

Bridge Management Progression in New Zealand

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SYNOPSIS

Over recent years, management of the New Zealand national highway network has been reformed. Previously this was the responsibility of a single Government Department. Now the highway management functions are split between funding provider, owner, consultants and contractors. Private sector services are procured using competitive pricing procedures. The resulting reforms to bridge management in particular, have been successfully implemented, with significant cost savings. The reforms have demanded careful consideration of contractual arrangements, systems development and personnel issues.

1 INTRODUCTION

Between 1984 and 1996, the New Zealand Government introduced major changes to the management of the Land Transport system. Transit New Zealand (Transit) was established in 1989 as a new organisation to manage the national highway network.

The reforms required the separation of the roles of funding provider, asset owner, consultant and contractor. For the delivery of services, competitive pricing procedures were introduced to allow an open market for service providers.

The reforms have demanded a new style of bridge management for the national network (State Highway bridges), dictated by the legislative changes, the funding processes, the owners responsibilities and the competitive, commercial environment for Consultants and Contractors.

Within the national road network there are about 2500 bridges and 1300 large culverts with a replacement value of NZ\$2.4Billion.

2 BRIDGE MANAGEMENT PRE 1984

Prior to 1984, the national road network was administered by the National Roads Board, with the Ministry of Works and Development (MWD), a Government Department, responsible for the management and maintenance of the highways.

All activities related to bridge management were undertaken by MWD including:

- Overweight vehicle management
- Feasibility studies/investigations
- Design for new structures
- Supervision of construction
- Routine maintenance
- Structural maintenance
- Structural reviews
- Superficial inspections
- Formal inspections

In addition, some new bridge construction was undertaken by MWD, although the majority was let to private Contractors.

MWD comprised a Head Office, 7 District Offices and 24 Residency Offices. Head Office developed policies, design standards, management procedures and guidelines, and undertook specialist design. District Offices undertook investigations, design, contract supervision, formal bridge inspections and overweight management. Residency Offices were predominantly contract focussed, undertaking the day-to-day bridge management and maintenance activities. Most Residency Offices had at least one dedicated “bridge gang” responsible for bridge maintenance.

Under the MWD regime, there was an assured work load (and funding), resulting in long serving personnel, with extensive experience and skills. MWD acted as a training establishment for a large number of bridging personnel, including many who subsequently transferred to the private sector.

MWD received annual Government Funding, with a specific allocation for bridge management. The overall level of funding for bridge management was largely dictated by the MWD resources (bridge gangs and other bridging staff). Funding was resource driven, based on historic levels, rather than based on asset needs (i.e. demand driven).

The overall bridge management processes were encapsulated in manuals, guidelines, policies and specifications. These were largely method based rather than output or performance focused. The procedures, although prescriptive, were thorough. They encouraged a culture of “follow the rules”, and included extensive audits and reviews. However, the procedures did not necessarily deliver “fit for purpose” or cost-effective outcomes that result from a performance-based approach incorporating a risk management philosophy.

3 STATE HIGHWAY MANAGEMENT – POST REFORMS

Figure 1 illustrates customer and stakeholder relationships and the principal functions and responsibilities of each party under the current highway management regime.

The key requirements relating to asset management are as follows:

- The funding provider, asset owner, consultant and contractor functions must be clearly defined.
- The delivery of roading services must be open to all service providers, and be procured using competitive pricing procedures.
- Policies and procedures are the responsibility of Transit and Transfund.
- Funding is sought from Transfund on the basis of annual planning requests.

