Transit New Zealand
ITS Strategy 2004
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# Table of Contents

1. Intelligent Transport Systems Defined ........................................ 3
2. ITS in Support of the New Zealand Transport Strategy & Land Transport Management Act ........................................ 5
3. The Need for a Transit New Zealand ITS Strategy ......................... 9
4. The Objectives of Transit's ITS Strategy .................................. 10
5. Who the Strategy is Aimed at .................................................. 11
6. Key Functional Areas For Transit ........................................... 12
7. Interagency Cooperation ....................................................... 20
8. Transit's National ITS Framework ........................................ 21

Appendix 1 – Regional ITS Deployment [Separate Document]
   Appendix 1.1 Priority Summary
   Appendix 1.2 Glossary of Terms

Appendix 2 – Who the Strategy is Aimed at ................................ 25

Appendix 3 – NZTS Objectives .................................................. 29
1 Intelligent Transport Systems Defined

1.1 What is ITS?

Intelligent Transportation Systems (ITS) describes the integrated application of advanced information, electronic, communications, and other technologies to the management and operation of surface transportation systems. Examples include:

- motorway monitoring
- incident management
- traffic information
- computerised traffic signals
- variable message signs
- electronic tolls and road user charging
- freight and public transport fleet management
- in-vehicle systems such as collision avoidance, cruise control, trip planning and emergency notification

The International Standards Organisation (ISO) technical committee for Intelligent Transport Systems describes the field of ITS as:

“The application of information technology, communications technology, and sensor technology, including the Internet (both wired and wireless), to the general challenges and opportunities of surface transportation.”

The objective of ITS products and services are to:

- Improve travel safety, reliability, and convenience, increase mobility, mitigate traffic congestion, and reduce fuel consumption and emissions
- More effectively manage the transportation infrastructure, better control and operate private vehicles, public transport, and commercial vehicles
- Improve the quality and availability of information for users and providers of the transportation system
- Improve the ability to readily use the same products and services in many different places and environments.

1.2 What does ITS do?

Building new transportation infrastructure is expensive and environmentally risky. In most urban areas where traffic capacity is limited, it is becoming increasingly difficult to build new roads or increase physical capacity to meet transportation demand.

By applying the latest technological advancements to the transportation system, ITS can help meet increasing demand for transportation by improving the quality, safety, and effective capacity of existing infrastructure.

It is generally recognised from overseas experience that the full benefits of ITS will come, not from isolated projects, but from having a framework that supports and encourages the integrated deployment of ITS. This framework will not impede the continuing development of ITS, but encourage new ideas and developments beyond current perceptions.
1.3 How and why is Transit involved?
Transit New Zealand is responsible for the development, maintenance and operation of the national state highway system. It has already implemented a number of ITS projects across the country led mainly by the Advanced Traffic Management Systems (ATMS) projects in Auckland and Wellington.

Examples of the types of ITS facilities that can contribute to Transit’s goals in the future include:

- Improved road safety through warning systems (Variable Message Signs, Ice warnings etc)
- Future interaction with developing intelligent vehicle systems (collision avoidance etc)
- Emergency incident identification and management systems to:
  - achieve more rapid and appropriate response
  - reduce secondary accidents
  - deploy assistance more quickly to casualties
  - clear incidents more quickly
  - return traffic flows to normal
- Advanced traffic management systems to improve efficiency of traffic flow
- Route guidance systems to optimise traffic flow and journey times
- Providing travellers with accurate and timely information on road and traffic conditions
- Improved scope and quality of road asset information.

To ensure that Transit develops its ITS projects and initiatives in an effective and cost efficient way it is essential that the various systems are implemented as part of a coordinated strategy, with appropriate consideration of national consistency, future integration opportunities and technological advances.

To achieve this Transit has developed a National ITS Strategy, setting out the objectives as well as an ITS framework. This structure includes a National ITS Architecture and Standards framework set to be used in all state highway ITS projects, as well as appropriate operations systems and protocols.
2 ITS in Support of the New Zealand Transport Strategy & Land Transport Management Act

2.1 Introduction

The New Zealand Transport Strategy (NZTS) released in December 2002 sets out the Government’s overall vision for Transport.

“By 2010 New Zealand will have an affordable, integrated, safe and sustainable transport system”

This vision is underpinned by four principles and five objectives\(^1\) relating to:

Principles
- Sustainability
- Integration
- Safety
- Responsiveness

Objectives
- Economic Development
- Safety and Personal Security
- Access and Mobility
- Public Health
- Environmental Sustainability.

In support of the NZTS principles, the Land Transport Management Act 2003 (LTMA) states, “The objective of Transit New Zealand is to operate the state highway system in a way that contributes to an integrated, safe, responsive, and sustainable land transport system.”

The purpose of this ITS Strategy is to demonstrate how Transit New Zealand will apply ITS to the management of the state highway network to help achieve the NZTS and LTMA objectives.

ITS is defined\(^2\) as the application of information technology, communications technology, and sensor technology, including the Internet, to the general challenges and opportunities of surface transportation.

The primary focus of ITS for Transit New Zealand is the management of traffic and traffic demand on the state highway system. This is having increasing relevance as the more efficient use of the existing road network can delay or negate the need for new infrastructure.

Transit’s intended use of ITS in support of the NZTS and LTMA principles and objectives is described below.

2.2 LTMA Principle 1: Sustainability

ITS can play a major role in promoting and ensuring the sustainability of transport infrastructure. Through a range of means ITS can facilitate the more efficient use of existing infrastructure; regulate and control demand; encourage and facilitate the use of alternative modes; and manage congestion and its effects.

Key demand management tools such as electronic tolling, traveller information and access control are all ITS based, and are at the core of the demand management solutions that support transport infrastructure sustainability. Further, through the more efficient management of traffic on existing roads, ITS facilities can delay or negate the need for new infrastructure adding to the sustainability of all transport infrastructure.

