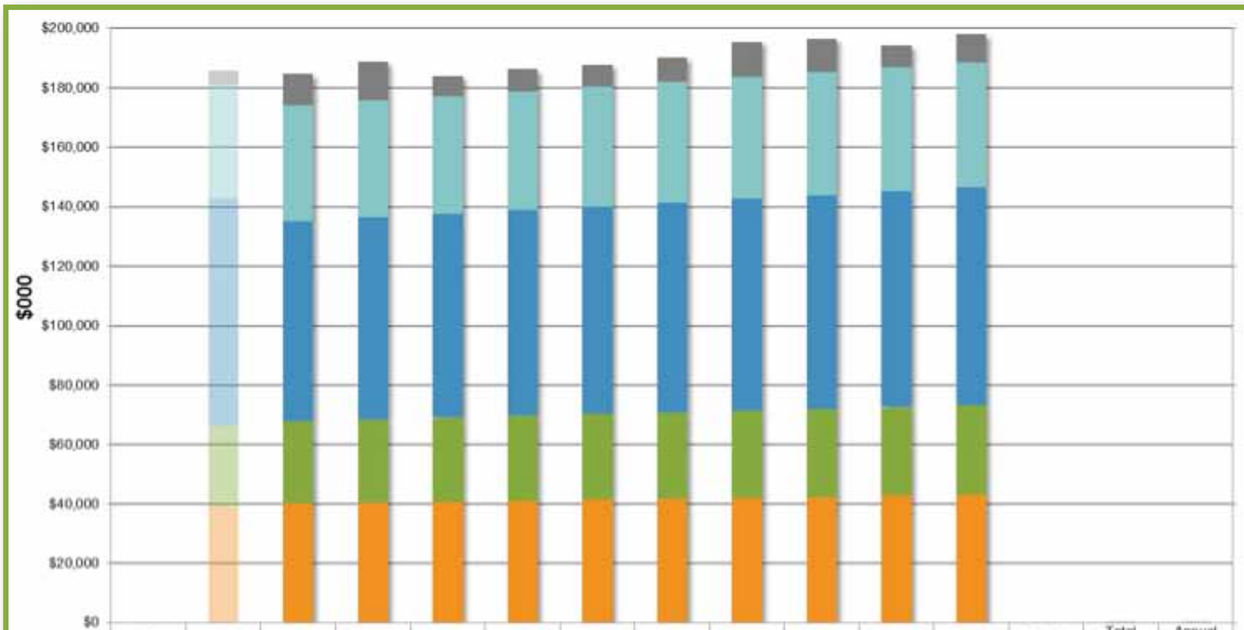
	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	Total network (km)	Annual average $/km
CAPEX New Works	53%	91,836	217,172	213,638	226,764	203,103	178,172	222,620	218,507	189,453	213,412	236,696	2,119,538	7,227	$29,328
Renewals	47%	185,684	184,674	188,770	184,047	186,291	187,846	190,244	195,514	196,607	194,387	198,111	1,906,490	7,227	$26,380
TOTAL	100%	277,520	401,846	402,408	410,811	389,394	366,018	412,864	414,021	386,060	407,799	434,807	4,026,028	7,227	$55,708

Figure 7.4-2 Renewals investment needs by activity type
Source: LTP budget model 12 April 2012 after refresh for AMP



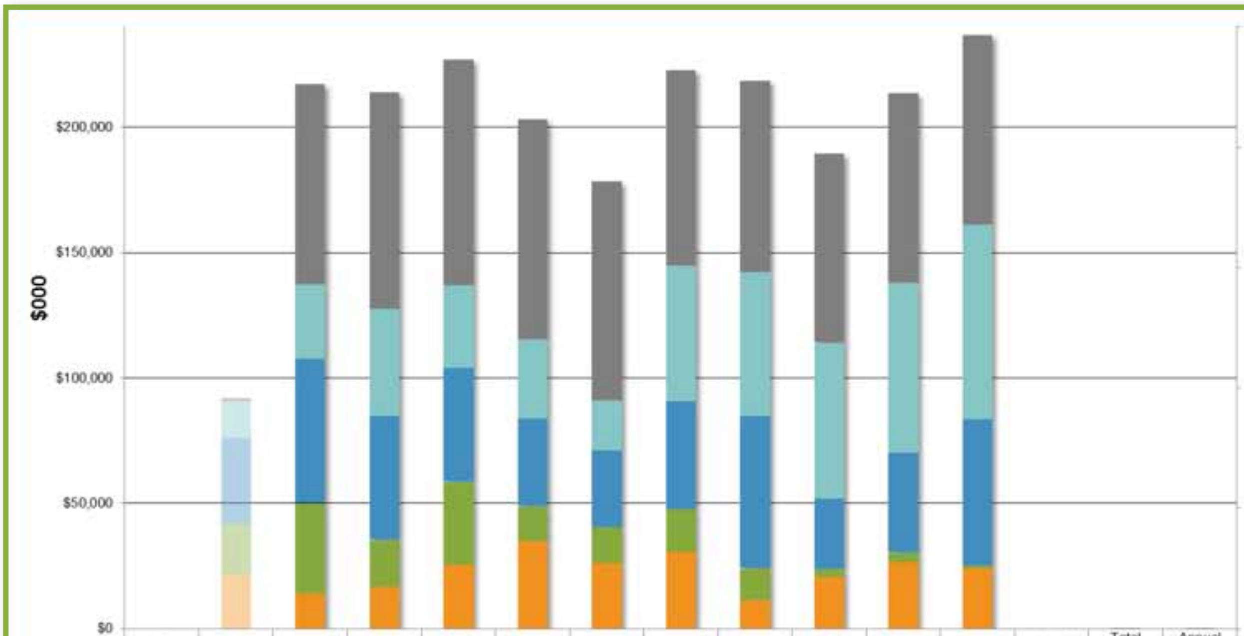
	Carriage way	Footpaths	Drainage	Bridges & Structure s	Street lighting	Traffic Systems	Parking Off-street	Parking On-street	Road Marking	Signs	Street Furniture	Commerc ial Areas	Cycleway s	Total
Per cent (%)	58%	17%	7%	7%	4%	3.5%	1.6%	0.9%	0.6%	0.2%	0.1%	0.1%	0.1%	100%
Annual average ($000s)	111,240	32,200	13,613	12,502	7,591	6,525	3,016	1,745	1,201	468	234	196	119	190,649

Figure 7.4-3 Forecast of renewals investment needs by network area
Source: LTP budget model 12 April 2012 after refresh for AMP



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	Total network (km)	Annual average $/km
General	5%	4,671	10,522	13,071	6,789	7,459	7,427	8,225	11,881	11,346	7,485	9,552	93,756	7,227	$1,297
North	21%	38,104	38,943	39,269	39,599	39,931	40,266	40,604	40,945	41,288	41,635	41,984	404,464	2,443	$16,557
Central	37%	76,575	67,224	67,873	68,529	69,189	69,856	70,528	71,205	71,889	72,578	73,273	702,143	1,480	$47,436
West	15%	27,312	27,944	28,178	28,414	28,652	28,892	29,134	29,379	29,625	29,873	30,124	290,216	805	$36,056
South	22%	39,022	40,041	40,378	40,717	41,060	41,405	41,753	42,105	42,459	42,817	43,177	415,912	2,499	$16,644
Total	100%	185,684	184,674	188,770	184,047	186,291	187,846	190,244	195,514	196,607	194,387	198,111	1,906,490	7,227	$26,381

Figure 7.4-4 Forecast for new works investment needs by network area
Source: LTP budget model 12 April 2012 after refresh for AMP



	% of Total Forecast	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2013-22 Total	Total network (km)	Annual average $/km
General	38%	1,067	79,906	86,204	89,749	87,620	87,359	77,994	76,397	75,540	75,417	75,683	811,868	7,227	$11,234
North	22%	14,884	29,590	42,818	32,947	31,771	19,812	53,938	57,434	62,073	67,990	77,578	475,951	2,443	$19,483
Central	21%	33,923	57,687	49,283	45,594	34,972	30,579	43,072	60,769	28,032	39,815	58,153	447,956	1,480	$30,263
West	7%	20,246	35,799	18,588	32,907	13,787	14,058	16,923	12,414	3,250	3,750	950	152,426	805	$18,937
South	11%	21,717	14,191	16,746	25,567	34,953	26,365	30,692	11,493	20,558	26,439	24,333	231,337	2,499	$9,258
Total	100%	91,836	217,172	213,638	226,764	203,103	178,172	222,620	218,507	189,453	213,412	236,696	2,119,538	7,227	$29,329

Table 7.5-1 Total O&M and renewals eligible for subsidies
Source: NZTA financial assistance guidelines

Expenditure type	Eligible for subsidy – asset types	Not eligible for subsidy – asset types	NZTA financial assistance ratio (%)
O&M	Pavements, signs, markings, signals, structures, drainage, cycleways, street lighting, vegetation and sweeping associated with drainage channels	Footpaths, vegetation and sweeping not associated with drainage channels	43%
Renewals	As for O&M	As for O&M	43%
New works			53%
Planning	Directly associated with planning and managing the road network, including demand management, travel planning and community programmes	Not directly associated with planning and managing the road network	53%

A comparison of renewals investment needs by network area, percentage and annual average spend per kilometre is shown in Figure 7.4-3.

A listing of the capital renewals works projects that make up the programme is included in section 7.10, renewals programme.

7.4.3 New works capital investment needs

New works budget allocations are combined for growth and levels of service improvements.

A comparison of new works investment needs by network area, percentage and annual average spend per kilometre is shown in Figure 7.4-4.

A listing of the capital renewals works projects that make up the programme is included in section 7.10, renewals programme.

7.5 Funding strategy and financial sustainability

7.5.1 Funding

The Local Government Act 2002 provides a range of funding sources (s103) that the Auckland Council can provide to Auckland Transport.

Funding sources include:

- General rates – provided through the council
- User charges – such as farebox recovery and leases
- Subsidies – from central government provided through NZTA
- Development contributions – for new works related to growth and development
- Loans.

Funding sources and allocations are targeted specifically to the type of expenditure. Expenditure types are defined and reported as follows:

- Operations and maintenance:

  Expensed (not capitalised) work that continues the provision of services provided by assets
- Renewals:

  Capitalised works to replace existing deteriorated assets or components of assets to restore their remaining life and service potential
- Service level improvement:

  Capitalised works that add new or enlarged existing assets to improve service levels or performance or to increase asset base life
- Growth:

  Capitalised works that add new or enlarged existing assets to increase the capacity to cater for further growth in demand.

NZTA subsidies and development contributions are further discussed below.

7.5.2 NZTA subsidies

Much of the roads programme is eligible for subsidy through the Government's financial assistance scheme, administered by NZTA. However, typically not all of the activities that are eligible for subsidy will be accepted by NZTA because capping limits are usually applied based on available funds.

The guideline for eligibility for NZTA subsidy is shown in Table 7.5-1.

7.5.3 Development contributions for capital new works

The council can use development contributions to fund part of its growth-related capital investment needs. Development contributions can be used for new works to add new or enlarged existing assets to cater for growth and to mitigate other effects that may result from development projects.

Development contributions are not intended to be used for operations, maintenance, renewals or new works required for service level improvement.

7.6 Asset valuation

An approximate summary of the value of road network assets in the Auckland region as at 30 June 2011 is given in Table 7.6-1.

Note: The quantity of the assets given in Table 7.6-1 will not necessarily match the quantity currently held in the RAMM system.

Table 7.6-1 Summary of asset valuations as at 30 June 2011
Source: Asset revaluations by ANA Group

Asset category	Asset type	Unit	Quantity	Replacement cost ($000s)	Depreciated replacement cost ($000s)	Annual depreciation ($000s)
ROADS	Pavement formation	m^2	70,237,634	1,743,203	1,743,203	
	Pavement surface	m^2	53,889,917	680,203	334,839	57,738
	Pavement base	m^2	53,886,845	2,900,961	2,005,999	42,692
BRIDGES AND STRUCTURES	Road bridges	m^2	157,113	537,191	280,502	6,632
	Retaining walls	m^2	243,848	177,599	130,406	2,191
	Sea walls	m	14,572	61,710	32,754	872
	Railings and fences	m	207,907	34,193	17,960	1,520
	Edge marker post	each	6,301	188	51	10
	Other structures	each	58	13,080	8,037	280
CYCLEWAYS	Cycleway surface	m^2	158,309	25,737	18,346	728
	Cycleway base	m^2	158,309	7,946	6,998	99
FOOTPATHS	Footpath	m^2	11,508,295	666,254	386,198	16,179
	Crossing	each				
DRAINAGE	Surface water channel	m	11,137,299	1,023,762	658,684	17,574
	Subsoil drain	m	4,265,462	250,458	176,106	3,690
	Catchpits	each	81,738	228,786	124,169	2,980
	Catchpit leads	m	653,904	210,546	110,643	2,694
	Soakholes	each	2,299	58,625	23,731	659
	Treatment devices	each	8	954	835	16
	Manholes	each	2,907	18,681	16,913	233
	Minor culverts <2100mm	m	283,301	127,121	105,664	1,761
STREET LIGHTING	Poles	each	57,546	103,194	57,730	4,076
	Brackets	each	94,106	24,469	11,473	1,254
	Lanterns	each	109,839	37,385	17,410	1,982
TRAFFIC CONTROLS	Traffic controlled signals	each	665	56,494	33,820	4,165
	SCATS equipment	each	72	1,591	834	204
	SCATS ducting	m	8,400	764	81	21
	Pukekohe ducting	each	1	464	362	9
	SCATS cabling	m	9,450	219	23	6
	CCTV	each	1	1,263	285	89
	Traffic islands	m^2	177,393	19,729	8,252	457
	Signs	each	125,124	21,600	10,869	1,724
	Advertising signs		584	7,753	5,655	368
	Marking (thermoplastic)	m	174,207	1,305	641	153
PARKING	Pay and display	each	889	9,233	4,811	871
	Off-street carparking	m^2	631,714	32,665	20,126	798

Table 7.6-1 Continued...

Asset category	Asset type	Unit	Quantity	Replacement cost ($000s)	Depreciated replacement cost ($000s)	Annual depreciation ($000s)
	Lighting	each	548	299	210	9
	Variable message signs and equipment	each	11	173	95	15
STREET FURNITURE	Rubbish bins	each	1,420	1,191	604	52
STREET FURNITURE	Benches (seats)	each	1,909	3,318	1,384	122
PUBLIC TRANSPORT – BUS NETWORK	Bus shelters	each	1,532	22,476	13,204	562
PUBLIC TRANSPORT – BUS NETWORK	Bus stations	each	5	18,270	17,158	261
PUBLIC TRANSPORT – FERRY	Wharves – structures	each	17	73,708	42,954	1,620
TOTAL	Total Auckland Transport valuation			9,204,763	6,430,019	177,368
	Total previous valuation			8,517,792	5,298,529	172,718
	Variation			686,971	1,131,490	4,650
	% Variation			8.1%	21.4%	2.7%

7.7 Financial assumptions

The financial assumptions upon which the un-inflated financial needs are based include the following:

1. Financial needs are stated in dollar values un-inflated from the 2011/12 baseline. The effect of inflation and cost escalation has not been built into the financial model.
2. Financial forecasts exclude corporate and IT support overheads.
3. Maintenance and operational costs are based on historical expenditure and an expectation of continuation of current levels of service and have been adjusted to meet efficiency and mayoral proposal targets.
4. Operations, maintenance and renewal costs allow for the impact of consequential OPEX and consequential renewals from growth changes in the road network and demand for services.
5. The AMP financial needs include state highway revocation (51km) costs of $2.6 million per year for OPEX and $2.4 million per year for renewals starting 1 July 2012, which are not included in the proposed LTP.
6. Unit rates have been assumed from the current maintenance contracts.
7. The above financial needs are for the road network and include parking and community transport, but do not include the public transport networks for bus, rail and ferry. Refer to a separate public transport AMP for these details.
8. All financial needs, revenue and funding figures in this AMP are sourced from Auckland Transport's SAP financial management system, which is also used for the transport financial information in the LTP.
9. It is assumed that the capacity exists in the contracting industry and in the Auckland Transport management of consents, land purchase, legalisation, design, procument and contract administration to implement the capital new works and renewals projects and programmes that are forecasted.
10. The degree of accuracy and completeness of the asset data information is as assessed in the various LCMPs.

7.8 Reliability of financial forecasts

Considering the assumptions made in deriving the future financial needs of the network and the historical levels of expenditure for various activities, the reliability of the financial forecast to deliver the current level of service is considered to be 'high'. This can be further stated as follows:

- Operations high
- Maintenance high
- Renewals high
- New works high

7.9 Recommendations for improving financial management

1. Define capitalisation rules (e.g. minimum dollar value and/or frequency less than one year). This will define the difference between O&M expenditures and capital expenditures for renewals and new works. This in turn will define which assets are valued and depreciated and how they are coded in the asset register and asset management system.
2. Consider capitalising AMPs and strategic documents.
3. Confirm the definition and difference between capital expenditures for renewals versus that for new works. This will assist in calculating development contributions (DCs), if applicable, related to growth and also levels of service improvement costs.
4. Define CAPEX new works either for growth (development contributions may apply. See Section 3, Growth and Demand) or LOS (see Section 2, Levels of Service). Note – many projects will be a mix of new work for growth, new work for LOS, and renewals.
5. Consider costs and projects for consequential OPEX and renewals on CAPEX new works.
6. Consider the implications on the financials and forecasts of all the other issues listed in the LCMPs and issues register.
7. Provide 20-year horizons for AMP forward works programmes and financials. Significant assets such as road surfacing have useful lives of between 10 and 20 years.
8. Operational budgets for retaining walls and bridges need to be separated at general ledger level.
9. All budgets for corridor structures, gardens, street furniture and many other minor assets that are embedded in other budgets need to be separated and reported.

7.10 Renewals programme

Table 7.10-1 shows the indicative 10-year renewals programme (in dollars) for road network projects. These are capital renewals works required because of ageing and deterioration of assets.

