An investigation into the application of international environmental Greenroads Certification standards to road construction in New Zealand

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Abstract

Greenroads is a USA designed environmental certification system for quantifying sustainable best practices for roadway design and construction. The major objectives of my research were to evaluate the suitability of Greenroads certification for use in New Zealand and compare the potential impacts of Greenroads compliance with the environmental outcomes achieved under the current New Zealand legislation and standards.

A further two environmental certification systems, CEEQUAL (Civil Engineering Environmental Quality Assessment and Awards Scheme based in the UK) and INVEST (VicRoads – Integrated VicRoads Environmental Sustainability Tool managed by VicRoads in Australia) were also evaluated.

For the Greenroads certification process to operate in New Zealand it was first necessary to undertake several Pilot Projects so that Greenroads criteria could be adapted to New Zealand conditions. Greenroads offered NZTA the option of undertaking an "A-Lined (pilot) Assessment" for the Te Rapa Bypass Road construction project that was underway in the Waikato region in 2011/12.

Information regarding the design and construction of the Te Rapa Bypass was collated and submitted to Greenroads for the A-Lined Assessment. The results of the Greenroads A-Lined Assessment showed that the Te Rapa Bypass, with limited additional work, could have achieved a Greenroads Bronze Certificate.

The collated information was also used as a basis to evaluate the CEEQUAL and INVEST systems. It was estimated that the Te Rapa Bypass could have achieved a CEEQUAL "Pass Award" or an INVEST two star rating. However to get any rating from CEEQUAL or INVEST a considerable amount of work would be required on all documentation.

Greenroads, INVEST and CEEQUAL assessments show that currently, under the requirements of the New Zealand Resource Management Act (1991) (RMA) and other New Zealand legislation, New Zealand roads are already designed and constructed to a high environmental standard.

Of the Greenroads, INVEST and CEEQUAL, certification systems, I consider that Greenroads is the better system for road projects in New Zealand.

I recommend that New Zealand should use the Greenroads accreditation system to demonstrate that we meet international environmental standards in road construction. Much of the reporting required for Greenroads accreditation can be developed with, and incorporated into, the RMA consent process.

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Chapter One: Introduction

1.1 Road Development in New Zealand

The majority of New Zealand roads lie on the foundations of bullock tracks established 150 years ago. Many of the New Zealand roads are far from straight; they reflect the topography and take the line of least resistance.

As the New Zealand economy grew formed roads began to appear allowing traffic to move to and from ports, goldfields, farms and elsewhere. Today the state highway network has almost 11,000 kilometres of road, with 5,981km in the North Island and 4,924km in the South Island (NZTA, 2011). The state highway road network links to almost 83,000km of local roads - 17,298km urban and 65,600km rural. The state highway network has about 199km of motorway, with most in Auckland. Motorways carry 10 percent of New Zealand's traffic (NZTA, 2011).

In 2013 around 70 percent of all freight in New Zealand goes by road, and over 80 percent of people go to work by car, truck or motorcycle. New Zealand has the second highest car ownership rate in the world (Transit NZ, 2008). Over 3.9 million vehicles were registered in 2012 (NZTA, 2013a), this is an increase of 0.7million vehicles since 2006.

The pressures of transport on the environment has caused multiple direct and indirect impacts, including emissions to air, noise, light and heat pollution and potential long term global warming effects from carbon dioxide (CO_2) emissions (Macbeth, 2004).

With increasing vehicle numbers the demand for better roads grows, so does the awareness of the environmental impacts of roading. Expanding roading networks and increasing traffic volumes result in degradation of surrounding environments. Habitats are altered, isolating plant and animal populations, spreading pollutants and exotic species into the surrounding landscape (Macbeth, 2004).

1.2 Road Management Infrastructure and Legislation

In New Zealand the Land Transport Management Act 2003 (LTMA), New Zealand Transport Strategy (NZTS) and Resource Management Act 1991 (RMA) are the main enabling legislation for road infrastructure. These Acts mandate sustainable management with the expectation that the New Zealand Transport Authority (NZTA) "exhibits a sense of social and environmental responsibility" in meeting the statutory objective of operating a state highway(Transit NZ, 2008).

The RMA promotes the sustainable management of natural and physical resources. As such, the state highway system is a physical resource that needs to be sustainably managed by NZTA. The RMA has a particular focus on ensuring that the adverse environmental effects of activities are avoided, remedied or mitigated (RMA section 5).

NZTA operates within the RMA framework. Therefore as a developer of urban and rural transport projects NZTA must comply with all aspects of the RMA (Transit NZ, 2008).

1.3 The "Greenroads" System

"Greenroads" is an environmental certification system for quantifying and measuring sustainable best practices for roadway design and construction. It was developed in the United States jointly by the University of Washington (UW) and CH2M Hill, an American-based global provider of consulting, design, and construction.

Greenroads accreditation consists of seven sections. Each section is assigned a point value according to its impact on roadway sustainability. That score can then be used directly for sustainability tracking, internal information and publicity. There are several levels of "certification" that potential Greenroads projects may choose to pursue. Currently, there are four certification levels, Evergreen, Gold, Silver and Certified (Muench, et al, 2011).

Greenroads accreditation provides a potential mechanism for New Zealand to benchmark their road building performances against an international standard.

1.4 Seven Roads of National Significance

In 2009 the New Zealand Transport Agency (NZTA) identified seven roads of national significance. The seven roads were identified as essential state highways that link New Zealand's major economic regions. As all seven significant roads support large volumes of traffic, they will require considerable work to improve safety and reduce congestion (NZTA, 2013b).

The seven roads identified were Puhoi to Wellsford – SH1, The Auckland Western Ring Route – SH20/16/18, Auckland Victoria Park – SH1 (figure 1.1), Waikato Expressway – SH1(figure 1.2), Tauranga Eastern Corridor – SH2 (figure 1.3), Wellington Northern Corridor (Levin to Wellington) – SH1(figure 1.4) and Christchurch motorway project (figure 1.5) (NZTA, 2013c).

Figure 1.1: Auckland Puhoi to Wellsford, The Auckland Western Ring Route and Auckland Victoria Park (NZTA, 2013d).

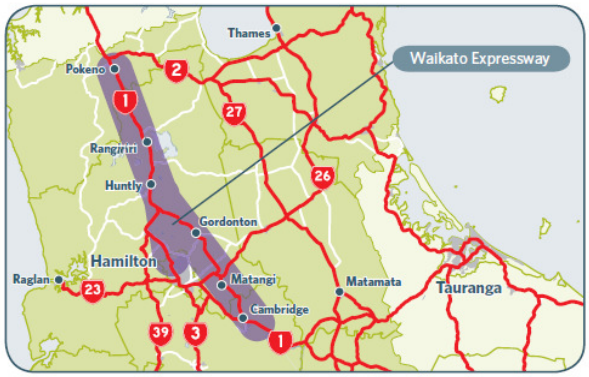

Figure 1.2: Waikato Expressway (NZTA, 2013d).

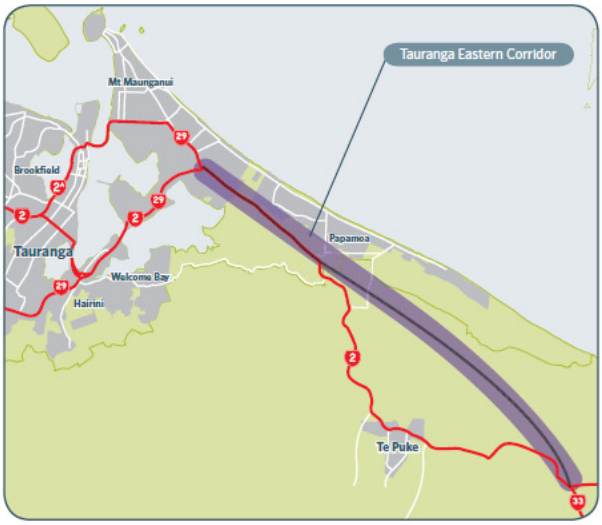

Figure 1.3: Tauranga Eastern Corridor (NZTA, 2013d).

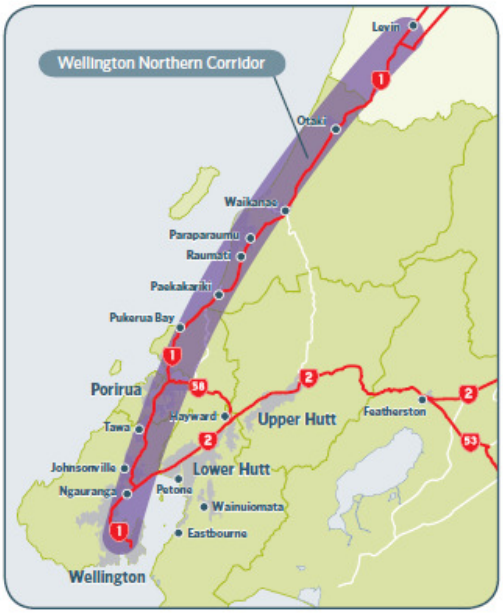

Figure 1.4: Wellington Northern Corridor (NZTA, 2013d).

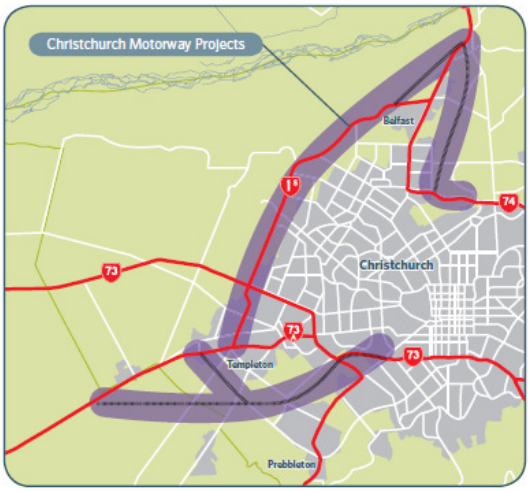

Figure 1.5: Christchurch Motorway (NZTA, 2013d).

1.5 The Te Rapa Bypass

In 2010 the NZTA awarded the design and construction contract of the Te Rapa section of the Waikato Expressway to an alliance comprising; Fulton Hogan, Opus International Consultants (Opus) and NZTA. As part of the construction contract NZTA requested that the alliance endeavour to gain Greenroads certification for the project. If this was possible then the Te Rapa Bypass would be the first road in New Zealand to gain Greenroads certification.

Te Rapa Alliance originally wanted to achieve “Evergreen” Greenroad status.

The first step to undertake Greenroads certification for the Te Rapa Bypass was to find out from Greenroads if a road outside of the USA was eligible for certification and what would be involved.

The Te Rapa Alliance (TRA) and NZTA contacted the Waikato University to engage a master’s student to undertake the background work for the project and collect the data required for certification.

1.6 Research Objective

The overall objective of this master's thesis was to investigate the benefits of gaining Greenroads Certification and compare the effects of Greenroads Certification with the outcomes achieved under existing New Zealand Environmental legislation. The specific objectives were to:

a) Evaluate the requirements of the New Zealand legislation and standards compared to the requirements for Greenroads certification.

b) Compare road construction certification systems available.

c) Collect data required for Greenroads certification.

d) Assess what the Te Rapa Alliance currently had in place and what extra work they need to undertake to gain Greenroads certification.

e) Assess collected Te Rapa Bypass data with other environmental accreditation systems.

Chapter Two: Review of Environmental Accreditation Systems for Road Construction

2.1 Introduction

New Zealand transportation currently accounts for about 40% of New Zealand's carbon dioxide (CO_2) emissions or 15% of all New Zealand's greenhouse gas (GHG) emissions each year. With the signing of the Kyoto Proposals (2002) the New Zealand government put in place initiatives including the New Zealand Ttransport Strategy (2002) and the Land Transport Management Act (2003) (Macbeth, 2004).

Many western countries are developing "sustainable" construction and transportation policies. These countries include the United States, Canada, United Kingdom, Australia and many countries in Western Europe (Macbeth, 2004).

This chapter gives an overview of the different accreditation systems and the systems which are most applicable to New Zealand road construction. These accreditation systems will be reviewed in depth in following chapters.

2.2 Advantages of an Environmental Accreditation

An environmental accreditation system is an incentive to designers and contractors to adopt best practices to deliver more sustainable road construction and operation.

An environmental accreditation system can give project teams a common goal to work towards, increasing team spirit and allow project teams to assess how well

they are performing with environmental and social issues. An environmental accreditation system allows project teams to compare themselves against other project teams (CEEQUAL, 2010).

International benchmarking demonstrates that New Zealand is "walking the talk".

2.3 An Environmental Accreditation System for New Zealand

There are a number of questions that should be asked when considering which environmental accreditation system is most suitable for New Zealand.

- Is there added value in obtaining a rating?
- Is the rating system practical to implement?
- Does the rating system cover transportation planning, design, construction, operation and maintenance?
- Is there a life cycle analysis component that will identify short and long term financial requirements?

These questions will be addressed in the concluding chapter of the thesis when all information is brought together.

2.4 Transport Sustainable Rating Programmes

A number of Environmental Accreditation systems have been developed since 2000. It is estimated that there are over 200 individual rating systems for civil engineering worldwide (Hirsch, 2011). The relevant assessment systems focusing on transport are listed in Table 2.1.

Table 2.1: Major Transport Assessment Systems.

Name of Programme	Year Established	Country Established	Ref Source
Greenroads	2010	USA	www.greenroads.org/
CEEQUAL	2011	UK	www.ceequal.com/
AGIC	2011	Australia	www.agic-khub.net.au/
INVEST	2011	Australia	www.vicroads.vic.gov.au/NR/rdonlyres/BE125F3A-4C18-4888-9396-2D84BD9F513D/0/INVESTMar2011VicRoadsV2.pdf
GreenLITES	2008	USA	www.dot.ny.gov/programs/greenlites
I-LAST	2010	USA	www.dot.state.il.us/green/documents/I-LASTGuidebook.pdf
STARS	2010	USA	www.transportationcouncil.org/about-stars
BE2ST	2010	USA	www.cte.ncsu.edu/EEConference/sessions/documents/08-3_Edil.pdf
Envision	2012	USA	www.terralogicss.com/LiteratureRetrieve.aspx?ID=122006
Greenway	2012	USA	www.terralogicss.com/LiteratureRetrieve.aspx?ID=122006

2.5 Greenroads

2.5.1 Overview

Greenroads is an environmental certification system for quantifying and measuring sustainable best practices for roadway design and construction. It was developed in the United States jointly by the University of Washington (UW) and CH2M Hill and is now managed independently as a third-party not-for-profit corporation called Greenroads Foundation (Soderlund, 2007).

The Greenroads rating system is similar to the LEED™ (Leadership in Energy and Environmental Design) rating system for construction of sustainable buildings, developed by the U.S. Green Buildings Council (USGBC) in the mid 1990's (Soderlund, 2007).

The Greenroads rating system is designed and constructed for new, reconstructed and rehabilitated roads. Through seven categories of sustainable design features,

credits are awarded based on dozens of initiatives, including storm water management, bicycle and pedestrian assess, reduced fuel use, and paving emissions (Soderlund, 2007).

2.5.2 Greenroads Accreditation

The Greenroads rating system is a collection of 48 practices that are arranged in seven sections; Project Requirements, Environment and Water, Access and Equity, Construction Activities, Materials and Resources, Pavement Technologies and Custom Credits. In total there are 118 points available for accreditation and the points are divided up into the following sections:

1. Project Requirements: contains 11 practices which carry no points value, however all practices are required in order to gain certification
2. Environment and Water: contains 8 practices with a total of 18 points available
3. Access and Equity: contains 9 practices with a total of 30 points available
4. Construction Activities: contains 8 practices with a total of 14 points available
5. Materials and Resources: contains 6 practices with a total of 23 points available
6. Pavement Technologies: contains 6 practices with a total of 22 points available
7. Custom Credits: provides for practices customised to a specific project, which are subject to approval from Greenroads, with a total of 10 points available.

Currently there are four levels of Greenroads certification, Evergreen (project requirements, plus 64+ points), Gold (project requirements, plus 55-63 points), Silver (project requirements, plus 43-54 points) and Certified (project requirements, plus 32-42 points) (Muench, et al, 2011).

2.5.3 Greenroads Internationally

Currently Greenroads is working with a number of countries including New Zealand on developing a Greenroads system which could be applied specifically in a country outside the USA. To date no country outside of the USA has achieved Greenroads certification.

2.6 Civil Engineering Environmental Quality Assessment Scheme (CEEQUAL)

2.6.1 Overview

The Civil Engineering Environmental Quality Assessment and Awards Scheme (CEEQUAL) is based in the United Kingdom and aims to deliver improved project specification, design and construction for civil engineering, infrastructure, and landscaping projects. CEEQUAL awards are presented to projects where developers, designers and contractors have gone beyond the minimum legal and environmental requirements to achieve distinctive environmental standards of performance (CEEQUAL, 2012).

CEEQUAL assesses performance across 12 areas of environmental and social impacts. The 12 areas focus on the major impacts civil engineering developments have on the environment, natural resources, and quality of life (CEEQUAL, 2010).

Since the launch of CEEQUAL, more than 130 final and 60 interim Awards have been achieved with a further 240 projects and contracts currently being assessed mainly in the United Kingdom (CEEQUAL, 2012).

2.6.2 History of CEEQUAL

The CEEQUAL Award Scheme was originally managed by Crane Environmental Ltd and developed by the Institute of Civil Engineers (ICE), in the United Kingdom. In 2003 the Awards scheme was launched and in 2004 the scheme became public. The scheme was originally titled the "Civil Engineering

Environmental Quality Assessment and Awards Scheme", but is now promoted as the "Assessment and Awards Scheme, for improving sustainability in civil engineering and public realm projects"

CEEQUAL is continuing to develop and in March 2012 released a new extended version 5 manual and recently launched a version of CEEQUAL for International Projects. CEEQUAL is quickly becoming widely used in the UK by major civil engineering companies, designers and contractors (CEEQUAL, 2012).

2.6.3 Benefits of CEEQUAL

When a project gains an award from an accreditation programme such as CEEQUAL, it can help the reputation of those involved and provide the project with good publicity. It can demonstrate that the project is committed to sustainability and the environment. When an award is being pursued, CEEQUAL principles can aid in enhancing a project and provide improved best practices for the project (CEEQUAL 2010).

2.6.4 CEEQAUL Accreditation

CEEQUAL is an awards scheme that is based on self assessments which a trained CEEQUAL Assessor will assist with. The assessments that are carried out by the CEEQUAL Assessor are then independently verified by a CEEQUAL Verifier (CEEQUAL 2010).

There are 12 sections in the CEEQUAL Assessment Scheme:

1. Project management
2. Land Use
3. Landscape
4. Ecology & Biodiversity
5. The Historic Environment
6. Water Resource and the Water Environment
7. Energy and Carbon
8. Material Use

9. Waste Management
10. Transport
11. Effects on Neighbours
12. Relations with the Local Community and other Stakeholders (CEEQUAL, 2010).

There are four grades available for all types of awards, Excellent (over 75%), Very Good (60%-74%), Good (40%-59%) and Pass (25% -39%). Due to the way that the sections are set up, it is not possible to achieve 100%, as some sections conflict with each other (CEEQUAL, 2010).

2.6.5 International CEEQUAL Accreditation

International projects can achieve a Sustainability Strategy & Performance Assessment (completing Sections 1-9), or Sustainability Performance Assessment (completing Sections 2-9).

There are five international awards currently available; Whole Project Award, Construction Award, Design Award, Design and Construction Award and a Client and Design Award.

The Whole Project Award is the only award which covers the whole project from client to design to the principal contractors. The other four award types are part team awards. The Construction Award applies only to the principal contractor, the Design Award applies only to the principal designer, the Design and Construction Award applies to the contractor and the designers and the Client and Design Award applies to the client and the designers.

These four award schemes also allow individuals to apply for an assessment, which is good in situations where other partners are not participating (CEEQUAL, 2012).

2.7 Australian Green Infrastructure Council (AGIC)

2.7.1 Overview of AGIC

The Australian Green Infrastructure Council (AGIC) was formed in 2008 by industry professionals from the engineering, construction, environmental, planning, finance, and legal sectors.

AGIC has a formal technical collaboration with CEEQUAL, which allows AGIC to utilise the underlying CEEQUAL methodology in the development of an Australian rating tool (CEEQUAL, 2013).

In February 2012 AGIC launched the Infrastructure Sustainability (IS) Rating Scheme for the design, construction and operation of Australian infrastructure. The IS system evaluates sustainability across the design, construction and operation of infrastructure projects.

In 2012 the IS Rating System came out of the pilot project stage and is currently only available in Australia, however the tool is available online and can be used to undertake a self assessment of any project (AGIC, 2012).

2.7.2 AGIC Accreditation

The IS Rating Scheme is based on a self assessment tool and score card. Once an initial self assessment is complete it is submitted to the AGIC for an independent review. Once a final submission is made by a project, the AGIC will have the project verified by an independent reviewer and a recommendation will be made. AGIC will then certify the project and the rating level achieved (AGIC, 2013a).

The IS rating tool framework consists of 15 categories within six themes (AGIC, 2013b).

1. Management and Governance:
    - Management System
    - Procurement and Purchasing
    - Climate Change Adaptation
2. Using Resources:
    - Energy and Carbon
    - Water
    - Materials
3. Emissions, Pollution, and Waste
    - Discharge to Air, Land, and Water
    - Land
    - Waste
4. Ecology
    - Ecology
5. People and Place
    - Community Health, Well-being and Safety
    - Heritage
    - Stakeholder Participation
    - Urban and Landscape Design
6. Innovation

The IS rating tool uses a 100 point scale to measure performance of the project and the score determines the rating level achieved. There are three levels of certification ‘Good rating’, ‘Excellent rating’ and ‘Leading rating’.

There are three stages over the development of a project during which a rating can be given. The design phase, the as-built phase and the operation phase (AGIC, 2012).

2.8 VicRoads – Integrated VicRoads Environmental Sustainability Tool (INVEST)

2.8.1 Overview of INVEST

Integrated VicRoads Environmental Sustainability Tool "INVEST" was developed by VicRoads for assessing the sustainability aspects of road projects. It sets the standard for best practice and innovation in sustainable road design and construction (VicRoads, 2011).

VicRoads is the Victorian State Road Authority. VicRoads is one of several state government agencies that assist the "Australian Government to achieve its integrated transport policy objectives" (VicRoads, 2013).

Improving sustainability of Victoria's roads is a theme underlying the VicRoads' corporate strategic direction. INVEST was designed to support the VicRoads' strategic direction, namely, to make the transport system more sustainable (VicRoads' Strategic Direction 2010-2012)

2.8.2 INVEST Accreditation

INVEST has 11 categories, which reflect a range of issues that may be encountered on a road project:

1. Air Quality
2. Behavioural Change and Capacity Building
3. Biodiversity
4. Culture Heritage
5. Community Engagement
6. Energy Management
7. Design
8. Noise Management
9. Resource Management
10. Urban Design
11. Water Management

Documentation submitted to VicRoads is assessed and reviewed by an independent review panel. Upon completion of assessment and verification the project will be given a star rating.

INVEST has a Five Star rating system.

- 1 Star = All prerequisites + 60 points
- 2 Star = All prerequisites + 90 points
- 3 Star = All prerequisites + 130 points
- 4 Star = All prerequisites + 180 points
- 5 Star = All prerequisites + 240 points

All projects are required to meet all prerequisites before being eligible for certification and no points are associated with the prerequisites.

Key Prerequisites are:

- Compliance with all permits and permit conditions
- Compliance with VicRoads Environmental Policy
- Compliance with Legislation requirements
- Environmental reporting

2.9 Other Rating Systems:

2.9.1 Leadership in Transportation and Environmental Sustainability (GreenLITES)

Leadership in Transportation and Environmental Sustainability (GreenLITES) was designed by the New York State Department of Transportation. The rating system consists of five categories, Sustainable Sites, Water Quality, Material Resources, Energy & Atmosphere, and Innovation. GreenLITES is a "Leadership in Energy and Environmental Design (LEED)" type rating system for transport design, focusing on the operation and maintenance of roads and has four internal levels of certification (Hirsch, 2011).

2.9.2 Illinois - Livable and Sustainable Transportation Rating System and Guide (I-LAST)

Illinois - Livable and Sustainable Transportation Rating System and Guide (I-LAST) was designed by the Illinois Department of Transportation. The rating system consists eight categories, Planning, Design, Environmental, Water Quality, Transportation, Lighting, Materials and Innovation, with a large emphasis on environmental impacts and management. I-LAST has a checklist approach for planning and design and has no internal certification (Hirsch, 2011).

2.9.3 Sustainable Transportation Access Rating System (STARS)

Sustainable Transportation Access Rating System (STARS) is currently being developed by the Portland (Oregon) Bureau of Transportation and the Santa Cruz County Regional Transportation Commission. The STARS rating system has six categories, Integrated Process, Access, Climate and Energy, Ecological Function, Cost Effectiveness Analysis and Innovation. The program is organised into 29 credits and five specific credits are required to obtain certification (Hirsch, 2011).