2.3 LTMA Principle 2: Integration

ITS can play a major role in promoting and facilitating an integrated transport system, particularly in congested urban areas such as Auckland. Through a range of means ITS can facilitate more efficient interoperability between modes; coordination across and between modes; and encourage and facilitate the use of public transport and other alternatives.

ITS tools such as integrated ticketing, electronic charging systems, traveller information services, integrated traffic management and bus priority all support transport systems integration by facilitating a coordinated transport system with seamless mode interfaces; allowing for optimisation of the transport system across all modes.

The development of multi modal ITS systems architecture, consistent standards, operating procedures and protocols are fundamental elements of good ITS Strategy and have a major role to play in ensuring system interoperability.

\(^1\) See Appendix 3 for a more detailed definition

\(^2\) The International Standards Organisation technical committee for Intelligent Transport Systems
2.4 LTMA Principle 3: Safety

ITS can play a major role in promoting safe behaviours through a mixture of education and enforcement techniques. ITS in the form of hazard detection and warning systems, variable speed limits, speed enforcement, access control and tunnel safety systems already contribute to improving the safety of the state highway network in New Zealand. These types of systems will continue to expand in both coverage and capability. Following overseas trends, will begin to integrate with more advanced vehicle-based devices such as collision avoidance, automated speed limiters, driver monitoring systems and other road-vehicle interaction systems.

2.5 LTMA Principle 4: Responsiveness

ITS in its various forms has the potential to provide a wide range of innovative solutions to specific regional issues and problems. To facilitate effective use of these tools good ITS strategy is needed to focus on the specific needs and issues of individual regions, and provide a structure within which the diverse needs of urban and rural communities can be effectively targeted.

ITS strategy also provides a structure within which appropriate responses to those needs can be identified and pursued; identifies issues that are similar across other regions; and develops coordinated solutions that provide benefits from economies of scale.

The development of open and flexible architectures and standards will also lead to improved freedom to respond to specific regional needs within a reliable and cost-effective support structure.

2.6 NZTS Objective 1: Economic Development

The main issue that ITS can address in this area is congestion relief; in this context meaning both regularly occurring peak period traffic congestion, or congestion resulting from unplanned incidents such as accidents and breakdowns.

Congestion is increasing in most urban areas of New Zealand causing cumulative delays that result in significant economic, social and environmental impacts.
2.6.1 How ITS Will Assist

**Demand Management**

A major application of ITS in managing traffic on urban networks is demand management. ITS can be used to manage traffic demand through a range of active and passive means including:

- Charging vehicles electronically entering congested areas; and potentially varying rates dependent on purpose and time of day.
- Controlling access to the motorway network through on-ramp controls
- Encouraging the use of alternative routes by diverting traffic away from congested areas and advising on alternative routes
- Informing travellers at all stages of their journey; providing information to homes, workplaces, and travellers already in their vehicles in order to improve their ability to make alternative transport choices.

This is a major focus for Transit, particularly in Auckland, and supported by the recent LTMA legislation, the National Tolls Administration Project [NTAP] is being developed to support future deployment of these types of systems.

**Tidal Flow**

In conjunction with other equipment, ITS can be used to increase the capacity of urban motorways at peak times by changing the direction of flow of some lanes.

**Incident Management**

ITS in the form of cameras, emergency telephones and other specialist detection equipment on urban motorways, can enable operators in the traffic management centre to quickly detect any incident; providing for a swift and appropriate response, and so a more rapid return to full capacity conditions.

ITS also assists in diverting traffic away from the site of an incident, warning other drivers, and suggesting alternative routes. At the same time, traffic signals are coordinated to increase the capacity of the alternative routes to deal with the extra vehicles.

2.7 Objective 2: Safety and Personal Security

The Government’s Road Safety to 2010 strategy sets a target of no more than 300 fatalities and 4,500 hospitalisations per annum by 2010.

Reducing the rate of fatal and personal injury accidents on the state highway system is a major focus for Transit New Zealand.

2.7.1 How ITS Will Assist

**Safety Education and Enforcement**

Safe behaviours can be encouraged through a mixture of education and enforcement techniques.

- The techniques include variable speed limits or advisory speeds using smart electronic speed signs; where congestion, incidents or adverse road conditions require reduced speed on a regular basis.
- Smart signs can also be targeted at specific types of vehicle, for example heavy trucks approaching a curve too quickly.
- Electronic signs installed for other purposes can be used to issue safety messages.
- ITS can be used in rural and alpine areas for hazard warning, in particular snow and ice, avalanche danger, rock falls, wind or flooding.
- ITS Tunnel Safety systems monitor internal conditions and trigger responses such as fire sprinkler systems or increased ventilation.
- Personal security on the state highway network is being increasingly enhanced as more cameras and emergency roadside phones are installed.

2.8 Objective 3: Access and Mobility

Traffic congestion, either in the form of recurring peak delays or unplanned incidents and emergency works, has a major impact on access and mobility for those using urban state highways for local or longer distance travel.

Outside of these areas, snow, ice, flooding, rock falls, slips and high winds are the main causes of route closures, and are particularly common in areas such as the Desert Road and alpine passes.
2.8.1 How ITS Will Assist

**Congestion**

As described in 2.6.1 above there is a range of ITS measures that can assist with improving both the level and impact of congestion in urban areas.

**Advance Warning**

For other areas ITS, in the form of remote weather stations, thermal mapping and other forms of condition monitoring systems, can provide early warnings of adverse conditions. Timely mitigation measures can be implemented such as laying grit on ice-affected areas, or early advice to travellers of a closure so that they can divert or retime their journey.

**Traveller Feedback**

Feedback on conditions, particularly in rural areas, can also be facilitated via an 0800 Transit number and specialist communications for maintenance contractors where cell phone coverage is limited.

**Traveller Experience**

The ITS facilities that provide information via cell phone, email and web on incidents and conditions can also be used to indicate alternative more scenic routes, local attractions, and rest stops. These will enhance the travellers’ experience of the state highway system and reduce driver fatigue.