Table 7.10-1 10-year road network renewals programme ($s)

Source: Auckland Transport SAP system (April 2012)

LCMP / Activity name	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	TOTAL
Pavement rehabilitation	52,073,150	52,600,771	53,132,878	53,669,507	54,210,698	54,756,489	55,306,919	55,862,028	56,421,855	56,986,441	545,020,738
Pavement renewals for SH revocation	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	2,400,000	24,000,000
Resurfacing total	52,291,751	52,736,231	53,184,489	53,636,557	54,092,467	54,552,253	55,015,948	55,483,583	55,955,194	56,430,813	543,379,284
Chip seals	13,261,703	13,374,428	13,488,111	13,602,760	13,718,383	13,834,989	13,952,587	14,071,184	14,190,789	14,311,410	137,806,343
Thin asphalt	22,564,563	22,756,362	22,949,791	23,144,864	23,341,595	23,539,999	23,740,089	23,941,880	24,145,386	24,350,621	234,475,148
General sealed	15,236,722	15,366,234	15,496,847	15,628,570	15,761,413	15,895,385	16,030,496	16,166,755	16,304,172	16,442,758	158,329,353
Unsealed road metalling	1,228,762	1,239,207	1,249,740	1,260,363	1,271,076	1,281,880	1,292,776	1,303,765	1,314,847	1,326,023	12,768,440
Footpaths	30,987,188	31,250,579	31,516,209	31,784,097	32,054,262	32,326,723	32,601,500	32,878,613	33,158,081	33,439,925	321,997,178
Drainage kerbs, channels and catchpits	13,100,855	13,212,212	13,324,516	13,437,774	13,551,995	13,667,187	13,783,358	13,900,517	14,018,671	14,137,830	136,134,916
Bridges, culverts and structures	12,031,285	12,133,551	12,236,686	12,340,698	12,445,594	12,551,382	12,658,068	12,765,662	12,874,170	12,983,601	125,020,698
Bridge renewals	2,640,798	2,663,244	2,685,882	2,708,712	2,731,736	2,754,956	2,778,373	2,801,989	2,825,806	2,849,825	27,441,322
Other structural	4,937,987	4,979,960	5,022,290	5,064,979	5,108,031	5,151,450	5,195,237	5,239,397	5,283,931	5,328,845	51,312,107
Retaining walls	4,452,500	4,490,347	4,528,515	4,567,007	4,605,827	4,644,976	4,684,458	4,724,276	4,764,433	4,804,930	46,267,269
Street lighting renewals	6,974,411	7,033,694	7,093,480	7,153,775	7,214,582	7,275,906	7,337,751	7,400,122	7,463,023	7,526,458	72,473,200
Street lighting OHUG	330,668	333,479	336,314	339,172	342,055	344,963	347,895	350,852	353,834	356,842	3,436,075
Road traffic systems and operations	6,274,641	6,328,895	6,383,629	6,438,847	6,494,554	6,550,753	6,607,450	6,664,650	6,722,356	6,780,574	65,246,349
Signals	5,065,306	5,108,361	5,151,782	5,195,573	5,239,735	5,284,273	5,329,189	5,374,487	5,420,170	5,466,242	52,635,118
CCTV	1,209,334	1,220,534	1,231,847	1,243,275	1,254,819	1,266,481	1,278,261	1,290,163	1,302,186	1,314,332	12,611,231
Parking	6,076,228	8,588,561	2,269,135	2,901,787	2,832,578	3,592,507	7,210,578	6,636,731	2,737,156	4,765,669	47,610,930
Off-street	2,076,228	4,638,561	2,219,135	2,901,787	2,782,578	2,192,507	3,210,578	2,686,731	2,687,156	4,765,669	30,160,930
On-street	4,000,000	3,950,000	50,000	0	50,000	1,400,000	4,000,000	3,950,000	50,000	0	17,450,000
Road marking	1,155,478	1,165,299	1,175,204	1,185,194	1,195,268	1,205,428	1,215,674	1,226,007	1,236,428	1,246,938	12,006,917
Road signs	450,580	454,410	458,272	462,168	466,096	470,058	474,054	478,083	482,147	486,245	4,682,113
Street furniture	225,091	227,004	228,934	230,880	232,842	234,822	236,818	238,831	240,861	242,908	2,338,990
Commercial areas	188,358	189,959	191,573	193,202	194,844	196,500	198,170	199,855	201,553	203,267	1,957,280
Cycleways	114,111	115,081	116,059	117,045	118,040	119,044	120,055	121,076	122,105	123,143	1,185,759
TOTAL RENEWALS WORKS ($)	184,673,794	188,769,726	184,047,378	186,290,703	187,845,876	190,244,014	195,514,239	196,606,608	194,387,435	198,110,653	1,906,490,426

7.11 Capital improvement programme

Table 7.11-1 shows the indicative 10-year capital improvement programme for road network projects (in dollars). These are capital new works required for growth and/or service level improvement.

Table 7.11-1 10-year road network capital improvement programme

Source: Auckland Transport SAP system (April 2012)

Capital improvement project name	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	TOTAL
AMETI projects	26,622,730	24,172,288	16,539,504	18,320,754	18,827,004	21,477,004	17,627,004	15,852,004	24,735,338	41,972,838	226,146,463
AMETI land – Roading 75%	15,095,772	15,706,038	11,602,004	11,602,004	11,602,004	11,602,004	11,602,004	11,602,004	11,602,004	22,139,504	134,155,338
AMETI – Panmure Corridor Package 1 – Roading 25%	11,526,958	8,466,250	4,937,500	6,718,750	7,225,000	9,875,000	6,025,000	4,250,000	8,766,667	3,916,667	71,707,791
AMETI – package 6 Mt Wellington area	0	0	0	0	0	0	0	0	4,366,667	15,916,667	20,283,334
Regional road reconstruction	20,000,000	20,000,000	20,000,000	20,000,000	20,000,000	20,000,000	20,000,000	20,000,000	20,000,000	20,000,000	200,000,000
Safety and minor improvement	13,479,621	13,479,621	13,479,621	13,479,621	13,479,621	13,479,621	13,479,621	13,479,621	13,479,621	13,479,621	134,796,210
Westgate / Hobsonville projects	25,213,118	11,552,763	20,657,407	5,786,659	13,637,611	13,774,234	10,118,947	0	0	0	100,740,739
Plan Change 15 - Massey North and Westgate – Road 85%	19,321,858	7,989,214	6,878,766	656,115	4,930,000	5,774,234	4,618,947	0	0	0	50,169,134
Plan Change 14 – Hobsonville Town Centre and Industrial Precinct	3,522,260	2,513,549	13,778,641	5,130,544	8,707,611	8,000,000	5,500,000	0	0	0	47,152,605
Plan Change 13 Area – Hobsonville Airbase	2,369,000	1,050,000	0	0	0	0	0	0	0	0	3,419,000
Cycleway development and construction (Regional cycling and walking programme)	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	10,000,000	100,000,000
Local Board initiatives – road 80%	8,400,000	8,400,000	8,400,000	8,400,000	8,400,000	8,400,000	8,400,000	8,400,000	8,400,000	8,400,000	84,000,000
Albany Highway Upgrade projects	12,100,000	30,400,000	15,400,000	14,800,000	4,650,000	0	0	0	0	0	77,350,000
Albany Highway North Upgrade (Schnapper Rock to SH17)	10,600,000	30,150,000	15,150,000	9,550,000	0	0	0	0	0	0	65,450,000
Albany Highway North Upgrade (Sunset to SH18)	1,500,000	250,000	250,000	5,250,000	4,650,000	0	0	0	0	0	11,900,000
Mill Road corridor upgrade	4,000,000	7,000,000	11,000,000	8,000,000	1,000,000	1,000,000	1,000,000	13,000,000	15,000,000	15,000,000	76,000,000
Safety around schools projects	8,624,008	9,624,008	10,124,008	10,124,008	10,124,008	4,000,000	4,000,000	4,000,000	4,000,000	4,000,000	68,620,040
Safety around schools	8,124,008	8,124,008	8,124,008	8,124,008	8,124,008	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	50,620,040
Safety around schools (Mayor investment proposal)	500,000	1,500,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	18,000,000
Takapuna Lake Road upgrade (Hauraki to Bayswater)	288,000	264,000	2,261,000	2,800,000	2,500,000	3,500,000	10,200,000	20,500,000	20,500,000	1,200,000	64,013,000
Penlink projects	0	0	0	0	0	0	2,000,000	4,000,000	11,455,015	34,772,222	52,227,237
Penlink Toll Road	0	0	0	0	0	0	2,000,000	4,000,000	4,455,015	28,022,222	38,477,237
Penlink – Redvale Interchange	0	0	0	0	0	0	0	0	2,000,000	6,750,000	8,750,000

Table 7.11-1 Continued...

Capital improvement project name	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	TOTAL
Penlink – East Coast Road realignment	0	0	0	0	0	0	0	0	5,000,000	0	5,000,000
Neilsen Street upgrade - MMEWS (Multi Modal East West Corridor)	750,000	750,000	500,000	3,750,000	2,000,000	8,300,000	24,000,000	0	0	0	40,050,000
Seal extensions and local transport improvements	4,000,000	4,000,000	4,000,000	4,000,000	4,000,000	4,000,000	4,000,000	4,000,000	4,000,000	4,000,000	40,000,000
Long Bay projects	1,848,026	1,625,000	4,974,100	3,563,000	0	5,168,402	9,843,084	6,085,902	2,817,000	3,520,000	39,444,514
Long Bay Glenvar Road upgrade	310,026	0	0	0	0	2,668,402	6,335,084	4,643,902	0	0	13,957,414
Long Bay East Coast Road intersection	694,500	425,000	3,674,100	3,563,000	0	0	0	0	0	0	8,356,600
Long Bay Okura / Vaughans Road upgrade	235,000	0	0	0	0	0	453,000	997,000	2,817,000	3,520,000	8,022,000
Long Bay Glenvar Ridge Road	400,000	1,200,000	1,300,000	0	0	2,500,000	2,500,000	0	0	0	7,900,000
Long Bay Ashley Avenue upgrade	208,500	0	0	0	0	0	555,000	445,000	0	0	1,208,500
Corridor and intersection improvements	1,000,000	2,000,000	3,000,000	4,700,000	4,700,000	4,700,000	4,700,000	4,700,000	4,700,000	4,700,000	38,900,000
Warkworth projects	0	1,320,000	5,210,700	531,300	2,045,000	2,108,000	0	7,200,000	9,500,000	7,500,000	35,415,000
Warkworth Western Collector	0	0	0	0	2,045,000	2,108,000	0	6,700,000	8,000,000	2,000,000	20,853,000
Warkworth SH1 / McKinney / Hill / Hudson	0	1,320,000	5,210,700	531,300	0	0	0	0	0	0	7,062,000
Warkworth Matakana Link (SH1 to Matakana)	0	0	0	0	0	0	0	500,000	1,500,000	5,000,000	7,000,000
Warkworth Mahurangi East Road / Sharp Road	0	0	0	0	0	0	0	0	0	500,000	500,000
Tiverton-Wolverton corridor upgrade	10,000,000	10,000,000	13,179,000	0	0	0	0	0	0	0	33,179,000
Tamaki Drive corridor upgrade	0	0	0	0	2,250,000	3,000,000	2,750,000	5,000,000	7,000,000	13,000,000	33,000,000
Great North Road corridor improvements – Roading70%	350,000	420,000	700,000	3,150,000	3,500,000	7,350,000	7,000,000	3,500,000	3,500,000	0	29,470,000
Te Atatu Road corridor improvements	6,505,000	5,500,000	6,500,000	5,000,000	0	0	0	0	0	0	23,505,000
Crown Lynn regeneration (new public roads)	6,935,700	0	7,250,000	7,250,000	2,000,000	0	0	0	0	0	23,435,700
Porchester Road projects	0	100,000	500,000	2,000,000	300,000	3,530,000	4,200,000	2,138,000	9,209,464	1,232,536	23,210,000
Porchester Road – Popes intersection upgrade	0	0	0	0	0	2,000,000	0	0	4,307,464	1,232,536	7,540,000
Porchester Road – Walters intersection upgrade	0	0	0	0	0	1,530,000	4,200,000	0	0	0	5,730,000
Porchester Road – Airfield intersection upgrade	0	0	0	0	0	0	0	1,048,000	2,542,000	0	3,590,000
Porchester Road – Manuroa intersection upgrade	0	0	0	0	0	0	0	990,000	2,360,000	0	3,350,000
Porchester Road – Manuroa to Stream	0	100,000	500,000	2,000,000	0	0	0	0	0	0	2,600,000
Porchester Road – Stream-Manukau	0	0	0	0	300,000	0	0	100,000	0	0	400,000
Dominion Road corridor upgrade – Roading 25%	625,000	1,625,000	5,000,000	5,000,000	6,000,000	2,750,000	0	0	0	0	21,000,000
Street lighting improvements – region-wide	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	20,000,000
SWAMMCP Detailed design (Mayoral proposal) – Roading 40%	660,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	18,660,000

Table 7.11-1 Continued...

Capital improvement project name	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	TOTAL
Whangaparaoa Road upgrade (to Red Beach)	10,024,206	8,119,910	0	0	0	0	0	0	0	0	18,144,116
Murphys Road upgrade (Murphys Bush Roundabout)	200,000	30,000	1,075,000	4,075,000	6,075,000	6,040,000	0	0	0	0	17,495,000
East Coast Road widening	293,210	0	0	0	0	0	1,273,650	1,083,650	6,958,711	7,028,712	16,637,933
Regional safety programme	3,000,000	3,000,000	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000	127,000	16,627,000
Glenfield Sunnybrae Road upgrade (Northcote to Archers)	0	0	0	0	104,049	235,715	1,600,878	3,922,150	4,378,885	5,783,960	16,025,637
Albany Kyle Road upgrade	0	0	0	0	0	6,637,079	5,000,000	4,000,000	0	0	15,637,079
Great South Road (Manukau Central to Drury) – Roading 50%	0	0	500,000	7,500,000	7,500,000	0	0	0	0	0	15,500,000
Ellerslie / Panmure Highway upgrade – Roading 50%	0	0	410,000	218,339	1,406,661	775,000	2,500,000	3,500,000	3,500,000	3,000,000	15,310,000
Glenfield Road upgrade Stage 4 (James to Sunset)	8,532,000	6,477,000	0	0	0	0	0	0	0	0	15,009,000
Albany McClymonts Road upgrade (Don McKinnon to Medallion)	0	830,000	2,599,777	2,080,971	3,928,576	2,323,203	0	0	0	2,080,971	13,843,498
Murphys Road bridge improvements (Manukau)	780,000	50,000	5,775,000	5,726,000	0	0	0	0	0	0	12,331,000
MCC Chapel Road realignment and new bridge	0	200,000	1,550,000	4,352,000	3,500,000	2,460,000	0	0	0	0	12,062,000
Regional Liveable Streets and local area traffic management implementation	0	0	0	0	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	2,000,000	12,000,000
Albany Gills Link (Gills to Oteha Valley)	0	0	0	0	2,100,000	9,550,000	0	0	0	0	11,650,000
Glenfield Archers Road upgrade (Wairau to Coronation) – Road 80%	0	0	0	0	350,804	296,611	313,904	3,735,381	784,430	6,105,152	11,586,282
Smales / Allens / Harish / Springs Road widening and intersection upgrade	1,578,773	0	2,501,000	6,029,200	0	0	0	0	0	0	10,108,973
Flat Bush Collector Stream crossings	0	0	0	0	600,000	3,600,000	2,100,000	3,600,000	0	0	9,900,000
Albany Colisseum Drive Link (SH17 to Albany)	0	0	0	0	0	2,300,000	4,435,267	1,000,000	1,564,733	0	9,300,000
Brigham Creek Road corridor improvements	250,000	1,000,000	5,000,000	3,000,000	0	0	0	0	0	0	9,250,000
Network Performance (route optimisation)	3,000,000	3,000,000	3,000,000	0	0	0	0	0	0	0	9,000,000
Ormiston / Preston / East Tamaki Road intersection upgrade (Ormiston / Preston / East Tamaki Road intersection realignment)	870,536	5,003,000	2,857,000	0	0	0	0	0	0	0	8,730,536
HPMV routes	0	2,330,000	3,000,000	3,300,000	0	0	0	0	0	0	8,630,000
CCTV New	580,074	580,074	580,074	701,890	772,078	849,286	934,215	1,027,636	1,130,400	1,243,440	8,399,167

Table 7.11-1 Continued...

Capital improvement project name	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	TOTAL
Whitford projects	0	0	0	0	0	699,410	699,410	0	0	6,800,000	8,198,820
MCC Whitford Maraetai Road Arterial	0	0	0	0	0	238,600	238,600	0	0	1,000,000	1,477,200
MCC Whitford Park Road upgrade	0	0	0	0	0	220,000	220,000	0	0	1,000,000	1,440,000
MCC Whitford Maraetai Rd Okaroro – Beachlands	0	0	0	0	0	201,810	201,810	0	0	1,000,000	1,403,620
MCC Whitford Bypass	0	0	0	0	0	0	0	0	0	1,000,000	1,000,000
MCC Whitford Village NOR costs	0	0	0	0	0	0	0	0	0	1,000,000	1,000,000
MCC Whitford / Sommerville intersection	0	0	0	0	0	0	0	0	0	1,000,000	1,000,000
MCC Whitford Road widening	0	0	0	0	0	39,000	39,000	0	0	800,000	878,000
Glenfield Road / Birkenhead Avenue upgrade (Eskdale to Mokoia) – Road 80%	0	0	0	358,688	1,610,708	1,229,243	1,290,705	3,262,726	0	0	7,752,070
Albany Medallion Drive Link (Oteha Valley to Fairview)	0	0	0	0	0	0	0	1,750,000	6,000,000	0	7,750,000
Khyber Pass Road – Roading 50%	0	0	250,000	0	0	1,087,929	6,412,072	0	0	0	7,750,000
Glenfield Wairau Road upgrade	0	0	0	126,546	332,259	843,831	3,418,738	2,750,003	0	0	7,471,377
Tamaki Dr Brdwalk Kelly Tarltons – Millinium – Road 80%	686,400	2,348,640	2,085,840	2,103,120	0	0	0	0	0	0	7,224,000
Rodney Upper Weiti Bridge Link (East Coast to Curley)	0	0	0	0	530,000	3,180,000	2,650,000	0	0	0	6,360,000
MCC Papatoetoe Town Centre – Shirley stn bypass	0	0	0	0	1,000,000	2,687,880	1,900,000	0	0	750,000	6,337,880
East Coast Road upgrade (Sunset to Constellation) – Road 80%	0	0	0	0	653,715	1,788,428	3,648,358	0	0	0	6,090,501
Western Bypass extension	0	0	0	0	0	200,000	300,000	2,500,000	3,000,000	0	6,000,000
Safety speed management	558,652	558,652	558,652	558,652	558,652	558,652	558,652	558,652	558,652	558,652	5,586,520
Taharoto Road / Wairau Road upgrade (Shakespeare to Boulevard) – Roading 60%	4,350,000	1,086,000	0	0	0	0	0	0	0	0	5,436,000
Traffic signals new	0	0	700,000	700,000	700,000	700,000	700,000	700,000	224,000	700,000	5,124,000
Northcote Road / Hillcrest Road / Lake Road intersection	0	0	0	0	0	0	140,321	148,306	1,778,753	2,988,305	5,055,685
Crash reduction implementation	474,242	474,242	474,242	474,242	474,242	474,242	474,242	474,242	474,242	474,242	4,742,420
Albany Centre improvements	0	0	0	0	0	2,280,000	2,280,000	0	0	0	4,560,000
MCC Flat Bush School Road – Stage 4 Murphys	4,520,000	0	0	0	0	0	0	0	0	0	4,520,000
Takapuna Anzac Street upgrade (Northcote to Hurstmere) – Road 20%	0	0	0	0	0	520,000	2,900,000	1,100,000	0	0	4,520,000
Glenfield Target Road upgrade (Wairau to Sunset)	0	0	0	310,000	310,000	159,280	1,189,126	1,257,144	663,772	0	3,889,322

Table 7.11-1 Continued...