2.9.4 Building Environmentally and Economically Sustainable Transportation Infrastructure-Highways (BE2ST in-Highways)

Building Environmentally and Economically Sustainable Transportation Infrastructure-Highways (BE2ST) was designed by the University of Wisconsin-Madison and the Recycled Materials Resource Centre. The system consists of ten categories, Social Requirements, Greenhouse Gas Emission, Energy Use, Waste Reduction, Water Consumption, Social Carbon, Cost Savings, Life Cycle, Noise and Hazardous Waste. There are four levels of certification. BE2ST has an emphasis on the recycling, material use and construction, and also on the life cycle and impacts associated with highway construction (Hirsch, 2011).

2.9.5 Greenway

Greenway is being developed by the Department of Civil & Environmental Engineering at Jackson State University, Mississippi. The green highway construction rating system consists of five categories, Materials, Environment & Water, Traffic Efficiency, Lifecycle & Maintenance and Community (Hirsch, 2011).

2.10 Summary and Conclusion

There are many rating systems which have been developed or are in the process of development for road construction. Many of these have been developed by local states in the USA and as such are not as detailed in their approach to environmental sustainability or are currently still in the development stages. Also many are not available internationally or have little relevance to New Zealand conditions and laws.

There are four current systems that have detailed criteria in place that suit or could be made to suit New Zealand.

These systems are:

Greenroads	USA
CEEQUAL	UK
AGIC	Australian
INVEST	Australian

Greenroads is a rating system designed for new, reconstructed and rehabilitated roads. Greenroads is a collection of 48 practices arranged in seven categories of sustainable design and points are awarded based on dozens of initiatives. Greenroads is a dedicated road system and is not self-assessed.

Currently there are four levels of Greenroads certification: Evergreen, Gold, Silver and Certified. Greenroads is available internationally.

CEEQUAL is an assessment and awards scheme for improving sustainability in civil engineering and public realm projects. CEEQUAL is a civil engineering based award scheme using self-assessments, which are independently verified by a qualified CEEQUAL verifier. CEEQUAL has twelve categories for the assessments and four grades available, Excellent, Very Good, Good and Pass.

CEEQUAL is available internationally and has five international awards available: Whole project, Construction, Design, Design and Construction and a Client and Design award which can be applied for individually by the various partners.

AGIC uses underlying CEEQUAL methodology and has recently launched the IS (Infrastructure Sustainability) rating scheme. IS evaluates sustainability in design, construction and the operation of infrastructure projects.

IS has fifteen categories based within six main themes and has three levels of attainment, Excellent, Good and Leading. There are three stages within a project that can be rated; design stage, as built stage and operational stage.

Currently the IS system is only available in Australia.

INVEST is a tool for assessing the sustainability of road projects and sets the standard for best practice in sustainable road design and construction. INVEST has eleven categories and submitted documentation is assessed and reviewed by an independent panel. INVEST has a five star rating system and all projects are required to meet all of the four prerequisites: Compliance with permits,

Compliance with environmental policy, Compliance with Legislation and Environmental reporting. INVEST is not available internationally.

Of the four main rating systems discussed above only two are currently available internationally namely Greenroads and CEEQUAL.

The main difference between these two systems is the weight placed on the various categories and the method of assessment.

CEEQUAL being civil engineering based and does not have the road specific weighting of the Greenroads system and is more weighted towards engineering practices. The five award types within CEEQUAL allow individuals to apply for assessment that can be beneficial where other construction partners are not participating.

Greenroads with its dozens of initiatives within 48 categories allows for the many variations in road types, contours and environments. Greenroads is dedicated to road construction and the documentation required maintains a high standard of compliance. The whole contract must comply with the Greenroads system for all categories and these cannot be individually applied to the various partners of the contract. The only variation is to the level of certification obtained: Evergreen, Gold, Silver or Certified.

Due to these differences the Greenroads system has the most advantages for New Zealand purposes.

None of the systems have been previously applied or tested for New Zealand conditions. Thus it was decided to test the application of Greenroads certification in New Zealand. A briefer consideration of the application of CEEQUAL and

INVEST alternatives were also undertaken to provide a more detailed evaluation of the potential usefulness of application of these accreditation systems.

Chapter Three: Applicable Environmental Law and Standards for Road Construction in New Zealand

3.1 Introduction

The main environmental legislation applicable to road construction in New Zealand is the Resource Management Act (1991) (RMA).

When the New Zealand Transport Authority (NZTA) investigates the development of a state highway, the NZTA must ensure that all elements of the New Zealand Transport Strategy and National State Highway Strategy are addressed. Under the RMA the relevant regional land transport strategies and the National Energy Efficiency and Conservation Strategy must be taken into account. Also all relevant regional policy statements and district plans have to be identified and taken into account (Transit NZ, 2007a).

This Environmental Law and Standards chapter will focus on the different laws, standards and processes applicable to road construction in New Zealand.

3.2 New Zealand Transport Authority (NZTA)

The New Zealand Transport Authority (NZTA) was established in 2008 by merging Transit New Zealand with Land Transport New Zealand.

NZTA is a New Zealand crown entity whose function is safe road development, driver and vehicle licensing and rail accident investigation.

NZTA is tasked with improving New Zealand's land transport system from planning and funding activities, supporting public transport and building safe networks to connect communities.

The NZTA work within and have legal responsibilities under the Land Transport Management Act 2003.

The key transport agencies are the New Zealand Transport Agency (NZTA) and the Energy Efficiency and Conservation Authority (EECA).

The NZTA has over 500 different standards, codes of practices, specifications and guidelines (appendix one) which are followed during the design and construction of State Highways. The standards and guidelines range from air monitoring, chip sealing, road safety barrier systems, culverts and basecourse aggregate.

3.3 Other Parties Responsible for Roading in New Zealand

In New Zealand Local government also have transport responsibilities. Regional councils are responsible for developing regional land transport strategies and for public transport. District councils are responsible for local roads.

3.4 Resource Management Act (1991)

3.4.1 Overview of the Resource Management Act (1991)

The Resource Management Act (RMA) is the main legislation that sets out how New Zealanders should manage their environment. The RMA was passed in 1991 and regulates access to natural and physical resources such as land, air, and water, with sustainable management being the overriding goal (MfE, 2013).

The RMA is based on the idea of the sustainable management of our resources and encourages people to plan for the future of our environment (MfE, 2013).

The RMA provides opportunities for communities to inform their local and regional councils what they value about the environment. The RMA provides a guide to what's important in our environment (MfE, 2013).

3.4.2 Resource Consents

The Resource Management Act, Regional Plans, and District Plans all contain rules and guidelines to manage the natural and physical resources of New Zealand.

Resource Consents are permits that allow the use or take of water, land and coastal resources. A Resource Consent can allow the discharge of water or wastes into air, or into water or onto land. Resource consents include special conditions to protect the environment. Consented activities are monitored to make sure that the conditions are being complied with (WRC, 2012).

During the consent application process, Regional, District, and/or City Council staff will assess the likely and possible effects of a proposed activity on the surrounding environment and on other people. Council staff, unless a hearing is required, will determine what measures need to be taken to avoid, mitigate, or

remedy any adverse effects. At the end of the decision-making process, council can either grant or decline a consent application (figure 3.1).

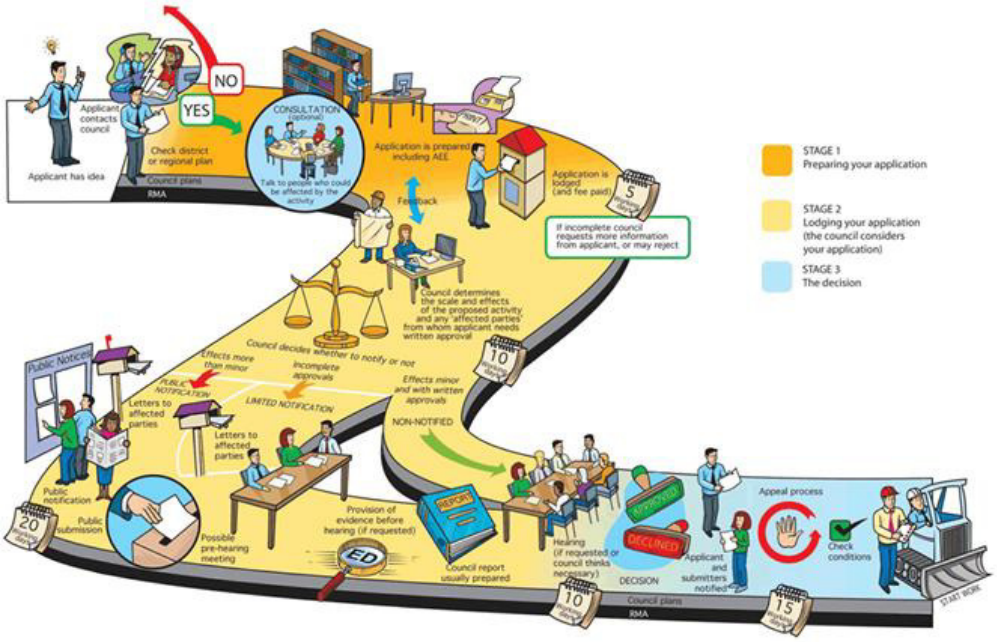

Figure 3.1: Steps to gaining resource consent (MfE, 2013).

A consent application may need to be 'notified' if a proposed activity is likely to have a significant effect on the environment and/or those persons who Council deem may be affected and who have not given their written approval for the proposal. Public notification means that Council will advertise the application in the local newspaper and place a sign on the proposed site. Public notification means anybody can make a submission for or against the proposed activity.

Limited notification means the Council will notify parties they consider may be potentially affected by the proposal. Only those people contacted by letter from Council can make a submission for or against the proposed activity (WRC, 2012)

3.5 Notice of Requirement for Designation Change

A designation is a form of 'Zoning' over an area or route in a district plan. "Zoning" allows the requiring authority to proceed with the activity and work on the area or route without the need for land use consent from the relevant territorial authority. Only a requiring authority can seek designations for land, such as NZTA.

Designations enable central and local government to obtain planning authorisation for public works and to protect land for future public works. Traditionally designations were used to provide areas for land transport, telecommunications and electricity transmission networks.

A designated area is still subject to any restrictions on land use under s9 and in relation to air, water, and the coastal marine area under s12 – 15 of the RMA.

A notice of requirement has an interim effect, in that it protects land for the designated purpose until the designation is confirmed and included in an operative district plan. If the designation is confirmed it overrides the provisions of the district plan (Quality Planners, 2011).

3.6 International Organization for Standardization (ISO)

3.6.1 Overview of ISO

ISO (International Organization for Standardization) is a network that sets international standards. ISO is the world's largest developer and publisher of International Standards.

Standards are documents that define materials, methods, processes, practices, or outcomes. They are used to set requirements, provide better practice, and deliver guidance. Standards push organisations to improve safety, quality, convenience, and efficiency. Standards can also support trade and export opportunities for an organisation (ISO, 2011).

3.6.2 ISO 14001:2004 - Environmental Management Systems

ISO 14001:2004 applies to environmental aspects that an organisation identifies as those which they can control and those which can influence. This standard is intended to be incorporated into any environmental management system. The extent of the application will depend on factors such as the environmental policy of an organisation, the nature of activities, location, products and services and the conditions in which it functions (ISO 14001:2004, 2004).

All requirements in ISO 14001:2004 should be incorporated into any environmental management system.

3.6.3 ISO 9001:2008 - Quality Management Systems

ISO 9001:2008 specifies a quality management system where an organisation needs to demonstrate its ability to consistently provide a product that meets customer and applicable statutory and regulatory requirements. The standard aims to enhance customer satisfaction through the effective application of the system, including processes for continual improvement of the system and the assurance of conformity to customer and applicable statutory and regulatory requirements (ISO 9001:2008, 2008).

3.7 New Zealand Standards

New Zealand Standards develop Standards and Standards-based solutions to help improve the effectiveness and reliability of every day goods and services. New Zealand Standards cover a wide range of industries including environmental management and information technologies. The standards have been developed in partnership with organisations such as Energy Efficiency Conservation Authority (EECA), Environmental Protection Agency (EPA) and Ministry for the Environment (MfE) (NZS, 2013a).

3.7.1 Applicable New Zealand Standards for new road construction

3.7.1.1 Environmental

Environmental standards have been developed to address a range of environmental management issues and to outline a minimum level environmental protection. The standards cover a wide range of topics from land use, to noise pollution.

- NZS 6806:2010 Acoustics - Road-traffic noise - New and altered roads

  NZS 6806 sets out the procedures and requirements for measuring, and assessing road traffic noise for new, altered state highways and local roads (NZS, 2013b).

- NZS 6083:1999. Acoustics – Construction Noise

  NZS 6083 sets out the measurement and prediction of noise from construction, maintenance and demolition work. The standard sets out how to assess such noise and how to determine whether action is required to control this noise (NZS, 2013c).

- NZS 6801:2008. Acoustics - Measurement of environmental sound

  NZS 6801 defines the basic quantities used to describe sound in the environment and procedures to measure these quantities.

- NZS 6802:2008. Acoustics - Environmental noise

  NZS 6082 sets out how to measure and assess noise compliance.

- NZS 6803:1999. Acoustics - Construction noise.

  NZS 6803 addresses methods for predicting noise, measurement of noise, and determines whether action maybe required in controlling the noise for demolition and construction sites (NZS, 2013d).

- NZS 4411:2001. Environmental standard for drilling of soil and rock

  NZS 4411 sets out the minimum national requirements for the construction, testing and maintenance when drilling soil and rock for bores (NZS 2013e).

3.7.1.2 Lighting

Good lighting on roads and in public spaces makes a difference to safety and visibility. A range of lighting standards are available to ensure best practice and minimum requirements are being met.

- NZS 4065:2010. Concrete utility services poles,
  NZS 4676:2000. Structural design requirements for utility services poles,
  NZS 4677:2010. Steel utility services poles.

  NZS 4065 and NZS 4677 standards apply to poles and components which support any street light, traffic signal or combination (NZS, 2013f).

  NZS 4676 standard sets out the minium loading and strength required in the structural design of an individual pole used for street lighting or signal (NZS, 2013g).

- NZS 1158.0:2005. Road Light – Introduction,
  NZS 1158.1.1:2008. Road Light – Vehicular Traffic (Category V) lighting - Performance and design requirements,
  NZS 1158.1.2:2010. Road Light – Vehicular traffic (Category V) lighting - Guide to design, installation, operation and maintenance,
  NZS 1158.2:2005. Road Light – Computer procedures for the calculation of light technical parameters for Category V and Category P lighting and
  NZS 1158.3.1:2005. Road Light – Pedestrian area (Category P) lighting - Performance and design requirements.

  The NZS 1158 series provides guidelines for the design, installation, operation and maintenance of lighting systems for different roading projects (NZS, 2013h).

- NZS 3827:1998. Lighting system performance - Accuracies and tolerances - Overview and general recommendations

  NZS 3827 can be used to identify factors influencing variability in lighting performance for a project and provide advice calculated/measured values of lighting parameters (NZS, 2013i).

- NZS 4783.1:2001. (Reconfirmed 2013): Performance of electrical lighting equipment
  NZS 60598.1:2003. Luminaires

  NZS 4783 provides methods for measuring energy consumption and performance for fluorescent lamps.

  NZS 60598 gives general and safety requirements for luminaires with related tests for mechanical and electrical constructions (NZS, 2013j).

3.8 Health and Safety in New Zealand

New Zealand has three key pieces of legislation that provide different components to New Zealand's occupational health and safety legislative framework. The Health and Safety in Employment Act (HSE) 1992, the Hazardous Substances and New Organisms Act (HSNO) 1996 and the Injury Prevention, Rehabilitation and Compensation (IPRC) Act 2001. The HSE Act is the principal Act that aims to prevent injuries, illnesses and accidents in the workplace. The HSNO Act covers the management of hazardous substances including their management in the workplace. The IPRC Act establishes New Zealand's compensation, rehabilitation and injury prevention system (MBIE, 2013). New Zealand businesses must adhere to workplace health and safety legislation and regulation and provide polices and work procedures around the type of work undertaken for the company.

3.9 Historical Places Act 1993

The Historic Places Act 1993 makes it unlawful for any person to destroy, damage or modify the whole or any part of an archaeological site without the prior authority of the New Zealand Historic Places Trust (NZHP, 2013).

3.10 Discussion and Conclusion

The overriding legislation for the protection of the environment for all road construction in New Zealand is the RMA (1991). This legislation ensures that all effected parties have a voice in the outcome of any project, but overall the protection of the environment is its underlying principle.

Issues relating to health and safety standards, ISO and other New Zealand Standards are also a major part of any roading design and construction.

This ensures that the final outcome is a safe and well designed highway that meets the principles of good structure with environmental protection.

Chapter Four: Greenroads

4.1 Introduction

The New Zealand Transport Authority (NZTA) is investigating the use of "Greenroads certification for road construction projects in New Zealand". "Greenroads" is an environmental certification system for quantifying and measuring sustainable best practices for roadway design and construction. It was developed in the United States jointly by the University of Washington (UW) and CH2M Hill and is now managed independently as a third-party not-for-profit corporation called Greenroads Foundation.

The Greenroads rating system is similar to the LEED™ (Leadership in Energy and Environmental Design) rating system for construction of sustainable buildings, developed by the U.S. Green Buildings Council (USGBC) in the mid 1990's (Soderlund. M., 2007).

The Greenroads rating system is designed for application to managing road construction on new, reconstructed, and rehabilitated roads. Through seven categories of sustainable design features, credits are awarded based on dozens of initiatives, including storm water management, bicycle and pedestrian access, reduced fuel use, paving emissions, recycled content and pavement technologies (Dahan & Goykhman; 2009).

The objectives of this chapter are to give a brief overview of the history of Greenroads, explain how Greenroads works and the process that is involved in developing a Greenroads certification system for New Zealand.

4.2 History of Greenroads

In 2007 Masters Student Martina Soderlund from the University of Washington's Department of Civil and Environmental Engineering wrote a master's thesis on "Sustainable Roadway Design – A Mode for an Environmental Rating System". Soderlund investigated ways in which an environmental rating system for roads could be structured to improve sustainability measures in roadway design (Soderlund. M., 2007). In mid-2008 the University of Washington (UW) teamed up with CH2M HILL to develop the Greenroads rating system (Muench, et al, 2011).

UW and CH2M Hill are continually developing the Greenroads system and in 2010 a new version (v 1.5) of Greenroads was released. Greenroads is still evolving and it is expected that a new version will soon be released.

As part of the development of Greenroads rating system, Greenroads rated over 100 projects of various types, sizes and stages of design. Historically the "pilot projects" have been road construction projects which had not been designed or were in the early design stage (Muench, S.T; Anderson, J.L. 2009). Some of the initial projects have gone on to gain Greenroads certification.

By 2010 there were over 20 projects registered with Greenroads (Greenroads, 2010).

4.3 Benefits of Greenroads

There are potential benefits associated with obtaining Greenroads Certification. Projects which gain Greenroads certification demonstrate how well they measure against other projects from around the world. A Project can also demonstrate that best practices were met in many aspects during the design and construction of the roadway.

4.4 How Greenroads Works

The Greenroads rating system is a collection of 48 practices to ensure best environmental roadway design and construction. There are 11 "Project Requirements" that must be completed in order for a roadway to be considered a Greenroad. The 11 Project Requirements carry no point value and must be met for all projects pursuing official recognition for a Greenroads Rating.

In addition to the Project requirements, there are a number of "Voluntary Credits" that a project team can choose to pursue. The points associated with the Voluntary Credits are added together to give a final Greenroads score.

Greenroads projects may choose to pursue one of four levels of "certification" based on the points associated with the Voluntary Credit achieved. The more points achieved the higher the certification level (Muench, et al, 2011).

4.5 Greenroads Accreditation

4.5.1 Overview

The 48 practices involved in the Greenroads rating system are arranged in seven sections, Project Requirements, Environment and Water, Access and Equity, Construction Activities, Materials and Resources, Pavement Technologies and Custom Credits. Currently there are four levels of Greenroads certification Evergreen (PR plus 64+ points), Gold (PR plus 55-63 points), Silver (PR plus 43-54 points) and Bronze (PR plus 32-42 points) (Muench, et al, 2011).

In total there are 118 points available for accreditation and the points are divided into sections as follows (Muench, et al, 2011):

1. *Project Requirements* contains 11 practices which carry no point value, however all practices are required in order to gain certification,
2. *Environment and Water* contains 8 practices with a total of 18 points available,
3. *Access and Equity* contains 9 practices with a total of 30 points available,

4. *Construction Activities* contains 8 practices with a total of 14 points available,
5. *Materials and Resources* contains 6 practices with a total of 23 points available,
6. *Pavement Technologies* contains 6 practices with a total of 22 points available, and
7. *Custom Credits* which are subject to approval from Greenroads, have a total of 10 points available.

4.5.2 Project Requirements

Project Requirements are the minimum steps a project must complete in order to be considered for Greenroads Certification. Project Requirements are designed to ensure that every project has a minimum baseline of information and that each project applying for Greenroads has a common element. The Project Requirements are designed to encourage a sound environmental decision-making process and to ensure that the appropriate construction management plans are in place (Muench, et al, 2011).

4.5.3 Environment and Water

The Environment and Water section of Greenroads encourages an ecological emphasis such as habitat and vegetation restoration, as well as promoting best practices for stormwater management. For example a project only planting non-invasive native species and using no water, can earn three points. A project that has a primary contractor who is ISO 14001:2004 certified will earn two points. A project that mimics predevelopment hydrological conditions can earn up to three points (Muench, et al, 2011).

4.5.4 Access and Equity

The Access and Equity section of Greenroads promotes safety, access for pedestrians and bicycles, and the promotion of cultural and community values. For example if a project includes one application in five separate categories of the Intelligent Transport Systems section (i.e. the project has traffic surveillance, adaptive signal controls, a dynamic message sign, HOV facilities for enforcement and an emergency call box) the project can earn five points. If a project includes a designated area for vehicles to exit the traffic stream to experience a scenic view, will earn two points. A project that provides a sidewalk or a bicycle lane can earn two points each (Muench, et al, 2011).

4.5.5 Construction Activities

The Construction Activities section of Greenroads promotes responsible construction management, by encouraging the use of alternative fuels, reducing emissions from construction equipment and improving the general health and safety for construction workers. For example a project that has a primary contractor who is ISO 9001:2008 or ISO 9001:2000 certified will earn two points. A project that has at least 75% of its construction equipment retrofitted with emission reduction exhausts can earn up to two points. A project that keeps detailed records regarding water use will earn two points (Muench, et al, 2011).

4.5.6 Materials and Resources

The Materials and Resource section of Greenroads promotes the use of local materials and the recycling and reuse of materials. The section encourages a project to have a whole site recycling plan. For example a project that reuses existing pavement and structural material can gain between one and five points. A project that uses recycled material as a substitute for virgin material can also earn between one and five points (Muench, et al, 2011).

4.5.7 Pavement Technologies

The Pavement Technologies section of Greenroads promotes the use of specific pavement engineering innovations and the use of pavement techniques which are well-established in practice and have direct sustainable benefits. For example a project that uses a long life pavement for at least 75% of the total road will earn five points. A project that uses a quiet pavement for at least 75% of the total road, could earn between two and three points (Muench, et al, 2011).

4.5.8 Custom Credits

Greenroads Custom Credits are available to projects that implement sustainable or innovative ideas. In recent times these ideas have ranged from the use of a Sustainable Transport Planner (Greenroads STP certified) in the project, pavement smoothness, roadside revegetation, work zone safety, alternative energy and freight access (Greenroads, 2013).

4.6 Greenroads in New Zealand

Greenroads certification is not immediately available without previous Pilot Projects for any project located outside of the United States. Generally, several pilot projects (a minimum of three fully detailed Pilot Projects or equivalent) are required to be completed at any non-U.S.A location before certification can be applied to any future project.

4.7 A-Lined Assessment

Greenroads offer an assessment called A-Lined Assessment. This is a chance for international projects to work with Greenroads at a project level, without necessarily pursuing certification. The A-Lined Assessment is designed to determine how well the project aligns with Greenroads and how well Greenroads aligns with the sustainability goals of the construction organisation undertaking the project.

Greenroads will assess:

- If the project can achieve Greenroads certification,
- What credits the project can earn,
- How Greenroads could be built into the bid package of the project,
- What innovative or interesting things could be considered Custom Credits for Greenroads,
- How Greenroads align with the goals of the road agency (i.e. in New Zealand's case NZTA),

An A-Lined Assessment can be completed at any time during the project lifecycle, in early planning stages, during construction, or even for completed projects.

For New Zealand, a number of A-Lined Assessments should be undertaken and then it is suggested that NZTA should pick the best New Zealand A-Lined project to be a Pilot Project.

4.8 Pilot Projects

Pilot Projects are intended to serve as a learning experience for both the owner-agency and for Greenroads. Pilot Project assessments are less formal than Certification, but follow the same general process.

Pilot Projects are more complex than the A-Lined Assessment. The primary difference is that Greenroads will look more closely at the regulatory framework of the applying country and the publicity given to the project. Pilot Projects also have the added benefit of the limited use of the Greenroads Pilot Project logo, which can be a good way to encourage engagement with stakeholders, especially on large projects. Pilot Projects are also featured on the Greenroads website and are shared as learning tools for other project teams.