2.9 Objective 4: Public Health

Three out of every four trips in New Zealand are by motor vehicle. One-third of all household trips are less than two kilometres and two-thirds of all trips are less than six kilometres. Cycling accounts for around only two percent of travel trips while walking accounts for 20 percent of all household travel trips.

2.9.1 How ITS Will Assist

**Walking and Cycling**

By providing reliable information on road conditions and alternatives, ITS can assist in promoting the use of alternatives such as walking, cycling and public transport. Examples of applications in this area include CCTV security monitoring of cycle and walkways, specifically designed traffic signals at cycleway crossings and VMS on congested routes used to display current travel times on public transport and cycleways. These are aimed at promoting the use of alternatives.

2.10 Objective 5: Environmental Sustainability

Domestic transport contributes 42 percent of total carbon dioxide emissions and accounts for 40 percent of the country’s total energy use. Transport energy demand has continued to grow at an average of 3.6 percent each year over the period 1991 – 2000. The approximate 30 million litres of used oil from transport forms New Zealand’s largest non-aqueous liquid waste stream.

2.10.1 How ITS Will Assist

ITS can assist environmental sustainability objectives by encouraging the use of alternative, less impacting transport modes. As described above, ITS can also be used to better manage bus and high occupancy vehicle lanes, provide priority for buses at signal controlled intersections, track public transport vehicles and so improve the delivery of accurate schedule information to bus passengers.

A major focus for ITS is the management of congestion, and as detailed in 2.6.1 above there is a range of applications that target this issue. The effective management of congestion also has a positive effect in the environmental sustainability field from a number of areas.

- The more efficient management of traffic on existing roads can delay or negate the need for new infrastructure
- Reduced congestion leads to reduced vehicle emissions, as vehicles run more efficiently.

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3 Source: New Zealand Transport Strategy, December 2002
The Need for a Transit New Zealand ITS Strategy

If ITS technology is to be developed in an effective and cost efficient way for the state highway network, it is essential that the various systems implemented are targeted at well defined needs, have the ability to ‘talk’ to one another, and are implemented as part of a coordinated strategy.

As Transit continues to progress with the development and implementation of ITS solutions on the state highway network, this issue will be addressed with a coordinated national ITS strategy. It will provide a closer connection to the NZTS, and a framework of national architecture, standards and protocols. Implemented effectively, this strategy will deliver:

- Uniformity in effective delivery of efficient state highway use/management
- Reduced risk of inappropriate or ineffective solutions
- Assistance and support to the effective promotion of the capabilities of ITS
- An environment which encourages other stakeholders / parties to develop complementary systems
- Effective and coordinated solutions targeted at real needs
- Benefits from the synergy between various ITS facilities
- Established and appropriate priorities for ITS initiatives.
The principal purpose of the Transit New Zealand ITS Strategy is:

“to optimise the application of ITS to support the principles, objectives and targets of the New Zealand Transport Strategy, Land Transport Management Act and Transit’s National State Highway Strategy.”

In order to achieve this purpose, eight specific objectives have been developed which state that the Transit New Zealand ITS Strategy should:

| Objective 1: | Identify trends and current opportunities for state highways from ITS internationally |
| Objective 2: | Establish Transit’s roles and responsibilities with respect to ITS and a process for periodic review |
| Objective 3: | Identify a process to pursue the benefits of ITS technologies on the strategies and objectives of Transit |
| Objective 4: | Ensure Transit’s ITS initiatives recognise the needs of the wider transportation sector |
| Objective 5: | Provide the framework for development and review of appropriate standards |
| Objective 6: | Develop an implementation and asset management plan for the co-ordinated application of ITS to state highways |
| Objective 7: | Provide and disseminate information to the community and stakeholders |
| Objective 8: | Measure and meet the reasonable needs, attitudes and expectations of the community, stakeholders and road users. |
11

Transit New Zealand ITS Strategy 2004

Who the Strategy is Aimed at

The Transit New Zealand ITS Strategy has been developed to meet the varied needs of a wide range of stakeholders.

Its primary purpose is to provide a structured approach to the development and deployment of ITS technologies to the state highway network and to enhance the operations of Transit in the management of that network.

However, the strategy also has a role to play in the business of a number of stakeholders, including:

- Minister of Transport
- Ministry of Transport
- Transit
- Transfund
- Land Transport Safety Authority
- Consultants and Contractors
- Local Government
- Police / Emergency Services
- Community interest groups
- Media
- Public Transport Providers
- Commercial 3rd Party Users
- Road Users and Road User organisations [e.g. NZAA]
- Commercial Vehicle Industry

Further details of the specific issues for each stakeholder are set out in Appendix 2.
6 Key Functional Areas For Transit

6.1 Advanced Traveller Information Systems (ATIS)

6.1.1 ATIS Strategy
Currently, Transit’s use of ATIS is limited to the ATMS facilities in Auckland and Wellington, isolated variable message signs at other strategic locations, a pilot 0800 contact centre and a traffic conditions website in Auckland.

These are used to relay information on current traffic conditions, incidents and scheduled works, and to date, have developed relatively independently.

The Auckland and Wellington ATMS are currently the two principal means at Transit’s disposal to deliver “real time” information to road users.

The source of the information being delivered thus far is primarily operational traffic information drawn from the existing systems. However, a key element of Transit’s ATIS strategy involves the development of reliable sources of quality information and delivery systems.

6.1.2 Objectives
Drawing on lessons learned from international research, Transit New Zealand has developed an ATIS strategy based on a range of user categories. This strategy provides:

• Direction on the results sought from the use of these systems, what information can best achieve these results and in what format
• A programme for the collection of appropriate information with respect to time, accuracy, relevance, cost and value
• A structure for appropriate delivery systems
• A framework for the collection, management and delivery of quality information to travellers that will improve highway efficiency and safety.

6.1.3 Process
In the ATIS area, Transit is progressing with the staged implementation of the programme set out in the ATIS strategy. This incorporates a range of delivery media and source information designed to suit regional needs.