Capital improvement project name	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	TOTAL
Takapuna Akoranga Drive upgrade Stage 2	0	0	0	0	0	0	0	185,382	294,285	3,108,532	3,588,199
Flat Bush Main Street Collector Link (Stream to Stancombe Road)	200,000	200,000	3,000,000	0	0	0	0	0	0	0	3,400,000
Manuroa / Takanini School Road intersection upgrade	150,000	170,000	680,000	2,400,000	0	0	0	0	0	0	3,400,000
Takapuna Auburn Street / Burns Avenue upgrade	600,000	0	0	0	0	2,600,000	0	0	0	0	3,200,000
Road drainage extensions – West	0	0	0	0	0	0	750,000	750,000	750,000	750,000	3,000,000
Regional transport asset – video data capture	0	0	1,000,000	0	0	0	1,000,000	0	0	1,000,000	3,000,000
Hingaia Peninsula Road improvement	1,600,000	0	0	0	0	0	200,000	400,000	330,000	300,000	2,830,000
Clevedon / Marne / Willis Intersection upgrade	0	0	0	0	0	0	0	1,000,000	1,700,000	0	2,700,000
MCC Ormiston Road widening (Ti Rakau Drive – Chapel)	0	2,500,000	30,000	0	0	0	0	0	0	0	2,530,000
Tamaki Drive / Takaparawha Point safety improvements	800,000	1,721,875	0	0	0	0	0	0	0	0	2,521,875
Manukau City Council Papatoetoe Town Centre – St.Geo / Kolmar / Wallace	0	0	0	0	2,500,000	0	0	0	0	0	2,500,000
New Lynn TOD Stage 5 Great North Road – Roads 70%	2,110,500	385,000	0	0	0	0	0	0	0	0	2,495,500
Manukau City Council link between Waddon and Windrush	0	0	0	0	0	2,300,000	0	0	0	0	2,300,000
Great South Road – Park Estate to Slippery Creek Bridge	320,000	1,043,000	0	0	80,000	800,000	0	0	0	0	2,243,000
East Coast Road / Spencer Road intersection	0	0	0	0	231,463	1,991,317	0	0	0	0	2,222,780
Asset management improvement activities	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000	2,000,000
Auckland Harbour Bridge Pathway (mayoral proposal)	750,000	1,250,000	0	0	0	0	0	0	0	0	2,000,000
Druces Road extension (Manukau)	0	0	0	0	1,000,000	1,000,000	0	0	0	0	2,000,000
Linwood Road route improvements (Franklin)	500,000	500,000	1,000,000	0	0	0	0	0	0	0	2,000,000
Waimauku South-West, future roads – rural and townships	0	0	0	0	0	945,000	945,000	0	0	0	1,890,000
Davies Avenue car park building upgrade	0	0	220,000	550,000	1,105,000	0	0	0	0	0	1,875,000
Great South / Beach Road intersection upgrade	0	0	0	0	0	1,800,000	0	0	0	0	1,800,000
Alfriston Stratford intersection upgrade	0	0	0	150,000	435,000	1,185,000	0	0	0	0	1,770,000
Hauiti – McKinney Link Road – R&T	0	0	0	0	0	885,000	885,000	0	0	0	1,770,000

Table 7.11-1 Continued...

Capital improvement project name	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	TOTAL
New Lynn TOD McCrae Way	1,720,000	50,000	0	0	0	0	0	0	0	0	1,770,000
Tamaki Drive and Ngapipi Road intersection safety improvements	697,500	1,000,000	0	0	0	0	0	0	0	0	1,697,500
TetraTrap installation – Central	0	180,000	180,000	180,000	180,000	180,000	180,000	180,000	180,000	180,000	1,620,000
New car park buildings equipment fit-out	390,000	1,200,000	0	0	0	0	0	0	0	0	1,590,000
Hunua Road realignment – past Winstones	0	0	0	0	0	1,550,000	0	0	0	0	1,550,000
East Coast and Forrest Hill roads intersection	0	0	0	0	0	0	0	92,691	294,285	1,139,795	1,526,771
Pay and display (new areas)	600,000	0	300,000	0	150,000	0	150,000	0	150,000	150,000	1,500,000
Kumeu Town Centre improvements	0	0	0	0	0	730,000	730,000	0	0	0	1,460,000
Puhoi Structure Plan implementation	0	0	0	0	0	700,000	700,000	0	0	0	1,400,000
Glenbrook and Kingseat roads intersection improvement	1,250,000					0					1,250,000
Browns Bay Road / East Coast Road – Corridor investigation Arran to Browns Bay roads	0	0	0	0	0	200,000	1,000,000	0	0	0	1,200,000
Rodney Leathers Bridge (Matakana Road)	0	0	0	0	0	600,000	600,000	0	0	0	1,200,000
Albany Rising Parade extension	0	0	0	1,171,403	0	0	0	0	0	0	1,171,403
Lunn Avenue / Marua Road / Harding Avenue – intersection upgrade	0	150,000	1,000,000	0	0	0	0	0	0	0	1,150,000
Rodney Peak No 2 Bridge (Peak Road)	0	0	0	0	0	550,000	550,000	0	0	0	1,100,000
Kitchener Road upgrade (Franklin)	0	0	0	0	0	20,000	644,000	420,000	0	0	1,084,000
Advance design	0	0	0	0	0	0	0	200,000	400,000	400,000	1,000,000
EC road overbridge and view site	0	0	0	0	0	0	0	0	0	1,000,000	1,000,000
GIS asset info and programming capability	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	1,000,000
Matakana Centre improvements	0	0	0	0	0	0	0	0	1,000,000	0	1,000,000
Manukau City Council Thomas Road Culvert replacement	0	0	0	0	0	1,000,000	0	0	0	0	1,000,000
Regional RAMM database improvement project	400,000	200,000	200,000	200,000	0	0	0	0	0	0	1,000,000
Te Atatu Road North – Gunner Drive to Yeovil Road	0	0	0	0	320,857	679,143	0	0	0	0	1,000,000
Matakana Leigh Road / Takatu Road intersection	0	0	0	0	0	480,000	480,000	0	0	0	960,000

Table 7.11-1 Continued...

Capital improvement project name	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	TOTAL
Waitakere City Council Swanson Road and Great North Road to Don Buck Road	0	0	0	0	100,000	850,000	0	0	0	0	950,000
Jenny's Road construction	0	0	0	0	0	0	0	0	900,000	0	900,000
Albany Lonely Track Road and Gills Road intersection	0	0	0	0	0	883,200	0	0	0	0	883,200
Central Park Drive and School Road intersection	0	100,000	750,000	0	0	0	0	0	0	0	850,000
South-western arterial – intersection improvement Bruce McLaren / Parrs Cross / Holden Road)	0	0	150,000	200,000	500,000	0	0	0	0	0	850,000
The Strand – Gabion Walls (WAI)	0	0	0	0	0	765,000	0	0	0	0	765,000
The Glade upgrade	0	0	0	0	0	0	0	0	0	672,000	672,000
Kingseat / McRobbie intersection upgrade	0	0	0	0	0	70,000	600,000	0	0	0	670,000
Great South Road / Bell Avenue / Mt Richmond Road intersection improvements	0	0	0	0	0	300,000	300,000	0	0	0	600,000
Dominion Road to Old Wairoa Road	0	100,000	500,000	0	0	0	0	0	0	0	600,000
Papakura Town Centre intersection upgrades	0	0	0	0	0	250,000	150,000	0	200,000	0	600,000
Rodney Taylors Bridge (Coatsville Riverhead Highway)	0	566,000	0	0	0	0	0	0	0	0	566,000
Warkworth Mahurangi East Road and Sharp Road intersection	500,000	0	0	0	0	0	0	0	0	0	500,000
Off-street – Grade upgrades (type 2 to 3)	0	100,000	0	100,000	0	100,000	0	100,000	0	100,000	500,000
Parking enforcement equipment and technology projects	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	50,000	500,000
Car park earthquake strengthening	0	50,000	50,000	0	400,000	0	0	0	0	0	500,000
Walters Road – Porchester to Grove improvements	0	0	0	0	465,000	0	0	0	0	0	465,000
Rodney Glennies Bridge (West Coast Road)	0	0	0	0	0	464,000	0	0	0	0	464,000
Portage Road – Neville Street to Kinross Street	0	0	0	0	0	450,000	0	0	0	0	450,000
IT parking – RFS migration and new	432,573	0	0	0	0	0	0	0	0	0	432,573
Centennial Park Drive SH1 intersection improvement	0	0	0	0	415,000	0	0	0	0	0	415,000
Downtown Car Park block work	400,000	0	0	0	0	0	0	0	0	0	400,000
Ramp Road / Sunset / Sycamore – detailed design and implementation	0	0	0	0	0	200,000	200,000	0	0	0	400,000
Takanini School / Airfield / Taka realignment	0	0	0	0	0	400,000	0	0	0	0	400,000

Table 7.11-1 Continued...

Capital improvement project name	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	TOTAL
Waitakere City Council Metcalfe Road – Swanson Road to Munroe Road	0	0	0	0	0	100,000	300,000	0	0	0	400,000
Waiuku Corners	0	0	0	0	0	375,000	0	0	0	0	375,000
Manukau / Harris / Custom intersection improvements	0	0	0	0	370,000	0	0	0	0	0	370,000
Rodney McPhersons Bridge (Wellsford Valley Road)	0	0	0	0	0	361,000	0	0	0	0	361,000
Northcote College Road upgrade	0	0	0	0	0	0	0	0	0	328,294	328,294
Red light camera new	0	0	0	0	100,021	100,021	100,000	0	0	0	300,042
Pay and display signage (new areas)	50,000	0	50,000	0	50,000	0	50,000	50,000	50,000	0	300,000
Red Beach Road / Bay Street intersection	0	0	0	0	0	300,000	0	0	0	0	300,000
Great South Road / Walters Roundabout improvement	0	100,000	180,000	0	0	0	0	0	0	0	280,000
Rodney Oldfield Bridge upgrade	0	250,000	0	0	0	0	0	0	0	0	250,000
Rata Street corridor improvements	0	0	0	0	0	0	0	0	0	200,000	200,000
Titirangi Road corridor improvements	0	0	0	0	0	0	0	0	0	200,000	200,000
Victoria Street block work	200,000	0	0	0	0	0	0	0	0	0	200,000
Residential parking permits	32,000	32,000	32,000	32,000	0	32,000	0	0	0	0	160,000
Cornwall Road rail crossing upgrade	0	0	0	0	0	152,000	0	0	0	0	152,000
Bridge upgrade – View Road	0	0	0	0	0	150,000	0	0	0	0	150,000
Pukekohe eastern arterial	0	0	0	0	0	0	0	0	0	150,000	150,000
Beach Road Widening (Papakura)	0	0	0	0	0	150,000	0	0	0	0	150,000
Harrisville / Mill Road Investigation (Franklin)	0	0	0	0	0	0	0	0	0	150,000	150,000
Lunn Avenue / EPH – intersection upgrade	20,000	120,000	0	0	0	0	0	0	0	0	140,000
Browns Bay Town Centre upgrade	0	0	0	0	0	108,820	0	0	0	0	108,820
Matua Road / SH16 intersection upgrade	0	0	0	0	0	0	105,000	0	0	0	105,000
Highbury Mainstreet	0	0	0	0	0	0	0	0	0	100,000	100,000
TOTAL ROADS CAPITAL NEW WORKS ($)	217,171,869	213,638,073	226,763,925	203,103,393	178,172,329	222,619,551	218,507,192	189,453,490	213,411,586	236,696,271	2,119,537,677

7.12 The approved Long Term Plan

The approved Long Term Plan

This section compares the approved LTP envelope for OPEX and renewals with the road network needs as determined by this AMP at a regional level and identifies the likely impacts of any variances. Revenue and funding incomes to Auckland Transport (from Auckland Council ratepayers and NZTA government subsidies and the like) are allocated through the approved Long Term Plan budgets. The LTP was adopted on 28 June 2012.

It is noted in Table 7.12-1, that the LTP OPEX and renewal budgets and network needs do not include corporate overheads.

OPEX impacts

Based on the information above, road operational expenditure shows variance between the LTP allocated budgets and the AMP needs. The LTP allocated budget for road OPEX has a 10-year shortfall of $298 million (14 per cent reduction) compared to the network needs determined by this AMP.

This shortfall of $298 million will impact the operations and maintenance of roads generally across the region and this may result in poor condition and reduced service as well as earlier than expected deterioration and failure over time. The OPEX shortfalls and impacts specific to the various road asset types are contained in the lifecycle management plans in section four of the AMP.

It is also noted that the AMP financial needs include state highway revocation (51km) costs of $2.6 million per year for OPEX and $2.4 million per year for renewals starting 1 July 2012, which are not included in the proposed LTP. Therefore, funds may need to be used from other allocations across the region.

Renewals impacts

The LTP allocated budget for road capital renewals has a 10-year shortfall of $82 million (four per cent reduction) compared to the network needs determined by this AMP. The approved LTP budget envelope appears to be insufficient to reduce the current levels of deferred renewals. This shortfall of $82 million equates to an average reduction of approximately four per cent of the road renewals programmes over the 10 years of the plan.

The renewal shortfalls and impacts specific to the various road asset types are contained in the lifecycle management plans in Section 4 of this AMP.

Further efficiency savings

As required by the approved LTP, a further reduction in OPEX of $18.6 million per year, reducing to nil by 2016/17, will need to be allocated against asset related operational budgets. The impact of this further reduction on road operational budgets is yet to be assessed and finalised.

Monitoring and management of Long Term Plan consequences

The consequences resulting from these variances will be monitored and reported as appropriate.

CAPEX new works

CAPEX new works contained in this AMP are derived from draft LTP listings as at April 2012 and are produced in section 7.4.3.

The capital new works programme has been further refined and adopted in late June 2012. Details of this adopted programme are contained in the LTP.

Table 7.12-1 Variance between LTP approved budget and AMP network needs for roads (all un-inflated)
Source: LTP Budget Model 12 April 2012 after refresh for AMP and revised LTP Budget Model 28 June 2012

Road network	10-year total LTP approved budget ($000s)	10-year total AMP network needs ($000s)	Variance ($000s)
Operations and maintenance	1,779,413	2,077,304	-297,891
Renewals	1,824,530	1,906,490	-81,960
Road network total	3,603,944	3,983,794	-379,851

7.13 Inflation effects

7.13.1 Inflation effects on AMP needs

Un-inflated and inflated road network needs for the AMP are shown in Table 7.13-1.

7.13.2 Inflation effects on LTP budgets

Un-inflated and inflated road network budgets from the LTP are shown in Table 7.13-2.