There are currently two levels of pilot projects, basic and detailed. As a minimum Greenroads require three "Detailed Pilot Projects" in any new country. There are several alternative ways to produce equivalent results by looking at more projects with a less detailed evaluation; however this is not a preferred option for Greenroads.

4.9 Reasons for A-Lined Assessment and Pilot Projects

The pilot testing approach is in place because the Greenroads Rating System is designed and developed using USA-based standards. It may not be appropriate to apply USA standards internationally, and there are underlying USA regulations that may be more or less stringent than those in place in international jurisdictions. Therefore, a research-based approach is first used to test Greenroads and understand if modifications should be made to accommodate projects in international locations.

Pilot Projects and any project used to test Greenroads are not automatically eligible for certification. Part of the testing process is actually an assessment of eligibility for the project and Pilot Projects can potentially go on to become certified (A-Lined assessments could too, in most cases).

The testing approach allows Greenroads to determine which regulations in each location are important (Greenroads, 2013).

4.10 Current (2013) application of Greenroads Certification in New Zealand

As of July 2012 Te Rapa Bypass in Hamilton has been A-Lined Assessed with Greenroads and the Peka Peka to Otaki Expressway Project (PP2O) is being considered to be the first New Zealand Pilot project with Greenroads. After the completion of the Peka Peka Pilot project Greenroads will consider the Transmission Gully project to be the first fully certified New Zealand Greenroad upon completion in 2021.

4.11 Summary/Conclusion

Greenroads is an environmental rating system developed in the USA by the University of Washington and CH2M Hill.

The benefits of the Greenroads system is that certified roads can be measured against each other and demonstrate that best practices and standards have been used in a road's design and construction.

Greenroads also gives consideration to environmental issues, road construction safety, and allows for all interested parties to be involved with the project.

The Greenroads rating system looks at 48 practices arranged into seven sections that cover all aspects of road design and construction. There are four levels of certification and two assessments that allow international projects to work with Greenroads USA at a project level without the necessity or cost of pursuing certification.

The first, called “A-Lined assessment”, examines how well the project aligns with Greenroads concepts and the second called “Pilot project” serves as a learning tool for Greenroads and the road contracting agencies.

Pilot projects are more complex than A-Lined assessments as a Pilot project covers in more detail the regulatory framework of the applying country. Limited use of the Greenroads Pilot project Logo is allowed in a Pilot Project.

Two different levels of assessments are required because Greenroads being developed in the USA, using USA based standards, may be more or less stringent that those in place internationally.

In New Zealand, the Te Rapa Bypass in Hamilton has been assessed using the A-Lined process and the Peka Peka to Otaki Expressway is being considered as the first Pilot Project.

Chapter Five: Application of Greenroads to the Te Rapa Bypass

5.1 Introduction

The Waikato Expressway when completed will consist of a four-lane highway from the Bombay Hills to south of Cambridge in the Waikato region of the North Island of New Zealand (figure 5.1). The Waikato Expressway upgrade will form part of the link between Auckland and Hamilton, will improve safety, reduce travel times and congestion on SH1. The Expressway is being built in sections, Mercer to Longswamp (completed), Longswamp to Te Kauwhata (designated), Rangiriri Bypass (design stage), Rangiriri to South Ohinewai (completed), Huntly Bypass (designated), Ngaruawahia Bypass (design stage), Hamilton Bypass (designated) Tamahere to Cambridge (designated), Cambridge Bypass (design stage) and the Te Rapa Bypass (completed) (NZTA, 2013e).

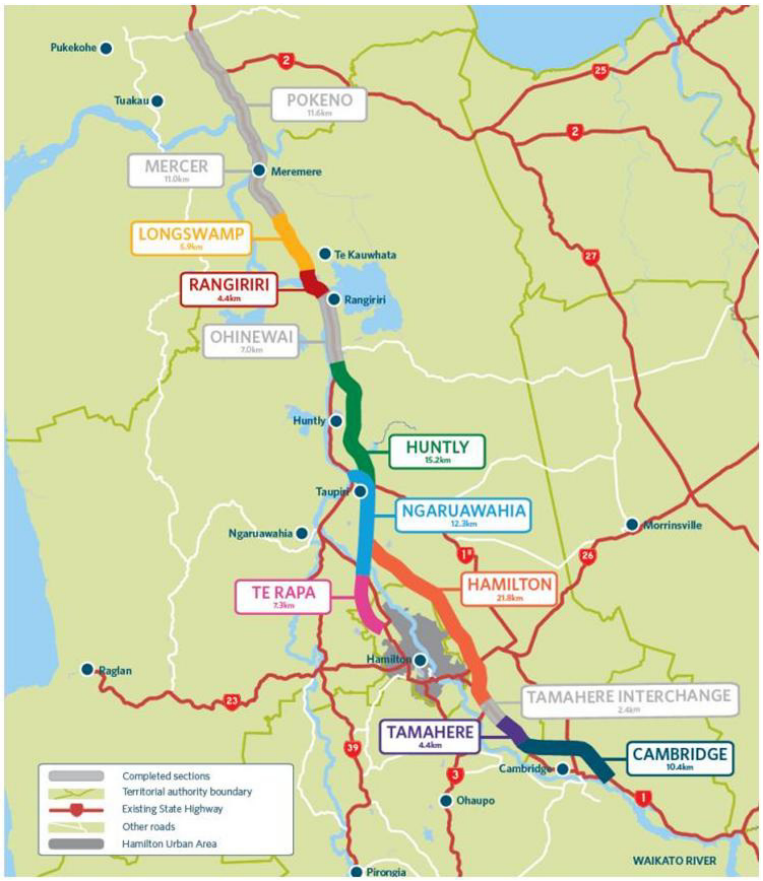

Figure 5.1: Waikato Expressway (NZTA, 2013f)

5.2 Waikato Expressway – Te Rapa Bypass

The Te Rapa Bypass section of the Waikato Expressway is located between State Highway 1 at Horotiu and Crawford Road on Avalon Drive in Hamilton (Figure 5.2).

The Te Rapa Bypass connects with the existing state highway via an interchange with ramps connecting to SH1. The Bypass runs southwards through Bern Road, crosses the Main Trunk Railway, then runs parallel with the railway line, crossing Ruffel Road, Onion Road and Te Kowhai Road, before joining Avalon Drive near the intersection with Gilchrist Street. The surrounding land adjacent to the highway is productive, flat to rolling and predominantly in dairy pasture (Transit NZ, 2007b).

The Te Rapa Bypass designation lies within the Waikato District and Hamilton City.

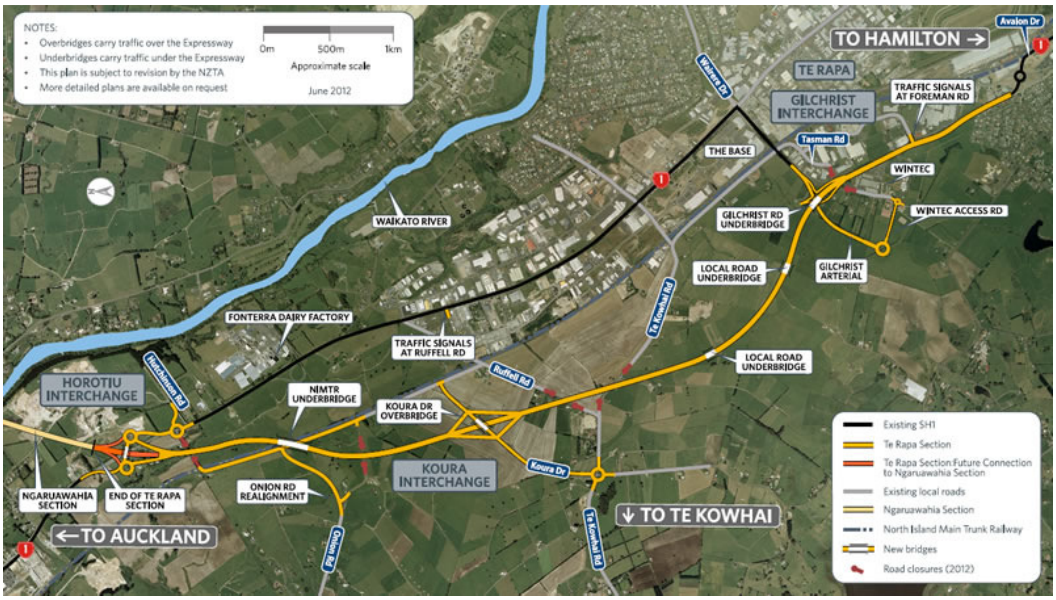

Figure 5.2: Te Rapa Bypass Location (NZTA, 2013g)

5.3 Te Rapa Alliance

The Te Rapa Bypass section of the Waikato Expressway was designed and constructed through an alliance contracting approach. The "Te Rapa Alliance" consists of the owner (NZTA), the designer (Opus), and the construction contractor (Fulton Hogan). This is a new approach to contracting in which three organisations have combined resources to form a single united team that works from design through to completion of construction.

The alliance approach creates the opportunity for designers and constructors to work together to achieve the most cost effective solution, and also gives the client (NZTA) more opportunity to engage in managing project risks and sharing in any savings made (NZTA, 2013h).

5.4 Te Rapa Bypass and the Application of Greenroads Certification Process

5.4.1 Background

In 2010 New Zealand Land Transport (NZTA) considered the Greenroads concept to evaluate road design and construction projects in New Zealand. The NZTA and Te Rapa Alliance (TRA) supported my MSc research to investigate the feasibility of a New Zealand road gaining certification under Greenroads, and whether the Te Rapa Bypass could gain certification under Greenroads.

The first step was to make contact with Greenroads, to see if such certification was possible. It became clear from the early stages that certification was not immediately available without Greenroads first undertaking a minimum of three detailed Pilot Projects for New Zealand roads.

The pilot testing approach is in place because the Greenroads Rating System was designed and developed using USA based standards. It may not be appropriate to apply the USA standards internationally, and there are underlying USA regulations that may be more or less stringent than those in place in international jurisdictions. Thus, a research-based approach was required to test Greenroads and to determine whether modifications would need to be made to accommodate projects in international locations.

Greenroads offered NZTA the option of undertaking an A-Lined Assessment for the Te Rapa Bypass, due to the fact that the Te Rapa Bypass was already well into construction and was designed before Greenroads was published. Greenroads and the NZTA concluded that the Te Rapa Bypass was a good learning opportunity for both organisations as collation of documentation for Greenroads had already begun.

5.5 Assessment of potential application of Greenroads to the Te Rapa Bypass project

5.5.1 Introduction

Initially this MSc project was contracted by the Te Rapa Alliance to gather information to pursue a full Greenroads Certification for the Te Rapa Bypass. The information that was collected and the potential Greenroads points that could be earned for the Te Rapa Bypass are summarised (Table 5.1) and discussed in the following sections.

Table 5.1: Te Rapa Alliance Assessment with Greenroads

Credit ID/Name	Points	Meet Greenroads*	Comments/info source
Project Requirements			
PR-1Environmental Review Process	Compulsory	Y	AEE, Consent Application, Alliance Agreement
PR-2Lifecycle Cost Analysis (LCCA)	Compulsory	M	SAHA report, NZTA Economic Evaluation report. Major further reporting required
PR-3Lifecycle Inventory (LCI)	Compulsory	M	Major further reporting required
PR-4Quality Control Plan	Compulsory	Y	Draft Plan was available
PR-5Noise Mitigation Plan	Compulsory	Y	Operational Noise Plan needed to be expanded to meet requirements
PR-6Waste Management Plan	Compulsory	Y	Draft Waste Management Plan was available
PR-7Pollution Prevent Plan	Compulsory	Y	Erosion and Sediment Control Plans were available
PR-8Low Impact Development (LID)	Compulsory	Y	Hydrologic and Geotechnical's reports available
PR-9Pavement Management System	Compulsory	Y	The project Alliance Agreement covers requirements, also the NZTA Waikato contract.
PR-10Site Management Plan	Compulsory	Y	The project Alliance Agreement covers requirements, also the NZTA Waikato contract.
PR-11Education Outreach	Compulsory	Y	A web site was set up and also school education days
Environment & Water			
EW-1Environmental Management System	2	N	ISO14001:2004 required
EW-2Runoff Flow Control	1-3	M	Major further reporting required
EW-3Runoff Quality	1-3	M	Major further reporting required
EW-4Stormwater Cost Analysis	1	M	Major further reporting required
EW-5Site Vegetation	1-3	Y	Site Vegetation Planting Plan covers this credit
EW-6Habitation Restoration	3	N	Most likely TRA could not meet this credit
EW-7Ecological Connectivity	1-3	N	The Burn Road Culvert was not enough to meet this credit
EW-8Light Pollution	3	Y	Kaos lighting used

* Y=Yes, N=No, M=Maybe

Credit ID/Name	Points	Meet Greenroads*	Comments/info source
Access & Equity			
AE-1Safety Audit	1-2	Y	Opus undertook all the safety audits required
AE-2Intelligent Transportation Systems (ITS)	2-5	M	Could have added a number of ITS into the project
E-3Context Sensitive Solutions	5	Y	Draft CSS was available
AE-4Traffic Emissions Reduction	5	M	TRA did not undertake congestion pricing; however they have built a road to move congestion. TRA could adapt opus modelling to look at emission but this would not be using the recommended MOVES2010 software, however it would give a curd answer.
AE-5Pedestrian Access	1-2	Y	Draft Walking and Cycling Strategy was available
AE-6Bicycle Access	1-2	Y	Draft Walking and Cycling Strategy was available
AE-7Transit Access	1-5	M	Could have investigated this credit and included enough in the design to gain 1 point
AE-8Scenic Views	1-2	M	The Bypass has a wonderful view of Pirongia Mountain; however no pull off area was included in the design.
AE-9Cultural Outreach	1-2	M	HCC allocated $250K for art work on the project
Construction Activities			
CA-1Quality Management System	2	Y	Opus and Fulton Hogan both have ISO 9001:2008 certification
CA-2Environmental Training	1	Y	TRA undertook Environmental Training on this project regularly
CA-3Site Recycling Plan	1	Y	Draft Site Recycle Plan was available and with little effort could meet this credit
CA-4Fossil Fuel Reduction	1-2	N	No bio-fuel was used on the site
CA-5Equipment Emissions Reduction	1-2	N	A spreadsheet of all inducted plant onto the site could have included information for this credit
CA-6Paving Emissions Reduction	1	N	Major further reporting required
CA-7Water Tracking	2	Y	Water use was required by the Waikato Regional Council for the Water Take/Use consent
CA-8Contractor warranty	3	M	This could be completed by TRA before handover
Materials & Resources			
MR-1Life Cycle Assessment (LCA)	2	M	Major further reporting required
MR-2Pavement Reuse	1-5	Y	Spreadsheet was available which would earn 1 point, with little work it could earn more
MR-3Earthwork Balance	1	M	Major further reporting required
MR-4Recycled Materials	1-5	Y	Spreadsheet was available which would earn 1 point, with little work it could earn more
MR-5Regional Materials	1-5	M	The majority of materials were sourced locally (Ngahinapouri and Te Kowhai), Minor further reporting required
MR-6Energy Efficiency	1-5	M	Kaos lighting used, potentially earning some points
Pavement Technologies			
PT-1Long-Life Pavement	5	M	With better calculations this maybe met
PT-2Permeable Pavement	3	N	Could not meet
PT-3Warm Mix Asphalt (WMA)	3	N	Could not meet
PT-4Cool Pavement	5	N	Could not meet
PT-5Quiet Pavement	2-3	M	Avalon Drive section of the bypass was sealed with a quiet pavement
PT-6Pavement Performance Tracking	1	M	NZTA has a pavement performance tracking system

* Y=Yes, N=No, M=Maybe

5.5.2 Analysis of Individual Sections

5.5.2.1 Introduction

This section reports which of the compulsory Project Requirements the Te Rapa Bypass would meet and where the Te Rapa Bypass could potentially gain points for voluntary credits. The voluntary credits the Te Rapa Bypass could not pursue are also considered.

5.5.2.2 Compulsory Project Requirements

a) Environmental Review Process (PR-1)

A document called Te Rapa Alliance –PR-1 Environmental Review Process (appendix two) was prepared. The document is a collation of information, to address the majority of the Environmental Review Process Project Requirements. The Te Rapa Alliance also had a Contract (No NZTA 2/03-016/601 Waikato Expressway Te Rapa Section Project Alliance Agreement dated September 2009) and the Transit New Zealand: SH1 Te Rapa Bypass Notice of Requirement (dated January 2008), which covered issues required for the Environmental Review Process Project Requirement.

b) Lifecycle Cost Analysis (PR-2) and Lifecycle Inventory (PR-3)

As Greenroads certification was not being pursued during the design stage of the Te Rapa Bypass a Lifecycle cost analysis and a lifecycle inventory were not undertaken. It would be difficult to undertake either of these assessments now that the project has been constructed. An analysis of the cost and inventory lifecycles would need to be undertaken at the design stage of any project pursuing Greenroads Certification.

The New Zealand Transport Authority contracted SAHA International in 2010 to undertake an economic assessment of New Zealand Roads of National Significance. The Waikato Expressway (the Te Rapa Bypass being part of the Waikato Expressway) was named as a Road of National Significance. As the

SAHA report covered all the New Zealand Roads of National Significance it did not cover the detail required by Greenroads for a Lifecycle Cost Analysis for the Te Rapa Bypass

c) Quality Control Plan (PR-4)

The Te Rapa Alliance has a draft Quality Control Plan, which would meet the Greenroads certification requirements of the Quality Control Plan project requirement.

d) Noise Mitigation Plan (PR-5)

The Te Rapa Alliance has an Operational Noise Mitigation Plan, however this plan does not fully meet the Greenroads Noise Mitigation Plan project requirement. The Transit New Zealand: SH1 Te Rapa Bypass Notice of Requirement (NOR) has an appendix covering noise and local receptors. The NOR information and Operational Noise Mitigation Plan would need to be expanded to meet the Greenroads Noise Mitigation Plan project requirements.

Future Operational Noise Mitigation Plans would need to ensure that the site induction check lists record where any noise reduction mufflers have been retrofitted to the construction/earthmoving equipment.

e) Waste Management Plan (PR-6)

The Te Rapa Alliance has a Draft Waste Management Plan which would need to be expanded to meet the Greenroads Waste Management Plan project requirement.

f) Pollution Prevention Plan (PR-7)

As a condition of consent, the Waikato Regional Council (WRC) required the TRA to provide an Erosion and Sediment Control Plan. Site inspections were undertaken weekly by the Regional Council and as a result of excellent compliance the TRA was awarded the WRC Erosion and Sediment Control Award two years running (Fulton Hogan, 2013).

The Te Rapa Alliance (TRA) has a number of Erosion and Sediment Control Plans, which if submitted together, should meet the Greenroads Pollution Prevention Plan project requirement.

g) Low Impact Development (PR-8)

The Te Rapa Alliance has the following documents which are applicable to the Low Impact Development Project Requirement:

- SH1 Avalon Drive Stormwater Management System Comparison with Proposed NZTA Stormwater Treatment Standard Requirements dated October 2008.
- Proposed NZTA Stormwater Treatment Standard Requirements dated October 2008.
- Transit New Zealand: SH1 Avalon Drive Bypass Stormwater Management System Project Review dated May 2008.
- Waikato Expressway Te Rapa Section – Cross Drainage Culverts dated May 2010.
- Waikato Expressway Te Rapa Section – Cross Drainage Culvert Design Report dated July 2010.

From the above documents a Low Impact Development (LID) evaluation could be completed to meet the Greenroads Project Requirement.

h) Pavement Maintenance Plan (PR-9)

The New Zealand Transport Authority Contract No 2/03-016/601 Waikato Expressway Te Rapa Section Project Alliance Agreement, sections S5-18 and S5-19 show that a pavement and bridge management system was in place. The Management system was maintained by Opus International (part of the Alliance) during the construction of the Te Rapa Bypass. The Management system would meet the Greenroads Pavement Maintenance Plan project requirement.

i) Site Maintenance Plan (PR-10)

The New Zealand Transport Authority (NZTA) Contract No 2/03-016/601 Waikato Expressway Te Rapa Section Project Alliance Agreement stated that a site maintenance plan would be implemented. The Site Maintenance Plan was written after the Te Rapa Bypass was constructed and handed over to Fulton Hogan who currently hold the Waikato Maintenance Contract for NZTA.

j) Education Outreach (PR-11)

The Te Rapa Alliance (TRA) through the New Zealand Transport Authority maintains a website which is updated regularly with information regarding the Te Rapa Bypass construction. A Waikato Expressway facebook page was also set up, where information was placed regarding future road closures and photos of the construction.

The TRA distributed a monthly newsletter to stakeholders with information on upcoming events that were happening on site including, road closures and progress updates.

The TRA gave presentations to primary schools about the project when the schools came to the site for planting days and also a number of presentations were given to key interest groups when they visited the site.

A professional technical presentation could have been undertaken to meet the requirements for Greenroads certification.

5.5.2.3 Greenroads Environment and Water Credits

a) Environmental Management System (EW-1)

Greenroads requires the prime contractor, design builder or construction management firm to hold ISO 14001:2004 certification or have an environmental management system that meets the requirements of ISO 14001:2004 certification. As Fulton Hogan did not hold ISO 14001:2004 certification or an equivalent they were unable to gain points for the Environmental Management System credit.

b) Runoff Flow Control (EW-2), Runoff Quality (EW-3) and Stormwater Cost Analysis (EW-4)

The Te Rapa Alliance (TRA) had two documents which relate to runoff credits. The SH1 Avalon Drive Stormwater Management System Comparison with Proposed NZTA Stormwater Treatment Standard Requirements dated October 2008 and the Transit New Zealand: SH1 Avalon Drive Bypass Stormwater Management System Project Review dated May 2008. TRA documents indicate that the stormwater would be treated to the required standard, however the documents do not show how the stormwater would be treated and to what degree. Stormwater retention pond designs are available potentially gaining two voluntary points per credit (except the Stormwater Cost Analysis credit which is worth one point). However additional work would be required on the stormwater documents to guarantee the points.

New Zealand Transport Authority have a Stormwater Treatment Standard for State Highway Infrastructure (May 2010) which ensures that runoff from State Highways comply with Resource Management Act requirements. Thus the adverse effects of runoff from state highways are limited in sensitive areas and stormwater treatment devices on the state highway network are shown to be effective.

Transfund New Zealand, a crown entity established under the Transit New Zealand Act 1998, also commissioned a report in 2004 on Integrated Stormwater Management Guidelines for New Zealand Roading Networks. The purpose of stormwater management guidelines are to give guidance around the complex issues relating to the management of stormwater runoff, such as the legal framework, the management framework, gaining resource consent, best practices, and the environmental issues and mitigation measures of stormwater runoff (Transfund New Zealand, 2004).

c) Site Vegetation (EW-5)

During the design stage of the Te Rapa Bypass the Waikato Link Landscape and Urban Design Team from the Te Rapa Alliance (TRA) wrote a Landscape and Urban Design Master Plan for the Bypass, which would meet the Greenroads Certification requirements for the Site Vegetation credit.

The Te Rapa Bypass used predominantly native plant species. However a few exotic trees were used to reflect the Hamilton Garden City image. The plantings were timed so no water was required (TRA, 2010). The plantings and non-watering would mean potentially the Te Rapa Bypass would gain two points for this credit, but as the plantings were not only native species (due to the use of exotic trees) only one point could be gained.

Other applicable documents for the Site Vegetation credit would be the NZTA Landscape Specifications Waikato Expressway Te Rapa Section, July 2010, the NZTA Riparian Management Plan Waikato Expressway Te Rapa Section, August 2010 and the numerous TRA Planting Plans and Planting Schedules.

In 2006 Transit New Zealand published Guidelines for Highway Landscaping. The guidelines set out the NZTA expectations for highway landscaping. The landscape guidelines provide information on how to achieve the expectations of NZTA through landscape protection, enhancement, and best practice. The landscape guidelines address suitable indigenous plants and native seed collection (Transit NZ, 2006), which would meet the requirement of the Greenroads Credit.

d) Habitat Restoration (EW-6) and Ecological Connectivity (EW -7)

The Habitat Restoration and Ecological Connectivity credits could not be pursued by the Te Rapa Alliance (TRA), as no budget was put in place to offset any ecological damage. The area in which the Te Rapa Bypass was constructed was highly modified and intensively farmed. Small areas of ecological values were enhanced such as the remnant plantings around Bern Road (TRA, 2010). As the remnant enrichment planting did not equal the total area of road construction, no points could be pursued for the Habitat Restoration Credit.

The TRA installed a culvert at Bern Road that was constructed in a manner which aided fish passage, however under the Ecological Connectivity credit the culvert would not be enough to gain any points.

e) Light Pollution (EW-8)

Light Pollution requires lighting to "Dark-Skys" certification or equivalent. The International Dark-Skys Association is a non-profit organisation fighting to preserve and protect the night time environment through responsible outdoor lighting (Dark-Skys, 2013).

The "Kaos" road lighting fixtures that were installed on the Te Rapa Bypass are high performance luminare lights with a downward light output ratio of 82%. This ratio means that there is minimal light emitted above the horizontal (Techlight, 2013). Kaos lighting has not been assessed by Dark-Skys, however the Kaos light could be put through the Dark-Skys assessment or an equivalent report could be produced to prove that the lights meet the standards, gaining three voluntary points.