6.1.4 Research
Current research in this area is being undertaken both in New Zealand and overseas. Transit will continue reviewing overseas research and experience, and is currently involved in research into traveller information, needs, expectations and systems.
6.2 Urban ITS

6.2.1 Transit Application

Existing urban traffic control and ATMS facilities demonstrate the viability of urban ITS technologies, such as traffic management operations, incident detection and monitoring, traffic signal control, and traveller information.

In Auckland and Wellington, Transit is leading the integration of urban ITS facilities and operations to achieve greater improvements in the coordinated management of traffic.

6.2.2 Objectives

Nationally, the integration of operations and systems is a key objective to provide efficiencies and backup. A network of regional centres is favoured over one central facility. Reasons for this include:

- The need for backup systems
- The need for regional focus and priorities
- Opportunities for integration with other regional systems.

Transit’s key objectives in urban areas include:

- The expansion of ATMS systems, both existing and new to improve the management of motorway and urban traffic
- Integration of systems to better coordinate traffic management initiatives
- Development of delivery systems for advanced traveller information
- Further development of tunnel management systems.

6.2.3 Process

Integration will be facilitated through the use of a Transit national ITS architecture and related standards.

As part of this process, regional stakeholder bases will be broadened to include non-traditional stakeholders, such as emergency management personnel and the travel and tourism industry. This will lead to:

- Routine consideration of ITS as part of the transportation planning process
- Encouraging regions to link their urban ITS development activities and architectures with a national plan and architecture.

6.2.4 Research

Transit will continue to monitor and promote current research being undertaken both in New Zealand and overseas. Specific areas of interest are:

- The development of next generation traffic signal control systems
- Enhancement of ATMS
- Next generation traffic modelling techniques and systems
- Electronic charging systems.

Major current efforts in urban ITS research are focused on dynamic control systems that predict traffic conditions in real time. These systems help to estimate and predict the status of urban traffic networks and provide for more proactive traffic management.

Current research is also focused on human factors to support the design and day-to-day operations of traffic management centres, driver response to new technologies and traveller information.
6.3 Public Transport Services

6.3.1 New Zealand Application
Current road-based public transport ITS in New Zealand comprises isolated bus tracking and information systems, some linked to traffic signal coordination.

6.3.2 Objectives
In the public transport ITS area Transit’s focus is:
- The development of the Northern Busway
- Improving integration with existing and developing public transport systems
- Improving information sharing between systems and those that monitor and manage traffic flow
- Improving road-based public transport efficiency by facilitating optimum use of the road network
- Utilising opportunities to improve the collection and quality of road-use data.

6.4 Rural & Regional ITS

6.4.1 Transit Application
The extent of the current rural ITS infrastructure in New Zealand is limited to a number of weather monitoring, traffic counting and weight monitoring systems on rural state highways.

The areas in which rural ITS is expected to develop in New Zealand include:
- Weather and hazard monitoring of “at risk” strategic routes
- Interaction with Emergency Services

Although none currently operate on state highways, the development of these systems around New Zealand is progressing and will inevitably expand onto the state highway network in the near future. As with commercial vehicle systems, Global Positioning Systems (GPS) is a key element in many such applications.

6.4.2 Objectives
The rural ITS strategy is focused on encouraging widespread integrated deployment of rural ITS technologies that assist in reducing fatalities and crashes, and increasing the accessibility and efficiency of transportation in rural areas.

Work in this area is focused on understanding which rural ITS services are most useful, how best to integrate them, and how to develop rural applications that can integrate with the larger urban systems.

6.4.3 Process
The rural strategy is focused on:
- developing and expanding existing systems
- developing better identification of needs through consultation with wider-focused groups
- integration of existing isolated systems, to increase the value of these systems and enhance the overall usefulness.
6.5 Electronic Toll Systems

6.5.1 Transit Application

As set out in the Land Transport Management Act, the Government is committed to the development of tolling for new roads. Further development of proposals for electronic Road User Charging (e-RUC) is also progressing, as are examinations of the feasibility and desirability of the pricing of existing roads.

A key issue in all of these will be the development of compatible, appropriate technology and management systems that facilitate future integration.

Transit New Zealand is likely to be one of the first to deploy electronic tolling on a significant scale on projects such as ALPURT B2, north of Auckland. As such, Transit will be closely involved in the development of a national toll systems framework to be led by the Ministry of Transport (MOT).

6.5.2 Objectives

There is a range of technologies developing in this field, as well as several business model structures that will need to be considered.

Transit’s key objectives in this area include:

- Maximising alignment with other ITS facilities, particularly those used in the management of the state highway
- Optimising benefits from synergies between systems
- Reducing duplication of costs, and
- Harnessing the opportunities of future interoperability.

6.5.3 Process

Transit will take an active role in assisting MOT with the development of a national toll systems structure and seek to maximise the opportunities for alignment with Transit’s national ITS architecture and standards framework.

6.5.4 Research

Transit will continue to monitor and promote current research being undertaken both in New Zealand and overseas. Specific areas of interest are:

- Electronic charging systems technology
- Interoperability with in-vehicle devices and traveller information systems
- Enhancement of ATMS through improved information sources that toll systems will provide.

6.6 Commercial Vehicle ITS

6.6.1 New Zealand Application

Current commercial vehicle ITS in New Zealand comprises isolated fleets equipped with GPS, used to track vehicles for the operator’s own commercial purposes.

GPS provides the key system element, allowing tracking of commercial vehicle locations for fleet management purposes. With on-board computing and short-range communications, these systems can provide for exchange of information between the vehicle and central management systems.
These systems can provide information exchange facilities related to recent trip information and schedules, truck status (e.g., engine status, odometer reading, etc.), driver information (e.g., identification, time behind the wheel, etc.), instant billing, and cargo manifests. There are also some GPS based systems that offer theft recovery and mayday functions.