Table 7.13-1 Un-inflated and inflated road network needs

Source: LTP Budget Model 12 April 2012 after refresh for AMP and revised LTP Budget Model 28 June 2012

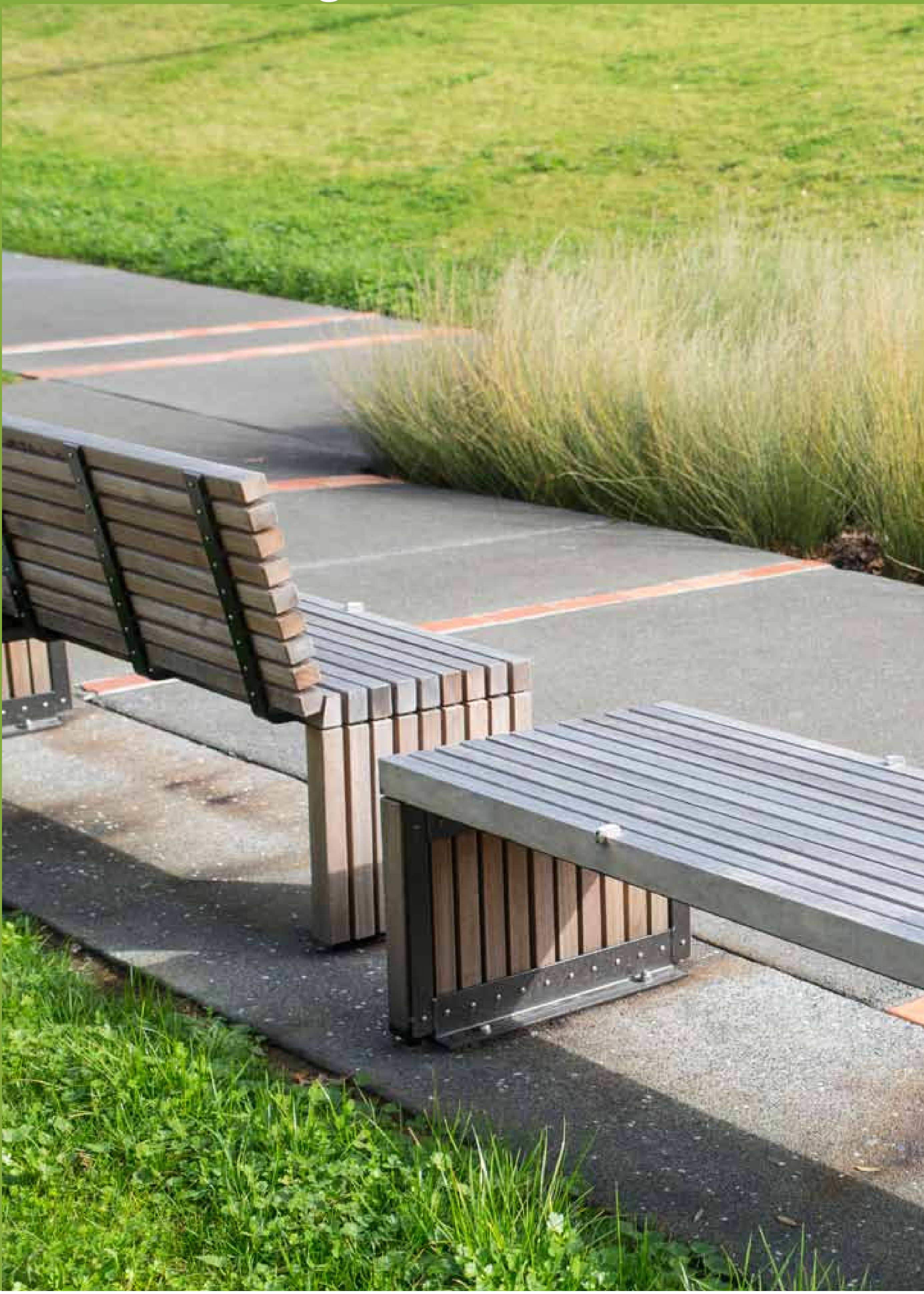
UN-INFLATED financial needs ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	202-21	2021-22	10-year total 2013-22
O&M		201,175	203,051	205,698	205,524	205,681	207,754	209,219	211,001	213,326	214,875	2,077,304
Renewal		184,674	188,770	184,047	186,291	187,846	190,244	195,514	196,607	194,387	198,111	1,906,490
Road total		385,849	391,821	389,745	391,815	393,527	397,998	404,733	407,608	407,713	412,986	3,983,794
AC inflator	OPEX	3.30%	3.30%	3.30%	3.30%	3.50%	3.60%	3.10%	3.10%	3.30%	3.60%	n/a
AC inflator	CAPEX	3.90%	3.40%	2.80%	2.90%	3.10%	3.30%	3.50%	3.70%	4.00%	4.00%	n/a
INFLATED financial needs ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	202-21	2021-22	10-year total 2013-22
O&M		207,814	216,673	226,742	234,479	243,105	253,169	262,857	273,844	286,829	299,311	2,504,823
Renewal		191,876	202,800	203,263	211,707	220,092	230,258	244,919	255,400	262,618	278,354	2,301,288
Road total		399,690	419,473	430,005	446,186	463,197	483,427	507,776	529,244	549,447	577,665	4,806,111

Table 7.13-2 Un-inflated and inflated road network LTP budgets

Source: LTP Budget Model 12 April 2012 after refresh for AMP and revised LTP Budget Model 28 June 2012

UN-INFLATED expenditure ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M		171,235	172,386	175,101	175,703	175,986	178,305	179,651	181,634	183,965	185,448	1,779,413
Renewal		180,835	180,032	173,938	176,408	179,473	182,246	187,271	188,230	186,229	189,867	1,824,530
Road total		352,070	352,418	349,039	352,111	355,458	360,551	366,922	369,865	370,194	375,316	3,603,944
AC Inflator	OPEX	3.30%	3.30%	3.30%	3.30%	3.50%	3.60%	3.10%	3.10%	3.30%	3.60%	n/a
AC Inflator	CAPEX	3.90%	3.40%	2.80%	2.90%	3.10%	3.30%	3.50%	3.70%	4.00%	4.00%	n/a
INFLATED expenditure ($000s)		2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	10-year total 2013-22
O&M		176,886	183,951	193,014	200,456	208,007	217,282	225,709	235,731	247,351	258,322	2,146,708
Renewal		187,887	193,413	192,098	200,477	210,282	220,578	234,593	244,519	251,596	266,772	2,202,215
Road Total		364,773	377,364	385,112	400,933	418,289	437,860	460,302	480,250	498,946	525,093	4,348,923

8 Risk Management



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Auckland Transport
An Auckland Council Organisation

8 Risk Mangement

8.1 Overview

This section covers the risk management process being implemented by Auckland Transport and how this applies to current and future transport activities.

The objectives of risk management in Auckland Transport are to provide:

- Protection and continuity of the core business activities
- Fulfilment of legal obligations
- Safeguarding of passenger, public, employee and contractor health
- Environmental protection
- Operation and protection of assets at the lowest cost
- Contingency planning for foreseeable emergency situations
- Secure funding and protection of the balance sheet.

8.2 Risk management approach

Auckland Transport's risk management function fulfils an essential governance role, overseeing the organisation's management of risk. It provides guidance to ensure that appropriate processes exist to identify and manage business risks.

Risk is an integral part of the world in which we live. Work and the management of risk is fundamental to achieving both organisational and related individual objectives. Risk management activities take various forms and although many people do not use the term 'risk' when they undertake these activities, the concept of risk is central to what they are doing.

Auckland Transport has developed a risk management framework consistent with the joint Australian New Zealand Standard – AS/NZS ISO: 31000:2009 (Risk Management – Principles and guidelines) in order to ensure that risks generally throughout the business are managed and that risk management is performed on a consistent basis.

The Rsk Management Framework defines the management policies, procedures and practices to be applied to the tasks of identifying, analysing, assessing, treating and monitoring risk.

8.3 Risk Management framework

Auckland Transport's Enterprise Risk Management Framework provides the basis for managing business risks of the organisation.

This framework defines:

- The Risk Management Policy
- Governance framework, roles and responsibilities within the Auckland Transport
- The risk assessment process
- Reporting and accountabilities
- Escalation process.

These polices, processes and definitions are included in the draft framework and in Auckland Transport's Infrastructure Risk Governance Plan.

The risk governance structure of the Infrastructure Department, which is included in the Risk Governance Plan, is reproduced in Figure 8.1-1.

8.4 Asset management key strategic objectives

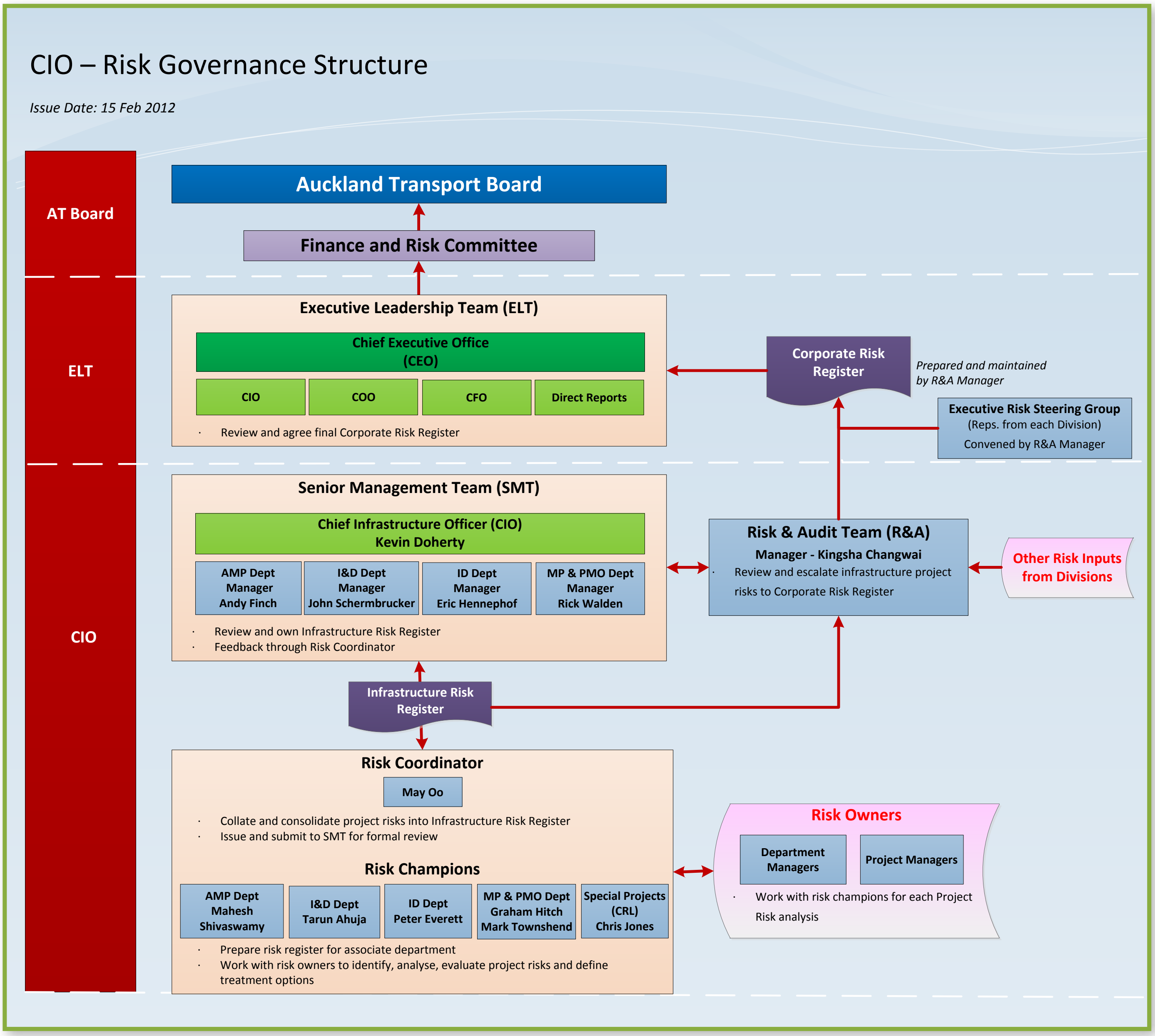
It is good business practice to align risk management with the strategic objectives of the organisation.

The Asset Management and Programming department has the following strategic objectives:

- To optimise Auckland Transport's capital project portfolio within the fiscal envelope
- To ensure effective strategic asset management planning including regional LOS to guide investment decisions across the business
- To maintain and optimise asset data to inform decision making across the business
- To ensure regional operating principles and standards reflect appropriate asset management practices for the network.

Figure 8.1-1 Infrastructure risk governance structure

Source: Auckland Transport Infrastructure Risk Governance Plan



8.5 Risk management process

The five major steps of the risk management process are summarised in Figure 8.5-1.

8.5.1 Establishing the context

Establishing the context defines the basic parameters within which risks must be managed and sets the scope for the rest of the risk management process.

All risks are reviewed in the context of the internal / external environment in which Auckland Transport seeks to achieve its business objectives.

The context includes linking and identifying risks relative to:

- **Strategy and objectives** (key for identifying risks) – also called value drivers
- **Risk types or categories** for aggregated reporting (to senior management and the Board)
- **Risk ownership** assigned to senior management (to ensure responsibility and accounting for managing risks)
- **Where the risk occurs** (location – business units, geographically and projects to generate risk registers per reporting entities)
- **Risk assessment criteria matrix** to guide the consistent analysis and evaluation of the likelihood and consequences of risks, which provides the overall risk rating.

8.5.2 Risk identification

Risk identification is a systematic and continuing process to maintain an up-to-date view of risks to achieving Auckland Transport's business objectives. The tools and techniques used to identify new risks are appropriate to Auckland Transport's business and include checklists, workshops, reports from subject matter experts, assessments based on review of data and records by experienced staff and process and systems' analysis.

Figure 8.5-1 Risk management process
Source: ISO 31000:2009 Risk Management Process Diagram

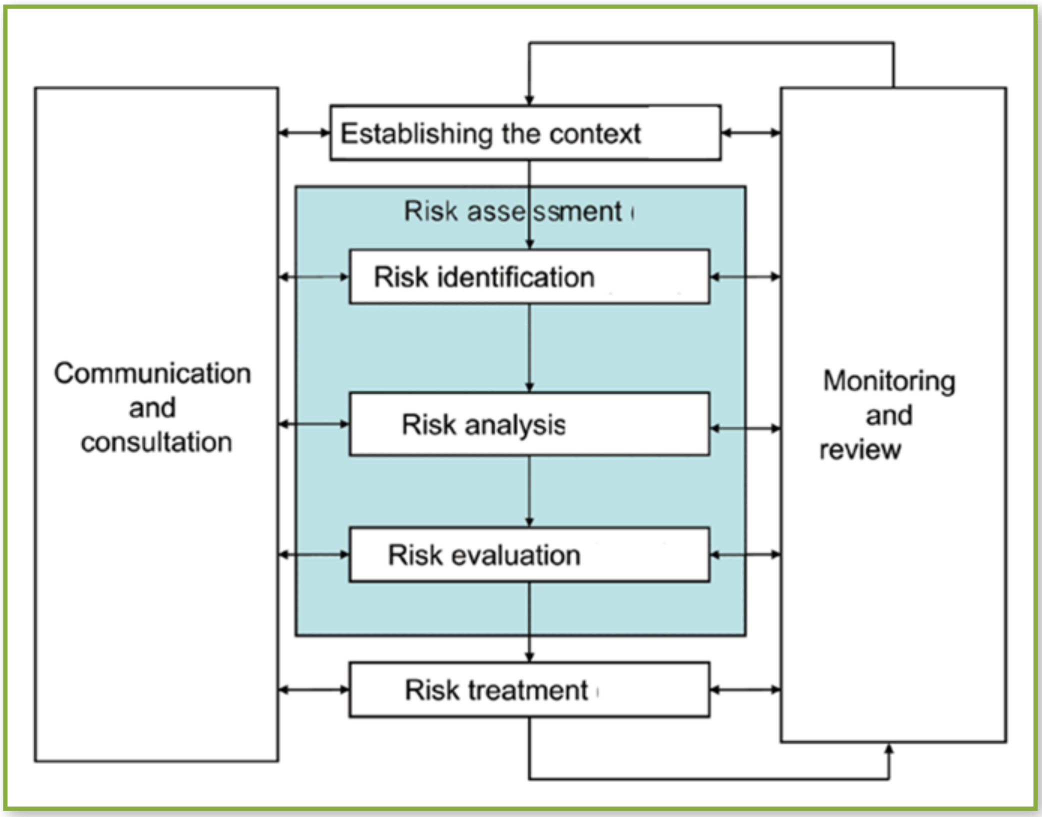


Table 8.5-1 Frequency / likelihood ratings table
Source: Draft Enterprise Risk Management Framework (v 1.0)

Likelihood risk rating				
1. Very low	2. Low	3. Medium	4. High	5. Very high
(May occur once in 20 years) <5%	(May occur once in five to 20 years) 2 - 20%	(May occur once in the next two to five years) 20 - 50%	(May occur once in the next two years) 50 - 75%	(May occur this year) > 75%

Auckland Transport operates a number of continuing programmes which assist the risk identification process including:

- Asset condition assessments
- Assessments of asset performance.

Both the impact and likelihood of each risk needs to be identified. The potential consequence to the achievement of business objectives will then be assessed. Auckland Transport maintains a number of systems which are used to support risk registers and inform the risk management process.

The responsibility for management of each risk is assigned to the most appropriate person within Auckland Transport.

8.5.3 Risk analysis

Risk analysis is the process used to determine the nature and level of risk, and if the risk requires treatment. Risk analysis includes:

- Consideration of risk causes / sources
- The likelihood (probability) that the risk will occur with current controls in place and considering any completed mitigation actions
- The consequences if all mitigations and controls fail and the risk crystallises
- Reviewing possible positive (opportunities) and negative consequences of risks to the achievement of business objectives.

The assessment of the risk can be qualitative or quantitative.

The estimated level (or magnitude) of risk is expressed as a combination of its consequences and their likelihood. The likelihood of occurrence and the severity of consequences should be based on as much real data as possible, for example local knowledge or recorded events such as maintenance records and weather events. Some analysis may be required for verification.

During the evaluation process, current controls (measures that reduce the risk) and completed mitigation actions are considered. Any future planned actions should not be considered until complete.

Risk should be considered in the context of the current position of the business and the risk to achieving its objectives.

The likelihood both in percentage and as timeframes for the risk crystallising is shown in Table 8.5-1.

After the likelihood and consequence factors have been determined, the level of risk is calculated by multiplying the likelihood of occurrence and the consequence rating.

Risk = the likelihood of an event occurring x the consequence of such an event

The final outcome is a risk rating. The risk rating enables definition between those risks that are significant and those that are of a lesser nature. Having established the comparative risk level applicable to individual risks, it is possible to rank those risks.