5.5.2.4 Greenroads Access and Equity Credits

a) Safety Audit (AE-1*)*

In July 2004 the New Zealand Transport Authority published a document called "Safety audit policy and procedures", which applies to new road works (NZTA, 2013i). The Te Rapa Alliance complied with the Safety audit policy and procedures fully and completed all required auditing. Safety audits were completed before and after construction and would meet the Greenroads Certification requirements for the Safety Audit credit, gaining two voluntary points.

b) Intelligent Transport Systems (AE-2)

No Intelligent Transport Systems were budgeted into the Te Rapa Bypass. Had Greenroads certification been planned during the design stage, it would have been easy to include traffic controls and warning systems into the design which would have earned points under the Intelligent Transport Systems credit.

c) Context Sensitive Solution (AE-3)

A short draft narrative document (Te Rapa Alliance Draft AE-3 Context Sensitive Solutions document, 2011) (appendix Three) was prepared by Te Rapa Alliance. The document included the purpose and need for the project, the planning and proposed timeline for the project, organisational chart, public involvement and the visual and aesthetics of the project. The Context Sensitive Solutions document required additional work to meet the five points available for this credit.

d) Traffic Emissions Reduction (AE-4)

The Traffic Emissions Reduction credit could not be pursued as the level of information required by Greenroads to gain these points had not been obtained by the New Zealand Transport Authority.

e) Pedestrian Access (AE-5) and Bicycle Assess (AE-6)

During the consent and designation process the Te Rapa Bypass was granted consent subject to the development of a Walking and Cycling Strategy. This Walking and Cycling Strategy required consultation with Hamilton City Council, Waikato District Council, Waikato Regional Council and relevant walking and cycle advocacy groups.

The New Zealand Transport Agency produced a Draft Walking and Cycling Strategy, Te Rapa Bypass, dated October 2009. The Te Rapa Bypass Walking and Cycling Strategy took guidance from the national Walking and Cycling Strategy, Getting There – On Foot by Cycle (MOT 2005) and from the New Zealand best practice guide to Walking and Cycling Strategies (Land Transport New Zealand Research Report 274). The draft strategy was approved by all relevant parties (Inder & McFarlane. 2009).

The Draft Te Rapa Bypass Walking and Cycling Strategy document would meet both the Pedestrian Access credit requirements and the Bicycle Access credit requirements for Greenroads certification and would gain two voluntary points per credit.

f) Transit & High-Occupancy Vehicle (HOV) Lane Access (AE-7)

The Transit New Zealand, SH1 Te Rapa Bypass Notice of Requirement (NOR) states the Te Rapa Bypass may help in local transit issues. The NOR does not go far enough into the specific transit installation to gain any points for this credit. Two points are possible, by ensuring that bus stops have shelters and rubbish bins provided and that any existing bus stops are upgraded to provide shelter and rubbish bins. These enhancements would need

to be done in conjunction with the Waikato Regional Council and the Hamilton City Council, as providers of the bus service and amenities.

g) Scenic Views (AE-8)

The Te Rapa Bypass has wonderful views of Pirongia Mountain. A designated area for scenic viewing was not included in the design. A designated area would have added to the cost of construction and as Greenroads certification was not being pursued at the time of design, no weight or consideration would have been given to this idea.

However, potentially one point maybe available as the Te Rapa Bypass has been designated as part of the Thermal Explorer Highway which runs from Auckland to the Hawkes Bay through the centre of the North Island. The Thermal Explorer Highway is a recommended touring route for visitors to New Zealand (Explore Central North Island, 2013).

h) Cultural Outreach (AE-9)

The Te Rapa Bypass is considered a high priority site in the Hamilton City Council's Public Art Plan as it serves as a gateway to Hamilton City. The Hamilton City Council (HCC) has allocated $250,000 to install art work along the Te Rapa Bypass and the art is proposed to be installed in the next one to five years (HCC, 2010). The art work could gain two points for the Culture Outreach credit, provided Greenroads accepted that the funding for the art was being provided by the HCC and not the Te Rapa Alliance.

5.5.2.5 Greenroads Construction Activities Credits

a) Quality Management System (CA-1)

Fulton Hogan and Opus International are both ISO 9001:2008 certified, gaining the maximum two points available for Quality Management System credit.

b) Environmental Training (CA-2)

The Te Rapa Alliance (TRA) is environmentally aware and this was evident when the TRA won the Waikato Regional Council's Erosion and Sediment Control Award two years running. The TRA undertook regular environmental awareness training days. A record of who undertook the training, the type of training and when the training occurred was kept by the TRA Environmental Manager. Little effort would be required to convert these environmental training records into an Environmental Training Plan which is required to be obtained for the Environmental Training credit for Greenroads certification. The Environmental Training Plan would gain one voluntary point.

c) Site Recycling Plan (CA-3)

A draft Waste Management Plan was created by the Te Rapa Alliance (TRA), however this plan is lacking in information required for the Site Recycling Credit. Additional work would be required on the Waste Management Plan to meet the standard required for Greenroads Certification, and if the work was undertaken the Site Recycling Plan would gain one voluntary point. The TRA may well have met the requirements of the Site Recycling Plan credit if the plan had been committed to paper.

d) Fossil Fuel Reduction (CA-4), Equipment Emissions Reduction (CA-5) and Paving Emissions Reduction (CA-6)

Greenroads certification was not a consideration during the start of construction; therefore use of alternative fuel sources was not a priority, nor were emissions reduction or paving emissions reduction.

When equipment was inducted onto the site, the induction sheet could have included a section on equipment emissions and suppliers of the equipment could have been encouraged to supply equipment which would have earned points.

The paver used may have met the standards required for the Paving Emissions Reduction credit; however no documentation was available to support this. The point available for the Paving Emissions Reduction credit may have been obtained with relatively little extra reporting work.

e) Water Tracking (CA-7)

Water tracking was required as a condition of consent from the Waikato Regional Council. Daily records of amount used and location of the source were maintained, gaining the maximum two points for this credit.

f) Contractor Warranty (CA-8)

The Contractor Warranty would be available after construction was completed, but was not available at the time this information was submitted to Greenroads for the A-Lined Assessment.

For a project pursuing Greenroads certification, the delay in Contractor Warranty documentation may need to be factored into the final assessment.

5.5.2.6 Greenroads Materials and Resource Credits

a) Life Cycle Assessment (MR-1)

A life cycle assessment was not undertaken for the Te Rapa Bypass. The effort and cost to undertake a life cycle assessment at the construction stage would have out weighed the two points gained.

Life Cycle Association of New Zealand could be a point of contact for a New Zealand project wishing to pursue the Life Cycle Assessment.

b) Pavement Reuse (MR-2)

An excel spreadsheet (Te Rapa Alliance – Greenroads info for Pavement Reuse Avalon Drive, 2011) was prepared (appendix four). Avalon Drive was the only section of existing road on the project. The Pavement Reuse spreadsheet showed that at least 50% of the existing pavement was reused within the construction of the Te Rapa Bypass. The excel spreadsheet would gain one point, with additional work and calculations more points could be awarded.

c) Earthworks Balance (MR-3)

An earthworks balance was not undertaken for the Te Rapa Bypass. The effort and cost to undertake such an assessment at the construction stage would have out-weighed the benefits of the point. An earthworks balance would require minimal extra effort if undertaken during the design stage of the process.

d) Recycled Material (MR-4)

An excel spreadsheet (Te Rapa Alliance – Re-use Recycle, 2011) was developed (appendix five) The Re-use Recycle spreadsheet showed that pavement materials from Avalon Drive would be recycled in some form within the construction of the Te Rapa Bypass. The excel spreadsheet would require minimal work and calculations to gain two points for the Recycled Material credit.

e) Regional Material (MR-5)

As excel spreadsheet (Te Rapa Alliance – Materials Cost and Distance, 2011) was developed (appendix six). The Materials, Cost, and Distance spreadsheet shows some materials were sourced locally, but more work is required to show what percentage of materials were sourced locally. Five points could easily be achieved with minimal additional work to this spreadsheet.

f) Energy Efficiency (MR-6)

In New Zealand RightLight developed an online resource to assist with the planning and implementing of road lighting. The aim of the online resource is to achieve optimal standards, designs and technical solutions for road lighting in New Zealand from design to construction and installation (RightLight, 2013).

RightLight was originally developed by the Electricity Commission with support of the Energy Efficiency Conservation Authority (EECA), Consumer New Zealand, New Zealand Green Building Council, Lighting Council NZ (LCNZ) and the Electrical Contractors Association of New Zealand (ECANZ). EECA now manages and maintains RightLight (RightLight, 2013).

The RightLight road light resource section was developed in conjunction with councils, the New Zealand Transport Agency (NZTA), road lighting specialists, Local Government New Zealand and members of the AS/NZS 1158 Standards committee (RightLight, 2013).

The Kaos luminare lighting selected for the Te Rapa Bypass was selected using the RightLight information and could potentially earn points for the credit. A copy of the specifications for the Kaos lighting would be required to gain any points for the credit.

5.5.2.7 Greenroads Pavement Technologies Credits

a) Long Life Pavement (PT-1)

The type of pavement used on the construction of the Te Rapa Bypass may gain points for the credit; however more work is required to provide the information required for the credit.

In 2007 Transit New Zealand (Transit) reviewed the management of long-term performance of the state highway network. Transit requires maintenance data to be captured by network management consultants (NMC). The main objectives of the database are to ensure any maintenance on a highway is

recorded and the maintenance on that section of highway is only what is actually required (Transit NZ, 2007c).

b) Permeable Pavement (PT-2), Warm Mix Asphalt (PT-3), Cool Pavement (PT-4) and Pavement Performance Tracking (PT-6)

These credits were not undertaken by the Te Rapa Alliance. The Warm Mix Asphalt could have been investigated, however this would have had a financial implication on the Te Rapa Alliance.

c) Quiet Pavement (PT-5)

A quiet pavement was used on the Avalon Drive section of the Te Rapa Bypass. However the Avalon Drive section of the Te Rapa Bypass does not equate to 75% of the total construction, therefore potentially no points can be awarded.

5.5.2.8 Greenroads Custom Credits

Potentially a Custom Credit could be awarded for creating an ecological corridor. The Transit New Zealand Notice of Requirement for the Te Rapa Bypass states that the area around the Te Rapa Bypass has "no outstanding features" or "no landscape of importance". However the construction of the bypass is an opportunity to provide a green corridor between future areas of development and a chance to enhance the northern gateway to Hamilton.

The selection and combination of planting materials will assist in enhancing wildlife opportunities. The planting of podocarp species, flax and kowhai will provide a food source for birds and all plants were eco-sourced.

5.5.3 Outcome of the assessment for potential application of Greenroads to the Te Rapa Bypass project

As the Te Rapa Bypass project stood in 2011/2012 it was my assessment that a Greenroads Bronze Certificate could have been potentially achieved with some additional effort. My assessment suggested that 9 of the 11 Project Requirements could have been met and 33 voluntary credits could have been achieved, giving the project a Bronze Certification. Major reporting work on the Lifecycle cost analysis and Lifestyle Inventory sections would have been required to meet the full 11 Project Requirements as this work was not undertaken at any stage of the project.

About 33 voluntary points could have been achieved. At least 6 points in the Environment & Water section, at least 11 points in the Access & Equity section, at least 6 points in the Construction Activities section, and at least 10 points in the Materials & Resources section. No points could have been achieved initially in the Pavement Technologies section as the project did not meet any of the Pavement Technologies criteria required for Greenroads.

An additional 19 voluntary points could possibly have been achieved, if a considerable amount of additional documentation had been undertaken by the Te Rapa Alliance. This could have given the Te Rapa Bypass a Silver Greenroads Certification.

5.6 Information submitted to Greenroads for an A-Lined Assessment

5.6.1 Information submitted

When Greenroads was contacted regarding certification it was clear that Pilot Projects for New Zealand roads were required before a full certification process could be undertaken. In July 2012 the NZTA registered the Te Rapa Bypass with Greenroads for an A-Lined assessment. Once the Te Rapa Bypass was registered with Greenroads and the fee paid, the documentation for the Te Rapa Bypass was uploaded to the Greenroads website for an A-Lined Assessment as part of the work undertaken for this thesis.

The following information was submitted to Greenroads for the A-Lined Assessment:

- Contract No. NZTA 2/03-016/601 Waikato Expressway Te Rapa Section Project Alliance Agreement dated September 2009.
- Transit New Zealand: SH1 Te Rapa Bypass, Notice of Requirement dated January 2008.
- Transit New Zealand: SH1 Avalon Drive Bypass Stormwater Management System Project Review dated May 2008.
- SH1 Avalon Drive Bypass Stormwater Management System Comparison with Proposed NZTA Stormwater Treatment Standard Requirements dated October 2008.
- Best Practice Project Design Plan. Waikato Expressway – Te Rapa Section dated March 30, 2010.
- Roads of National Significance Economic Assessments Review dated July 2010.
- Waikato Expressway Te Rapa Section – Cross Drainage Culverts dated May 2010.
- Waikato Expressway Te Rapa Section – Cross Drainage Culverts Design Report dated July 2010.
- Operational Noise Mitigation Plan dated August 23, 2010
- Quality Management Plan Draft.
- Waste Management Plan Draft.
- Fulton Hogan ISO 9001:2008 certification.
- Opus International Consultants LTD ISO 9001:2008 certification.
- Draft Walking and Cycling Strategy, Te Rapa Bypass. New Zealand Transport Agency. Dated October 2009.
- Landscaping and Urban Design Masterplan.
- Te Rapa Bypass Investigation, Preliminary Geotechnical. Geotechnical Report No. 2307 dated May 7, 2004.
- Kaos Street Lighting Catalogue
- Te Rapa Alliance, PR-1 Environmental Review Process documentation (appendix two).

- Te Rapa Alliance, AE-3 Context Sensitive Solutions documentation (appendix three).
- Te Rapa Bypass Alliance – Organisational Structure dated April 2011.
- Pavement and Surfacing Summary – Avalon Drive dated July 13, 2011.
- Greenroads info for Pavement Use Avalon.xlsx (appendix four)
- Re-use Recycle.xlsx (appendix five)
- Materials Cost and Distance.xlsx (appendix six)
- http://www.nzta.govt.nz/projects/te-rapa/overview.html

Documentation that was drafted by myself as part of this thesis is included in the appendices. All other documentation submitted to Greenroads was collected as part of this thesis, but documents that did not require any alteration by myself were not included in the appendices.

5.6.2 Outcome of A-Lined Assessment on the Te Rapa Bypass

The results of the A-Lined assessment (appendix seven) showed that as the Te Rapa Bypass project stood, with limited additional work a Greenroads Bronze Certificate could be achieved. The assessment illustrated that with minimal effort to reporting documentation the Te Rapa Bypass could have gained 34 voluntary points. However the main focus would need to have been on the Project Requirements. Greenroads assessment was that only 7 out of the 11 Project Requirements could have been achieved.

It was unclear if New Zealand projects would have difficulty with completing the current 11 Project Requirements as the level of detail required for the compulsory Project Requirements section was not available from Greenroads.

From the information submitted to Greenroads, Greenroads stated that it appeared that the New Zealand design and construction standards align well with the existing Greenroads credit requirements. The information submitted served well for an A-Lined assessment. However the documentation often did not meet the explicit criteria included in each Greenroads credit.

5.7 Discussion and Conclusion

It was found when applying the Greenroads Certification to Te Rapa Bypass there were a considerable number of issues that needed to be addressed:

1. The Te Rapa Bypass was designed before the Greenroads manual was published, meaning that the Greenroads Certification System was not considered in the design and construction of the Bypass.
2. Greenroads was not written for New Zealand road construction or New Zealand Laws, therefore compliance is only assumed in some credits.
3. The idea to pursue Greenroads Certification came during the construction phase of the Bypass. Existing Te Rapa Alliance documentation often provided good information, however the documentation was lacking in explicit information to meet Greenroads criteria.

If the Te Rapa Bypass had been eligible to apply for Greenroads Certification all documents required to be submitted to Greenroads would have needed to be up-graded to address all aspects of the credits being applied for. Also draft documentation would have needed to have been finalised at the commencement of the design stage.

From my review it was evident that many decisions made by the TRA would have met the credit requirements of Greenroads. However the documentation to obtain these credits was lacking in detail, or not undertaken at all. Had documentation been up to the standard required by Greenroads, the credits would have been met.

My assessment indicated that 9 of the 11 Project Requirements could have been met; however the Greenroads A-Lined assessment stated that only 7 of the 11 Project Requirements could have been met. The difference was lack of documentation in the files sent to Greenroads for the Pollution Prevention Plan and the Educational Outreach Requirements. The Te Rapa Alliance had undertaken a Pollution Prevention Plan; however Greenroads appeared to have not accepted this documentation. The Te Rapa Alliance could meet the Education Outreach requirements, however this was not available at the time the information was submitted to Greenroads for the A-Lined assessment.

With the documents currently available for the Te Rapa Bypass project Greenroads Certification could not be awarded, however a Greenroads Bronze Rating could have been pursued with little additional effort by the Te Rapa Alliance and even Greenroads Silver Rating could have been achievable.

Generally it appears that New Zealand road design and construction standards align well with the existing Greenroads credit requirements.

Under the Resource Management Act 1991 road construction projects are required to gain resource consent. Part of the consenting process requires a project team to undertake an assessment of environmental effect and to consult with any potentially affected party. This process aligns well with some of the basic principles behind Greenroads.

The additional cost to a project to implement some of the requirements for the credits can be minimal provided these requirements are included early in the design process.

When Greenroads is the main focus of a roading project, the required Greenroads documentation can be taken into consideration at the design, consenting and construction stages of the project. This initial documentation focus would greatly reduce the additional work required when Greenroads certification was sought.

For any New Zealand road under our current standards of road building, a Bronze Greenroads Certification should be possible with improved reporting. To achieve a level higher than bronze, the road construction as a whole would need to be reviewed.

Chapter Six: Application of INVEST and CEEQUAL to the Te Rapa Project

6.1 Introduction

This chapter discusses potential for the Te Rapa Bypass Project to be assessed against the INVEST (VicRoads – Integrated VicRoads Environmental Sustainability Tool managed by VicRoads in Australia) and the CEEQUAL (Civil Engineering Environmental Quality Assessment and Awards Scheme based in the UK) assessment tools.

6.2 VicRoads – Integrated VicRoads Environmental Sustainability Tool (INVEST)

6.2.1 Assessment of potential for the Te Rapa Bypass to meet the INVEST Pre-requisites

The primary pre-requisites for the INVEST tool are:

1. ***Compliance with all permits and permit conditions***.
   In Victoria Australia all road construction is required to obtain permits under the Environmental Protection and Biodiversity Conservation Act 1999, Native Title Act 1993, Environmental Effects Act 1978, Major Transport Project Facilitation Act 2009, Planning and Environmental Act 1987, Fauna and Flora Guarantee Act 1998, Catchment and Land Protection Act 1994, Fisheries Act 1995, Wildlife Act 1975, Aboriginal Heritage Act 2000, Heritage Act 1995, Water Act 1989 and the Land Conservation (Vehicle Control) Act 1972 (INVEST, 2011).

Under New Zealand law for the Te Rapa project, NZTA was required to gain the appropriate consents from the Waikato Regional Council, Waikato District Council and the Hamilton City Council, all acting under the Resource

Management Act 2001 (RMA). Each council monitors their consents to ensure compliance. The Waikato Regional Council monitors all consented earthwork activities weekly. The Te Rapa project would have met a New Zealand version of compliance with all permits and permit conditions complied with, including being awarded the Erosion and Sediment Control award from the Waikato Regional Council.

2. ***Compliance with VicRoads Environmental Policies***

- Noise - The VicRoads Traffic Noise Reduction Policy determines the project noise targets and ensures that the appropriate design and construction barriers are put in place.

During the designation process Opus Consulting was contracted by NZTA to undertake a Noise Effect Assessment. The noise assessment assessed noise from both the construction of the Project and subsequent traffic noise from the completed Bypass. From this report the Te Rapa Alliance produced an Operational Noise Mitigation Plan, which was implemented during construction of the bypass. The Operational Noise Mitigation Plan addressed who was likely to be impacted by noise, to what extent, and the mitigation measures for these impacts.

- Water Usage - VicRoads has committed under the Sustainability and Climate Change Strategy, to reduce by 80% all water used during road construction by 2015 and to reduce by 40% all water used for regional projects and maintenance by using non- potable water source (INVEST, 2011).

The Te Rapa project used groundwater, surface water and dewatering for dust suppression during construction. All water use was tracked, and records were kept. The Project did not look at alternative water sources. In New Zealand alternative non-potable water sources are not investigated. New Zealand could benefit at looking at such sources as often there are industries with good quality waste water not far away. For example: Te Rapa could have used the discharge from the Hamilton Waste Water Treatment Plant, or the waste discharge from the

Fonterra milk processing plant. There are also many quarries around the Te Rapa area with sediment retention ponds which could have been tapped.

3. ***Compliance with Legislative requirements***

   "The Project" must ensure that suitable environmental procedures and controls are established, consistent with the requirements of Environmental Guidelines for Major Construction Sites (EPA 1996). The Environmental Guidelines require a Project design to have minimal land disturbance, prevent soil erosion and mitigate the discharge of pollutants to water (INVEST, 2011).

Under the New Zealand regulator framework, erosion and sediment control is addressed by the Regional Councils. The Waikato Regional Council required the Te Rapa Alliance to produce an Erosion and Sediment Control Plan, which was signed off and inspected by the council weekly during construction.

Land disturbance was kept to a minimum at all time during construction of the Te Rapa Bypass and any land that was disturbed was stabilised and re-grassed as soon as possible.

4. ***Environmental Reporting***

   - Audits – are independent reviews of sediment and stormwater controls.

All sediment and stormwater controls were designed by Opus International who was contracted by NZTA, during the design and construction phase of the Te Rapa Bypass. The sediment and stormwater designs were then reviewed by the Waikato Regional Council during the consenting phase and signed off. The Waikato Regional Council monitored the site weekly, giving an independent review of compliance.

- Greenhouse Monitoring – Comply with the VicRoads workbook.

At the time the Te Rapa Bypass was designed and constructed there was no New Zealand requirement to calculate the greenhouse footprint of the road construction.

- Other Monitoring – Incidents on site, environmental incidents on site, monitoring results.

The Te Rapa Bypass was completed without any incidents or accidents on site.

6.2.2 Comparison of the Te Rapa Bypass and the INVEST Sustainable indicators

My INVEST assessment (Table 6.1) on the Te Rapa Bypass was based on the VicRoads INVEST handbook March 2011.

Table 6.1: Te Rapa Alliance Assessment with INVEST Sustainable indicators

Section	***Points***	***Meets INVEST Y/N/M****
Air Quality		
Speed of road construction vehicles	1	Y
Wetting soil surface	1	Y
Compacting and exposed soil	1	Y
Seeding and covering or fencing stockpiles	1	Y
Cover dust nuisance loads	1	Y
Installing dust fencing/physical barriers	5	N
Minimising the timing between clearing and stripping the site	5	Y
Behavioural Change and Capacity Building		
Develop a training program	3	Y
Environmental workshops	3	Y
Running introduction sessions	3	Y
Waste Minimisation	3	Y

* Y=Yes, N=No, M=Maybe

Section	*Points*	*Meets INVEST Y/N/M**
Energy Management	3	N
Travel Smart	3	N
Biodiversity		
Standard revegetation plan	3	Y
Bushland plan to detail key locations for planting, timing, the species selection and planting density	5	N
Provide a net gain assessment report	3	N
Vegetation and biolink/corridors	10	M
Wildlife Crossing	10	N
Culture Heritage and Community Engagement		
Install "Protected Area – No Access" signs and fencing up around sensitive areas	1	N
Undertake relocation of cultural heritage	3	N
Develop and implement an interpretive display	3	N
Produce and install road signs featuring the approved names	3	Y
Develop and implement a 'Welcome to Country' signage	3	N
Site visit during and after construction to discuss heritage values	1	M
Create an artefact toolkit for the local Indigenous communities, which can be used in cultural awareness programs delivered to schools	1	N
The construction of some form of community facility	5	N
Creation of employment initiatives	3	N
Creation of employment enabling initiatives	3	N
Energy Management		
Location where high efficiency lights can be used	1	M
Use of active reactors/lighting controllers	5	N
Undertake advance technologies or trials	10	N
Use of solar/wind/other	10	N
Green power lighting	1-5	N
Choose a carbon offset	3	N
Continued monitoring of the energy production	10	N

* Y=Yes, N=No, M=Maybe

Section	*Points*	*Meets INVEST Y/N/M**
Noise Management		
Design and Construct a noise barrier and /or alternative noise mitigation measures	10	M
Specify noise walls with coefficients of absorption	5	Y
Design noise walls so that they incorporate a community function	6	N
Provide noise attenuation for any public open space and which provide community benefit	5	N
"Noise Management Flowchart" during construction	5	N
Resource Management		
Demonstrate use of environmentally friendly products and materials	3-5	N
Utilise recycled material to reduce the volume of virgin material used	9	Y
Reuse contaminated material sourced from on-site/off-site	15	N
Arrange off-site recycling or reuse of excess material by a third party	3	M
Road Design		
Engage Stakeholders early	1	Y
Allow for future signage and freeway management	3	M
Provide a service tunnel for underground utilities	3	N
Design to accommodate utility placements	3	Y
Maintain close consultation with the planning engineers, the designer and contractor to produce an optimal construction	3	Y
The adoption of lean construction	3	N
Design allows for future infrastructure requirements	3	Y
Incorporate future maintenance requirements	3	M
Balancing earthworks	3	N
Using existing infrastructure	3	Y
Stakeholder Engagement		
Develop and implement a detailed Community and Stakeholder Engagement Plan	5	Y
Managing stakeholder complaints	5	Y
Reservation of land for public value purposes	10	N

* Y=Yes, N=No, M=Maybe

Section	*Points*	*Meets INVEST Y/N/M**
Urban Design		
Incorporate new pedestrian/cyclist signals and signs	3	Y
New crossing/paths for pedestrians and cyclists	10	Y
Construct community infrastructure	5	N
Design a natural or man-made features on existing views	5	N
Other aesthetic views	5	M
Water Management		
At least 50% non-potable water used for on-site maintenance	5	N
100% non-potable water used for all landscape watering	5	N
100% non-potable water used for construction activities	5	N
Design and use of permanent water infrastructure	5	N
Undertaking rehabilitation works of local waterways	10	N
Incorporate Water Sensitive Road Design (WSRD)	10	Y

* Y=Yes, N=No, M=Maybe

My assessment of the application of INVEST to the Te Rapa Bypass road construction suggests that a potential 93points could be gained giving the project a two star rating with the possibility of a three star rating with additional documentation by the Te Rapa Alliance.