6.6.2 Objectives
In the commercial vehicle area Transit’s ITS Strategy is focused on:

- Improving road safety for road users and the community in general by providing enhanced compliance with both general and specific operating conditions
- Improving road transport productivity by facilitating optimum use of the road network
- Improving methods of collection and quality of road use data
- Improving incident management and hazardous loads tracking

6.6.3 Process
The Ministry of Transport’s e-RUC project provides an opportunity for New Zealand to make advances in this area.

There are also a number of areas where alignment between this project and developing electronic toll technologies will be necessary, as referred to in 6.5.

The main focus of e-RUC is heavy vehicles but, as with many such initiatives, there is every likelihood that the infrastructure and systems developed for this project will form the basis for future expansion to a wider road user market.

6.7 Enforcement

As this technology advances, the potential to introduce smarter systems to enforce variable speed limits, toll systems, weight, dimension and height restrictions will increase and an appropriate strategic approach will assist this development, in partnership with key agencies and stakeholders.

6.7.2 Objectives
In the enforcement area, Transit’s ITS Strategy is focused on improving integration with existing and developing systems, and close cooperation with Police and other agencies. Such cooperation will minimise the risk to the state highway asset and road users.

6.7.1 New Zealand Application
Current ITS based enforcement systems are limited in New Zealand, comprising isolated fixed speed and red light cameras, weight enforcement and over-height detection.
6.8 Intelligent Vehicles and Safety

- Collision avoidance
- Vision enhancement
- Vehicle stability
- Driver condition warning
- Vehicle/highway interaction

6.8.1 New Zealand Application

In New Zealand currently there is little direct interaction between in-vehicle systems and existing ITS facilities. Although the development of these systems and vehicles is being led from overseas, these vehicles and technologies are beginning to arrive in New Zealand from Japan, Europe and the USA. It is therefore desirable to maintain a clear view of how these technologies are developing and to consider how they might interact with current developing ITS infrastructure.

Developments in the intelligent vehicle area overseas include:
- Rear-End Collision Avoidance
- Lane Change and Merge Collision Avoidance
- Road Departure Collision Avoidance
- Intersection Collision Avoidance
- Vision Enhancement
- Vehicle Stability
- Driver Condition Warning and Safety Impacting Services.

6.8.2 Objectives

From Transit’s perspective, the ongoing developments in intelligent vehicle technologies represent an important guide to future ITS infrastructure needs and opportunities. With the rapid advances in technologies in all areas of society it is important to monitor closely the future direction of these technologies to protect against investing in potentially redundant systems, as well as to benefit from the opportunities.

Transit’s objectives in this area are to work cooperatively with industry to advance the development and deployment of safety-enhancing intelligent vehicle technologies.

A further key issue for Transit and other agencies is how the introduction of cellular telephones and traveller information systems into vehicles may further increase a driver’s workload and may cause distraction.

Transit is also continually monitoring the linkages with intelligent infrastructure technologies, including roadway-based enhancements to crash-avoidance technologies.

Transit’s objectives in this area are to provide leadership, expertise, resources, and information to promote the development and adoption of these systems in New Zealand.

6.9 Telemetry and Weigh in Motion

- Increased function
- Increased coverage
- Increased integration

6.9.1 Transit Application

Transit has undertaken a review of its telemetry and weigh-in motion network with a view to expanding coverage and capability.

The existing network is primarily used for traffic counting and classification. This review investigated the information needs of Transit surrounding its current telemetry system as well as how this may be used to deliver further benefits to Transit’s network management.

The review highlighted a range of information needs, the timeframes for information delivery, the capability of existing infrastructure, and the benefits of providing more and better information for asset management and to the road user.
These include:

- Improved use of WIM for asset management and environment
- Roadside weather information at more locations to understand weather effects on pavement deterioration and safety
- Opportunities to direct more and better information to road users, providing guidance on the best use of the road network
- Support for environmental requirements such as possible future environmental monitoring of surface run-off and pavement elements.

6.9.2 Objectives

Transit’s existing telemetry network was built solely for the purpose of traffic vehicle counts and some weigh-in motion data collection and as such is not geared specifically for these newer, more demanding information collection requirements.

Changing the current communications to a more flexible platform will provide Transit with the ability to collect this wider variety of information types as well as report them to the appropriate stakeholders within the timeframes they require.

The current stage 2 assessment includes an in-depth evaluation of the costs and economic benefits, leading to a business case and development and programme for development.

6.10 Data Systems and Use

The focus of ITS on the efficient use of transportation networks and services is dependent on operational data that are collected and made available for immediate use. However, if such data were archived and made available in a usable format, it would also be valuable for purposes such as transportation policy, planning, safety analyses, programme assessment, research, and related activities. A wide range of stakeholders may potentially benefit from data generated by ITS, that may be used for:

- Urban and regional transportation planning
- Transportation system monitoring
- Safety analysis
- Air quality analysis
- Commercial vehicle operations
- Design, construction, and maintenance

6.10.1 Transit’s Objectives

As the lead road controlling authority in New Zealand, Transit is taking a leading role in developing this area of ITS. Current Transit systems such as the Traffic Monitoring System (TMS) and Location Referencing Management System (LRMS) are setting good basic foundations that can be built on to achieve successful implementation.

The direct involvement of Transit in research, testing, training, and deployment will promote further development and use in this area.

Successful implementation will require clear definition of a number of issues, including:

- System access
- Ownership
- Data quality
- Data management
- Data and communications standards
- Privacy concerns
- Data analysis
• Coordination with other data collection efforts
• Liability
• Confidentiality of privately collected data
• Incremental and uncoordinated ITS deployments
• Retrofitting versus new development of systems
• Training and outreach, and
• Development, operating, and maintenance costs.

To help guide progress in this area, a framework has been developed, structured around needs-driven early design. Objectives here include:

• Integrating with Transit’s national ITS architecture
• Incorporating key principles and concepts into ongoing standards development
• Focusing on coordination with other developing systems as ITS develops
• Deployment of data systems as part of routine ITS projects.

6.11 National ITS Infrastructure & Systems

6.11.1 Transit Application

Transit’s two main ITS facilities in Auckland and Wellington incorporate a number of diverse communications systems that have been developed primarily on a project specific basis.