Table 8.5-2 Risk consequence ratings table
Source: Draft Enterprise Risk Management Framework (v 1.0)

Consequence risk rating					
	Reputation	Finance	Environment	Health and safety	Service delivery / asset management
5. Very high	• Adverse global media coverage • Widespread and significant community concern • Potential prosecution with maximum fine / imprisonment • Significant negative impact on stakeholder confidence	Loss > $ 50m	Extensive irreversible damage (widespread) to the environment resulting in: • Widespread, irreversible damage to land and/or water ecosystems • Permanent loss of one or more species • Clean up and remediation work required.	Fatality – staff, agent or public, attributable to Auckland Transport	Failure to achieve core service delivery standards
4. High	• Adverse national media coverage • High-profile community concerns raised • High profile legal challenge or prosecution with heavy fine • Damage to stakeholder confidence	Loss > $20m to Loss < $50m	Irreversible localised damage (major) to the environment resulting in: • Widespread, long term reversible damage to land and/or water ecosystems • Significant reduction in one or more species • Clean up and remediation work required.	Life threatening injuries or impacts to staff, agent or public, attributable to Auckland Transport	Failure to achieve some service delivery standards
3. Medium	• Adverse local media coverage • Community complaints • Some legal constraints imposed, minimal fine • Some loss of stakeholder confidence	Loss > $10m to Loss < $20m	Measurable damage (some) to the environment requiring significant corrective action resulting in: • Localised, medium term reversible damage to land and/or water ecosystems • Moderate reduction in one or more species • Pollution which requires clean up and remediation work.	Non-life-threatening injuries or impacts to staff, agent or public requiring hospitalisation attributable to Auckland Transport	Some reduction in service delivery standards
2. Low	• Reputation within the transport industry is damaged • No media attention • Some community complaint • Technical legal challenge or breach • Marginal impact on stakeholder confidence	Loss > $0.5m to Loss < $10m	Contained and reversible (minimal) environmental impact resulting in: • Localised minor reversible damage to land and/or water ecosystems • Temporary reduction in one species • Contained pollution requires clean up.	Injuries to staff, agent or public attributable to Auckland Transport	Minor impact on service delivery standards
1. Very low	• Reputation intact, internal knowledge only • Minimal impact on stakeholder confidence • Minor legal impact or breach	Loss < $0.5m	Small localised and reversible environmental impact resulting in: • Slight short term damage to land and/or water ecosystems • No noticeable species reduction • Contained pollution which is cleaned up immediately by operators / contractors.	Minor injuries to staff, agent or public attributable to Auckland Transport	Negligible impact on service delivery standards

Table 8.5-2 shows how the consequences are assessed in terms of the outcome of an event affecting objectives. The range of outcomes are classified into five categories such as reputation, finance, environment, health and safety, and service delivery / asset management.

Five risk classes have been used to categorised the risk levels, based on the above ranking system, and they are very low, low, medium, high and very high. The estimated levels of risks are determined by using the table on the next page.

Once the impact has been ranked according to the relative risk level it poses, it is then possible to target treating the risk exposure, by beginning with the highest risks and identifying the potential mitigation measures.

The outcome of this stage provides an initial view of the significance of the identified risks. Particularly with simple scoring schemes, risks can be assigned a too high or too low significance on the first pass. The next stage is designed to review this assignment and adjust it where necessary.

8.5.4 Risk evaluation

Risk evaluation is the process of comparing the results of the risk analysis to determine whether a risk of a particular magnitude is tolerable or acceptable.

In order to assess the magnitude of the risk, the risk class is assessed. This is achieved by scoring the risk likelihood and consequence on the risk rating graphs shown in Table 8.5-3. Likelihood is plotted on the X-axis and consequence on the Y-axis.

Table 8.5-3 Risk scoring table

Source: Draft Enterprise Risk Management Framework (v 1.0)

Overall risk rating (likelihood x consequence)

Consequence rating					
5. Very high	Class 4 (5)	Class 4 (10)	Class 5 (15)	Class 5 (20)	Class 5 (25)
4. High	Class 3 (4)	Class 3 (8)	Class 4 (12)	Class 5 (16)	Class 5 (20)
3. Medium	Class 2 (3)	Class 3 (6)	Class 3 (9)	Class 3 (12)	Class 5 (15)
2. Low	Class 2 (2)	Class 2 (4)	Class 2 (6)	Class 3 (8)	Class 3 (10)
1. Very low	Class 1 (1)	Class 1 (2)	Class 1 (3)	Class 2 (4)	Class 3 (5)
	1. Very low	2. Low	3. Medium	4. High	5. Very high

Likelihood rating

The higher the risk class (representing the level of risk), the greater the priority afforded to treating the risk. Treatments in Class 5 risks should be immediate. Class 4 and 5 risks should be reported to the Board on a monthly basis.

There is likely to be strong correlation between the risk class (Class 4 and 5 risks will have higher priority) and the operational / capital projects. Major / strategic project risks will be reported or presented to the Board on a two-monthly rotating basis, as part of project reporting, in addition to enterprise-wide risks.

Table 8.5-4 is intended to provide a statement of the general approach at each class level, noting that each risk must still be assessed for treatment individually.

8.5.5 Risk treatment

Risk treatment involves selecting one or more options for treating risks and implementing those options. The selection process should include a cost / benefit analysis to ensure that the solution is cost effective.

The risk owner (with authority and accountability to manage the risk) will be responsible for development of appropriate risk treatment plans. In some cases, responsibility for development will be transferred between Auckland Transport teams (e.g. major project requirements are transferred from Operations to Infrastructure). Where this occurs, the transfer of responsibility should be clearly documented and associated reporting responsibilities should also be transferred.

The risk treatment options are shown below:

- **Tolerate:** Accept the risk without treatment. This would normally only be the case where treatment is not cost effective, in which case robust contingency plans should be developed and implemented. This option may be taken in the case of 'run to failure assets'. Where the risk will not be treated, then the decision to tolerate the risk should be clearly documented. The position should be monitored and significant changes reported
- **Terminate:** Cease the activity. This is rarely an option for a transport service provider
- **Transfer:** The risk is transferred to other parties e.g. as part of a contract. As with the termination option
- **Treat:** Develop one or more options for modifying the risk. Frequently, a number of stages is required over time to provide the maximum mitigation for the risk and an example is given.

Table 8.5-4 Risk class and priority for treatment
Source: Draft Enterprise Risk Management Framework (v 1.0)

Risk class	Significance	Priority for risk treatment
Class 5	Very high	Immediate action One monthly reviews by Board
Class 4	High	Treatment options investigated Short, medium and long-term actions developed and implemented One monthly review by Board
Class 3	Medium	Treatment is required where cost effective and practicable Changes regularly monitored, requirements for action reviewed Regular reviews scheduled
Class 2	Low	Implement cost-effective treatment where appropriate Tolerate only where treatment is not cost effective Changes regularly monitored Regular reviews scheduled
Class 1	Very low	Tolerate – monitor for significant changes in risk class

- **Short term** – Temporary operational treatments to stabilise the position, e.g. maintenance programmes to hold the current state
- **Medium term** – May include studies into options for a permanent solution, refurbishments and some smaller scale replacement projects
- **Long term** – Major replacement project.

The objective is for the treatment to become more robust and sustainable over time.

Expectations regarding how treatment will reduce likelihood and consequence need to be carefully reviewed. In addition, a wide range of treatment / mitigation actions are continuing at all times across Auckland Transport and the result of these actions should be considered when deciding on new or additional treatments.

Examples of a continuing treatment regime include condition assessments, planned preventative and corrective maintenance and incident and fault responses.

Due to the high consequence associated with the loss of a major transport asset, it is sometimes only possible to reduce the likelihood score. This should not detract from pursuing these risk treatments.

On completion of the risk treatments, the risk class should be reassessed and the risk register be updated accordingly. In addition, appropriate contingency and incident response plans must be maintained for risks where the consequence remains high, regardless of treatment.

8.6 Monitoring, review and reporting

Regular monitoring, review and reporting of risks is an important component of the Auckland Transport risk management framework, as it ensures new risks and changes to existing risks are identified and managed, and that risk treatment plans are developed and implemented.

The risk registers are the records of all risk-related information within Auckland Transport. Risks will be added to risk registers, appropriate risk owners assigned and all risk treatments will be referenced.

Risks that have been treated will be reviewed and the likelihood and consequence reassessed. Where the risk has been completely mitigated, it will be closed and archived (removed from the risk register, but clear records of the risk and its treatment will be maintained).

All risks held in the risk registers will be assigned a risk owner who has authority and responsibility for managing and reporting progress towards completion of the risk treatments for the specific risks.

Table 8.6-1 Reporting, monitoring and review regime
Source: Draft Enterprise Risk Management Framework (v 1.0)

Risk class	Responsibility for completion of review	Report to	Monitoring and reporting frequency
Class 5	Chief officers	Chief Executive and Board	Monthly, in enterprise risk report
Class 4	Chief officers	Chief Executive and Board	Monthly, in enterprise risk report
Class 3	Tier 3 / unit managers	Chief officers	Monthly
Class 2	Line managers	Tier 3 / unit managers	Quarterly
Class 1	Line managers	Tier 3 / unit managers	Quarterly

Chief officers will ensure that monitoring and reporting of risks is completed in accordance with Table 8.6-1.

To promote meaningful reporting, risks may be grouped where the underlying asset and treatment of risk allows for aggregated reporting (e.g. all rail stations or park-and-ride facilities with similar capacities or capabilities). Where aggregation of risks is applied, exception reporting (e.g. where there is a change to the risk profile of an individual asset, changing it from the classification of the group) is to be promoted.

The two-monthly management reporting process should note any significant changes to the classification of a component of an existing aggregated risk, i.e. any changes in profile compared to its group.

Chief officers and business unit managers will then complete reviews focusing on changes in the risk profile.

New risks will be classified and any with proposed class 4 or 5 risk classifications will be presented to the Executive Leadership Team for consideration before being added to the risk register.

The risk owner at lower management level, who is responsible for the individual (not aggregated) risk, will be assigned responsibility for reviews at appropriate intervals utilising the detail provided by supporting management information systems, and will advise the appropriate business unit manager of any resultant changes to risk profiles.

8.7 Current status

Risk registers are being developed and refined across Auckland Transport at present in line with the approach outlined in this section. Table 8.7-1 provides details of the Risk Register for the Asset Management and Programming Department of Auckland Transport.

The corporate risk management function coordinates risk registers across the organisation. These organisational risk registers are included in the Appendix.

Table 8.7-1 Risk Register (Asset Management and Programming) May, 2012

Ref ID (Business Unit and Risk #)	Date raised	Risk description	Risk type	Cause of the risk event	Consequence of the risk event	Gross risk (without controls)				Existing		Residual risk (after applying existing controls)				Future		Action plans to address gaps in controls	Responsibility	Due date
						Likelihood	Consequence	Gross Risk	Risk Class	Pre-event preventative controls	Post-event mitigation controls	Likelihood	Consequence	Residual Risk	Risk class	GAP missing preventative control(s) (treatments)	GAP missing post-event mitigation control(s) (treatments)			
AMP 1	Mar-12	Failure to deliver on funding investment outcomes	Service Delivery Financial Reputational	Lack of clear strategic alignment between Auckland Plan, Integrated Transport Plan (ITP), Regional Land Transport Plan (RLTP) and Asset Management Plan (AMP) Potential misalignment between national outcomes signalled in GPS and regional outcomes in Auckland Plan Optimised Decision Making process aligned to outcomes not yet developed Delivered project benefits not measured AC/Local Boards drive non-strategic local based investment decisions	Lack of confidence from Auckland Council and NZTA Additional oversight and control AT fail to convince NZTA to bulk fund capital projects under $5m	3	4	12	Class 4	A project team and steering group has been established to map the governance, resources and plot of the ITP First draft of ITP to be published in June 2012		2	4	8	Class 3	Clarification around ownership and responsibilities Future Versions of ITP Development of ODM through Integrated Transport Plan	Development of process to measure and report achieved project benefits- compare to those envisaged at commencement	Liaise with Strategy and Planning to formalise roles and responsibilities matrix for the ITP	Andy Finch (Manager Asset Management and Programming)	Dec-13
AMP 2	Mar-12	Ineffective decision making using inaccurate data in asset management systems	Service Delivery Financial Reputational	Inconsistent data sets within RAMM inherited from legacy councils. Legacy councils had different approaches, methodology and extent and quality of recorded data No controls over internal and external access to RAMM for data entry.	Inadequate forward work programmes affecting service delivery Effectiveness of new AMP contracts may be compromised through non-standardised data formats Possible impact upon viability of CRM Project. Requires RAMM 2011 to operate - AT runs RAMM 2008 Unable to obtain optimal benefits from investment	3	4	12	Class 4	A high level analysis of the asset data contained in RAMM has been completed and reported through decision value assurance committee (dVAC) Small project team established across AMP / IT / RCM to review migration to RAMM 2011	Development and implementation of asset data standards manual	3	3	9	Class 3	Lack of funding for the prioritised improvement plan. Total cost of implementation => $1m Development of competence criteria for accessing database.		Resubmit business case for funding improvement tasks in the next financial year (not approved this year)	Viren Sharma (Asset Systems and Monitoring Manager)	Jun-13
AMP 3	Mar-12	Failure to deliver capital works programme compromising the delivery of Statement of Intent (SOI) programme of action	Service Delivery Financial Reputational	NZTA moratorium on capital project subsidy Manual collation of spread sheets and information reliant upon individuals Unclear roles between Business Support, AMP, Finance and RLTP teams for managing NZTA subsidy process and reporting Capital programme split between divisions (lack of whole of organisation visibility) Present programme developed without capital programming tools	NZTA subsidisable projects not progressed, and increased AC funding required or reduction in programme Inefficient, inaccurate status reports and financial forecasting, with discrepancies, errors and out of date information Incomplete and inaccurate reporting from the lack of clear responsibility for monitoring Inconsistent information provided to management creating a poor reputation for programming and delivery Inaccurate programming information resulting in poor accuracy of programme delivery	3	4	12	Class 4	A Financial Assistance Rate (FAR) agreement with NZTA, for capital projects in 2011/12, Liaison with NZTA on subsidy level increases, possible ring fencing subsidy surpluses from projects Monthly performance value assurance committee (pVAC) meetings to review CIO delivery of performance. Project Highlight Reports (PHRs) Defined team roles and individual responsibilities, risk and project management guidelines developed Monthly review of data with management oversight Over-allocated programme based on legacy councils LTPs	Projects unlikely to receive subsidy in 2011/12 deferred to later years Post programme delivery review to be undertaken, end of year financial process Post programme delivery review to be undertaken, review team and individual responsibilities Recommendations to CEO on organisational structural changes to align with required workflows, accountabilities and interfaces Engage stakeholders to re-adjust future years capital programme to account for funding and delivery variance in 2011/12	2	4	8	Class 3	No agreement with NZTA on the balance between opex and capex to meet an overall subsidy funding shortfall No automated project and programme reporting developed mid 2012 sourced from a single data warehouse Needing additional clarification of team roles and individual responsibilities PMO, programming and risk assessment processes & reporting not consistent across all of AT Risk adjustment programme management process to be finalised, no GIS view of capital programme, information supply inconsistent and a manual process	Contingency Plan if NZTA agreement / subsidy not be received No KPI measurement on organisation compliance to following guidelines No business improvement plan or KPI's to track progress	Work with NZTA to identify opportunities to mitigate impact of moratorium on subsidy, and ensure sufficient projects are progressed to construction stage to enable rapid delivery once moratorium is lifted Initial discussions with IT around use of a dedicated IT resource for capital works programming Monthly reforecast of actual and forecast expenditure within CIO, systematised reporting framework under development A report with recommendations on role clarification, RLTP to return to Strategy and Policy PMO extended to cover all AT capital projects, staff training or administration support Develop risk adjustment programming database, GIS spatial tool and data warehouse solution to supply capital programme data	Veenay Rambisheswar (Regional Asset Programme Manager)	Jun-14
AMP 4		Ineffective life cycle management plans	Service Delivery Financial Reputational	Ineffective links between key Auckland Transport planning documents such as ITP, LTP, RLTP and AMP Poor understanding of levels of service and associated costs Lack of options for the delivery of alternative levels of service Lack of knowledge on asset condition and performance	Inaccurate recommendations for the Long-term Plan (LTP) Delivery of the agreed levels of Service will be compromised Value for money will not be delivered Objectives of the ITP and AMP may not be delivered	3	4	12	Class 4	The emerging asset management plan will identify the required levels of investment over the next 10 years to maintain asset condition and base levels of service. Publication date June 2012 Links being developed between AMP and ITP Consolidated legacy asset information.		3	3	9	Class 3	The AMP team has to develop the base levels of service and then identify the cost of maintaining it Undertake levels of service modelling Optimum investment levels for maintenance and renewals is yet to be established Compare actual growth and demand with forecast Whole of Life costs to be considered as part of procurement		Understand fully the life cycle needs of asset groups Undertake ODM based analysis to identify optimum investment levels • Develop a monitoring framework for growth and demand Develop Whole of Life principles with Procurement team	Siri Rangamuwa (Regional AMP and Policy Manager)	Jun-15

KEY:	
Very High	Class 5
High	Class 4
Medium	Class 3
Low	Class 2
Very Low	Class 1
Gross Risk	Risk before controls are applied
Residual Risk	Risk after application of existing controls
Gaps or missing controls	Controls that have not been applied/actioned

Table 8.7-1 Risk Register (Asset Management and Programming) May, 2012. Continued...