6.3 Civil Engineering Environmental Quality Assessment Scheme (CEEQUAL)

6.3.1 Project Management

My CEEQUAL assessment on the Te Rapa Bypass construction was based on the CEEQUAL Scheme Description and Assessment Process Handbook August 2010, for UK & Ireland Projects, as an international version was not available unless a project was signed up with CEEQUAL.

The potential of the construction phase of the Te Rapa Bypass for qualifying under the CEEQUAL rating system was assessed (Table 6.2).

Table 6.2: Te Rapa Alliance Assessment with CEEQUAL

Section	*Construction Points*	*Meets CEEQUAL Y/N/M**
Project Management		
Documented commitment to consider and assess environmental aspects	2	N
Member of the project team responsible for environmental aspects	4	Y
Environmental impacts and environmental enhancements identified	10	Y
Appropriate mechanisms in place to manage environmental issues	4	Y
Have checks been made to ensure that mechanisms implemented	4	M
Record of actions to be taken as result of checks	2	M
Results of the implementation of mechanisms been assessed	4	N
Training on environmental and social issues	6	N
Evidence that project team actively considered the principles of sustainable development	2	N
Have all those directly involved in the project been informed of the significant environmental impacts	4	M
Is there evidence that the construction team proposed changes to the specifications to improve whole life environmental performance.	8	N
Has a Pollution control plan been prepared	8	Y
Land Use		
Effective use of land resource made available	5	N
Appropriate control measures in place	6	Y
Provision for capturing run off	5	Y
Landscape Issues		
Landscape and visual factors been considered	2	M
Trees and other vegetation retained	10	M
Current best practice was applied for plantings	5	Y
Planting prior to construction	8	N

* Y=Yes, N=No, M=Maybe

Section	*Construction Points*	*Meets CEEQUAL Y/N/M**
Ecology & Biodiversity		
Consult with relevant nature conservation organisation	2	N
Ecological Work Plan	7	N
Survey of protected species	2	N
Site plan for protected species if required	10	N
Enhance existing wildlife habitats.	8	M
Install structures to accommodate wildlife	8	N
Monitoring success of habitat creation	8	N
The Historic Environment		
Any below ground archaeological remains been identified	8	N
Have sensitive receptors been cordoned off	7	N
Any restoration or enhancement work been completed	5	N
Water Resources and the Water Environment		
Consultation with regulatory authorities about water	3	Y
Has no regulatory action been taken	3	Y
Measures to conserve water and reduce consumption	8	N
Amount of water used measured	5	Y
Measures to prevent pollution of ground and surface water	10	Y
Water quality which would be affected by works monitored	6	Y
Any existing water features been protected	5	Y
Has existing water features been incorporated	8	Y
Energy and Carbon		
Life cycle energy assessment	3	N
Life cycle carbon assessment	3	N
Energy consumption consideration during construction	6	N
Carbon emissions consideration during construction	6	N
Renewable and/or low carbon resources been used	7	N
Construction plant maintained to maximise fuel efficiency and minimise carbon emissions	6	N

* Y=Yes, N=No, M=Maybe

Section	*Construction Points*	*Meets CEEQUAL Y/N/M**
Materials Use		
A plan recommending material use to minimise environmental impact	12	N
Excavated material reused on site	10	Y
Have subsoil and top soil been separated	4	Y
Has topsoil been re used	4	Y
Materials been stored appropriately to avoid wastage	8	Y
Responsible sourcing of materials have been considered prior to order	10	M
All locally available material	12	M
% of any existing structure used with the project	6	Y
% of sub-base material used from previously used material	10	Y
Waste Management		
Site waste management plan	4	Y
Has all waste taken from site been carried out by licensed carriers	6	Y
Evidence all waste taken to licensed facilities	6	Y
Disposal and transfer site been checked to ensure licensed to take material	6	Y
Disposal and transfer site been checked to ensure licensed to take waste	6	N
Recycling rate of the transfer station considered prior to placing order	6	N
Hazardous waste has been appropriately disposed of	6	Y
Any vegetation cleared disposed of correctly	8	M
Proportion of material present on site re-used as opposed to being disposed of	8	M
% of demolition waste to landfill	14	M

*Y=Yes, N=No, M=Maybe

Section	*Construction Points*	*Meets CEEQUAL Y/N/M**
Transport		
Has a Construction Traffic Management Plan been drawn up	14	M
Monitoring this Plan	8	N
Use of sustainable transport routes to move construction materials	6	N
Keep access roads that are open to the public clean and on site roads properly managed	10	Y
Green Travel Plan	8	N
Effects on Neighbours		
Does the Project Environmental Management Plan consider effects on neighbours and is it being monitored	14	M
Has local authority been consulted regarding the noise implications	2	Y
Are noise aspects being monitored	3	M
Have any abatement notices been issued	11	N
Have the proposals for mitigating noise been implemented	4	Y
Have the proposals for mitigating vibration been implemented	4	N
Have the appropriate measures been put in place to minimise adverse effects on the local air quality.	6	Y
Are there appropriate measures taken to minimise dust emissions	3	Y
Are the appropriate measures taken to minimise light emissions from the site during construction	3	M
Are the appropriate measures taken to minimise visual impact of site	7	N

* Y=Yes, N=No, M=Maybe

Section	*Construction Points*	*Meets CEEQUAL Y/N/M**
Relations with the local Community and other Stakeholders		
Has community consultation been carried out at each stage	3	Y
Has a member of the project team been made responsible for community consultation	2	Y
Did community consultation involve local interest groups	3	Y
Have any partnership links been established with local groups	9	Y
Local comment from community recorded	1	Y
Community responses taken into account	19	M
Principle contractor taken steps to actively encourage local firms to compete for work	4	M

* Y=Yes, N=No, M=Maybe

Under CEEQUAL it is my assessment that 195 points could be achieved from the 516 points available for construction. The points potentially achieved would give the Te Rapa Bypass a 37% which gives the project a pass score. However to get any rating from CEEQUAL a considerable amount of work would be required on all the documentation. Overall the Te Rapa Bypass project does not fit within the realms of CEEQUAL. This is due to CEEQUAL being more civil engineering based and not specifically designed for road construction.

6.4 Discussion

Only CEEQUAL is available internationally at the present time, however as INVEST is an Australian system which is in the process of becoming international, and designed around road construction, it is appropriate to give a comparison with the New Zealand RMA and the Te Rapa Bypass.

The comparison with INVEST and the Te Rapa Bypass shows that had INVEST been available, the Te Rapa Bypass would have achieved at least a two star rating and with a little extra documentation could have achieved a three star rating.

The INVEST Prerequisite 2 – VicRoads Water Usage Policy and the Water Management section requires road designers to investigate the use of non-potable water. To date the use of non-potable water for road construction in New Zealand has not been investigated, in-depth. This prerequisite could be important for new development as in New Zealand water resources are becoming stretched and over allocated.

INVEST's Culture Heritage and Community Engagement section has points for creating an artifact toolkit for the local Indigenous communities, constructing some form of community facility and creation of employment initiatives. These three subsections are not so relevant in most New Zealand situations and would increase the financial cost of a project considerably.

When comparing the Te Rapa Bypass with CEEQUAL a very large amount of detailed work would have been required as the documentation requirement under the CEEQUAL rating system, being a self assessment system which is independently reviewed is of a high standard.

The CEEQUAL score of 37% means that the award gained would be a "Pass Award" for the construction of the Te Rapa Bypass. A "Pass Award" suggests that a project's environmental performance was only 37% minimum legal compliance to the pinnacle best practice represented by the highest achievable score. I believe this is not a fair representation of the Te Rapa Bypass project, as the Resource Management Act's "minimal legal requirement" ensures a high standard is set which would far exceed 37%. The way CEEQUAL is designed a New Zealand road project does not have enough points available to ensure a higher pass mark.

Because CEEQUAL is engineering focused many points are not applicable to road construction. This focus also makes it difficult for a road constructing project to achieve a high score and intern a higher award grade.

Chapter Seven: Summary, Discussion and Conclusion

7.1 Summary of Key Points

In 2010 the New Zealand Transport Authority (NZTA) set out to investigate the use of "Greenroads certification for road construction projects in New Zealand". The NZTA and Te Rapa Alliance (TRA) supported my MSc research to investigate the feasibility of a New Zealand road gaining certification under Greenroads, and whether the Te Rapa Bypass could gain certification under Greenroads.

"Greenroads" is an environmental certification system for quantifying and measuring sustainable best practices for roadway design and construction.

The benefits of the Greenroads system is that certified roads can be measured against each other and demonstrate that best practices and standards have been used in road design and construction. Greenroads also gives consideration to environmental issues, road construction safety, and allows for all interested parties to be involved with the project.

The Greenroads rating system assesses 48 practices arranged into seven sections that cover all aspects of road design and construction. There are four levels of certification; Evergreen, Gold, Silver and Certified. There are also two interim assessments, A-Lined assessment and Pilot Project. The interim assessments allow international projects to work with Greenroads USA at a project level without the necessity or cost of pursuing certification.

The overall objective of this master's thesis was to investigate the benefits of gaining Greenroads Certification and compare the effects of Greenroads Certification with the outcomes achieved under existing New Zealand Environmental legislation.

When Greenroads was contacted regarding certification of a New Zealand road it became clear from the early stages that certification was not immediately available without Greenroads first undertaking several Pilot Projects in New Zealand. A minimum of three fully detailed Pilot Projects, or equivalent, would need to be completed before certification could be applied to any future project.

Greenroads offered NZTA the option of undertaking an A-Lined Assessment for the Te Rapa Bypass, due to the fact that the Te Rapa Bypass was already well into construction and was designed before Greenroads was contacted. Greenroads and the NZTA concluded that the Te Rapa Bypass was a good learning opportunity for both organisations as collation of documentation for Greenroads had already started.

From the information submitted the Greenroads results for the A-Lined assessment (appendix seven) showed that as the Te Rapa Bypass project stood, with limited additional work a Greenroads Bronze Certificate could have been achieved. The assessment illustrated that with minimal effort to reporting documentation the Te Rapa Bypass could have gained 34 voluntary points. However the main focus would need to have been on the Project Requirements. Greenroads assessed that only 7 out of the 11 Project Requirements could have been achieved.

Based on a detailed study of the documentation my assessment differed from the actual Greenroads results in that I considered that 9 of the 11 Project Requirements could have been met and 33 voluntary credits could have been

achieved with preparation of appropriate documentation, giving the project a Greenroads Bronze Certification. The first difference between my assessment and the Greenroads assessment was the Pollution Prevention Plan Requirement. The Te Rapa Alliance undertook a Pollution Prevention Plan however it was lacking in detail so Greenroads could not accept the Plan. The second difference in assessments was the Education Outreach Requirement. At the time the information was submitted to Greenroads for the A-Lined assessment, the documentation for the Education Outreach Requirement was not available. My assessment was undertaken after Greenroads had undertaken the A-Lined assessment and by this time the documentation and website was available. Major reporting work on the Lifecycle Cost Analysis and Lifestyle Inventory sections would have been required to meet the full 11 Project Requirements, unfortunately this work was not undertaken at any stage of the project.

For the 33 voluntary points that I considered could have been achieved at least 6 points were in the Environment & Water section, at least 11 points in the Access & Equity section, at least 6 points in the Construction Activities section, and at least 10 points in the Materials & Resources section. No points could have been achieved initially in the Pavement Technologies section as the Te Rapa project did not meet any of the Pavement Technologies criteria required for Greenroads.

An additional 19 voluntary points could possibly have been achieved, if a considerable amount of additional documentation had been undertaken by the Te Rapa Alliance. This would have brought the total points to 52 and have given the Te Rapa Bypass a Silver Greenroads Certification.

It was unclear if New Zealand projects would have difficulty in completing the current 11 Project Requirements as the level of detail required for the compulsory Project Requirements section was not available from Greenroads when the A-Lined assessment was undertaken.

From the information submitted to Greenroads, Greenroads stated that it appeared that the New Zealand design and construction standards align well with the existing Greenroads credit requirements. The information submitted served well for an A-Lined assessment. However the documentation often did not meet the explicit criteria included for each Greenroads credit.

This thesis also compared two other Rating systems INVEST (VicRoads – Integrated VicRoads Environmental Sustainability Tool managed by VicRoads in Australia) and the CEEQUAL (Civil Engineering Environmental Quality Assessment and Awards Scheme based in the UK). Out of these two systems only CEEQUAL is currently available internationally.

From the information collected regarding the design and construction of the Te Rapa Bypass, my assessment of application to INVEST suggested that a potential 93 points could be gained giving the Te Rapa Bypass project a two star rating with the possibility of a three star rating with additional documentation by the Te Rapa Alliance.

From the Te Rapa Bypass information it is my assessment that 195 points could have been achieved from the 516 points under the CEEQUAL construction assessment. The points potentially achieved would have given the Te Rapa Bypass 37% which would give the project a pass score. However to obtain any rating from CEEQUAL a considerable amount of work would be required on all the documentation. Overall the Te Rapa Bypass project does not fit within the realms of CEEQUAL. This is due to CEEQUAL being more civil engineering based and not specifically designed for road construction.

7.2 Discussion

7.2.1 Greenroad and the Te Rapa Bypass

In New Zealand the RMA and other legislation ensure that our roads are being constructed to a high standard. When applying Greenroads to the Te Rapa Bypass, it was found that with minimal changes to the documentation required under the RMA the Te Rapa Bypass could have achieved a Bronze Greenroads Certification.

However for a New Zealand road to gain a higher level of Greenroads Certification a considerable amount of work on documentation and changes to practices would need to be adopted by a project team. To gain a Greenroads Evergreen, Gold or Silver Certification a New Zealand road would need to go above and beyond the current requirements of the RMA and other New Zealand legislation.

An example of where Greenroads certification goes above and beyond the RMA and current New Zealand legislation is the Greenroads Pavement Technologies Credits. The Te Rapa Bypass used quiet pavement road construction on the Avalon Drive section of the road only. However the amount of quiet pavement used on the total of the Te Rapa Bypass did not equate to 75% of the total road construction, therefore no Greenroads points could be awarded. The use of Warm Mix Asphalt could also have been investigated. However as warm mix pavement would have had a financial implication for the Te Rapa Alliance it was not considered. The Pavement Technologies Credits section of Greenroads is worth up to 20 points.

Some core Greenroads credits are not usually included in Assessment of Environmental Effects (AEE) considerations under the RMA process such as a Lifecycle Cost Analysis and a Lifecycle Inventory. The Lifecycle Cost Analysis and Lifecycle Inventory are Compulsory Project Requirements for Greenroads certification and would need to be undertaken in before Greenroads accreditations could be achieved.

The Greenroads credit for Ecological Connectivity is not applicable to New Zealand conditions as it was written for the different ecology of USA. The Greenroads Ecological Connectivity credit would require adapting to cover matters specific to the New Zealand ecological situation. For instance in New Zealand the Ecological Connectivity credit would need to be more aligned with our smaller wildlife and could have more emphasis on ecological corridors, creating new habitats or better fish migratory passage and not on providing wildlife crossing and protective fencing for larger animals.

Greenroads also has a credit for "Light Pollution". As the majority of road lights currently imported into New Zealand are from countries which do not currently have an emphasis on dark skies they have not been certified by "Dark-Skys". However the lights used on the Te Rapa Bypass could have met the dark skies criteria provided they had been tested for Dark-Skys certification or equivalent.

Greenroads does not address some important New Zealand issues such as the use of productive land for road construction or alternative water use.

Historically major towns and cities in New Zealand have been developed around productive land leading to some of this productive land being used for road construction. New Zealand is a relatively small country and as New Zealand's major export earnings come from agriculture using productive farm land for road construction needs to be kept to a minimum (NZTA, 2011).

Water use is becoming a major issue in New Zealand as water catchments are becoming "over-allocated" (Waikato Regional Council, 2013). New Zealand must start to look at alternative water sources and non-potable water use for road construction. The Greenroads Water Tracking credit addresses water use but not water source. Either the Greenroads Water Tracking credit could be changed to include alternative water sources, or if an alternative water source is used on a project, then this could be used to earn points under the Greenroads Custom credits.

Cultural values on a road project are important in New Zealand. The Greenroads Cultural Outreach credit would require changing to focus more on identifying and labelling any culturally important areas. The Greenroads Cultural Outreach credit needs to be more aligned towards what is culturally important in New Zealand.

The current cost of undertaking a Greenroads certification is 0.05% of the project cost plus disbursements or a fixed fee for projects that equal or exceed $US10 million.

7.2.2 INVEST, CEEQUAL and the Te Rapa Bypass

Of the main rating systems currently available only two are currently available internationally namely Greenroads and CEEQUAL; however INVEST the Australian VicRoads rating system may become internationally available in the future.

My assessment of the application of CEEQUAL to the Te Rapa Bypass road construction was that potentially 195 points could be achieved from the 516 points available for construction. The points would give the Te Rapa Bypass a 37% which gives the project a pass score. The CEEQUAL score of 37% means that the award gained by the Te Rapa Bypass would be a “Pass Award”. I consider that a “Pass Award” is not a fair representation of the Te Rapa Bypass project, as the New Zealand's Resource Management Act’s “minimal legal requirement” ensures a high standard. However to get any rating from CEEQUAL a considerable amount of work would be required on all documentation, as the Te Rapa Alliance documentation overall was not up to the standard required for CEEQUAL certification.

As CEEQUAL has an engineering focus, many points are not applicable to road construction. The engineering focus also makes it difficult for a road construction project to achieve a high score.

My assessment of the application of INVEST to the Te Rapa Bypass shows that had INVEST been available, the Te Rapa Bypass would have achieved at least a two star rating and with a little extra documentation could have achieved a three star rating.

To have obtained the full five star rating however considerable attention would have needed to be applied to the following areas: Biodiversity, Cultural Heritage and Community Engagement, Energy Management, Water Management, and Noise Management.

7.2.3 Is Environmental Certification Worth Pursuing for a New Zealand Road?

Overall I consider that Greenroads is worth pursuing as higher certifications (Evergreen, Gold and Silver) make a project go above and beyond the requirements of the RMA.

Some of the advantages of a New Zealand road gaining Greenroads certification are, giving a project team a common goal to work towards, increasing team spirit and allow project teams to assess how well they are performing with environmental and social issues. Environmental certification allows project teams to compare themselves against other project teams around the world (CEEQUAL, 2010). The Greenroads certification is an international benchmark demonstrating that New Zealand is "walking the talk".

An environmental management system can also help a project team to improve processes and practices to comply with all New Zealand legislation (NZS, 2013a). An environmental management system such as Greenroads can help a project team recognise risks and environmental effects as well as setting environmental goals and objectives from a long-term perspective (Inspecta, 2013).

The disadvantage of gaining Greenroads certification is the cost involved and the time and effort required of the road construction project team.

Greenroads and the RMA process fit well together. If a project is considering undertaking Greenroads Certification, work required for the certification can be used during the RMA process.

7.3 Conclusion

A comparison with Greenroads, INVEST and CEEQUAL assessments show that currently, under the requirements of the New Zealand Resource Management Act (1991) (RMA) and other New Zealand legislation, New Zealand roads are already designed and constructed to a high environmental standard.

Of the Greenroads, INVEST and CEEQUAL, certification systems, I consider that Greenroads is the better system for road projects in New Zealand and currently New Zealand aligns well with Greenroads.

The advantage that Greenroads offers New Zealand over our current RMA is the standard of documentation is higher and the system is designed specifically for road construction. Greenroads covers the very best practices of road construction available internationally incorporating environmental issues, safety issues and ensures the involvement of the local community.

The detail that Greenroads requires for Certification goes beyond that currently required by New Zealand's current legislation which would ensure New Zealand roads and road design meet international best practice.

Some sections of Greenroads would need adapting to New Zealand conditions, for example, the Cultural Outreach credit, the Water Tracking credit and the

Ecological Connectivity credit to support the RMA. Other Greenroads sections such as the Pavement Technologies would enhance New Zealand road design and construction as they are not addressed in the RMA process.

Other advantages of a New Zealand road gaining Greenroads certification are that Greenroads gives a project team a common goal to work towards, increasing team spirit and allows project teams to assess how well they are performing with environmental and social issues.

The Greenroads certification process is independent of the project and is generally easier to use than CEEQUAL.

I recommend that New Zealand should undertake Greenroads accreditation and should work with Greenroads to ensure that when the accreditation system is adapted to New Zealand conditions that, as much as possible, it aligns with requirements of the RMA Consent Process to avoid duplication of effort.