The Auckland ATMS at present consists mainly of a Transit owned and operated fibre optic backbone linking a series of components back to a single control centre. The system also includes some isolated conventional telephone lines and radio linked facilities at the geographic limits of the system.

The Wellington system comprises a Transit owned and operated fibre optic link from Ngauranga Gorge to the main processing centre at Johnsonville, a Transit-operated microwave connection to the central police control centre and a leased fibre optic connection to the network consultant’s control facility in central Wellington.

A leased link has also been installed to provide a connection between Wellington and Auckland.

6.11.2 Objectives

Transit’s main objectives in this area are to develop solutions that provide appropriate telecommunications facilities best suited to its specific needs, both locally and nationally.

To achieve this, a National Telecommunications Services framework will be developed, aligned with the appropriate ITS architecture.

The key objectives of the framework are:

• To identify and develop current and future requirements, opportunities and risks
• To develop appropriate ITS infrastructure solutions that provide the best long-term value for Transit
• To invest in infrastructure and systems that will provide for future needs in an efficient way.
7 Inter-agency Cooperation

7.1 Inter-agency Cooperation

In order to develop a sound ITS strategy capable of delivering long-term benefits, Transit needs to work closely with other agencies and stakeholders to establish clear and appropriate responsibilities and ownership.

7.1.1 Current Situation

Although this strategy has been developed by Transit New Zealand, it must complement and support any future New Zealand ITS strategy and standards framework.

The National ITS Steering Group provides a wider national perspective on the development of this strategy. This group comprises representatives from Transit, the MOT, Transfund, LTSA, local authorities, AA and Police.

The steering group’s principal role has been to guide the development of the National State Highway ITS Strategy and possible integration with the wider road and transport network.

The steering group has provided valuable input in prioritising ITS initiatives, to maintain consistency with wider strategic objectives and provided a steering function on issues such as:

- Identifying the potential impact and benefits of ITS technology on the operations, objectives and strategies of Transit
- Considering the implications for all road user sectors within New Zealand including privacy issues, and links with other work being undertaken in this area
- Identifying potential benefits and perceived disbenefits which may enhance or diminish the marketability of ITS
- Assessing and monitoring the needs and attitudes of stakeholders and road users
- Engaging the wider industry in the development of strategy and specific initiatives
- Considering ways of lifting and more effectively aligning community and industry awareness, expectation of, and attitudes towards, ITS possibilities

7.1.2 Objectives

Through this process a number of key areas have emerged that may lead to further New Zealand policy and inter-agency focus and cooperation. These include:

- The desirability of an adopted New Zealand ITS architecture
- The desirability of a defined New Zealand ITS standard
- Privacy policies related to the use of CCTV, data collection, management and storage
- Operational issues related to the management of incidents and ATMS facilities.
8 Transit’s National ITS Framework

8.1 Overview
Transit New Zealand’s ITS Strategy provides a broad overview of Transit’s direction and objectives in the application of ITS. It sets out the specific issues that ITS will be targeted to address in each of the seven Transit regions along with broader national issues. (Appendix 1)

Driven by the objectives of the NZTS, the development of ITS solutions to meet these defined needs have been structured into four categories:

1. Detection and monitoring of incidents, traffic and road conditions
2. Traffic management mainly in urban areas but also to mitigate the effects of incidents and planned events
3. Traveller information systems including collection, management and delivery
4. Telecommunications services

The design, implementation and management of all ITS solutions will be guided by and form part of a National ITS Framework similar to overseas models comprising:

- National ITS Architecture
- National Standards
- Defined ITS Processes

Once established all Transit ITS systems implemented will be defined within a standard ITS inventory. This in turn forms the basis for a detailed ITS Asset Management Plan feeding into the 10-year plan and National Land Transport Programme (NLTP) alongside other projects and maintenance functions.

Effectively, the ITS Strategy and Framework provides a defined pathway from the objectives of the NZTS, through regional needs and issues, defined national standards and systems through to the NLTP.

8.2 National ITS Vision
Built on the range of issues developed from a national and regional perspective, and the direction provided by the NZTS, a National ITS Vision provides the background on which the National ITS Architecture is built. This vision represents how Transit’s ITS facilities would look if all of the desired facilities were in place.

The National ITS 5-Year Vision set out below indicates Transit’s view of how its key ITS facilities will be set up based on current issues, needs and technology.

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### National ITS 5-Year Vision

**Detection & Monitoring**
- National network of Telemetry, WIM & road condition monitoring devices

**Traffic Management**
- Nationally-linked regional centres serving regional needs; backed up by 24 hour facility in Auckland

**Traveller Information**
- Centralised national information processing & delivery through broker

**Telecommunications**
- National network of WIM & road condition monitoring devices
8.3 National Transit ITS Architecture & Standards

8.3.1 Current Situation
Transit has a range of individual ITS systems and developing projects around the country. Local architectures are in place for these particular systems, which are now being aligned with a Transit National ITS Architecture.

From the standards perspective, the systems in Auckland and Wellington have been developed in line with the USA originated “National Transportation Communications for ITS Protocol” (NTCIP).

8.3.2 Objectives

Architecture
The development of a National Transit ITS Architecture provides a “big picture” view of how Transit ITS facilities will develop.

The architecture provides direction on how Transit intends to run current and future systems, the interaction with other agencies and authorities, private industry, and the philosophies behind future ITS solutions.

It sets out how Transit will move forward and provides guidance on key issues such as:

- Levels of commercial involvement and outsourcing functions
- Transit’s future ITS use and role
- How Transit’s strategy fits with other national initiatives
- How it fits with regional and other non-Transit initiatives
- What systems exist already and how they will be integrated [or not] into the architecture
- What systems are currently being developed by Transit and others.

Standards
NTCIP is the dominant standard suite and one that Transit will continue to follow and formalise as a key part of Transit’s architecture and standards package.

Transit has now adapted the broader NTCIP framework for specific application on Transit systems, which is set out in the National NTCIP Alignment Guide.