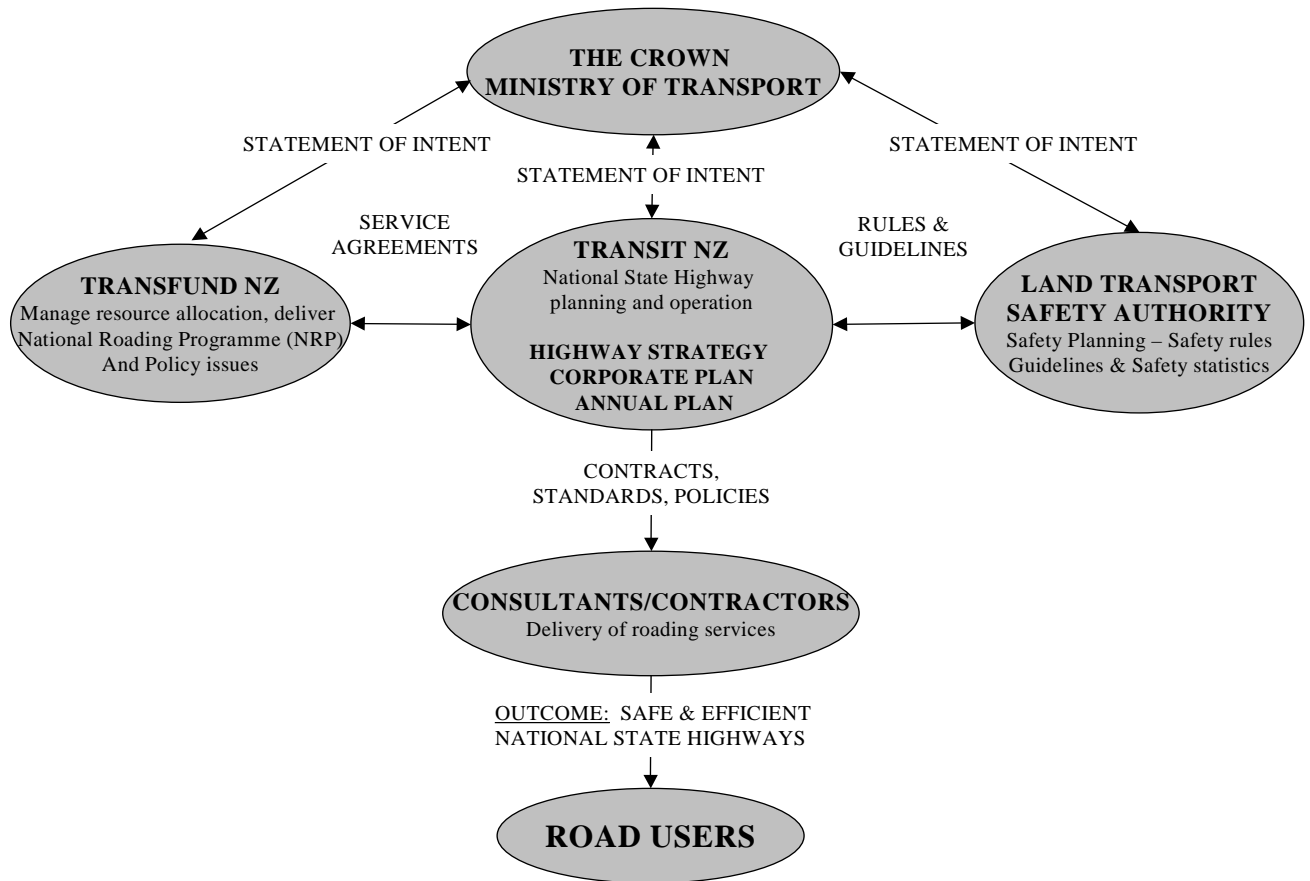


Figure 1: Current Highway Management Regime

4 BRIDGE MANAGEMENT – POST REFORMS

4.1 Management Structure

Figure 2 describes the management structure implemented by Transit for management of the bridge stock. Figure 2 also describes the specific functions of Transit, Consultants and Contractors.

4.1.1 Transit National Office

The National Office retains a small team of Bridge asset management and technical staff. They develop policies, manuals, specifications and guidelines with assistance from Consultants. In addition, they manage and operate the national bridge database and overweight management system.

4.1.2 Transit Regional Offices

There are 7 Regional Offices throughout New Zealand. Each Office has a Bridge Project Manager responsible for all non-capital bridge works, as well as liaison with the Regional Bridge Consultant and Network Management Consultants.