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Appendix One

New Zealand Transport Agency,

Register of network standards and guidelines

Status type Refer Register process manual	Category / Series	Subcategory	Full title	Version	Last amendment / revision date	Availability
Investment standard						
Investment standard	NZTA procurement policy	Code of practice	NZTA Procurement manual for activities funded through the NLTP NZTA 2009	1	July 2009	http://www.nzta.govt.nz/resources/procurement-manual/index.html
Investment standard	NZTA procurement policy	Code of practice	Competitive Pricing Procedures Manual: Volume 2 Passenger Transport		May-13	http://www.nzta.govt.nz/resources/competitive-pricing-procedures-manual/vol-2/
Investment standard	Public transport		Requirements for Urban Buses in New Zealand: New Zealand's common standard for urban bus quality	2	Aug-13	http://www.nzta.govt.nz/resources/requirements-for-urban-buses/
Investment standard	NZTA programme development policy	Code of practice	Planning, Programming and Funding Manual, NZTA, August 2008	2	Aug-08	http://www.nzta.govt.nz/resources/planning-programme-funding-manual/
Investment standard	NZTA programme development policy	Code of practice	Investment knowledge - base		23-Aug-11	http://www.nzta.govt.nz/resources/planning-and-investment-knowledge-base/
Investment standard	NZTA programme development policy	Code of practice	Economic Evaluation Manual : Volume 1, NZTA		Sep-11	http://www.nzta.govt.nz/resources/economic-evaluation-manual/volume-1/manual1.html
Investment standard	NZTA programme development policy	Code of practice	Economic Evaluation Manual : Volume 2, NZTA , January 2010		Jan 2010	http://www.nzta.govt.nz/resources/economic-evaluation-manual/volume-2/manual2.html
Investment standard	NZTA programme development policy	Asset Management Code of practice	Road condition and rating roughness manual Parts 1 & 2, also known as RAMM rating manual	2	Jun-05	http://www.nzta.govt.nz/resources/road-assessment-and-maintenance-management/
State Highway standard, Investment & Local Guidelines	NZTA programme development policy	Asset Management Code of practice	National Code of Practice for utility operators' access to transport corridors		Jan-12	NZUAG Website
Investment standard	NZTA programme development policy		Speed Limits New Zealand, LTSA, 2003 (published with Land Transport Rule: Setting of Speed Limits 2003, MOT)		2003	http://www.nzta.govt.nz/resources/speed-limits/speed-limits-nz/
Investment standard	NZTA programme development policy	Safety code of practice	Road Safety Audit Procedures for Projects, Transfund, 2004		May-13	http://www.nzta.govt.nz/resources/road-safety-audit-procedures/
State Highway standard						
State Highway standard	Environmental, land use and resource planning		NZTA Air Quality Monitoring Spatial Viewer Layers			https://spatialviewer.nzta.govt.nz/
State Highway standard	Environmental, land use and resource planning	Code of practice	Department of Conservation (DoC) Memorandum of Understanding (MoU)		Jan-03	
State Highway standard	Project and contract management	Code of practice	State Highway Stakeholder Agreement Proforma Manual, Jun 2004	1	Jun 2004	http://www.nzta.govt.nz/resources/state-highway-stakeholder-agreement-proforma-manual/
State Highway Standard Investment & Local guidelines						

State Highway Guideline	Project and contract management	Risk management	Insurance and Risk Management Manual	7	Mar 08	Hard copy only. See Project Services, Highways
State Highway Standard Investment and Local Guideline	Project and contract management	Risk management	HNO Drug and Alcohol Policy Minimum Standard for Contractors	1	Aug-13	Contact document owner
State Highway Standard Investment and Local Guideline	Administration	Risk management	Z44 Risk Management Minimum Standard	2	Mar-13	http://www.nzta.govt.nz/resources/state-highway-professional-services-contract-proforma-manual/standards/z-series.html
State Highway standard Investment & Local Guidelines	Administration	Risk management	Risk Management Process Manual, TNZ, Sep 04	2	Sep 04	Hard copy only
State Highway Standard Investment & Local Guidelines	Asset management		Annual Plan Instructions Manual, TNZ, Aug 2005	5	Aug 05	CD copy only
State Highway Standard Investment & Local Guidelines	Asset management	Bridge	Bridge Asset Management Plan, TNZ, Feb 2001		Oct 2001	Hard copy only
State Highway Standard Investment & Local Guidelines	Environmental, land use and resource planning	Noise	Calculators and Templates on the Transport Noise Website			http://acoustics.nzta.govt.nz/tools/templates
State Highway Standard Investment & Local Guidelines	Environmental, land use and resource planning		Professional services contract PROFORMA manual	Various	Mar-13	http://www.nzta.govt.nz/resources/state-highway-professional-services-contract-proforma-manual/standards/z-series.html
Investment, State Highway and Local Guidelines	Pavement and surfacing	Specification	Construction of Unbound Granular Pavement Layers		2005	http://www.nzta.govt.nz/resources/construction-unbound-granular-pavement-layers/index.html
Investment, State Highway and Local Guidelines	Pavement and surfacing	Specification	Construction of Unbound Granular Pavement Layers		2005	http://www.nzta.govt.nz/resources/construction-unbound-granular-pavement-layers/index.html
State Highway Standard Investment & Local Guidelines	Pavement and surfacing	Specification	Specification for In-situ Stabilisation of Modified Pavement Layers		2008	http://www.nzta.govt.nz/resources/insitu-stabilisation-mod-pavement-layers/index.html
State Highway Standard Investment & Local Guidelines	Pavement and surfacing	Specification	Notes to Specification for In-situ Stabilisation of Modified Pavement Layers		2008	http://www.nzta.govt.nz/resources/insitu-stabilisation-mod-pavement-layers/index.html
State Highway Standard Investment & Local Guidelines	Basecourse	Specification	Changes to B/5 Specification for In-situ Stabilisation of Modified Pavement Layers		2008	http://www.nzta.govt.nz/resources/insitu-stabilisation-mod-pavement-layers/index.html
State Highway Standard Investment & Local Guidelines	Pavement and surfacing	Specification	Earthworks Construction		1997	http://www.nzta.govt.nz/resources/earthworks-const/index.html

State Highway Standard Investment & Local Guidelines	Pavement and surfacing	Specification	Earthworks Construction		1997	http://www.nzta.govt.nz/resources/earthworks-const/index.html
State Highway Standard Investment & Local Guidelines	Pavement and surfacing	Specification	Pipe Subsoil Drain Construction		2000	http://www.nzta.govt.nz/resources/pipe-subsoil-drain-const/index.html
State Highway Standard Investment & Local Guidelines	Pavement and surfacing	Specification	Pipe Subsoil Drain Construction		2000	http://www.nzta.govt.nz/resources/pipe-subsoil-drain-const/index.html
State Highway Standard Investment & Local Guidelines	Bridges and culverts (structures)	Specification	Pipe Culvert Construction		2010	http://www.nzta.govt.nz/resources/pipe-culvert-const/index.html
State Highway Standard Investment & Local Guidelines	Bridges and culverts (structures)	Specification	Pipe Culvert Construction		2010	http://www.nzta.govt.nz/resources/pipe-culvert-const/index.html
Investment, State Highway and Local Guidelines	Formation	Specification	Fence Construction		May 1975	http://www.nzta.govt.nz/resources/fence-const/index.html
State Highway Standard Investment & Local Guidelines	Pavement and surfacing	Specification	Corrugated Plastic Pipe Subsoil Drain Construction		2000	http://www.nzta.govt.nz/resources/corrugated-plastic-pipe-subsoil-drain-const/index.html
State Highway Standard Investment & Local Guidelines	Pavement and surfacing	Specification	Corrugated Plastic Pipe Subsoil Drain Construction		2000	http://www.nzta.govt.nz/resources/corrugated-plastic-pipe-subsoil-drain-const/index.html
State Highway Standard Investment & Local Guidelines	Pavement and surfacing	Specification	Fabric Wrapped Aggregate Subsoil Drain Construction		2003	http://www.nzta.govt.nz/resources/fabric-wrapped-aggregate-subsoil-drain-const/index.html
State Highway Standard Investment & Local Guidelines	Pavement and surfacing	Specification	Fabric Wrapped Aggregate Subsoil Drain Construction		2003	http://www.nzta.govt.nz/resources/fabric-wrapped-aggregate-subsoil-drain-const/index.html
State Highway Standard Investment & Local Guidelines	Pavement and surfacing	Specification	Geotextiles		2003	http://www.nzta.govt.nz/resources/geotextiles/index.html
State Highway Standard Investment & Local Guidelines	Pavement and surfacing	Specification	Geotextiles		2003	http://www.nzta.govt.nz/resources/geotextiles/index.html
State Highway Standard Investment & Local Guidelines	General	Specification	Supply of Aggregate by Weight		1981	http://www.nzta.govt.nz/resources/supply-aggregate-weight/index.html
State Highway Standard Investment & Local Guidelines	General	Specification	Supply of Aggregate by Weight		1981	http://www.nzta.govt.nz/resources/supply-aggregate-weight/index.html
State Highway Standard Investment & Local Guidelines	Material	Specification	Roading Bitumens		2011	http://www.nzta.govt.nz/resources/roading-bitumens/index.html
State Highway Standard Investment	Material	Specification	Roading Bitumens		2011	http://www.nzta.govt.nz/resources/roading-bitumens/index

& Local Guidelines						.html
State Highway Standard Investment & Local Guidelines	Material	Specification	Roading Bitumens		2011	http://www.nzta.govt.nz/resources/roading-bitumens/index.html
State Highway Standard Investment & Local Guidelines	Material	Specification	Sub-Base Aggregate		1986	http://www.nzta.govt.nz/resources/sub-base-aggregate/index.html
State Highway Standard Investment & Local Guidelines	Material	Specification	Basecourse Aggregate		2006	http://www.nzta.govt.nz/resources/basecourse-aggregate/index.html
State Highway Standard Investment & Local Guidelines	Material	Specification	Basecourse Aggregate		2006	http://www.nzta.govt.nz/resources/basecourse-aggregate/index.html
State Highway Standard Investment & Local Guidelines	Material	Specification	Basecourse Aggregate		2006	http://www.nzta.govt.nz/resources/basecourse-aggregate/index.html
State Highway Standard Investment & Local Guidelines	Material	Specification	Sealing Chip	7	29 Sep 2011	http://www.nzta.govt.nz/resources/sealing-chip/index.html
State Highway Standard Investment & Local Guidelines	Material	Specification	Sealing Chip	6	29 Sep 2011	http://www.nzta.govt.nz/resources/sealing-chip/index.html
State Highway Standard Investment & Local Guidelines	Material	Specification	Changes to specification for sealing chip	2	29 Sep 2011	http://www.nzta.govt.nz/resources/sealing-chip/index.html
State Highway Standard Investment & Local Guidelines	Material	Specification	Amendment to Specification for Sealing Chip for use with Melter Slag from New Zealand Steel	1	29 Sep 2011	http://www.nzta.govt.nz/resources/sealing-chip/docs/nz-steel-amendments.pdf
State Highway Standard Investment & Local Guidelines	Signs and markings	Specification	Roadmarking Paints		2009	http://www.nzta.govt.nz/resources/roadmarking-paints/index.html
State Highway Standard Investment & Local Guidelines	Signs and markings	Specification	Roadmarking Paints		2009	http://www.nzta.govt.nz/resources/roadmarking-paints/index.html
State Highway Standard Investment & Local Guidelines	Signs and markings	Specification	Roadmarking Paints		2009	http://www.nzta.govt.nz/resources/roadmarking-paints/index.html
State Highway Standard Investment & Local Guidelines	Material	Specification	Asphaltic Concrete		2005	http://www.nzta.govt.nz/resources/asphaltic-concrete/index.html
State Highway Standard Investment & Local Guidelines	Material	Specification	Asphaltic Concrete		2005	http://www.nzta.govt.nz/resources/asphaltic-concrete/index.html
State Highway Standard Investment & Local Guidelines	Material	Specification	Pre-Coating Sealing Chips		June 1975	http://www.nzta.govt.nz/resources/pre-coating-sealing-chips/index.html
State Highway Standard Investment	Signs and markings	Specification	Raised Pavement Markers		2007	http://www.nzta.govt.nz/resources/raised-pvmt-

& Local Guidelines						markers/index.html
State Highway Standard Investment & Local Guidelines	Signs and markings	Specification	Raised Pavement Markers		2007	http://www.nzta.govt.nz/resources/raised-pvmt-markers/index.html
State Highway Standard Investment & Local Guidelines	Signs and markings	Specification	T12 Specification for Long Life Pavement Marking Material Applicators		2013	http://www.nzta.govt.nz/resources/long-life-pavement-marking-material-app-testing/docs/T12-Long-Life-Pavement-Marking-Material-Application.pdf
Other Reference Documents	Signs and markings	Specification	T12 notes Specification for Long Life Pavement Marking Material Applicators		2013	http://www.nzta.govt.nz/resources/long-life-pavement-marking-material-app-testing/docs/T12-Notes-Long-Life-Pavement-Marking.pdf
State Highway Standard Investment & Local Guidelines	Material	Specification	Specification for Roadmarking Raised Pavement Marker (RPM) Adhesive Heater and Thermoplastic Pre-Heater		30 Sep 2011	http://www.nzta.govt.nz/resources/raised-pvmt-markers-heaters/
State Highway Standard Investment & Local Guidelines	Pavement and surfacing	Specification	Adhesion Agents			http://www.nzta.govt.nz/resources/adhesion-agents/
State Highway Standard Investment & Local Guidelines	Pavement and surfacing	Specification	Adhesion Agents			http://www.nzta.govt.nz/resources/adhesion-agents/
State Highway Standard Investment & Local Guidelines	Material	Specification	Edge Marker Posts		2011	http://www.nzta.govt.nz/resources/edge-marker-posts/index.html
State Highway Standard Investment & Local Guidelines	Material	Specification	Edge Marker Posts		2011	http://www.nzta.govt.nz/resources/edge-marker-posts/index.html
State Highway Standard Investment & Local Guidelines	Material	Specification	Edge Marker Posts		2011	http://www.nzta.govt.nz/resources/edge-marker-posts/index.html
State Highway Standard Investment & Local Guidelines	Pavement and surfacing	Specification	Lime for use in Soil Stabilisation		1986	http://www.nzta.govt.nz/resources/lime-for-use-in-soil-stabilisation/index.html
State Highway Standard Investment & Local Guidelines	Pavement and surfacing	Specification	Lime for use in Soil Stabilisation		1986	http://www.nzta.govt.nz/resources/lime-for-use-in-soil-stabilisation/index.html
State Highway Standard Investment & Local Guidelines	Material	Specification	W-Section Bridge Guardrail		1989	http://www.nzta.govt.nz/resources/w-section-bridge-guardrail/index.html
State Highway Standard Investment & Local Guidelines	Material	Specification	Tubular Steel Lighting Columns		1994	http://www.nzta.govt.nz/resources/tubular-steel-lighting-columns/index.html
State Highway Standard Investment & Local Guidelines	Material	Specification	Notes to the Specification for Tubular Steel Lighting Columns		2002	http://www.nzta.govt.nz/resources/tubular-steel-lighting-columns/index.html

State Highway Standard Investment & Local Guidelines	Material	Specification	Long-Life Roadmarking Materials	2003	http://www.nzta.govt.nz/resources/long-life-roadmarking-materials/index.html
State Highway Standard Investment & Local Guidelines	Material	Specification	Long-Life Roadmarking Materials	2003	http://www.nzta.govt.nz/resources/long-life-roadmarking-materials/index.html
State Highway Standard Investment & Local Guidelines	Material	Specification	Road Safety Barrier Systems	March 2009	http://www.nzta.govt.nz/resources/road-safety-barrier-systems/index.html
State Highway Standard Investment & Local Guidelines	Material	Specification	Road Safety Barrier Systems	January 2010	http://www.nzta.govt.nz/resources/road-safety-barrier-systems/index.html
State Highway Standard Investment & Local Guidelines	Material	Specification	Road Safety Barrier Systems	March 2009	http://www.nzta.govt.nz/resources/road-safety-barrier-systems/index.html
State Highway Standard Investment & Local Guidelines	Material	Specification	Audio Tactile Profiled Roadmarkings	2006	http://www.nzta.govt.nz/resources/audio-tactile-profiled-roadmarkings/index.html
State Highway Standard Investment & Local Guidelines	Material	Specification	Audio Tactile Profiled Roadmarkings	2007	http://www.nzta.govt.nz/resources/audio-tactile-profiled-roadmarkings/index.html
State Highway standard Investment & Local Guidelines	Safety	Specification	Specification for lighting columns		http://www.nzta.govt.nz/resources/lighting-columns/
State Highway standard Investment & Local Guidelines	Safety	Specification	Notes on the specification for lighting columns		http://www.nzta.govt.nz/resources/lighting-columns/
State Highway standard Investment & Local Guidelines	Safety	Specification	Specification for lighting columns Appendix A		http://www.nzta.govt.nz/resources/lighting-columns/
State Highway standard Investment & Local Guidelines	State highway operations	Specification	Concrete Weighpit		http://www.nzta.govt.nz/resources/concrete-weigh-pit/index.html
State Highway standard, Investment & Local Guidelines	State highway operations	Specification	Concrete Weigh Pits		http://www.nzta.govt.nz/resources/concrete-weigh-pit/index.html
State Highway Standard Investment & Local Guidelines	Signs and markings	Specification	Thermoplastic Roadmarking Materials		http://www.nzta.govt.nz/resources/long-life-roadmarking-materials/index.html
State Highway Standard Investment & Local Guidelines	Signs and markings	Specification	Internally illuminated pavement markers	2011	http://www.nzta.govt.nz/resources/internally-illuminated-pavement-markers/index.html
State Highway Standard Investment & Local Guidelines	Material	Specification	Suppliers of Surfacing Aggregate – Polished Stone Values	2004	http://www.nzta.govt.nz/resources/sealing-chip/index.html
State Highway Standard Investment & Local Guidelines	Pavement and surfacing	Specification	First Coat Sealing		http://www.nzta.govt.nz/resources/first-coat-sealing/index.html

State Highway Standard Investment & Local Guidelines	Pavement and surfacing	Specification	First Coat Sealing			http://www.nzta.govt.nz/resources/first-coat-sealing/index.html
State Highway Standard Investment & Local Guidelines	Pavement and surfacing	Specification	Resealing			http://www.nzta.govt.nz/resources/resealing/index.html
State Highway Standard Investment & Local Guidelines	Pavement and surfacing	Specification	Resealing			http://www.nzta.govt.nz/resources/resealing/index.html
State Highway Standard Investment & Local Guidelines	Paving and Surfacing and Construction	Specification	Rubber Latex in Reseal Binders			http://www.nzta.govt.nz/resources/rubber-latex-in-reseal-binders/index.html
State Highway Standard Investment & Local Guidelines	Paving and Surfacing and Construction	Specification	Rubber Latex in Reseal Binders			http://www.nzta.govt.nz/resources/rubber-latex-in-reseal-binders/index.html
State Highway Standard Investment & Local Guidelines	Paving and Surfacing and Construction	Specification	Construction of Asphaltic Concrete Paving		June 1975	http://www.nzta.govt.nz/resources/asphaltic-concrete-paving-construction/index.html
State Highway Standard Investment & Local Guidelines	Paving and Surfacing and Construction	Specification	(Auckland) Construction of Asphaltic Concrete Paving		November 1992	http://www.nzta.govt.nz/resources/asphaltic-concrete-paving-construction/index.html
State Highway Standard Investment & Local Guidelines	Pavement and surfacing	Specification	Open Graded Porous Asphalt		2007	http://www.nzta.govt.nz/resources/open-graded-porous-asphalt/index.html
State Highway Standard Investment & Local Guidelines	Pavement and surfacing	Specification	Open Graded Porous Asphalt		2007	http://www.nzta.govt.nz/resources/open-graded-porous-asphalt/index.html
State Highway Standard Investment & Local Guidelines	Pavement and surfacing	Specification	Changes to Open Graded Porous Asphalt 2007		2007	http://www.nzta.govt.nz/resources/open-graded-porous-asphalt/index.html
Investment, State Highway and Local Guidelines	Paving and Surfacing and Construction		Pavement Marking		2000	http://www.nzta.govt.nz/resources/pvmt-marking/index.html
State Highway Standard Investment & Local Guidelines	Paving and Surfacing and Construction		Pavement Marking			http://www.nzta.govt.nz/resources/pvmt-marking/index.html
State Highway Standard Investment & Local Guidelines	Signs and markings	Specification	Installation of Raised Pavement Markers			http://www.nzta.govt.nz/resources/raised-pvmt-markers-installation/index.html
State Highway Standard Investment & Local Guidelines	Signs and markings	Specification	Installation of Raised Pavement Markers			http://www.nzta.govt.nz/resources/raised-pvmt-markers-installation/index.html
State Highway Standard Investment & Local Guidelines	Signs and markings	Specification	Installation of Edge Marker Posts		2011	http://www.nzta.govt.nz/resources/edge-marker-posts-installation/index.html
State Highway Standard Investment & Local Guidelines	Signs and markings	Specification	Installation of Edge Marker Posts		2011	http://www.nzta.govt.nz/resources/edge-marker-posts-installation/index.html

State Highway Standard Investment & Local Guidelines	Signs and markings	Specification	Installation of Edge Marker Posts	2011	http://www.nzta.govt.nz/resources/edge-marker-posts-installation/index.html
State Highway Standard Investment & Local Guidelines	Pavement and surfacing	Specification	Performance Based Specification for Bituminous Reseals	2002	http://www.nzta.govt.nz/resources/bituminous-reseals/index.html
State Highway Standard Investment & Local Guidelines	Pavement and surfacing	Specification	Performance Based Specification for Bituminous Reseals	2002	http://www.nzta.govt.nz/resources/bituminous-reseals/index.html
State Highway Standard Investment & Local Guidelines	Paving and Surfacing and Construction	Specification	Performance Based Specification for Edge Marker Posts	2003	
State Highway Standard Investment & Local Guidelines	Paving and Surfacing and Construction	Specification	Notes for the Performance Based Specification for Edge Marker Posts	2003	
State Highway Standard Investment & Local Guidelines	Paving and Surfacing and Construction	Specification	Reflectorised Pavement Marking	2006	http://www.nzta.govt.nz/resources/reflectorised-pvmt-marking/index.html
Investment, State Highway and Local Guidelines	Paving and Surfacing and Construction	Specification	Performance Based Specification for Hotmix Asphalt Wearing Course Surfacing	2005	http://www.nzta.govt.nz/resources/hotmix-asphalt-wearing-course-surfacing/index.html
Investment, State Highway and Local Guidelines	Paving and Surfacing and Construction	Specification	Notes to the Performance Based Specification for Hotmix Asphalt Wearing Course Surfacing	2005	http://www.nzta.govt.nz/resources/hotmix-asphalt-wearing-course-surfacing/index.html
State Highway Standard Investment & Local Guidelines	Paving and Surfacing and Construction	Specification	Performance Based Specification for Traffic Signs	2008	http://www.nzta.govt.nz/resources/traffic-signs-perf-based-specs/index.html
State Highway Standard Investment & Local Guidelines	Paving and Surfacing and Construction	Specification	Notes for the Performance Based Specification for Traffic Signs	2008	http://www.nzta.govt.nz/resources/traffic-signs-perf-based-specs/index.html
State Highway Standard Investment & Local Guidelines	Paving and Surfacing and Construction	Specification	Improvement of Pavement Macrotexture by use of High Pressure Water and Grooving	2003	http://www.nzta.govt.nz/resources/imprvmnt-macro-texture-high-pressure-water-grooving/index.html
State Highway Standard Investment & Local Guidelines	Paving and Surfacing and Construction	Specification	Improvement of Pavement Macrotexture by use of High Pressure Water and Grooving	2003	http://www.nzta.govt.nz/resources/imprvmnt-macro-texture-high-pressure-water-grooving/index.html
State Highway Standard Investment & Local Guidelines	Asset management	Specification	Maintenance and Installation of Inductive Loops at Traffic Monitoring Sites	Nov 2006	http://www.nzta.govt.nz/resources/maint-installation-inductive-loops-traffic-monitoring-sites/index.html
State Highway Standard Investment & Local Guidelines	Paving and Surfacing and Construction	Specification	High Performance Roadmarking	Jan 2009	http://www.nzta.govt.nz/resources/high-performance-roadmarking/index.html
State Highway Standard Investment	Paving and Surfacing and Construction	Specification	High Performance Roadmarking	Jan 2009	http://www.nzta.govt.nz/resources/high-performance-

& Local Guidelines						roadmarking/index.html
State Highway Standard Investment & Local Guidelines	Signs and markings	Specification	Electronic Warning Signs on State Highways		May 2010	http://www.nzta.govt.nz/resources/electronic-warning-signs/
State Highway Standard Investment & Local Guidelines	Signs and markings	Specification	Notes for Electronic Warning Signs on State Highways			http://www.nzta.govt.nz/resources/electronic-warning-signs/
State Highway standard, Investment & Local Guidelines	Project and contract management		NZTA Insurance Services Portal			https://nzta.aon.co.nz/
State Highway standard Investment & Local Guidelines	Project and contract management		Prequalification for Physical Works Application Pack 2010	4	Nov-10	http://www.nzta.govt.nz/network/tenders-contracts/prequalification/index.html
State Highway Standard Investment & Local Guidelines	Quality Assurance	Specification	Guideline on Roles in Quality Assurance			http://www.nzta.govt.nz/resources/qa-level-contracts/
State Highway Standard Investment & Local Guidelines	Quality Assurance	Specification	Chipsealing		1995	http://www.nzta.govt.nz/resources/chipsealing-hot-mix-asphalt/index.html
State Highway Standard Investment & Local Guidelines	Quality Assurance	Specification	Hot Mix Asphalt		June 1995	http://www.nzta.govt.nz/resources/chipsealing-hot-mix-asphalt/index.html
State Highway Standard Investment & Local Guidelines	Quality Assurance	Specification	Q1 Notes & Q/2 Notes Chipsealing			http://www.nzta.govt.nz/resources/chipsealing-hot-mix-asphalt/index.html
State Highway Standard Investment & Local Guidelines	Quality Assurance	Specification	Normal QA Level Contracts		1995	http://www.nzta.govt.nz/resources/qa-level-contracts/
Investment, State Highway and Local Guidelines	Quality Assurance	Specification	High QA Level Contracts		1995	http://www.nzta.govt.nz/resources/qa-level-contracts/
Investment, State Highway and Local Guidelines	Asset management	Technical Memorandum	Amendments to Appendices of SHDOM		Dec-06	Contact document owner
State Highway Standard Investment & Local Guidelines	Bridges and culverts (structures)	Specification	Bridge and other Structures Inspection Policy		2011	http://www.nzta.govt.nz/resources/bridges-structures-inspection-policy/
State Highway standard Investment & Local Guidelines	Bridges and culverts (structures)	Specification	Best Practice Guidelines for Stock Crossings	Feb 2010	2010	http://www.rcaforum.org.nz/guidelines-for-stock-crossings/
State Highway Standard Investment & Local Guidelines	Testing	Specification	Benkelman Beam Deflection Measurements		June 1977	http://www.nzta.govt.nz/resources/benkelman-beam-deflection-measurements/index.html
State Highway Standard Investment & Local Guidelines	Testing	Specification	Measurement of Texture by the Sand Circle Method		1981	
State Highway Standard Investment & Local Guidelines	Testing	Specification	Description of Test Locations on Highways		1981	http://www.nzta.govt.nz/resources/test-locations-highways-description/ind

					ex.html
State Highway Standard Investment & Local Guidelines	Testing	Specification	Size, Shape and Grading of Grades 1-4 Sealing Chips		http://www.nzta.govt.nz/resources/size-shape-grading-of-grades-1-4-sealing-chips/index.html
State Highway Standard Investment & Local Guidelines	Testing	Specification	Pore Size Distributions of Filter Fabric	1986	http://www.nzta.govt.nz/resources/filter-fabric-pore-size-distributions/index.html
State Highway Standard Investment & Local Guidelines	Pavement and surfacing	Specification	Permeability of Filter Fabrics 1983		http://www.nzta.govt.nz/resources/filter-fabrics-permeability/index.html
State Highway Standard Investment & Local Guidelines	Testing	Specification	Roadmarking Paint Applicator Testing	September 2008	http://www.nzta.govt.nz/resources/roadmarking-paint-applicator-testing/index.html
State Highway Standard Investment & Local Guidelines	Testing	Specification	Changes to Roadmarking Paint Applicator Testing	September 2008	http://www.nzta.govt.nz/resources/roadmarking-paint-applicator-testing/index.html
State Highway Standard Investment & Local Guidelines	Testing	Specification	Procedure for the Estimation of the Kerosene Content	2003	http://www.nzta.govt.nz/resources/kerosene-content-estimation/index.html
Investment, State Highway and Local Guidelines	Pavement and surfacing	Specification	Skid Resistance Deficiency Investigation and Treatment Selection 2013	Jul-13	http://www.nzta.govt.nz/resources/skid-resistance-investigation-treatment-selection/
Investment, State Highway and Local Guidelines	Testing	Specification	Notes Skid Resistance Deficiency Investigation and Treatment Selection	Jul-13	http://www.nzta.govt.nz/resources/skid-resistance-investigation-treatment-selection/index.html
State Highway Standard Investment & Local Guidelines	Testing	Specification	Determination of the Permeability of Hot Mix Asphalt Pavements		http://www.nzta.govt.nz/resources/permeability-hot-mix-asphalt/index.html
State Highway Standard Investment & Local Guidelines	Signs and markings	Specification	Long-Life Pavement Marking Material Applicator Testing		http://www.nzta.govt.nz/resources/long-life-pavement-marking-material-app-testing/index.html
State Highway Standard Investment & Local Guidelines	Signs and markings	Specification	Long-Life Pavement Marking Material Applicator Testing		http://www.nzta.govt.nz/resources/long-life-pavement-marking-material-app-testing/index.html
State Highway Standard Investment & Local Guidelines	Testing	Specification	Durability Test Method for Bitumen		http://www.nzta.govt.nz/resources/durability-test-method-for-bitumen/
State Highway Standard Investment & Local Guidelines	Testing	Specification	Determination of Roadmarking Retroreflectivity		http://www.nzta.govt.nz/resources/determination-retroreflectivity/index.html
State Highway Standard Investment & Local Guidelines	Testing	Specification	Determination of Heavy Metal Content in Glass		http://www.nzta.govt.nz/resources/determination-heavy-metal-content/index.