However, this does not cover all areas and Transit will continue to review, monitor, develop and adopt future standards as necessary.

The ISO TC 204 standard-set for “Transport information and control systems” currently under development, seeks to standardise information, communication and control systems in the field of urban and rural surface transportation, including:

- Intermodal and multimodal aspects
- Traveller information
- Traffic management
- Public transport
- Commercial transport
- Emergency services and commercial services in the transport information and control systems (TICS) field.

Transit will continue to keep up to date and be involved with such ISO developments in order to identify and pursue opportunities.

The goal of Transit’s national ITS standards will be to provide a framework that will enable a seamless, nation-wide ITS system that can meet local needs.

- It will be the cornerstone for integrated ITS deployments
8.4 National Transit ITS Operations and Processes

8.4.1 ATMS Operations

The existing ATMS systems in Auckland and Wellington have been developed relatively independently, with operations, message development and use being formulated to meet the specific needs of those areas.

Although there are benefits in maintaining a certain level of flexibility to address local needs and to allow for the different capabilities and objectives of each system, there is a need to develop more consistency.

Specifically there is a need for:
- Consistency of legends, wording and VMS design
- Consistency in the use of driver information and traffic management systems
- Improved understanding of driver perspectives, expectations and needs.

8.4.2 ITS Systems Development and Procurement

To date Transit has purchased ITS and operational services on a case-by-case basis, and the scope and structure of the various contracted services have resulted from project specific needs.

Transit’s ITS Procurement Strategy sets out the future vision of how ITS projects and services will be delivered in future.

Key aspects include a more technology focused approach to project development, and a move to longer term, performance-based alliance type contracts.

8.5 National ITS Asset Management Plan (AMP)

8.5.1 Current Situation

Transit’s current and developing ITS facilities do not align well with existing AMP processes, designed to deal with traditional roading assets.

8.5.2 Objectives

Transit’s objectives in this area are to:
- Develop a purpose designed AMP system that will take adequate account of the different needs of technology based assets, and
- Align this with Transit’s other AMP systems in order to provide sound inputs to the annual NRP.

The overall goal for Transit’s National ITS Standards Framework will be to adopt a comprehensive set of standards that are routinely used and well aligned with other major New Zealand and overseas ITS systems.
Appendix 2 – Who the Strategy is Aimed at

Minister / Ministry of Transport

- Providing confidence that a strategic approach to ITS development is being applied, aligned with appropriate goals and objectives
- Providing a potential model and input to a wider New Zealand ITS Strategy
- In broader terms, the benefits of ITS both for the state highway network and beyond will be of specific interest to government/MOT in areas such as:
  - Best use of infrastructure
  - Cost effectiveness
  - Best use of resources
  - Emission reduction
  - Environmental improvement
  - Environmental sustainability
  - Safety
  - Access
  - Mobility
  - E-Government initiatives

Transit New Zealand

- Providing confidence to the Transit Board that a strategic approach to ITS development is being applied to the state highway network, aligned with Transit's corporate goals and objectives
- Providing guidance to staff in the development of ITS projects, within the context of a developed National ITS Framework including architecture and standards

Transfund

- Providing confidence that funded ITS projects on the state highway are being developed within a strategic framework, aligned with appropriate goals and objectives, to achieve tangible benefits
- Providing a benchmark for other ITS initiatives
- Reduced demand for infrastructure capital to meet growing demand
- In broader terms the benefits of ITS both for the state highway network and beyond will be of specific interest to Transfund in areas such as:
  - Maximising resources
  - Coordination across modes
  - Demand management
Appendix 2 – Who the Strategy is Aimed at

**Land Transport Safety Authority**

- Providing a strategic approach to the development and deployment of ITS based safety systems on the state highway
- Provide direction for structured research aimed at developing and expanding ITS safety benefits
- Specific safety and regulatory ITS areas of interest for LTSA will be:
  - Monitoring the safety performance of the network
  - Standards [signs]
  - Fleet regulation
  - Enforcement
  - Incident management

**Consultants / Contractors**

- Providing a stable strategic benchmark against which projects will be measured, and a clear direction on Transit’s ITS objectives and strategic goals
- Ultimately providing clear standards and systems architecture within which to develop Transit projects

**Commercial 3rd Party Users**

- Providing a defined framework, architecture and commitment to specified standards against which to develop commercial initiatives with confidence
- Specific ITS areas of interest for 3rd Party users will be:
  - Added value services
  - Communications
Local Government / Territorial Local Authorities (TLAs)

While this strategy has been developed specifically for state highways and has no status outside of Transit’s field of control, it will provide other road controlling authorities with a clear guide to Transit’s ITS strategy. This will assist with possible integration and interoperability issues and may provide a framework for complementary strategies and standards in other road controlling authorities.

In broader terms, the benefits and development of ITS within their own areas will be of specific interest in fields such as:

- Network management
- Travel demand management
- Parking management
- Operational efficiency
- Signals
- Public transport

Police / Emergency Services

The architecture developed by this strategy will include consideration of specific incident management and emergency response systems on the state highway network. This will involve close co-operation with New Zealand Police and other emergency services.

The strategy will also include structures and standards related to traffic enforcement technologies which will assist in better aligning equipment and systems in this area.