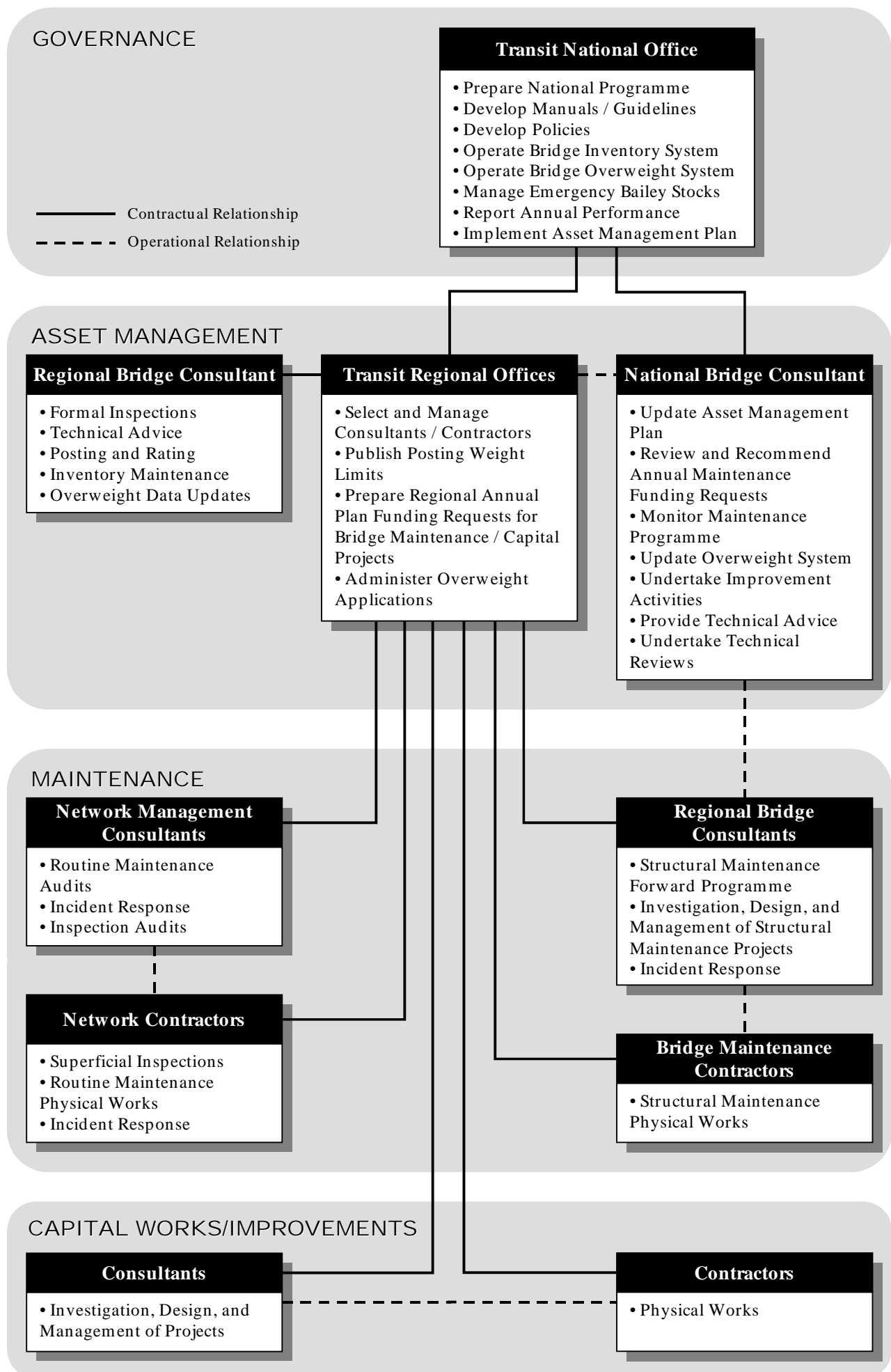


Figure 2: Bridge Management Structure

4.1.3 Regional Bridge Consultants

There are 9 Regional Bridge Consultant (RBC) contracts nationally. Each contract is competitively tendered on a weighted attribute basis, (relevant experience, track record, technical skills, management skills, methodology, price (price weighted 10-20%)) for a duration of up to 5 years, the maximum allowed. Each contract comprises on average 420 bridges and large culverts.

RBC's provide specialist engineering input. The contracts require the RBC's to take "ownership" of the bridge stock and to provide overall management of the stock.

4.1.4 Network Management Consultants

There are 24 contracts nationally, competitively tendered for durations of up to 5 years. Bridge management is only a small part of the Consultant's overall highway management functions.

The Network consultants provide principally an audit role of the network contractor's functions. In addition, they coordinate network emergency response including bridge operations.

4.1.5 Network Contractors

There are 37 Highway Maintenance Contracts nationally, with durations of up to 10 years. The contracts include bridge superficial inspections and routine maintenance, being only part of the overall contract scope.

The Network Contractors carry out the day to day observation and routine maintenance of the bridges, including accident damage, cleaning, drainage maintenance and waterway clearing.