						html
Other Reference Documents	Maintenance management systems	Specification	General Maintenance 1995			http://www.nzta.govt.nz/resources/general-maint-c-series-specs/index.html
Other Reference Documents	Maintenance management systems	Specification	Addendum No 1 1997 to the Specification for General Maintenance			http://www.nzta.govt.nz/resources/general-maint-c-series-specs/index.html
Other Reference Documents	Maintenance management systems	Specification	General Maintenance			http://www.nzta.govt.nz/resources/general-maint-c-series-specs/index.html
State Highway Standard Investment & Local Guidelines	Maintenance	Specification	Repair Potholes Replacement		2006	http://www.nzta.govt.nz/resources/repair-potholes/index.html
State Highway Standard Investment & Local Guidelines	Maintenance	Specification	Digout Repairs in Flexible Pavements Replacement		2006	http://www.nzta.govt.nz/resources/digout-repairs/index.html
State Highway Standard Investment & Local Guidelines	Maintenance	Specification	Repair of Surface Openings and Minor Surface Levelling Replacement		2006	http://www.nzta.govt.nz/resources/surface-opening-repair/
State Highway Standard Investment & Local Guidelines	Maintenance	Specification	Repair of Surface Defects Replacement		2006	http://www.nzta.govt.nz/resources/surface-defect-repair/index.html
State Highway Standard Investment & Local Guidelines	Maintenance	Specification	Repair of Edge Break Replacement		2006	http://www.nzta.govt.nz/resources/edge-break-repair/index.html
State Highway Standard Investment & Local Guidelines	Maintenance	Specification	Adjusting Surface Boxes Replacement		2006	
State Highway Standard Investment & Local Guidelines	Maintenance	Specification	Emergency Work Replacement		2006	http://www.nzta.govt.nz/resources/spec-emergency-work/index.html
State Highway Standard Investment & Local Guidelines	Maintenance	Specification	Maintenance of Unsealed Shoulders Replacement		2006	http://www.nzta.govt.nz/resources/maint-unsealed-shoulders/index.html
State Highway Standard Investment & Local Guidelines	Maintenance	Specification	Replacement Unsealed Pavements: Repair of Potholes Replacement		2006	http://www.nzta.govt.nz/resources/unsealed-pvmts-repair-potholes/index.html
State Highway Standard Investment & Local Guidelines	Maintenance	Specification	Unsealed Pavements: Surface and Shape Restoration Replacement		2006	http://www.nzta.govt.nz/resources/unsealed-pvmts-surface-shape/index.html
State Highway Standard Investment & Local Guidelines	Maintenance	Specification	Unsealed Pavements: Digout Repairs Replacement		2006	http://www.nzta.govt.nz/resources/unsealed-pvmts-digout-repairs/index.html
State Highway Standard Investment & Local Guidelines	Maintenance	Specification	Unsealed Pavements: Supply and Place Maintenance Aggregate Replacement		2006	http://www.nzta.govt.nz/resources/unsealed-pvmts-supply-place-maint-aggregate/index.htm
State Highway Standard Investment	Maintenance	Specification	Removal of Surface Detritus Replacement		2006	http://www.nzta.govt.nz/resources/removal-surface-

& Local Guidelines					detritus/index.html
State Highway Standard Investment & Local Guidelines	Maintenance	Specification	Maintenance of Stormwater Structures Replacement	2006	http://www.nzta.govt.nz/resources/maint-stormwater-structures/index.html
State Highway Standard Investment & Local Guidelines	Maintenance	Specification	Maintenance of Guardrails and Median Barriers Replacement	2006	http://www.nzta.govt.nz/resources/maint-guardrails-med-barriers/index.html
State Highway Standard Investment & Local Guidelines	Maintenance	Specification	Erection and Maintenance of Traffic Signs, Chevrons, Markers and Sight Rails	2003	http://www.nzta.govt.nz/resources/erection-maint-traffic-signs/index.html
State Highway Standard Investment & Local Guidelines	Maintenance	Specification	Erection and Maintenance of Traffic Signs, Chevrons, Markers and Sight Rails	2003	http://www.nzta.govt.nz/resources/erection-maint-traffic-signs/index.html
State Highway Standard Investment & Local Guidelines	Maintenance	Specification	Vegetation Control	July 1997	http://www.nzta.govt.nz/resources/vegetation-control/index.html
State Highway Standard Investment & Local Guidelines	Maintenance	Specification	Specification for Winter Maintenance	2005	http://www.nzta.govt.nz/resources/specs-winter-maint/index.html
State Highway Standard Investment & Local Guidelines	Maintenance	Specification	Notes to Specification for Winter Maintenance	2005	http://www.nzta.govt.nz/resources/specs-winter-maint/index.html
State Highway Standard Investment & Local Guidelines	Maintenance	Specification	Specification for Winter Maintenance Replacement		http://www.nzta.govt.nz/resources/specs-winter-maint/index.html
Investment, State Highway and Local Guidelines	Maintenance	Specification	Repair of Corrosion Protection Systems		http://www.nzta.govt.nz/resources/repair-corrosion-protection-systems/index.html
State Highway Standard Investment & Local Guidelines	Street lighting and traffic signals	Specification	Maintenance of Highway Lighting		http://www.nzta.govt.nz/resources/maint-highway-lighting/index.html
State Highway Standard Investment & Local Guidelines	Street lighting and traffic signals	Specification	Maintenance of Highway Lighting		http://www.nzta.govt.nz/resources/maint-highway-lighting/index.html
State Highway Standard Investment & Local Guidelines	Maintenance	Specification	Maintenance and Repair of Traffic Signal Installations		http://www.nzta.govt.nz/resources/maint-repair-traffic-signal-installations/index.html
State Highway Standard Investment & Local Guidelines	Maintenance	Specification	Maintenance and Repair of Traffic Signal Installations		http://www.nzta.govt.nz/resources/maint-repair-traffic-signal-installations/index.html
Investment, State Highway and Local Guidelines	Maintenance	Specification	Specification for the Cleaning and Recoating of Steelwork Coated with Lead Based Paint	2003	http://www.nzta.govt.nz/resources/cleaning-recoating-steelwork/index.html
Investment, State Highway and Local Guidelines	Maintenance	Specification	Notes for the Cleaning and Recoating of Steelwork Coated with Lead Based Paint	2003	http://www.nzta.govt.nz/resources/cleaning-recoating-steelwork/index.html

State Highway Standard Investment & Local Guidelines	Maintenance	Specification	Definitions SM032 specifications	2006	http://www.nzta.govt.nz/resources/maint-specs-definitions-sm032/index.html
State Highway Standard Investment & Local Guidelines	Maintenance	Specification	Incident Response	2006	http://www.nzta.govt.nz/resources/maint-specs-incident-response/index.html
State Highway Standard Investment & Local Guidelines	Maintenance	Specification	Winter Maintenance	2006	http://www.nzta.govt.nz/resources/maint-specs-winter-maint/index.html
State Highway Standard Investment & Local Guidelines	Maintenance	Specification	Surfacings	2006	http://www.nzta.govt.nz/resources/maint-specs-surfacings/index.html
State Highway Standard Investment & Local Guidelines	Maintenance	Specification	Digouts	2006	http://www.nzta.govt.nz/resources/maint-specs-digouts/index.html
State Highway Standard Investment & Local Guidelines	Maintenance	Specification	Depressions	2006	http://www.nzta.govt.nz/resources/maint-specs-depressions/index.html
State Highway Standard Investment & Local Guidelines	Maintenance	Specification	Edgebreak	2006	http://www.nzta.govt.nz/resources/maint-specs-edgebreak/index.html
State Highway Standard Investment & Local Guidelines	Maintenance	Specification	Service Covers	2006	http://www.nzta.govt.nz/resources/maint-specs-service-covers/index.html
State Highway Standard Investment & Local Guidelines	Maintenance	Specification	Shoulder Maintenance	2006	http://www.nzta.govt.nz/resources/maint-specs-shoulder-maint/index.html
State Highway Standard Investment & Local Guidelines	Maintenance	Specification	Barrier Repairs	2006	http://www.nzta.govt.nz/resources/maint-specs-barrier-repairs/index.html
State Highway Standard Investment & Local Guidelines	Maintenance	Specification	Potholes	2006	http://www.nzta.govt.nz/resources/maint-specs-potholes/index.html
State Highway Standard Investment & Local Guidelines	Maintenance	Specification	Detritus and Slip Removal	2006	http://www.nzta.govt.nz/resources/maint-specs-detritus-slip-removal/index.html
State Highway Standard Investment & Local Guidelines	Maintenance	Specification	Drainage Systems	2006	http://www.nzta.govt.nz/resources/maint-specs-drainage-systems/index.html
State Highway Standard Investment & Local Guidelines	Maintenance	Specification	Unsealed Pavements	2006	http://www.nzta.govt.nz/resources/maint-specs-unsealed-pvmts/index.html
State Highway Standard Investment & Local Guidelines	Maintenance	Specification	Drainage Improvements	2006	http://www.nzta.govt.nz/resources/maint-specs-drainage-improvements/index.html
State Highway Standard Investment & Local Guidelines	Maintenance	Specification	Pre-surfacing Repairs (identical to OR09 Pre-Surfacing Repairs)	2006	http://www.nzta.govt.nz/resources/pre-surfacing-repairs/index.html

State Highway Standard Investment & Local Guidelines	Environmental, land use and resource planning		Ambient Air Quality Annual Report		Jan-10	http://www.nzta.govt.nz/resources/air-quality-monitoring/
State Highway standard, Investment & Local Guidelines	Environmental, land use and resource planning		NZTA (ARRB) Research Report 003 - Traffic noise: prediction of interrupted flow noise		Jun-05	http://www.nzta.govt.nz/resources/research/reports/3/index.html
State Highway standard, Investment & Local Guidelines	Environmental, land use and resource planning		NZTA Consent Compliance Management System (CS-Vue User Protocol)		Jan-11	http://www.nzta.govt.nz/resources/consent-compliance-management-system/
State Highway standard Investment & Local Guidelines	Environmental, land use and resource planning	Specification	NZTA Transport Acoustics Website		Aug-09	http://acoustics.nzta.govt.nz/
State Highway standard Investment & Local Guidelines	Environmental, land use and resource planning	Specification	Stormwater Treatment Standard for State Highway Infrastructure		May-10	http://www.nzta.govt.nz/resources/stormwater-management/stormwater-management.html
State Highway standard Investment & Local Guidelines	Environmental, land use and resource planning	Specification	Urban Design Policy			http://www.nzta.govt.nz/resources/urban-design/index.html
State Highway Standard Investment & Local Guidelines	ITS projects and systems	Specification	VMS National Operating Procedures		May-10	Contact document owner
State Highway Standard Investment & Local Guidelines	Basecourse	Specification	NZTA B6: 2012 Specification for In-situ Stabilisation of Bound Sub-base Layers	1		http://www.nzta.govt.nz/resources/insitu-stabilisation-bound-sub-base-layers/
State Highway Standard Investment & Local Guidelines	Basecourse	Specification	NZTA B6: 2012 Notes to Specification for In-situ Stabilisation of Bound Sub-base Layers	1		http://www.nzta.govt.nz/resources/insitu-stabilisation-bound-sub-base-layers/
State Highway Standard Investment & Local Guidelines	Basecourse	Specification	NZTA B7: 2012 Specification for the Manufacture and Construction of Plant Mixed Modified Pavement Layers	1		http://www.nzta.govt.nz/resources/manufacture-plant-mixed-modified-pavement-layers/
State Highway Standard Investment & Local Guidelines	Basecourse	Specification	NZTA B7: 2012 Notes to Specification for the Manufacture and Construction of Plant Mixed Modified Pavement Layers	1		http://www.nzta.govt.nz/resources/manufacture-plant-mixed-modified-pavement-layers/
State Highway Standard Investment & Local Guidelines	Basecourse	Specification	NZTA B8: 2012 Specification for the Manufacture and Construction of Plant Mixed Bound Sub-Base Pavement Layers	1		http://www.nzta.govt.nz/resources/manufacture-plant-mixed-bound-sub-base-pavement-layers/
State Highway Standard Investment & Local Guidelines	Basecourse	Specification	NZTA B8: 2012 Notes to Specification for the Manufacture and Construction of Plant Mixed Bound Sub-Base Pavement Layers	1		http://www.nzta.govt.nz/resources/manufacture-plant-mixed-bound-sub-base-pavement-layers/
State Highway Standard Investment & Local Guidelines	Basecourse	Specification	NZTA M15: 2012 Specification for Lime for Use in Soil Stabilisation	1		http://www.nzta.govt.nz/resources/lime-for-use-in-soil-stabilisation/
State Highway Standard Investment & Local Guidelines	Basecourse	Specification	NZTA M15: 2012 Notes on Specification for Lime for Use in Soil Stabilisation	1		http://www.nzta.govt.nz/resources/lime-for-use-in-soil-stabilisation/

State Highway standard, Investment & Local Guidelines	Pavement and surfacing	Specification	Chipsealing and Hot Mix Asphalt			http://www.nzta.govt.nz/resources/chipsealing-hot-mix-asphalt/index.html
State Highway standard, Investment & Local Guidelines	Pavement and surfacing	Specification	Crushed Basecourse Aggregate			http://www.nzta.govt.nz/resources/basecourse-aggregate/index.html
Investment, State Highway and Local Guidelines	Pavement and surfacing		Freeze-Thaw Effects in New Zealand Pavements" Transit New Zealand Research Project No. 51, 1996		Jul 1995	http://www.nzta.govt.nz/resources/research/reports/51/
State Highway Standard Investment & Local Guidelines	Pavement and surfacing	Performance based chipsealing	NZTA P17 Performance Based Specification for Bituminous Reseals	9	Oct-12	http://www.nzta.govt.nz/resources/bituminous-reseals/
State Highway Standard Investment & Local Guidelines	Pavement and surfacing	High Skid Resistant Surfacings	NZTA P25P: 2011 Pilot Specification for Calcined Bauxite	1	2011	http://www.nzta.govt.nz/resources/p25-specification/index.html
State Highway Standard Investment & Local Guidelines	Pavement and surfacing	High Skid Resistant Surfacings	NZTA P25P: 2011 Notes for Pilot Specification for Calcined Bauxite	1	2011	http://www.nzta.govt.nz/resources/p25-specification/index.html
State Highway standard, Investment & Local Guidelines	Pavement and surfacing	Chipsealing Practice Note	Reasons for Resealing	1	Apr-11	http://www.nzta.govt.nz/resources/chipsealing-new-zealand-manual/index.html
State Highway standard Investment & Local Guidelines	Signs and markings		Manual of Traffic Signs and Markings: Part 1 - Traffic Signs (with updates to March 2010)		Jan 2010	http://www.nzta.govt.nz/resources/motsam/part-1/
State Highway standard Investment & Local Guidelines	Signs and markings		Manual of Traffic Signs and Markings: Part 2 Markings		Aug-10	http://www.nzta.govt.nz/resources/motsam/part-2/index.html
State Highway standard Investment & Local Guidelines	Signs and markings		Manual of Traffic Signs and Markings: Part 3 Motorways and Expressways (with updates to March 2010)		Mar-10	http://www.nzta.govt.nz/resources/motsam/part-3/index.html
State Highway standard Investment & Local Guidelines	Safety		Code of Practice for Temporary Traffic Management (CoPTTM)	3	May-13	http://www.nzta.govt.nz/resources/code-temp-traffic-management/
State Highway standard Investment & Local Guidelines	Signs and markings		Traffic control devices manual, part 9, level crossings, NZTA Dec 2012	2	Dec-12	http://www.nzta.govt.nz/resources/traffic-control-devices-manual/part-09-level-crossings/index.html
State Highway Standard Investment & Local Guidelines	Signs and markings		TNZ M/12 Raised Pavement Markers			http://www.nzta.govt.nz/resources/raised-pvmt-markers/
Local Guidelines	Safety		Road Infrastructure Safety Assessment (RISA) Guidelines			
Local Guidelines	Signs and markings		TNZ P/12 Pavement Marking			http://www.nzta.govt.nz/resources/pvmt-marking/
Investment, State Highway and Local guidelines						
State Highway standard, Investment & Local Guidelines	Asset management		Location Referencing Management System (LRMS) Manual, TNZ, 2004		2004	http://www.nzta.govt.nz/resources/location-ref-management-sys-manual/
Investment, State Highway and Local Guidelines	Asset management		State Highway Asset Management Best Practice Guidelines, TNZ, Apr 2003		Apr 03	Contact document owner

Investment, State Highway and Local Guidelines	Asset management		State Highway Asset Management Manual, TNZ, Aug 2000	3	Aug 2000	http://www.nzta.govt.nz/resources/state-highway-asset-management-manual
Investment, State Highway and Local Guidelines	Asset management		State Highway Asset Management Plan, TNZ, Feb 2004		Feb 2004	Contact document owner
Investment, State Highway and Local Guidelines	Asset management		State Highway Database Operations Manual, TNZ, Apr 2006		Apr 2006	http://www.nzta.govt.nz/resources/state-highway-database-operation-manual/
Investment, State Highway and Local Guidelines	Environmental, land use and resource planning		Engine Braking Noise Leaflet		Jul-05	http://acoustics.nzta.govt.nz/system/files/NZTA%20Engine%20Braking%20v1.0.pdf
Investment, State Highway and Local Guidelines	Environmental, land use and resource planning		Environmental Plan		Jun-08	http://www.nzta.govt.nz/resources/environmental-policy-manual/
State Highway standard, Investment & Local Guidelines	Environmental, land use and resource planning		Environmental Policy Manual	1		http://www.nzta.govt.nz/resources/environmental-policy-manual/
Investment, State Highway and Local Guidelines	Environmental, land use and resource planning		Guidelines for Highway Landscaping, Dec 2006	2	Dec 2006	http://www.nzta.govt.nz/resources/guidelines-highway-landscaping/
Investment, State Highway and Local Guidelines	Environmental, land use and resource planning		NZTA Guideline for Handling Environmental Complaints (Transit NZ - EPM SP/M/023		Jun-05	Contact document owner
Investment, State Highway and Local Guidelines	Environmental, land use and resource planning		NZTA (Incite / MHA) Land transportation and noise: land use planning for a quieter New Zealand		Jun-05	http://www.nzta.govt.nz/resources/research/reports/299/docs/299.pdf
Investment, State Highway and Local Guidelines	Environmental, land use and resource planning		NZTA State Highway Guideline - Interim Guideline for Air Quality inside Road Tunnels (VAC Paper and Decision Sep 09)		Jul-05	Contact document owner
Investment, State Highway and Local Guidelines	Bridges and culverts (structures)	Technical Memorandum	Bosspipe Product and TNZ F/2 Specification for Pipe Subsoil Drain Construction		Apr-08	http://www.nzta.govt.nz/resources/bosspipe-product/index.html
Investment, State Highway and Local Guidelines	Bridges and culverts (structures)	Technical Memorandum	Bosspipe Product and TNZ F/3 Specification for Pipe Culvert Construction		Jun-08	http://www.nzta.govt.nz/resources/bosspipe-product/docs/memo-april-2008-f3.pdf
Investment, State Highway and Local Guidelines	Bridges and culverts (structures)		Bridge Descriptive Inventory Administration and User Guideline	2	Oct 2003	http://www.nzta.govt.nz/resources/bridge-data-system-structural-guide/
Investment, State Highway and Local Guidelines	Bridges and culverts (structures)		Bridge Inspection and Maintenance Manual		Jul 2001	http://www.nzta.govt.nz/resources/bridge-inspection-maintenance-manual/
Investment, State Highway and Local Guidelines	Bridges and culverts (structures)	Technical Memorandum	Bridge Manual Third Edition 2013	3	May-13	http://www.nzta.govt.nz/resources/bridge-manual/
Investment, State Highway and Local Guidelines	Bridges and culverts (structures)		Bailey Bridge Manual		Oct-09	http://www.nzta.govt.nz/resources/bridge-manual/index.html
Investment, State Highway and Local Guidelines	Bridges and culverts (structures)	Specification	Concrete Weigh Pits			http://www.nzta.govt.nz/resources/concrete-weigh-pit/index.html
Investment, State Highway and Local Guidelines	Bridges and culverts (structures)	Technical Memorandum	Traversable and Mountable Grates for Precast Concrete Headwalls		Oct-08	http://www.nzta.govt.nz/resources/traversable-and-mountable-

					grates-for-precast-concrete-headwalls/
Investment, State Highway and Local Guidelines	Bridges and culverts (structures)	Technical Memorandum	Staged Adopting of Transit Bridge Manual Amendments	Jan-06	http://www.nzta.govt.nz/resources/staged-adopting-of-transit-bridge-manual-amendments/
Investment, State Highway and Local Guidelines	Street lighting and traffic signals		Stops and goes of traffic signals- A traffic signal auditor's perspective, LTNZ, Dec 2006	Dec 2006	http://www.nzta.govt.nz/resources/stop-and-goes-of-traffic-signals/stop-and-goes-of-traffic-signals.html
Investment, State Highway and Local Guidelines	Geometric design (& traffic management)		Highway Surface Drainage: Design Guide for Highways with a Positive Collection System, NRB, 1977	1977	http://www.nzta.govt.nz/resources/highway-surface-drainage-design-guide/index.html
Investment, State Highway and Local Guidelines	Geometric design (& traffic management)		NZS 4404:2010 Land Development and Subdivision	2010	Standards NZ
Investment, State Highway and Local Guidelines	Geometric design (& traffic management)		"Traffic notes" series, 1 to 61	Oct-11	http://www.nzta.govt.nz/resources/traffic-notes/
Investment, State Highway and Local Guidelines	Environmental, land use and resource planning		AS 2187-2:2006 Explosives – Storage and use – Part 2: Use of explosives	Jun-05	http://www.saiglobal.com/search-publications/
Investment, State Highway and Local Guidelines	Environmental, land use and resource planning		MfE Good Practice Guide for Assessing Discharges to Air from Land Transport	Jun-05	http://www.mfe.govt.nz/publications/air/
Investment, State Highway and Local Guidelines	Environmental, land use and resource planning		DIN 4150-3: 1999 Structural Vibration - Effects of vibration of structures	Jun-05	http://www.saiglobal.com/search-publications/
Investment, State Highway and Local Guidelines	Environmental, land use and resource planning		ICOMOS [International Council of Monuments and Sites] New Zealand Charter for the Conservation of Cultural Heritage	Jun-05	http://www.international.icomos.org/charters/
Investment, State Highway and Local Guidelines	Environmental, land use and resource planning		NZHPT Sustainable Management of Historic Heritage Guidance Series	Jun-05	http://www.historic.org.nz/publications/sustainmgtseries.aspx
Investment, State Highway and Local Guidelines	Geometric design (& traffic management)		Cycle Network and Route Planning Guide, LTNZ, 2004)	2004	http://www.nzta.govt.nz/resources/cycle-network-and-route-planning/
Investment, State Highway and Local Guidelines	Geometric design (& traffic management)	Technical Memorandum	Dent Breakaway System for Signposts	Jun-06	http://www.nzta.govt.nz/resources/dent-breakaway-system-signposts/index.html
Investment, State Highway and Local Guidelines	Geometric design (& traffic management)		TNZ M/19 Specification – Evaluation of 6mm OCLYTE Short Stub TM manufactured by CSP Pacific Application for Approval.	Jun-06	http://www.nzta.govt.nz/resources/eval-6mm-approval-ocylte-short-stub-tm/
Investment, State Highway and Local Guidelines	Geometric design (& traffic management)		Hinge Mechanism for Signs Mounted on Two or More Breakaway Timber Posts: Provisional Advice: December 2005	Dec-05	http://sh20mountroskill.co.nz/technical/memoranda.jsp
Investment, State Highway and Local Guidelines	Geometric design (& traffic management)		State Highway Geometric Design Manual: Transit 2000: Rev Dec 2005	Dec 2000	http://www.nzta.govt.nz/resources/state-highway-geometric-design-manual/
Investment, State Highway and Local Guidelines	Geometric design (& traffic management)		Overweight Permit Manual (OPM) 11	01 Nov 2011	http://www.nzta.govt.nz/resources/overweight-permit-manual/