Ref ID (Business Unit and Risk #)	Date raised	Risk description	Risk type	Cause of the risk event	Consequence of the risk event	Gross risk (without controls)				Existing		Residual risk (after applying existing controls)				Future		Action plans to address gaps in controls	Responsibility	Due date
						Likelihood	Consequence	Gross Risk	Risk Class	Pre-event preventative controls	Post-event mitigation controls	Likelihood	Consequence	Residual Risk	Risk class	GAP missing preventative control(s) (treatments)	GAP missing post-event mitigation control(s) (treatments)			
AMP 5	Mar-12	Unexpected failure of critical assets	Service Delivery Financial Reputational health and safety	Incomplete asset inventory inherited from legacy Councils Incomplete knowledge of condition and remaining life of critical infrastructure Insufficient maintenance and renewal funding Insufficient opex budget to undertake asset condition surveys in accordance with published standards and guidelines	Unforeseen Capital or Renewal Expenditure required between LTP periods Unplanned closure or restrictions on network Health and safety issues Adverse publicity Reduction in LoS	3	4	12	Class 4	New contracts for asset condition surveys being procured with a commencement date of July 2012. These will establish robust protocols for data collection and processing to provide additional assurance around completeness of asset data by 2015 Routine inspections of assets by Operations staff Potential implications of funding shortfalls to be identified in Asset Management Plan Opex growth bid submitted for 2012/13 onwards to support specified level of condition surveys	Emergency procedures and incident management plans developed and managed by Operations Division through their maintenance contracts.	2	4	8	Class 3	Develop programmes to ensure appropriate maintenance and renewals and prevent deterioration of assets		Focus on filling the critical gaps in asset information through new contracts Identify funding needs to maintain LoS	Viren Sharma (Asset Systems and Monitoring Manager)	Jun-14
AMP 6	Mar-12	Inaccurate asset registers and asset valuation	Service Delivery Financial Reputational	Numerous registers, databases and spread sheets held across AT recording different types of asset No AT wide process for recording asset changes	Incorrect Fixed Asset Register Incorrect asset depreciation calculation Incomplete knowledge of assets held across AT	4	3	12	Class 3	A project to formalise asset recording across the business has been scoped Memo sent to CFO, CIO & COO		4	3	12	Class 3	A decision needs to be made by the business as to whether this is a priority at this time		Follow-up with management to get a decision	Andy Finch (Manager Asset Management and Programming)	Jun-14
AMP 7	Mar-12	Failure to assess the Levels of Service needs in the development of AMP	Service Delivery Financial Reputational	Legacy LOS inherited from previous councils were not consistent throughout the region Lack of knowledge about customer expectations	Mis-alignment between levels of service and long term needs in AMP and LTP Customer service expectations may not be aligned to LoS	4	3	12	Class 3	Completed a stock take of legacy levels of service • Assumed maintaining the legacy LOS across the region until the approval of 2012-15 LTP Legacy council LoS were based around customer expectations		4	3	12	Class 3	Harmonise LOS across the region Obtain feedback from Local Boards and customers on proposed LoS		Develop options for harmonise regional levels of service and identify local variations Develop a framework for collecting customer views on LoS	Siri Rangamuwa (Regional AMP & Policy Manager)	Jun-15
AMP 8	Apr-12	Failure or unserviceability of critical infrastructure during an emergency event	Service Delivery Financial Reputational	Critical Transport Infrastructure not aligned to AC's emergency planning processes Insufficient funding within AMP budgets to undertake criticality assessment and resilience screening	Implementation of emergency plans may be compromised Significant adverse publicity	4	5	20	Class 5	AMP contracts to commence in July 2012 include scope for resilience screening		2	5	10	Class 4	Insufficient existing budget to support resilience screening		Business case for increased opex funding submitted	Andy Finch (Manager Asset Management and Programming)	Jun-14
AMP 9	Mar-12	Unforeseen programme cost escalation due to external factors (overspend)	Service Delivery Financial Reputational	Sudden change in the economic situation or market supply and demand	Lack of approved funding to meet improvement capital projects Programme delay leads to expiry of designations and consents on individual projects Failure to deliver on the strategic impacts for growth or service level as identified in SOI	3	4	12	Class 4	Factoring cost escalation into project budgets, NZTA inflation agreement Extension sought on existing consent Monthly re-forecasting of capital expenditure within CIO.	Individual projects deferred to meet the programme envelope New consents sought Agree with stakeholders adjusted future programme	2	4	8	Class 3	Monitoring and analysis cost indices that affect transport infrastructure		Investigate cost escalation forecasts Review cost escalation indices	Veenay Rambisheswar (Regional Asset Programme Manager)	Jun-13

KEY:	
Very High	Class 5
High	Class 4
Medium	Class 3
Low	Class 2
Very Low	Class 1
Gross Risk	Risk before controls are applied
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Gaps or missing controls	Controls that have not been applied/actioned

9 Asset Management Practices

9 ASSET MANAGEMENT PRACTICES

Contents

9 Asset Management Practices

9.1 Auckland Transport organisational responsibility

9.1.1 Governance

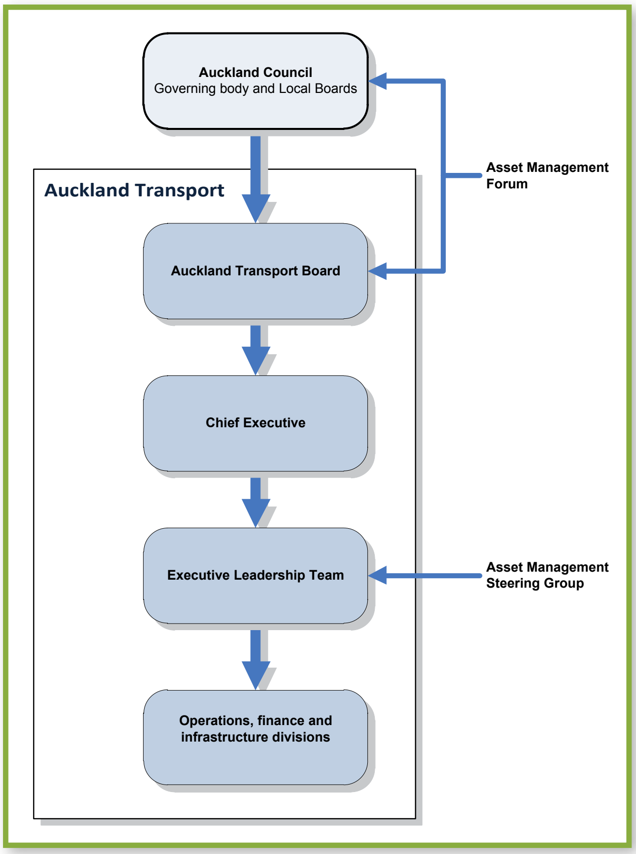
Auckland Transport has been given the management and control of the Auckland transport system under the Local Government (Auckland Council) Act 2009. It has the responsibility for all local roading and public transport activities in the wider Auckland region extending from Rodney in the north to a portion of Franklin in the south.

People, processes and practices together contribute to Auckland Transport achieving effective asset management. The main business divisions of Auckland Transport are Operations, Infrastructure and Finance as shown in Figure 9.1-1. The organisation is structured beneath the chief executive as tier 2 divisions, tier 3 departments and tier 4 management units.

The Asset Management and Programming Department is within the Infrastructure Division and leads asset management planning and programming across the organisation. It has three management units which work closely together; AM Planning and Policy, Asset Programming and AM Systems. These units are tasked with providing the strategic and tactical asset management for the division.

Auckland Transport has an Asset Management Steering Group that meets fortnightly. It provides strategic overview and direction for the AMP project team. Auckland Transport also participates in Auckland Council's Asset Management Forum. This allows for information to be shared across all council units and CCOs such as growth projections. Auckland Transport follows the guidance material provided where appropriate for the transport business.

Figure 9.1-1 Governance hierarchy



9.1.2 Frameworks for asset management

Two asset management frameworks were adopted by Auckland Transport's Board in April 2011:

- Asset Management Framework
- Levels of Service Framework.

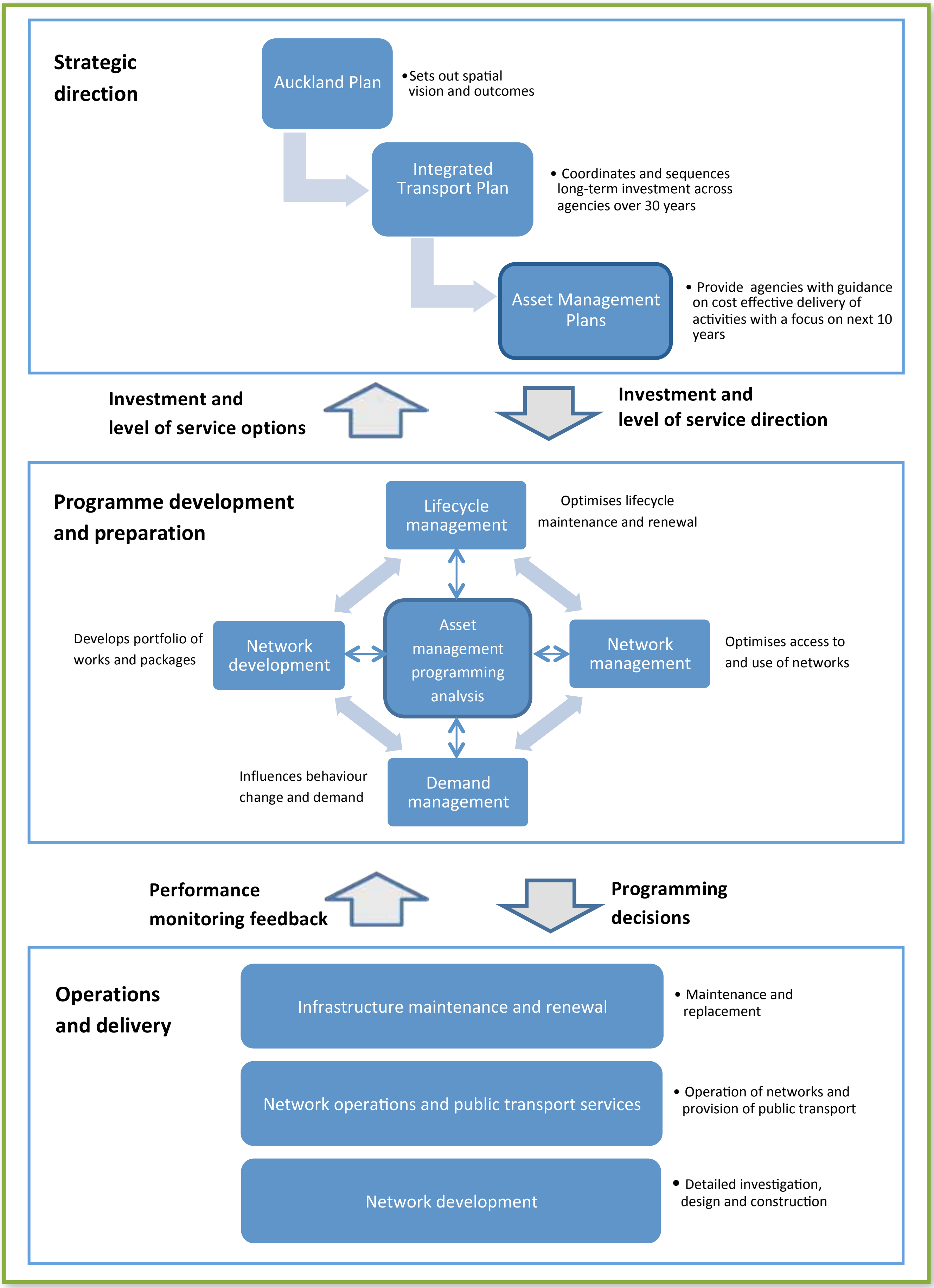
The Asset Management Framework integrates policies, planning processes, decision making and information across all transport assets and activities, and sets the asset management policy. It provides a management structure within which stakeholder needs, levels of service, asset information, finance, risk and resources are brought together. This enables balanced, consistent and high-quality asset management decision making.

The Levels of Service Framework provides the structure to monitor and manage a common set of performance measures, outputs and outcomes. It provides the links between operational activities and strategic outcomes. It also aligns with Auckland Transport's Integrated Transport Plan (ITP), Statement of Intent (SOI) and Auckland Council's Long-term Pan (LTP). These frameworks are included in the appendix of this plan.

9.1.3 Auckland Transport system planning and delivery framework

Auckland Transport's planning regime and the delivery mechanism are shown in Figure 9.1-2.

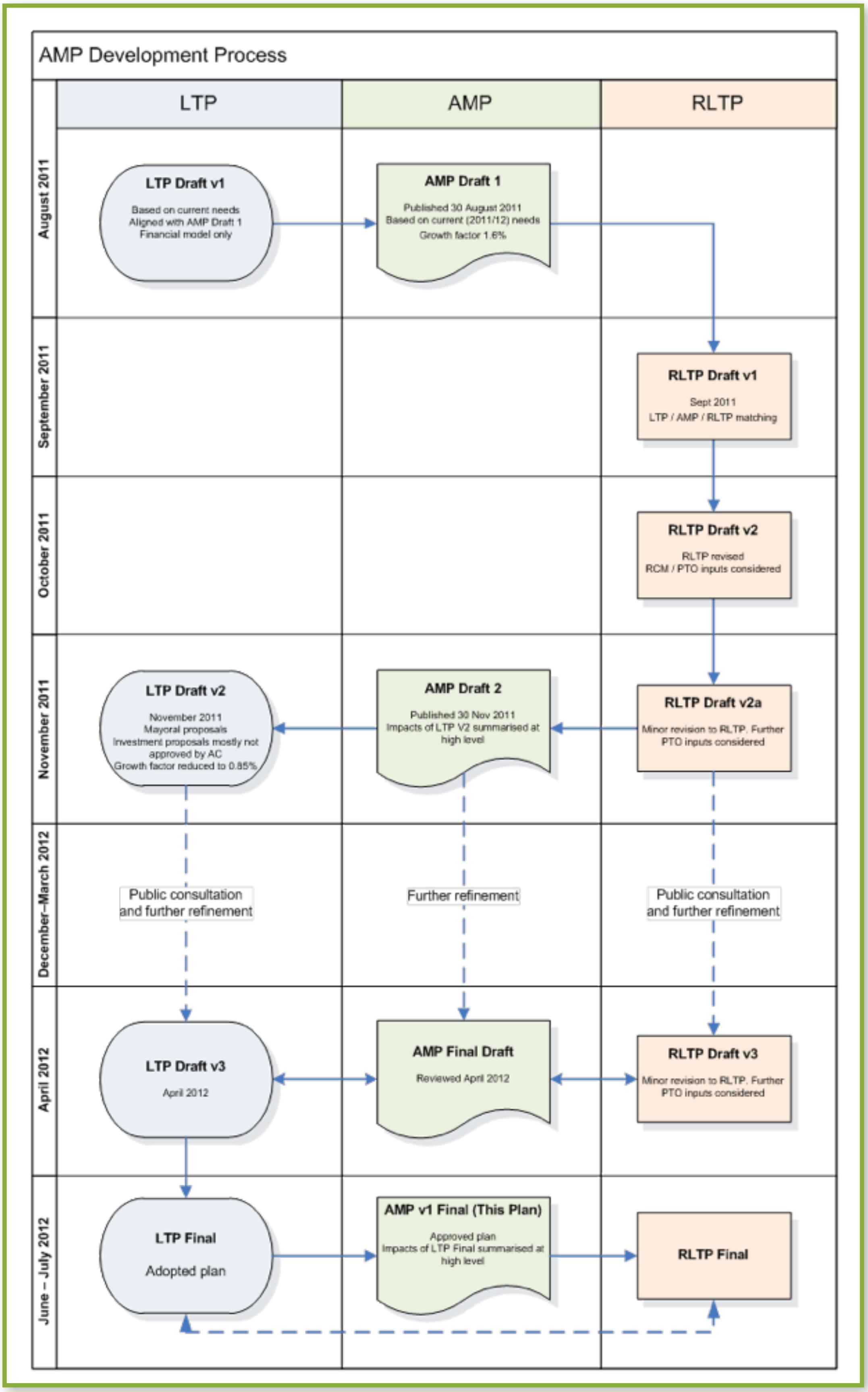
Figure 9.1-2 Asset management development process



9.2 Process involving key Auckland Transport plans

The process that has been followed to date for the development of the key Auckland Transport plans is given in Figure 9.2-1. This process is still evolving in the new organisation and it will be further refined as necessary in the future.

Figure 9.2.1 Asset management development process



9.3 Asset management practices

9.3.1 Legacy practices

Auckland Transport combines the transport skills and functions of seven local councils and Auckland Regional Transport Authority. The legacy councils generally followed the New Zealand Asset Management Support (NAMS) guidelines, in particular the International Infrastructure Management Manual (IIMM).

In 2010, NZTA undertook a review and comparison of the transport AMPs of Auckland's legacy local councils. Individual sections considered by the review to be best in their category are listed in Table 9.3-1.

Overall, the NZTA review concluded that the Auckland region's AMPs were current and of a very high standard. The overall best practice document was produced by North Shore City Council. Auckland City Council's 2009 Transport AMP won the 2010 Ingenium Asset Management Excellence award.

A stocktake has since been completed of the asset management planning processes and outcomes of the legacy councils. The stocktake found that the large urban councils had the best asset management practices. These have been used as the starting point to produce the new transport tactical Asset Management Plans for the region.

The legacy councils managed the public transport networks in a council environment where the public transport function was embedded with other services. The single Auckland Transport agency allows a more holistic and coordinated approach to regional public transport. It provides an opportunity for a more effective and efficient governance and use of asset management to help deliver service and value to the stakeholders in the region.

9.3.2 AMP development process

The initial draft AMPs (refer to Figure 9.2-1) were based on the existing AMPs of the legacy councils and their consolidated asset data, existing levels of service and condition information, the draft Auckland Plan (March 2011), and a preliminary financial model (based on existing budgets available in SAP).

These draft AMPs have now been further refined in this final AMP and they include the latest available information from key documents such the adopted Auckland Plan (March 2012) and the Integrated Transport Plan.

AMP development team

A rigorous approach has been taken with the production of this AMP. A structured project team with a blend of in-house specialists and external resources have been used to produce each the draft AMPs and this final version. Members of this AMP development team have extensive asset management experience with most of them holding bachelors and masters degrees in engineering and related fields.

Stakeholder consultation and feedback

The initial draft AMPs were completed in June and November 2011 and provided to internal and external stakeholders such as Auckland Transport business units, Auckland Council and NZTA. Formal sessions were completed in June and July 2011 with key internal and external teams to gather feedback on levels of service, identify additional network needs, understand any new information and indicate forward work programmes.

Table 9.3-1 Legacy councils evidencing best practice for AMP sections

Category / AMP section	Best practice council
Process of development	Auckland
Links to other planning documents	Manukau
Demand management	North Shore and Waitakere
LOS and performance measurement	North Shore and Waitakere
Asset systems and data	Rodney and Waitakere
Financial information	North Shore
Lifecycle management and asset management practices	North Shore
Risk management	Papakura
Optimised decision making	Rodney
Improvement programme	Auckland

The information gathered from these feedback sessions have been incorporated in the final AMPs as appropriate.

The key Auckland Transport business units consulted include:

- Road Corridor Maintenance
- Road Corridor Operations
- Road Corridor Access
- PT Operations
- Parking
- Community Transport
- Property
- Business Support
- Strategy & Planning.

Peer reviews and audits of draft AMPs

A number of peer reviews and audits have been completed to establish the compliance of draft AMPs with industry best practice and audit NZ requirements. The details of these reviews and audits are included in Section 10, Improvement Plan and Monitoring.

These peer reviews and audits have been completed by following organisations:

- Auckland Council
- Audit NZ
- GHD and Beca.

AMP approval process

The approval of Auckland Transport Board has been obtained for the publication of this final AMP.