4.1.6 National Bridge Management Consultant

This contract is competitively tendered on a weighted attribute basis for a duration of up to 5 years.

The National Bridge Consultant is engaged to provide strategic advice, to monitor and update the Bridge Asset Management Plan, to coordinate funding requests, as well as to undertake improvement initiatives and policy and specification updates, on behalf of Transit National Office.

4.1.7 Bridge Maintenance Contractors/Capital Works Consultants and Contractors

Structural maintenance contracts and Capital works contracts are tendered by Transit as required.

4.2 Management Principles

Transit has a *National State Highway Strategy*, which sets high level objectives and goals for highway management. This is underpinned by a national State Highway Asset Management Plan which defines the levels of service for management and maintenance of all road assets.

A *Bridge Asset Management Plan* (BAMP) has been developed by Transit to identify:

- Specific strategies to enable the bridging objectives of the National State Highway Strategy to be achieved.
- Appropriate Levels of Service, which are used to drive 20 year, renewal and development financial forecasts.

- Appropriate maintenance strategies and 20 year maintenance financial forecasts.
- A robust improvement programme to enable Transit to meet its long term asset management planning objectives.

The BAMP is intended to demonstrate responsible stewardship of bridges by Transit, and to act as a vehicle for communication with all parties with an interest in bridge asset management practices, including the funding provider (Transfund).

Transit bridge management practices are underpinned by policies, manuals, specifications and guidelines. The specifications are generally performance based, and are included in the relevant contracts to ensure integration of activities between service providers as well as to set performance criteria.

The bridge management structure and operation is based on the following drivers.

- Bridges are key highway assets requiring skilled and experienced specialist engineering input.
- Bridges are high value, long life assets requiring effective asset management to achieve defined levels of service at optimum cost over a long term.
- Bridges need to be maintained on a regular basis to achieve a “no surprises” environment for road users, to maintain a safe network, and to minimise the cost of long term ownership.
- Wherever possible, professional services and physical works should be procured using external service providers engaged on the basis of providing *value* to Transit.

4.3 Regional Bridge Consultant Contracts

These contracts provide the key professional services for highway structures asset management. The contracts have a nationally consistent scope, described within a standard specification and include:

- Bridge and structure inspections
- Overweight data updating
- Overweight technical support
- Inventory maintenance
- Posting and Rating
- Investigation, design and management of structural maintenance projects
- Technical advice
- Emergency response
- Annual maintenance funding requests

The contracts have a focus on asset management and maintenance, and aim to utilise local skilled engineering practitioners to take “ownership” of the stock. Payment of consultants is on the basis of lump sums, scheduled rates and negotiated sums. There is regular reporting and liaison with the Transit Regional Project Manager.

4.4 Funding Allocation

Transit submits a funding request annually to Transfund.

For bridge capital works (i.e. bridge replacements or Level of Service improvements), justification is usually based on achieving a qualifying benefit/cost ratio, although funding can also be based on national strategic issues.

For bridge maintenance, the Regional Bridge Consultants and Network Maintenance Consultants submit requests via Transit Regional Offices to the National Bridge Consultant. Requests are prioritised on the basis of experienced engineering judgement (for projects < NZ\$20,000), and on the basis of condition, component importance, bridge importance and cost consequence of delaying maintenance, for higher value projects. The process ensures national consistency. In recent years, the annual request for physical works maintenance funds has equated to about 0.4% of the bridge replacement value. The BAMP provides strong support for the funding request.

Throughout the year, maintenance funding expenditure is monitored by the National Bridge Consultant, with intervention and reallocation where necessary.

4.5 Maintenance Works/Capital Works Implementation

Bridge Routine Maintenance forms part of the Network Maintenance Contracts, which are competitively tendered. Payment for maintenance is usually a combination of Lump Sum (cyclic maintenance) and Negotiated Sums (non-cyclic maintenance).

All *Structural Maintenance* (maintenance requiring design input) and Capital Works are competitively tendered in accordance with prescribed competitive pricing procedures. These procedures are robust, and different procurement models are used to suit specific needs, eg *Lowest price conforming* and *Quality-price trade-off*. All contract documentation complies with current industry best practice. For projects less than NZ\$50,000, a single price may be sought from an appropriate Contractor. For projects less than NZ\$100,000, a minimum of 3 tenders may be sought. This allows for local, or specialist Contractors to be engaged, and reduces the relatively high cost of full tendering procedures for the smaller projects. Above NZ\$100,000, tenders must be publicly advertised.