Specific ITS areas of interest for Police and emergency services will be:

- Safety
- Fleet regulation
- Enforcement
- Incident detection, monitoring and management

Community interest groups

Providing information on how specific facilities fit within Transit’s broader strategy, and the opportunity to identify and promote particular ITS related facilities within this (environmental monitoring, traffic control etc)
Appendix 2 – Who the Strategy is Aimed at

Media

- Providing an improved indication of how ITS projects and initiatives fit within Transit’s longer-term plans

Public Transport Providers

- Providing the potential to align and integrate wider transportation ITS technologies, particularly in the areas of real time information and broader traveller information systems
- Specific ITS areas of interest for public transport operators will be:
  - Signal pre-emption
  - Passenger information
  - Priority lanes

Road Users and Road User organisations [e.g. AA]

- This strategy will provide road users with a clear indication of how current and planned ITS initiatives fit within Transit’s wider strategy
- With the strong emphasis on research in driver perception and expectations, the strategy will also provide improved opportunities for road users to influence future strategy in this area
- Specific areas of interest for organisations such as the AA will be:
  - Added value services
  - Travel information
  - User information
  - Navigation (in-car)
  - Incident data

Commercial Vehicle Industry

- Providing the potential to align and integrate wider ITS technologies, particularly in the areas of fleet management systems, real time incident and traffic information
- Specific ITS areas of interest for commercial vehicle operators will be:
  - Fleet management
  - Travel time savings
  - Improved scheduling
  - Vehicle location (GPS)
Appendix 3 – NZTS Objectives

Assisting Economic Development

New Zealand will have a coherent and efficient transport system that contributes to our quality of life and supports economic development goals, both nationally and within regions. Achieving the government’s vision for transport will lead to improved flows of people, goods and services within and between urban and rural areas, and between New Zealand and overseas. Regulation and investment will recognise the need for economic development and the costs that inefficiency and unnecessary duplication in transport can impose on economic well-being.

In the long run economic development and transport growth need not be directly related. The government will promote the use of state-of-the art technology and new knowledge about transport systems, integrated land use planning, and energy efficiency to facilitate sustainable transport systems. This approach will minimise the extent of transport growth necessary to achieve economic development goals, and in particular minimise transport-related energy consumption. The government will ensure social, economic and environmental costs and benefits of transport are incorporated into transport decision-making. The costs of different transport modes will be fair and transparent to users.

Assisting Safety and Personal Security

Targets, standards and rules for the safety of those who use or are affected by the transport system will be implemented through the Road Safety 2010 strategy and other measures. The government will continue work on improving safety outcomes across all modes and will recognise the contribution that reduced dependence on private vehicles can make to improve safety. New Zealand’s safety standards will be more positively related to international standards.

Safety and personal security concerns associated with transport will be addressed in order to improve quality of life and to promote modes such as walking, cycling and public transport. Current commitments to road safety education and enforcement of road code for all road users will be strengthened.

The government will promote participation by users of, and those affected by, transport in the design of new safety regulations and in monitoring.

Improving Access and Mobility

Access and mobility for all New Zealanders will be enhanced through education, investment and infrastructure to improve local networks and communication and travel within and between regions. Affordable and reliable transport services will make a key contribution to better access and mobility.

The government will promote optimal use of different modes of transport in different settings through a range of measures including its pricing and funding priorities.

The government will improve access to appropriate transport for all, including for vulnerable users, for the transport impaired and their caregivers, in order to enhance participation and independence and reduce social exclusion. Policy and regulation will recognise that motor vehicles are not the only users of roading space and will ensure the needs of others, such as pedestrians and cyclists, are catered for.

Local solutions to local needs will be encouraged with national consistency where necessary.

Protecting and Promoting Public Health

Transport will contribute to healthy communities and human interaction. Health outcomes will be improved through regulation, education, encouragement and investment. Walking and cycling for short trips will be promoted and reduced dependence on private vehicles for mobility is encouraged. The government will put in place policies that encourage modal shifts that enhance air and water quality and reduce exposure to transport noise or other aspects of transport systems that can impinge on community and personal health.

Ensuring Environmental Sustainability

Transport will be more energy efficient and environmentally sustainable. Negative local and global environmental effects of transport will be reduced through education, regulation, technology and investment.

Enhanced mobility for people, goods and services within New Zealand and between New Zealand and overseas will be achieved through creative responses that meet people’s needs with minimal adverse effects on the environment. Improving the efficiency of existing road and rail networks, promoting alternatives to roads, and reducing traffic growth will be key elements in minimising the adverse effects of land transport.

Transport policy will reflect New Zealand’s commitment to energy efficiency, and to the Kyoto Protocol and the Framework Convention on Climate Change, and will recognise the role transport plays in meeting this commitment.
Transit New Zealand Directory

National Office
Investment house
20 – 26 Ballance Street
P O Box 5084, Wellington
New Zealand.
Telephone 04 499 6600
Facsimile 04 496 6666

Auckland Regional Office
Qantas House
Level 13,
191 Queen Street
P O Box 1459, Auckland.
Telephone 09 368 2000
Facsimile 09 368 2059

Northland Office
CPO Building
Level 1, Rathbone Street
P O Box 1899, Whangarei.
Telephone 09 430 4355
Facsimile 09 459 6944

Hamilton Regional Office
BNZ Building
Level 4,
354 Victoria Street
P O Box 973, Hamilton.
Telephone 07 957 1610
Facsimile 07 957 1437

Tauranga Office
405 Cameron Road
P O Box 430,
Tauranga.
Telephone 07 578 2903
Facsimile 07 578 2909

Napier Regional Office
Napier Library Building
22 Station Street
P O Box 740
Napier.
Telephone 06 835 1750
Facsimile 06 835 0283

Wanganui Regional Office
Seddon House
Park Place
P O Box 345,
Wanganui.
Telephone 06 345 4173
Facsimile 06 345 7151

Wellington Regional Office
Logical House
Level 8, 186 – 190 Willis Street
P O Box 24 477, Wellington.
Telephone 04 801 2580
Facsimile 04 801 2599

Marlborough Regional Office
The Forum, Level 1
Unit 2.4, Market Street
P O Box 1031, Blenheim.
Telephone 03 577 1850
Facsimile 03 577 5309
0800 MARLORDS (0800 627 573)

Christchurch Regional Office
Education House
Level 7,
123 Victoria Street
P O Box 1479, Christchurch.
Telephone 03 366 4455
Facsimile 03 365 6576

Dunedin Regional Office
Skeggs House
Level 2,
62 – 66 Tennyson Street
P O Box 5241, Dunedin.
Telephone 03 477 8527
Facsimile 03 477 9237

www.transit.govt.nz