The overall approval process that was followed at various stages of the AMP development process is highlighted below:

Milestone	Status
1st draft of AM Plans	Completed in June 2011. Endorsed by AM Steering Group
2nd draft of AM Plans	Completed in November 2011. Endorsed by Auckland Transport Board
Final AM plans • Report to ELT • Report to AT Board	Approved June 2012 Approved June 2012
Final AM plans	Published June 2012

9.3.3 Formal practices' assessment

A formal practices review of public transport services for the new organisation needs to be undertaken to help prioritise initiatives. Generally, the legacy councils periodically used gap analysis to review business practices, and to identify and prioritise asset management improvements.

9.4 Current status overview

This section discusses the status of Auckland Transport's current asset management practices and identifies practices the organisation wishes to use. Many of the legacy councils had mature business practices to support the delivery of their transport services. Auckland Transport is now working through harmonising and refining these processes, systems and data.

The key asset management practices needed to support good asset management plans can be grouped into three broad areas:

Processes	The necessary processes, analysis and evaluation techniques needed for lifecycle asset management
Information systems	The information support systems that support the above processes and which store and manipulate asset data
Data	Data available for manipulation by information systems to support asset management decision making

Harmonising the legacy data, systems and processes has been a significant task, required to develop the initial draft AMPs. Although a lot has been achieved to date, there is still much work to fully integrate these asset management practices to a consistent level regionally.

9.4.1 Asset management systems

Information systems are essential for storing and analysing asset information to make good asset management decisions. The main asset management information systems used by Auckland Transport for public transport assets are:

- RAMM for asset inventory
- SAP for finances
- dTIMS for predictive modelling.

More detail on the systems used to manage the public transport assets is shown in Table 9.4-1

RAMM database review

The RAMM database has historically been the primary transport asset repository for all council-owned and maintained assets. It is Auckland Transport's main asset inventory for the road asset network.

Table 9.4-1 Asset management systems summary

System purpose	Name	Purpose	System owners	Status / enhancement
Asset information system for roads	RAMM	RAMM holds individual asset records and condition for most road asset types.	Asset Systems and Monitoring	A number of significant issues exist from merging the seven legacy RAMM databases. These differences were in approach, methodology and recorded data in the seven databases. These need to be understood, managed and updated to provide a consistent, single database over time. (Refer to the table below for further detail)
Asset information	GIS	Access information using networks maps and aerial photographs	Auckland Council	The council manages all updates and holds the enterprise licence for the council and CCOs. It also uses ESRI products
Accounting system	SAP Finance	The mainframe accounting system used throughout Auckland Transport	IT and Business Systems	
Financial modelling	Financial model	Development of the financial model for AMP and LTP purposes using raw SAP financial data	Asset Planning and Policy	Currently in Excel spreadsheet but in future may use a planning module in SAP
LOS monitoring and reporting	LOS framework	Stores the performance data from the legacy councils, SOI measures and new measures where developed. Integrates the monitoring of KPIs with LTP and LOS to provide management, executive and governance reporting	Asset Planning and Policy	Currently in Excel spreadsheet. Future plans are to store the performance data in the SQL management system with a front face in SharePoint
Managing customer services	Resolve / CRM	To record customer service requests, complaints and enquiries regionally for roads and public transport. Resolve is an ARTA legacy system	Customer Services	CRM is the new Customer Relationship Management system that is progressively replacing the legacy system Resolve. MS Dynamics is the customer management system. It went live in April 2011 with integrated ticketing for public transport for RWC and with a phased roll out. It will provide a single view of the customer for call centre and front line operations staff. Both systems will operate until 2012/13. CRM has a wider job than Resolve, including the RFS system, and communications and marketing campaigns
Customer service information	My Street Citizen Portal	'My Street' is a Web Portal that delivers a series of online services and information that will transform Auckland Transport's primary interface with its customers. My Street will be implemented progressively in 2012	IT and Business Systems	Over time, customers will be able to: • Request a larger variety of services online • More effectively plan and manage journeys, across multiple transport modes, by having access to higher quality information about network activity (works, incidents, congestion). It is expected that internal customers will use My Street as well as information readily available in a user-friendly format
Road safety analysis	CAS (Crash Analysis System)	CAS is a national database owned and managed by NZTA. The data is based on completed Traffic Crash Reports from the New Zealand Police. There can be up to six month delay on crash data being available	Road Safety	Auckland Transport uses the crash data through ad hoc reports (about 200 queries are available) as well as the annual reports produced. Information is available regionally and for the six CAS areas within the Auckland region CAS information is used for project prioritisation such as crash reduction studies, 40km speed zones and school travel plans
Roads capital renewal modelling	dTIMS	dTIMS is populated with extracts from RAMM and other data used to do predictive modelling for pavements	Asset Planning and Policy	dTIMS is the current tool for modelling pavements. Other applications may be considered in future such as NODEM and Trifecta. A Trifecta pilot has been completed in collaboration with NZTA and dTIMS for the central area. It is being recommended as an interim solution for programming and renewals. Trifecta is a GIS portal for spatially displaying outputs to a layperson, as well as an analysis and reporting tool
Traffic modelling	EMME Saturn S-Paramics	There are three main traffic modelling tools. EMME is GIS linked for demand modelling regionally. Auckland Council uses the same tool for transport strategy planning. Saturn is used for network traffic modelling for large area networks. S-Paramics is used for micro simulation for small areas Saturn and S-Paramics are not GIS linked	Strategy and Planning	
Managing resource consents	CS-VUE	CS-VUE is used to record and manage resource and building consents for Auckland Transport, both as the asset owner and applicant	Investigation and Design	This is a proprietary system of Andrew Stewart Ltd
Request access to dig in road corridor	CAR (Corridor Access Request)	CAR Monitor is a new service. It combines the current process of lodging a beforeUdig enquiry and having to apply separately for a CAR if the intended excavation site is in the road corridor	Road Corridor Access	CAR is progressively being rolled out throughout New Zealand over the next 12 months. The roll-out started at Auckland Transport in March 2011

The integration of the seven legacy RAMM databases into a single regional database has resulted in significant issues. An independent review by Opus International Consultants in April 2011 has identified prioritised improvement tasks required for a single RAMM database for the Auckland region. These issues impact many key transport areas including forward works' programming (FWP) preparation, asset valuation, asset renewal planning, and Asset Management Plan development. It is a major project to implement these improvement tasks.

The impact of the merged databases on the core RAMM tables has now been independently assessed. These core tables are used for FWP, asset valuation, pavement deterioration modelling (dTIMS) and network operations. Prioritised improvement tasks based on the influence or impact on these key areas at a high level has been identified. These improvement tasks will start in 2011/12 and continue into 2012/13 and beyond.

9.4.2 Asset management data

Data quality is important for end users so that they can have confidence in making an analysis using that data. Data was supplied by the legacy councils and its quality and completeness varies across the region and between asset classes.

Completeness and accuracy has been assessed and reported in each LCMP by the following data attributes:

- Asset quantity
- Asset age
- Condition
- Performance.

A summary of the overall rating of each asset group is summarised in Table 9.4-2.

Road safety data

Auckland Transport uses the crash data stored in CAS to analyse and identify high-risk areas. The national focus is on fatal and serious injury crashes in accordance with the government's Safer Journeys strategy. Fatal and serious injury crashes are analysed jointly with NZTA to investigate environmental and road factors. NZTA participates in this analysis to ensure good data is being captured at the appropriate sites. High-risk areas tend to be high-volume local roads.

Core data

The core data used for preparing the Roads AMP is detailed in the appendices. This summarises for each roading asset group the data sources and dates including condition, proxy and source, asset value, useful life, and 10-year average renewals.

Table 9.4-2 Asset data confidence

Asset group	Very uncertain	Uncertain	Reliable	Highly reliable
Roads				
Bridges and major culverts				
Retaining walls				
Corridor structures				
Parking				
Footpaths				
Cycleways				
Street lighting				
Traffic control equipment and structures				
Signs and markings				
Drainage				
Street vegetation				
Corridor fixtures				

9.4.3 Asset management processes

The asset management processes from the legacy councils were adopted in November 2010 but not mapped. These were used as a starting point for developing the initial tactical AMPs.

Auckland Transport is made up of employees from different councils and authorities who each had their own way of doing things. It is clear there needs to be a single framework for managing the collective assets from this point on.

Auckland Transport has developed a Process Management Framework to bring consistency to the way processes are documented across the business. Every current process will need to be revised and documented using the new system. A key feature of the process management plan is to ensure the customer is kept in mind during every step of the process. The framework is made up of objectives, goals and actions. It is grouped in Figure 9.4-1.

High-level business processes are being developed for the key processes throughout Auckland Transport. The asset management processes are expected to be mapped by December 2012, to include:

- Stakeholder consultation such as NZTA, Auckland Council, Asset Management Steering Group
- Data flow information between the Asset Management and Programming Unit
- AMP development
- Financial model development and ongoing maintenance
- Asset revaluation.

9.5 Future improvements

Key improvements have been identified that will ensure end-user needs are met are as follows:

Figure 9.4-1 Process framework

Table 9.5-1 Key improvement initiatives

Improvement initiative number	Description	AMP section	Priority
Practices 1	Complete a formal practices review of public transport services for the new organisation to help prioritise initiatives	9.3.3	High
Practices 2	Complete the high-level asset management process maps by December 2012	9.4.3	High

10 Improvement Plan and Monitoring

10 IMPROVEMENT PLAN AND MONITORING

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10.1 Commitment to asset management

A key feature in Auckland Transport's asset management framework is to continue to improve asset management practices, processes and tools. This is essential to ensure the asset system and services are effectively managed. Through the initiatives presented in this section, Auckland Transport is committed to moving towards appropriate advanced asset management practices. This practice is being developed in keeping with the New Zealand Asset Management Support (NAMS) practice as presented in their suite of asset management publications.

The following activities are undertaken in support of this commitment:

- Adoption of the asset management and levels of service frameworks by the Board
- Development of the Asset Management improvement plan, which will be reviewed and endorsed by Auckland Transport's Asset Management Steering Group
- Internal and external reviews of the AMPs to incorporate identified improvements and to align them with other strategic documents
- Staged adoption of the AMPs by the Board
- Quality audits of information in the AMPs to confirm degree of confidence, integrity and cost effectiveness of data collected.

10.2 Peer reviews of AMPs

Peer reviews are integral to monitoring the goal of advanced asset management. Four reviews of the first draft AMP were completed and the findings addressed before the documents were finalised in June 2012. These reviews were undertaken by internal and external specialists with a different focus area for each review. This process is summarised in Table 10.2-1. Note that the Activity Management Plan is now called the Overview Transport Network AMP.

The key findings of these reviews are summarised in Table 10.2-2 with the full reviews provided in the Appendices. The review findings will be considered in further developing the AMPs and the improvement plan.

Note: The improvements suggested by these reviews have been built into the asset management improvement programme discussed in Section 10.5.

Table 10.2-1 Planned asset management reviews

Review focus	AMP documents	Reviewer	Current status
Compliance with the Local Government Act and Office of the Auditor General requirements	· Activity Management Plan · Road AMP · Public Transport AMP	Audit New Zealand	· Preliminary review provided in November 2011 with feedback considered in the development of the AMPs · Issues relating to the formal audit were clarified in January 2012 and verbal feedback indicated the approach for the AMP process was acceptable · Formal audit report delivered to Auckland Council in June 2012
Technical review and good asset management practice	· Activity Management Plan · Road AMP · Public Transport AMP	Becas	· Technical review provided in October 2011 with feedback considered for the updates of the second and final AMPs
Strategic overview and good asset management practice to meet external stakeholder requirements	· Activity Management Plan	GHD	· Strategic advice provided in October 2011 · Review assists with developing the strategic level plan and with support required from the tactical AMPs for the final AMPs
Quality assurance (internal) review against the Auckland Council's Asset Management Planning Evaluation Framework	· Activity Management Plan · Road AMP · Public Transport AMP	Auckland Council	· Final internal review provided in October 2011 · Process review provided feedback considered for the improvement plan for the second and final AMPs

Table 10.2-2 Asset management review summary

Review	Review type	Assessment	Strengths	Improvements
Audit New Zealand	Compliance	· Assessed compliance with good practice as set out in the International Infrastructure Management manual (IIMM) and Audit New Zealand methodology · Assessed against their expectations for seven areas	· Plans are well presented overall · Some areas of strengths in: corporate context improvement planning levels of service review and audit. · Activity Management Plan shows clear linkages to key documents	· Lack of reliability of asset data · Indicate movement towards advanced principles · Establish performance measures for all significant assets and services · Give specific examples of how Auckland Transport contributes to sustainable development · Clearly define core services · Specifically identify critical assets · Maintenance budgets do not reflect the age profile · Include confidence factor of the reliability of the financial forecasts · Key improvement tasks should include resources, responsibilities, risks and delivery measures
Beca	Technical	· Used a gap analysis for assessment to assist with prioritising improvement areas · All three plans achieved 60 per cent status for all sections except 70 per cent for growth and demand and Lifecycle Management Plans sections · 55 to 80 per cent is considered competence · Overall, the three AMPs were assessed as competent	· The plan follows the IIMM, which is generally accepted as best practice in New Zealand and various other countries · Good presentation of the levels of service hierarchy · Good sections on demand, and demand management plan · The LCMP section is extensive and brings together the information from the legacy councils in a good, logical format · The limitations and status of the financial information is clearly noted	· Provide clearer linkages between the target levels of service, the associated maintenance and capital management strategies, projects, and associated financial forecasts · Develop linkages between preceding and subsequent sections · Give greater emphasis to the fact that there is still a lot of work to fully integrate processes and systems · Levels of service need to be consolidated and linked to other council documents · Improvement tasks should have scopes, resources, budgets and programmes associated with them
GHD	Strategic overview	· Reviewed the traditional approach against future strategic issues to be considered	· Achievement in bringing together an enormous amount of asset data from predecessor organisations · Forms a sound basis for activity management planning	· Review the future role of activity management planning · Focus on the future strategic issues · Three options presented for future Activity Management Plans · Prepare a communications document to highlight the key findings of the current plan
Auckland Council	Process / quality assurance (internal)	· Assessed compliance against Asset Management Plan Evaluation Framework · Both the road and public transport AMPs sections were assessed as partially compliant, except risk was assessed as compliant · Assessed for opportunity for improvement and alignment	· Demonstrates a sound understanding of the operational business · Excellent job in structuring AMPs, providing and demonstrating excellent asset management principles and understandings · Discerns the broad direction of the Auckland Plan and align priorities accordingly · Demand trends and drivers are integrated into the business · LCMP is comprehensive · Has begun to document infrastructure sustainability initiatives	· Needs direct correlation between the two Auckland Transport AMPs as both contribute to a common strategic intent · Deficiencies in strategic alignment due to the timing of the Auckland Plan · Populate the current performance at legacy council level · Does not contain actual demand forecasts for the region · Relocate network management and planning activities from LCMP and move to other AMP sections · Include the approach to the cost allocation methodology for development contribution purposes

10.3 Issues register

The development of the regional AMPs was based on existing information from the legacy councils. The information and systems varied, which resulted in a large number of discrepancies and gaps. As part of the regional AMP development process – and for transparency – the issues to be resolved were methodically recorded in an issues register.

There are 92 issues in total for roads and public transport that cover the following broad areas:

- Levels of service – inconsistent levels of service and policies regionally such as footpath material and width; different weed control practices; different intervention levels for treatment
- Data completeness – including variable quality and completeness in information by portfolio/ asset class/ criticality for asset condition data in the RAMM database; many assets are not in RAMM such as street furniture, parking and green assets; condition information for wharves is generally poor and not always available

- Financial – including a need to define capitalisation rules; need to define CAPEX new works as either for growth or levels of service; need to separate operational budgets for retaining walls and bridges at general ledger level etc.
- Development contributions – to develop a regional approach to identify the part of planned capital expenditure that relates to growth to replace the legacy policies currently still in operation.
- Asset ownership –unclear ownership and responsibilities of some parking buildings and facilities not on Auckland Transport's road reserve land; some street lighting poles in RAMM do not distinguish poles owned by Vector and Telecom
- Roles and responsibilities – including confirming with Auckland Council regarding roles and responsibilities in town centres and city transformation assets such as catchpit emptying and public toilets ownership; shared ownership and responsibilities of assets with Watercare and Stormwater Unit to be carefully managed.

A complete listing of issues is included in the Appendices.

It will take time and resources to resolve the issues as systems, data and processes are developed and embedded into the new organisation. These issues have provided input into developing the key improvement programmes listed below.

10.4 Key improvement programmes

Key improvement programmes and associated projects have been developed through a review of the gaps in developing this draft AMP, issues identified and recorded in the issues register, and the recommendations from the four completed reviews.

Twelve key improvement programmes are the priorities for regional asset management integration work in the next three years. These are described in Table 10.4-1.

Improvement initiatives were identified in the existing AMPs of the legacy councils. An assessment of achievement against the previous plans has not been completed, as these improvements have now been superseded. Achievement against Auckland Transport's single Public Transport AMP is intended, in future, to be formally assessed on an annual basis.

10.5 Three-year improvement projects

The three-year improvement projects are outlined in Table 10.5-1 with the full projects provided in the Appendices.