5 COMPARISON OF BRIDGE MANAGEMENT – PRE AND POST REFORMS

In part, the reforms were undertaken to achieve:

- Improved bridge asset management through the separation of regulatory and service delivery functions, with a focus on providing bridges “fit for purpose”
- Cost reduction through private sector involvement and competitive procurement of services.

5.1 Asset Management Outcomes

A simplistic assessment could be based on changes in Levels of Service compliance and bridge condition changes, pre and post reforms.

5.1.1 Level of Service Compliance

- Since 1984, load restricted bridges (i.e. bridges with less than the current legal load capacity) have reduced from 11 to 3
- The number of one lane bridges has reduced from 196 to 180
- The number of timber bridges has reduced from 24 to 16

While these changes are significant, they do not necessarily result from the management reforms, but are driven mainly by funding constraints.

5.1.2 Bridge Condition

Pre 1984, bridge condition was not specifically measured. Anecdotal evidence, and monitoring of deferred maintenance suggests that the overall condition of the bridge stock now is not dissimilar to that pre 1984. That is not surprising, given that bridge maintenance funding requests have generally been fulfilled.

5.2. Cost Outcomes

The overall cost of bridge maintenance physical works has reduced from about 0.5% of bridge replacement value pre 1984, to about 0.4% now.

The overall cost of bridge management (Transit internal costs and professional services costs, excluding costs associated with capital works), is currently about 0.09% of bridge replacement value. This is similar to pre 1984 costs. The cost savings from competitive tendering appear to have been offset partly by the costs associated with contract preparation and administration, and partly by the additional asset management functions now undertaken. This includes asset management planning, preparation and justification of funding requests, and increased focus on investigation and justification of maintenance/repair/renewal options, which ultimately results in optimal physical works expenditure.

6. LESSONS LEARNED

6.1 Contractual Arrangements

- The maximum contract period for professional services and physical works maintenance contracts was increased from 3 to 5 years to encourage “ownership” and a longer term focus. There are also some longer term 10 year duration contracts.
- The maximum contract sum for non-contestable and limited-contestability works has increased to reflect the high cost of tendering and to provide greater flexibility in the procurement of services.
- The tender evaluation procedures for the engagement of Consultants and Contractors must encourage and recognise appropriate non-price attributes to encourage *value* creation.
- Contract Pricing Schedules must have sufficient flexibility to encourage proactive management of the bridge stock.
- Roles and responsibilities must be clearly defined.

6.2 Personnel

- Each Transit Regional Office requires a nominated “Bridge Champion” who acts as the focus for bridge related issues, and ensures effective communication between parties.
- The Client must retain in-house bridging expertise (at least at Governance level) to ensure that bridging policies align with long term highway strategies, as well as to identify and implement improvement programmes. Assistance from Consultants provides added technical value where Client expertise is limited by resources.

- The transition to a new bridge management regime needs to be carefully managed to ensure minimum loss of skilled personnel from the industry due to redundancies.
- The success of a contract driven service procurement model is dependant on establishing good relationships. Client and Consultant upskilling in new styles of contract management is essential.

6.3 Systems

- An effective Bridge Information System is critically important for long term bridge management. This system needs to be “owned and managed” by the Client but updated by the Service Providers as part of their contracts, with supporting performance measures and audits. The information (e.g. drawings, photographs, inventory) needs to be secure but readily accessible to changing Consultants and Contractors.
- The Bridge Information System needs to include all significant structures such as tunnels, large retaining walls, sign gantries and river/coastal protection works, so that appropriate engineering input ensures safe and well managed structures.
- Specifications must be comprehensive, consistent, emphasise communication protocols, and as far as possible be performance based.
- Technical Reviews (including field inspections) are important for ensuring national consistency and for ensuring appropriate bridge stewardship by the various parties responsible.
- A comprehensive Bridge Asset Management Plan is essential to link strategies and Levels of Service, to funding regimes and improvement programmes.

7. SUMMARY

- Changes to bridge management have been successfully implemented in NZ following the roading reforms.
- The cost of bridge maintenance has reduced by about 20% following the reforms. The condition of the bridges has been maintained.
- Successful implementation of bridge management, where funding, ownership, consulting and contracting functions are separated, and where delivery of services must be open and procured through competitive pricing procedures, requires careful assessment of;
 - Contractual arrangements
 - Personnel issues
 - Systems