Table 10.4-1 Key improvement programmes

No.	Key improvement programmes	Description	Priority
1	Levels of service options and costs	Establish investment levels needed for different levels of service options.	Very high
2	Robust optimised decision-making processes	Establish a robust optimised decision making processes for major transport projects.	High
3	Robust renewal programming	Develop robust renewal programmes on a regional basis.	High
4	Asset management risk management processes	Further develop the asset management risk management processes including criticality, vulnerability and resilience requirements.	High
5	LCMP and customer expectation alignment	Establish alignment between lifecycle management plans and customer expectations.	High
6	Condition assessment programme	Complete a condition assessment programme for high risk assets as a priority and implement a routine condition survey programme for all transport assets.	Very high (for high risk assets)
7	Quality of asset data in asset management systems	Improve the quality of asset data in asset management systems such as RAMM and SPM.	High
8	Asset operations and maintenance	Rationalise monitoring and reporting frameworks and operational procedures between internal Auckland Transport groups including clarification of roles and responsibilities.	High
9	Assets ownership	Develop a process to clarify asset ownership issues.	High
10	Sustainability	Develop policies and strategies to promote sustainability through innovative solutions.	Medium
11	Financial planning	Implement a financial planning model to facilitate the development of long-term financial plans.	Medium
12	Asset Management Practice	Complete a formal practice review of Auckland Transport asset management practices.	Medium

Table 10.5-1 Improvement plan summary table

Asset management improvement programme areas	Action	Priority	Completion date	Resources (external only)	Responsibility
Levels of service options and costs	Identify priorities, with feedback from stakeholders, for analysing levels of service options	Very high	Dec 2012	$50,000	Asset Planning and Policy
	Establish investment levels needed for different levels of service options. Understand trade-offs for investment options between different modes (i.e. road versus public transport) and services to achieve a balanced outcome	Very high	Dec 2013	$250,000	Asset Planning and Policy
	Develop a system to report on alternative levels of service options to facilitate decision-making processes	Very high	June 2014	$100,000	Asset Planning and Policy
Robust optimised decision-making processes	Establish a framework for optimised decision-making processes	High	June 2013	$50,000	Asset Planning and Policy
	Develop robust processes for optimised decision making including introducing appropriate tools	High	June 2014	$250,000	Asset Planning and Policy
Robust renewal programming	Establish a framework for developing long-term renewal programmes	High	June 2013	$50,000	Asset Planning and Policy
	Develop robust 10-year renewal programmes for the whole Auckland region. Programme based on condition and performance assessment, work coordination, risk, criticality and acceptable service levels	High	Dec 2014	$200,000	Asset Planning and Policy
Asset management risk management processes	Identify critical assets of the transport network for further risk analysis	High	June 2013	$50,000	Asset Planning and Policy
	Further develop the asset management risk management processes including criticality, vulnerability and resilience requirements. The formal review of the regional transport network is to include assessment against location on Lifeline routes, age, seismic screening, overweight routes, HPMV routes, and load capacity of existing bridges	High	June 2014	$150,000	Asset Planning and Policy
LCMP and customer expectation alignment	Identify customer expectations in relation to the transport services	High	June 2013	$100,000	Asset Planning and Policy
	Establish alignment between lifecycle management plans and customer expectations. Develop a framework for determining long-term needs to reflect customer expectations	High	June 2014	$150,000	Asset Planning and Policy
Condition assessment programme	Complete a condition assessment programme for high-risk road assets including bridges and retaining walls	Very high	Ongoing from July 2012	$300,000	Asset Systems and Monitoring
	Complete a condition assessment programme for high-risk public transport assets including ferry facilities, bus shelters and rail assets	Very high	Ongoing from July 2012	$200,000	Asset Systems and Monitoring
	Implement a routine condition survey programme for all road assets	High	Ongoing from July 2012	$700,000	Asset Systems and Monitoring
	Implement a routine condition survey programme for all public transport assets	High	Ongoing from July 2012	$300,000	Asset Systems and Monitoring
Quality of asset data in AM systems	Improve the quality of road asset data in asset management systems such as RAMM	High	June 2014	$700,000	Asset Systems and Monitoring
	Improve the quality of public transport asset data in asset management systems such as SPM	High	June 2014	$250,000	Asset Systems and Monitoring
Asset operations and maintenance	Rationalise monitoring and reporting frameworks and operational procedures between internal Auckland Transport groups including clarifying roles and responsibilities	High	June 2013	$25,000	Asset Management and Programming
Asset ownership	Develop a process to clarify and agree asset ownership between key stakeholders (Auckland Transport, Auckland Council, KiwiRail, NZTA)	High	June 2013	$50,000	Asset Planning and Policy
Sustainability	Develop policies and strategies that promotes sustainability through innovative solutions	Medium	June 2014	$150,000	Asset Planning and Policy
Financial planning	Implement a robust financial planning model including a new budget structure to facilitate the development of long-term financial plans for the assets network	Medium	June 2013	$200,000	Asset Planning and Policy
Asset management practice	Complete a formal practice review of asset management within Auckland Transport	Medium	Dec 2013	$150,000	Asset Planning and Policy

10.6 Improvement monitoring

Auckland Transport Asset Management Steering Group manages the asset management activity and receives monthly reports. The improvement plan is formally reviewed by this group on a quarterly basis.

Actions are implemented to address issues arising in order to ensure that programmed improvement tasks are delivered.

This plan is a living document and priorities may well change, which makes the review even more important. Table 10.6-1 shows the review activities that will be undertaken.

Table 10.6-1 Monitoring and review of improvement programme

Frequency	Review task	Action	KPI	Report name	Audience
Three yearly	AMP development	Formal adoption of the plan by Auckland Transport's Board	100% achievement	Board AMP report	Board and Audit New Zealand
Annually	AMP peer review	Revise plan annually to incorporate new knowledge from the asset management improvement programme	100% achievement	Internal report	AMP steering group
Three yearly	Formal review	The plan will be formally reviewed three yearly to assess adequacy and effectiveness	100% achievement	External consultant report	AMP steering group, Auckland Transport's Board and Audit New Zealand
Annually	Monitoring and reporting	The KPIs identified in this table will be monitored and reported on annually	100% achievement	Internal KPI report	AMP Steering Group and Auckland Transport's Board
Quarterly	Implementing the improvement programme	Tracking the progress of implementing the improvement programme quarterly, particularly the projects in the short-term improvement programme	100% achievement	Quarterly reports	AMP Steering Group

Glossary of terms

Acronym or Term	Meaning
AADT	Annual Average Daily Traffic
Activity	An activity is the work undertaken on an asset or group of assets to achieve a desired outcome.
Advanced Asset Management	Asset management which employs predictive modelling, risk management and optimised renewal decision making techniques to establish asset lifecycle treatment options and related long term cash flow predictions. (See Basic Asset Management).
AIS	Accident Investigation System
Annual Plan	The Annual Plan provides a statement of the direction of Council and ensures consistency and co-ordination in both making policies and decisions concerning the use of Council resources. It is a reference document for monitoring and measuring performance for the community as well as the Council itself.
Asset	A physical component of a facility which has value, enables services to be provided and has an economic life of greater than 12 months.
Asset Management (AM)	The combination of management, financial, economic, engineering and other practices applied to physical assets with the objective of providing the required level of service in the most cost effective manner.
Asset Management Plan (AMP)	A plan developed for the management of one or more infrastructure assets that combines multi-disciplinary management techniques (including technical and financial) over the lifecycle of the asset in the most cost effective manner to provide a specified level of service. A significant component of the plan is a long term cash flow projection for the activities.
Asset Management Strategy	A strategy for asset management covering, the development and implementation of plans and programmes for asset creation, operation, maintenance, renewal, disposal and performance monitoring to ensure that the desired levels of service and other operational objectives are achieved at optimum cost.
Asset Management System (AMS)	A system (usually computerised) for collecting analysing and reporting data on the utilisation, performance, lifecycle management and funding of existing assets.
Asset Register	A record of asset information considered worthy of separate identification including inventory, historical, financial, condition, construction, technical and financial information.
Auckland Regional Public Transport Plan	Specifies the public transport services for the region and the policies which apply to those services.
Basic Asset Management	Asset management which relies primarily on the use of an asset register, maintenance management systems, job/resource management, inventory control, condition assessment and defined levels of service, in order to establish alternative treatment options and long term cash flow predictions. Priorities are usually established on the basis of financial return gained by carrying out the work (rather than risk analysis and optimised renewal decision making).
Benefit Cost Ratio (B/C)	The sum of the present values of all benefits (including residual value, if any) over a specified period, or the lifecycle of the asset or facility, divided by the sum of the present value of all costs.
Berm	The area of a road reserve between the kerb or surface water channel and property boundary exclusive of footpath.
Business Plan	A plan produced by an organisation (or business units within it) which translate the objectives contained in an Annual Plan into detailed work plans for a particular, or range of, business activities. Activities may include marketing, development, operations, management, personnel, technology and financial planning
Bus Priority Measures	Measures designed to improve the efficiency of scheduled bus services by giving priority to buses over general traffic. Measures include: signal pre-emption at traffic lights, bus lanes, high occupancy vehicle lanes.
Busway	Dedicated bus lanes which run alongside the Northern motorway forms part of the RTN network.
Busway Station	Bus shelter facility located on the Busway.
Capital Expenditure (CAPEX)	Expenditure used to create new assets or to increase the capacity of existing assets beyond their original design capacity or service potential. CAPEX increases the value of an asset.
Carriageway	The portion of road devoted particularly to the use of wheeled vehicles, including shoulders.
Cash Flow	The stream of costs and/or benefits over time resulting from a project investment or ownership of an asset.
CCO	Council Controlled Organisation
Commercial Service	A passenger transport service that is provided on a commercial basis with no subsidy provided.
Condition Monitoring	Continuous or periodic inspection, assessment, measurement and interpretation of resulting data, to indicate the condition of a specific component so as to determine the need for some preventive or remedial action
Contracted Service	A passenger transport service that is contracted and paid for or subsidised.
CORe	Community oriented results and co-ordinated operating requirements
CPP	Competitive Pricing Procedures; procedures for assessing tender prices based on one of three evaluation methods.
Critical Assets	Assets for which the financial, business or service level consequences of failure are sufficiently severe to justify proactive inspection and rehabilitation. Critical assets have a lower threshold for action than non-critical assets.
Current Replacement Cost	The cost of replacing the service potential of an existing asset, by reference to some measure of capacity, with an appropriate modern equivalent asset.
Deferred Maintenance	The shortfall in rehabilitation work required to maintain the service potential of an asset.
DMUs	Diesel multiple units includes a locomotive train and a series of carriages.
Demand Management	The active intervention in the market to influence demand for services and assets with forecast consequences, usually to avoid or defer CAPEX expenditure. Demand management is based on the notion that as needs are satisfied expectations rise automatically and almost every action taken to satisfy demand will stimulate further demand.
Depreciated Replacement Cost (DRC)	The replacement cost of an existing asset after deducting an allowance for wear or consumption to reflect the remaining economic life of the existing asset.

Acronym or Term	Meaning
Depreciation	The wearing out, consumption or other loss of value of an asset whether arising from use, passing of time or obsolescence through technological and market changes. It is accounted for by the allocation of the historical cost (or revalued amount) of the asset less its residual value over its useful life.
Design Life	The theoretical life of an asset assumed in its design.
Disposal	Activities necessary to dispose of decommissioned assets.
dTIMS	A predictive modelling system used to project future asset condition, network treatment and budget needs, it provides a long term economic or performance based analysis.
Economic Life	The period from the acquisition of the asset to the time when the asset, while physically able to provide a service, ceases to be the lowest cost alternative to satisfy a particular level of service. The economic life is at the maximum when equal to the physical life however obsolescence will often ensure that the economic life is less than the physical life.
EMUs	Electromotive units
Facility	A complex comprising many assets (e.g. a hospital, water treatment plant, recreation complex, etc.) which represents a single management unit for financial, operational, maintenance or other purposes.
Geographic Information System (GIS)	Software that provides a means of spatially viewing, searching, manipulating, and analysing an electronic database.
GPS	Government Policy Statement
HOP card	Name given to Auckland's smartcard ticketing system that can be used to pay for public transport.
Infrastructure Assets	Stationary systems forming a network and serving whole communities, where the system as a whole is intended to be maintained indefinitely at a particular level of service potential by the continued replacement and refurbishment of its components. The network may include normally recognised 'ordinary' assets as components.
Integrated Ticketing	The ability to use one ticket across different modes of transport.
Kaitiakitanga	A practice of guardianship and resource management that includes social and environmental dimensions.
KPI	Key performance indicator
KRA	Key result area
Local Connector Network (LCN)	Term used to describe one of four different layers of the network hierarchy. The local connector networks provide access to local centres and connect with the RTN and/or the QTN.
Level Of Service (LOS)	The defined service quality for a particular activity or service area (i.e. interior) against which service performance may be measured. Service levels usually relate to quality, quantity, reliability, responsiveness, regulatory & environmental acceptability and cost.
LGA	Local Government Act 2002
LID	Low impact design
Life	A measure of the anticipated life of an asset or component; such as time, number of cycles, distance intervals etc.
Lifecycle	Lifecycle has two meanings: a) The cycle of activities that an asset (or facility) goes through while it retains an identity as a particular asset, i.e., from planning and design to decommissioning or disposal. b) The period of time between a selected date and the last year over which the criteria (e.g. costs) relating to a decision or alternative under study will be assessed
Lifecycle Cost	The total cost of an asset throughout its life including planning, design, construction, acquisition, operation, maintenance, rehabilitation and disposal costs.
LTCCP	Long Term Council Community Plan (as required by the Local Government Act 2002). The NSCC LTCCP is known as the City Plan.
LTMA	Land Transport Management Act 2003
Maintenance	All actions necessary for retaining an asset as near as practicable to its original condition, but excluding rehabilitation or renewal.
Mauri	Lifeforce
MAXX	Brand name which has been adopted for public transport in the Auckland region.
NLTF	National Land Transport Fund
NLTP	National Land Transport Programme
NZTA	New Zealand Transport Agency
Objective	An objective is a general statement of intention relating to a specific output or activity. They are generally longer-term aims and are not necessarily outcomes that managers can control.
Operation	The active process of utilising an asset that will consume resources such as manpower, energy, cleaning products and materials. Operation costs are part of the lifecycle costs of an asset.
Optimised Decision Making (ODM)	An optimisation process for considering and prioritising all options to rectify performance failures of assets. The process encompasses net present value analysis and risk assessment.
Park n Ride	A service that allows people to park their person vehicle and catch a public transport service.
PCB's	Polychlorinated Biphenols; toxic substances found in some electrical components.
Performance Measure	A qualitative or quantitative measure of a service or activity used to compare actual performance against a standard or other target. Performance indicators commonly relate to statutory limits, safety, responsiveness, cost, comfort, asset performance, reliability, efficiency, environmental protection and customer satisfaction.
Performance Monitoring	Continuous or periodic quantitative and qualitative assessments of the actual performance compared with specific objectives, targets or standards.
Physical Life	The actual life of an asset.

Acronym or Term	Meaning
Planned Maintenance	Planned maintenance activities fall into 3 categories : (a) Periodic - necessary to ensure the reliability or sustain the design life of an asset. (b) Predictive- condition monitoring activities used to predict failure. (c) Preventive- maintenance that can be initiated without routine or continuous checking (e.g. using information contained in maintenance manuals or manufacturers' recommendations) and is not condition-based.
PT	Public transport
PTMA	Public Transport Management Act 2008
PTNP	Public Transport Network Plan ten year plan centring on developing infrastructure and services for the Auckland region.
QTN	Term used to describe one of four different layers of the network hierarchy. The quality transit network provides fast, high frequency transit services between key centres and over major corridors.
RAMM	Road Assessment and Maintenance Management system; Roading AMS, developed as an asset inventory and treatment selection tool.
Rehabilitation	Works to rebuild or replace parts or components of an asset, to restore it to a required functional condition and extend its life, which may incorporate some modification. Generally involves repairing the asset using available techniques and standards to deliver its original level of service (i.e. re roofing, replacing doors etc.) without resorting to significant upgrading or replacement.
Renewal	Works to upgrade, refurbish, rehabilitate or replace existing facilities with facilities of equivalent capacity or performance capability.
Repair	Action to restore an item to its previous condition after failure or damage.
Replacement	The complete replacement of an asset that has reached the end of its life, so as to provide a similar or agreed alternative, level of service.
Replacement Value	The prevailing market cost of supply and installation of an asset delivering an equivalent service, making no allowance for depreciation of the asset.
Risk Management	The application of a formal process to the range of possible values relating to key factors associated with a risk in order to determine the resultant ranges of outcomes and their probability of occurrence.
RLTS	Regional Land Transport Strategy
RMA	Resource Management Act 1991
RMM	Road Maintenance Management
Routine Maintenance	Day to day operational activities to keep the asset operating (replacement of light bulbs, flushing of pipes, repairing leaks, etc.) and which form part of the annual operating budget, including preventative maintenance.
RRPM	Raised Reflectorised Pavement Marker
RTIS	Real time information systems
Rapid Transit Network (RTN)	Term used to describe one of four different layers of the network hierarchy. The rapid transit network provides high quality, fast, high frequency service on its own right of way where it is unaffected by traffic congestion. The RTN connects major growth centres with the CBD.
Service Potential	The total future service capacity of an asset. It is normally determined by reference to the operating capacity and economic life of an asset.
SLIMS	A street lighting information management system, this is a module of the RAMM System
SOI	Statement of Intent
Standards	Standards which detail the roading materials and practices that are approved for use within the District. Physical details for items such as typical metal depths, carriageway widths and cross sectional shape are contained in Council's Engineering Standards.
Strategic Plan	Strategic planning involves making decisions about the long term goals and strategies of an organisation. Strategic plans have a strong external focus, cover major portions of the organisation and identify major targets, actions and resource allocations relating to the long term survival, value and growth of the organisation.
Structure Maintenance	Maintenance of the physical items associated with prolonging the life of the road pavement or road surfacing. It includes pavement patching, shoulder maintenance, grading, maintenance and repair of drainage facilities, periodic re-metalling of unsealed roads (up to 50mm) and repair of kerb and channel.
Sumps	Stormwater catchpits
Targeted Services	Term used to describe one of four different layers of the network hierarchy. Targeted sservices provide transport for groups whose needs are not met by the regular passenger transport network.
Te Ao Maori	The Maori worldview
Traffic Volume	The number of vehicles flowing in both directions past a particular point in a given time (usually measured in vehicles per hour (vph) or vehicles per day).
Transit	Transit New Zealand, the national road controlling authority for State Highways throughout New Zealand
Unplanned Maintenance	Corrective work required in the short term to restore an asset to working condition so it can continue to deliver the required service or to maintain its level of security and integrity.
Upgrading	The replacement of an asset or addition/ replacement of an asset component which materially improves the original service potential of the asset.
User Cost	Cost borne by the travelling public when using the roading network.
Valuation	Estimated asset value which may depend on the purpose for which the valuation is required, i.e. replacement value for determining maintenance levels or market value for lifecycle costing.
Vehicle Crossing	A formed area for vehicles to cross the road channel and footpath.
WSUD	Water sensitive urban design

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