Investment, State Highway and Local Guidelines	Geometric design (& traffic management)		RTS 18 - New Zealand on road tracking curves for heavy vehicles (August 2007)		Aug 2007	http://www.nzta.govt.nz/resources/road-traffic-standards/rts-18.html
Investment, State Highway and Local Guidelines	Signs and markings		Motorway Exits and Entrances: Geometric Details and Traffic Signs Plan TNZ M1 (2004)		2004	Contact document owner
Investment, State Highway and Local Guidelines	Signs and markings	Technical Memorandum	Revisions to TNZ P/24 and the RSMA Compliance Standard		Jul-08	http://www.nzta.govt.nz/resources/rev-tnzp24-rsma-compliance-standard/index.html
Investment, State Highway and Local Guidelines	Street lighting and traffic signals		AS/NZS 1158.0:2005 Road Lighting – Introduction		2005	Standards NZ
Investment, State Highway and Local Guidelines	Street lighting and traffic signals		AS/NZS 1158.1.1:2005 Road Lighting – Vehicle Traffic (Category V) lighting – Performance and installation design requirements		2005	Standards NZ
Investment, State Highway and Local Guidelines	Street lighting and traffic signals		AS/NZS 1158.6:2010 Road Lighting Luminares standard	2010	February 2010	Standards NZ
Investment, State Highway and Local Guidelines	Pavement and surfacing	Technical Memorandum	Asphalt surfacing treatment selection guidelines	2.1	Sep-12	http://www.nzta.govt.nz/resources/asphalt-surfacing-treatment-selection/index.html
Investment, State Highway and Local Guidelines	Pavement and surfacing	Technical Memorandum	Best Practice Guidelines for the use of Alternative Materials and Processes in Road Construction with respect to Environmental Issues		Jul-06	http://www.nzta.govt.nz/resources/guide-use-of-alternative-materials-processes-in-road-construction/
Investment, State Highway and Local Guidelines	Pavement and surfacing		Chipsealing in New Zealand, TNZ, 2005		Aug 2005	http://www.nzta.govt.nz/resources/chipsealing-new-zealand-manual/index.html
Investment, State Highway and Local Guidelines	Pavement and surfacing	Chipsealing Practice Note	Racked-in seal to minimise traffic delays during resealing	1	Apr-11	http://www.nzta.govt.nz/resources/chipsealing-new-zealand-manual/index.html
Investment, State Highway and Local Guidelines	Pavement and surfacing	Chipsealing Practice Note	Combination Chipseals	1	Apr-11	http://www.nzta.govt.nz/resources/chipsealing-new-zealand-manual/index.html
Investment, State Highway and Local Guidelines	Pavement and surfacing	Chipsealing Practice Note	Selection of techniques for repairing newly constructed seals	1	Apr-11	http://www.nzta.govt.nz/resources/chipsealing-new-zealand-manual/index.html
Investment, State Highway and Local Guidelines	Pavement and surfacing	Technical Memorandum	Macrotexture Requirements for Surfacings		Dec-05	http://www.nzta.govt.nz/resources/macrotexture-requirements/index.html
Investment, State Highway and Local Guidelines	Pavement and surfacing	Technical Memorandum	2008 Skid Resistance Survey Data		Jun-08	http://www.nzta.govt.nz/resources/macrotexture-requirements/index.html
Investment, State Highway and Local Guidelines	Pavement and surfacing	Technical Memorandum	Approval to Issue Revised TNZ M/4 Specification for Basecourse Aggregate		Apr-06	http://www.nzta.govt.nz/resources/basecourse-aggregate/index.html
Investment, State Highway and Local Guidelines	Pavement and surfacing	Technical Memorandum	M/1 Bitumen Testing		Jan-11	http://www.nzta.govt.nz/resources/roading-bitumens/index.html

Investment, State Highway and Local Guidelines	Pavement and surfacing	Technical Memorandum	Roughness Requirements for Finished Pavement Construction		Jul-06	http://www.nzta.govt.nz/resources/roughness-requirements-finished-pavement/index.html
Investment, State Highway and Local Guidelines	Pavement and surfacing	Technical Memorandum	Use of Reclaimed Tyre Rubber in Asphalt		Jul-06	http://www.nzta.govt.nz/resources/reclaimed-tyre-rubber-use/index.html
Investment, State Highway and Local Guidelines	Pavement and surfacing	Technical Memorandum	Procedure for Assessing Bltumens for Acceptance by the Penetration Test		Jan-11	http://www.nzta.govt.nz/resources/procedure-for-assessing-bitumens/index.html
Investment, State Highway and Local Guidelines	Maintenance management systems		RAMM Road Condition Rating and Roughness Manual, Transfund, 1997 (parts3 to 5)	1	Jul 1997	http://www.nzta.govt.nz/resources/road-assessment-and-maintenance-management/
Investment, State Highway and Local Guidelines	Maintenance management systems		Local Authority RAMM Database Operation Manual, Transfund, 1997		Jul 1997	
Investment, State Highway and Local Guidelines	Maintenance management systems		State Highway Database Operations Manual, TNZ, 2004		2004	http://www.nzta.govt.nz/resources/state-highway-database-operation-manual/
Investment, State Highway and Local Guidelines	Safety		A New Zealand guide to the Treatment of Crash Locations, Land Transport NZ, 2004)		2004	http://www.nzta.govt.nz/resources/guide-to-treatment-of-crash-location/index.html
Investment, State Highway and Local Guidelines	Safety		Crash Reduction Study monitoring reports, LTSA, 1994 to 2004		2004	http://www.nzta.govt.nz/resources/crash-reduction/
Investment, State Highway and Local Guidelines	Safety		Cycling aspects of Austroads guides		Mar-11	https://www.onlinepublications.austroads.com.au/items/AP-G88-11
Investment, State Highway and Local Guidelines	Safety		Fact Sheet 26: Kea Crossings - School Crossing Points, LTNZ, 2005		2005	http://www.nzta.govt.nz/resources/factsheets/26/kea-crossings.html
Investment, State Highway and Local Guidelines	Safety		NZTA Safe journeys for motorcycling on New Zealand roads		Jul-12	http://www.nzta.govt.nz/resources/safer-journeys-motorcyclists/docs/safer-journeys-motorcyclists.pdf
Investment, State Highway and Local Guidelines	Safety		RTS 14: Guidelines for Installing Pedestrian Facilities for People with Visual Impairment, LTSA, 2003		2003	http://www.nzta.govt.nz/resources/road-traffic-standards/rts.html
Investment, State Highway and Local Guidelines	Safety	Guideline	High risk rural roads guide	1	Sep 2011	http://nzta.govt.nz/resources/high-risk-rural-roads-guide/
Investment, State Highway and Local Guidelines	Safety	Guideline	High risk intersection guide	1	Aug-13	http://www.nzta.govt.nz/resources/high-risk-intersections-guide
Investment, State Highway and Local Guidelines	Safety		RTS 11 Urban roadside barriers and alternative treatments, LTSA		Reprinted 2001	http://www.nzta.govt.nz/resources/road-traffic-standards/rts.html
Investment, State Highway and Local Guidelines	Safety		RTS 13 Guidelines for service stations, LTSA, 1996.		Reprinted Sep 2001	http://www.nzta.govt.nz/resources/road-traffic-standards/rts.html

Investment, State Highway and Local Guidelines	Safety		RTS 15 Guidelines for urban-rural speed thresholds, LTSA, 2002		Feb 2002	http://www.nzta.govt.nz/resources/road-traffic-standards/rts.html
Investment, State Highway and Local Guidelines	Safety		RTS 16 Guide to heavy vehicle management, LTNZ, Jun 2006		Jun 2006	http://www.nzta.govt.nz/resources/road-traffic-standards/rts.html
Investment, State Highway and Local Guidelines	Safety		TNZ M/23 Road Safety Barrier Systems		Oct 2009	http://www.nzta.govt.nz/resources/road-safety-barrier-systems/
Investment, State Highway and Local Guidelines	Road safety hardware technical memorandum		TM2503; Guidelines for Edge Protection and Medians on Dual Carriageway Roads, incorporating a Safe System Philosophy		2012	http://www.nzta.govt.nz/resources/dual-carriageway-safe-system-for-ratification/index.html
Investment, State Highway and Local Guidelines	Signs and markings		Guidelines for marking multi-lane roundabouts		Sep-10	http://www.nzta.govt.nz/resources/guidelines-marking-multi-roundabouts/
Investment, State Highway and Local Guidelines	Signs and markings		RTS 1: Guidelines for the Implementation of Traffic Control at Crossroads, LTSA, 1990		1990	http://www.nzta.govt.nz/resources/road-traffic-standards/rts.html
Investment, State Highway and Local Guidelines	Signs and markings		RTS 2: Guidelines for Street Name Signs, LTSA, 1990		1990	http://www.nzta.govt.nz/resources/road-traffic-standards/rts.html
Investment, State Highway and Local Guidelines	Signs and markings		RTS 3: Guidelines for Establishing Rural Selling Places, LTSA, 1992		1992	http://www.nzta.govt.nz/resources/road-traffic-standards/rts.html
Investment, State Highway and Local Guidelines	Signs and markings		RTS 4: Guidelines for Flush Medians, LTSA, 1991		1991	http://www.nzta.govt.nz/resources/road-traffic-standards/rts.html
Investment, State Highway and Local Guidelines	Signs and markings		RTS 5: Guidelines for Rural Road Marking and Delineation, LTSA, 1992	1	1992	http://www.nzta.govt.nz/resources/road-traffic-standards/rts.html
Investment, State Highway and Local Guidelines	Signs and markings		RTS 6: Guidelines for Visibility at Driveways, LTSA, 1993	1	1993	http://www.nzta.govt.nz/resources/road-traffic-standards/rts.html
Investment, State Highway and Local Guidelines	Signs and markings		RTS 7: Advertising Signs & Road Safety: Design and Location Guidelines, LTSA, 1993	1	1993	http://www.nzta.govt.nz/resources/road-traffic-standards/rts.html
Investment, State Highway and Local Guidelines	Signs and markings		RTS 8: Guidelines for Safe Kerbline Protection, LTSA, 1993	1	1993	http://www.nzta.govt.nz/resources/road-traffic-standards/rts.html
Investment, State Highway and Local Guidelines	Signs and markings		RTS 9: Guidelines for the Signing and Laying out of Slip Lanes, LTSA, 1994	1	1994	http://www.nzta.govt.nz/resources/road-traffic-standards/rts.html
Investment, State Highway and Local Guidelines	Environmental, land use and resource planning		NZ Archaeological Association Archaeological Site Recording Scheme Website			http://www.historic.org.nz/
Investment, State Highway and Local Guidelines	Environmental, land use and resource planning		The NZ Urban Design Protocol	1	Mar-05	http://www.nzta.govt.nz/resources/urban-design/protocol/index.html
Investment, State Highway and Local Guidelines	Environmental, land use and resource planning		PIARC Road Tunnels: A Guide to Optimising the Air Quality Impact upon the Environment (2008R04)		Jun-05	http://www.piarc.org/ressources/publications/4/5891,2008R04WEB.pdf

Investment, State Highway and Local Guidelines	Environmental, land use and resource planning	BS 5228-2:2009 Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration		Jul-05	Standards NZ
Investment, State Highway and Local Guidelines	Environmental, land use and resource planning	Road Traffic Noise Calculator		Jul-05	http://acoustics.nzta.govt.nz/node/2718/edit
Investment, State Highway and Local Guidelines	Environmental, land use and resource planning	NZTA Noise Barrier Design Guide	1	Aug 2010	http://acoustics.nzta.govt.nz/management/barrier-design-guide
Investnent State Highway and Local Guideline	Environmental, land use and resource planning	State highway construction and maintenance noise and vibration guide	1	Aug-13	http://ww2.nzta.govt.nz/resources/environmental-and-social-responsibility-manual/docs/construction-maintenance-noise-vibration-guide.pdf
State Highway standard Investment & Local Guidelines	Environmental, land use and resource planning	Social and Environmental Management	2	Mar-10	http://www.nzta.govt.nz/resources/state-highway-professional-services-contract-proforma-manual/standards/z-series.html
State Highway standard Investment & Local Guidelines	Environmental, land use and resource planning	Social and Environmental Management Form	2	Mar-10	http://www.nzta.govt.nz/resources/state-highway-professional-services-contract-proforma-manual/forms/psf.html
Investment, State Highway and Local Guidelines	Environmental, land use and resource planning	Urban and Landscape Design Frameworks - Highways and Network Operations Guideline		Oct-09	http://www.nzta.govt.nz/resources/urban-design/highways-network-ops-guideline/
Investment, State Highway and Local Guidelines	Environmental, land use and resource planning	Urban Design - Frequently Asked Questions			http://www.nzta.govt.nz/resources/urban-design/index.html
Investment, State Highway and Local Guidelines	Environmental, land use and resource planning	Urban Design Principals: Landscaping Guidance Notes		Jan-10	http://www.nzta.govt.nz/resources/urban-design/principles/landscape/docs/landscape-design.pdf
Investment, State Highway and Local Guidelines	Environmental, land use and resource planning	Urban Design Principals: Noise Walls Guidance Notes		May-09	http://www.nzta.govt.nz/resources/urban-design/principles/noise-walls/
Investment, State Highway and Local Guidelines	Environmental, land use and resource planning	Urban Design Principals: Pedestrian Bridge Guidance Notes		Dec-09	http://www.nzta.govt.nz/resources/urban-design/principles/pedestrian-bridge/
Investment, State Highway and Local Guidelines	Environmental, land use and resource planning	Urban Design Principals: Road Bridge Guidance Notes		Sep-09	http://www.nzta.govt.nz/resources/urban-design/principles/road-bridge/
Investment, State Highway and Local Guidelines	Environmental, land use and resource planning	Urban Design Principals: Underpass Guidance Notes		Mar-09	http://www.nzta.govt.nz/resources/urban-design/principles/underpass/
Investment, State Highway and Local Guidelines	Environmental, land use and resource planning	Urban Design Professional Services Guide	2	Mar-10	http://www.nzta.govt.nz/resources/urban-design/professional-services-guide/
Investment, State Highway and Local Guidelines	Environmental, land use and resource planning	Waste and Energy Management Policy		Aug 2003	http://www.nzta.govt.nz/resources/environmental-policy-manual/

Investment, State Highway and Local Guidelines	Environmental, land use and resource planning		Climate Change Position Statement		Jul-04	http://www.nzta.govt.nz/resources/environmental-policy-manual/environmental-policy.html
Investment, State Highway and Local Guidelines	Geometric design (& traffic management)		Pedestrian Planning and design guide, LTNZ		Dec 2007	http://www.nzta.govt.nz/resources/pedestrian-planning-guide/
Investment, State Highway and Local Guidelines	ITS projects and systems		Fixed Variable Message Sign Design Guide	2a		Contact document owner
Investment, State Highway and Local Guidelines	ITS projects and systems		ITS Equipment Room Standards	1a		Contact document owner
Investment, State Highway and Local Guidelines	ITS projects and systems		Mobile Variable Message Sign Design Guide	1a		Contact document owner
Investment, State Highway and Local Guidelines	ITS projects and systems		Traffic Cameras Policy and Design Guide (Draft only)			Contact document owner
Investment, State Highway and Local Guidelines	ITS projects and systems		A Guide to the Use of CCTV Imagery	1	Sep-04	G:\Region\IS\Projects\Architecture Considerations\ITS Documentation\Ethernet ATMS Project\fibreproject\
Investment, State Highway and Local Guidelines	ITS projects and systems		Policy on the use of CCTV Imagery	1	Sep-04	G:\Region\IS\Projects\Architecture Considerations\ITS Documentation\Ethernet ATMS Project\fibreproject\
Investment, State Highway and Local Guidelines	ITS projects and systems		Transit New Zealand NTCIP Application Guide	2a		Contact document owner
Investment, State Highway and Local Guidelines	ITS projects and systems	Specification	VMS National Operating Policy		May-10	Contact document owner
Investment, State Highway and Local Guidelines	Project and contract management		Contract Procedures Manual	8	Jul-10	http://www.nzta.govt.nz/resources/contract-procedures-manual/
Investment, State Highway and Local Guidelines	Project and contract management		Cost Estimation Manual	2	Nov-10	http://www.nzta.govt.nz/resources/cost-estimation-manual/index.html
Investment, State Highway and Local Guidelines	Project and contract management		Long Term Procurement Strategy		Dec 2000	
Investment, State Highway and Local Guidelines	Project and contract management		Minimum Standard Z/22 Accidental Discovery Procedures		Jul-05	http://www.nzta.govt.nz/resources/state-highway-professional-services-contract-proforma-manual/standards/z-series.html
Investment, State Highway and Local Guidelines	Project and contract management		Prequalification for Physical Works Procedure Manual (Trial) Nov 2005	4	Nov 2005	
Investment, State Highway and Local Guidelines	Project and contract management		Project Management Manual	4	Mar-11	http://www.nzta.govt.nz/resources/project-management-manual/

Investment, State Highway and Local Guidelines	Project and contract management		PROMAN Manual	4 (draft)	Aug 2004	
Investment, State Highway and Local Guidelines	Project and contract management		State Highway Construction Contract Proforma Manual	11	Mar-11	http://www.nzta.govt.nz/resources/state-highway-construction-contract-proforma-manual/index.html
Investment, State Highway and Local Guidelines	Project and contract management		State Highway Maintenance Contract Proforma Manual	10	Mar 2010	http://www.nzta.govt.nz/resources/state-highway-maintenance-contract-proforma-manual/index.html
Investment, State Highway and Local Guidelines	Project and contract management		SH Portfolio Procurement Strategy 2010			http://www.nzta.govt.nz/resources/state-highway-portfolio-procurement-strategy/
Investment, State Highway and Local Guidelines	Project and contract management	Standard	State Highway Professional Services Contract Proforma Manual	NZTA Issue 1	Mar-11	http://www.nzta.govt.nz/resources/state-highway-professional-services-contract-proforma-manual/professional-services-contract-proforma.html
Investment, State Highway and Local Guidelines	Project and contract management	Standard	Network Management Professional Services Specification	3	01 Nov 2011	
Investment, State Highway and Local Guidelines	Property		PADS Acquisitions Training Manual, Sep 2007	2	Sep 2007	
Investment, State Highway and Local Guidelines	Property		PADS Disposals Training Manual, Nov 2005	4	Nov 2005	
Investment, State Highway and Local Guidelines	Property		Process for Acquisition of Property, Oct 2004	2	Oct 2004	
Investment, State Highway and Local Guidelines	Property		Process for Disposal of Property, Nov 2002	2.1	Nov 2002	
Investment, State Highway and Local Guidelines	Property		Property Division Accounting System Procedures Manual, Feb 2005		Feb 2005	
Investment, State Highway and Local Guidelines	Property		Property Division Management Systems Manual, Nov 2002		Nov 2002	
Investment, State Highway and Local Guidelines	Property		Property Management System "OPM", Jun 2005		Jun 2005	
Investment, State Highway and Local Guidelines	Property		Property Policy and Information Manual, Mar 2003	2	Mar 2003	
Investment, State Highway and Local Guidelines	Quality assurance		NZ Transport Agency Risk Management Framework 2010 - 2013		Sep-10	http://www.nzta.govt.nz/resources/risk-management-framework/
Investment, State Highway and Local Guidelines	Quality assurance	Specification	Normal and High Level Contracts			http://www.nzta.govt.nz/resources/qa-level-contracts/index.html

Investment, State Highway and Local Guidelines	Quality assurance		Quality Standard TQS1 : 2005 for High QA Level Contracts, Jun 2005	2	Mar-06	http://www.nzta.govt.nz/resources/quality-std-tqs1/index.html
Investment, State Highway and Local Guidelines	Quality assurance		Quality Standard TQS2 : 2005 for Normal QA Level Contracts, Jun 2005	2	Jun 2005	http://www.nzta.govt.nz/resources/quality-std-tqs2/
Other reference documents	State highway operations		Overdimension Vehicle Route Maps (OVRM)	1	Nov 2004	http://www.nzta.govt.nz/resources/overdimen-veh-route-maps/
Other reference documents	State highway operations		Overweight Permit Route Maps (OPRM)	2.1	Nov 2004	http://www.nzta.govt.nz/resources/overweight-permit-route-maps/
Investment, State Highway and Local Guidelines	State highway operations		Seismic Screening of Bridges, Jan 2000	2	Oct 2000	
Investment, State Highway and Local Guidelines	State highway operations		State Highway Control Manual	4 Rev 2.11	Oct-09	
Investment, State Highway and Local Guidelines	State highway operations		State Highway Performance Indicators and Targets, Aug 2002		Aug 2002	
Investment, State Highway and Local Guidelines	State highway operations		State Highway Safety Management System Manual (SMS), Mar 2007	4	Mar 2007	http://www.nzta.govt.nz/resources/state-highway-safety-management-system/
Investment, State Highway and Local Guidelines	State highway operations		State Highway Traffic Volumes	1	May 2010	http://www.nzta.govt.nz/resources/state-highway-traffic-volumes/
Investment, State Highway and Local Guidelines	State highway operations		State Highway Valuation Procedures Manual, Mar 2002	3	Mar 2002	
Investment, State Highway and Local Guidelines	State highway operations		Traffic Monitoring for State Highways, monthly	1 Rev 2	Jan 2010	http://www.nzta.govt.nz/resources/traffic-monitoring-state-hways/
Investment, State Highway and Local Guidelines	Network Guidelines		Guide to Asset Management		01 July 2009	Austroads website
Investment, State Highway and Local Guidelines	Network Guidelines		Guide to Bridge Technology		01 July 2009	Austroads website
Investment, State Highway and Local Guidelines	Network Guidelines		Guide to Pavement Technology		01 July 2009	Austroads website
Investment, State Highway and Local Guidelines	Network Guidelines		Guide to Project Delivery		01 July 2009	Austroads website
Investment, State Highway and Local Guidelines	Network Guidelines		Guide to Project Evaluation		01 July 2009	Austroads website
Investment, State Highway and Local Guidelines	Network Guidelines		Guide to Road Design		01 July 2009	Austroads website
Investment, State Highway and Local Guidelines	Network Guidelines		Guide to Road Safety		01 July 2009	Austroads website
Investment, State Highway and Local Guidelines	Network Guidelines		Guide to Road Transport Planning		01 July 2009	Austroads website

Investment, State Highway and Local Guidelines	Network Guidelines		Guide to Traffic Management		01 July 2009	Austroads website
Investment, State Highway and Local Guidelines	Network Guidelines		Guide to Road Tunnels		01 July 2009	Austroads website
Other reference documents	Network Guidelines		Austroads Glossary of Terms	4	Aug-10	Austroads website
Investment, State Highway and Local Guidelines	Environmental, land use and resource planning		Acoustics - Construction Noise			http://www.standards.co.nz/default.htm
Other reference documents	Environmental, land use and resource planning		Acoustics – Road traffic noise – New and altered roads	2010	May 2010	http://www.standards.co.nz/default.htm
Investment, State Highway and Local Guidelines	Environmental, land use and resource planning	Assessing noise NZS 6806 state higway projects	Guide to assessing road-traffic noise using NZS 6806 for state highway asset improvement projects	1	Oct-11	http://acoustics.nzta.govt.nz/guide-to-assessing-road-traffic-noise-using-nzs-6806-for-state-highway-asset-improvement-projects
Investment, State Highway and Local Guidelines	Environmental, land use and resource planning		ISO 4866:2010 Mechanical vibration and shock - Vibration of fixed structures - Guidelines for the measurement of vibrations and evaluation of their effects on structures		Jul-05	Standards NZ
Investment & Local guidelines						
Investment & Local Guidelines	Public transport		Public Transport Management Act 2008 Factsheets 1 to 14, Ministry of Transport		2008	MOT website
Investment & Local Guidelines	Public transport		Total Mobility scheme. A guide for local authorities, LTNZ		July 2008	http://www.nzta.govt.nz/resources/total-mobility-scheme/
Investment & Local Guidelines	Public transport		Guidelines for the development of regional public transport plans, NZTA		January 2009	http://www.nzta.govt.nz/resources/regional-public-transport-plans/
Other reference documents						
Other Reference Documents	Administration		Highways & Network Operations Management System Manual	1	Jul-12	http://www.nzta.govt.nz/resources/highways-management-system-manual/
Other Reference Documents	Asset management		State Highway Pavement Condition Report, annual		Mar-02	http://www.nzta.govt.nz/resources/state-highway-national-pavement-condition-report/
Other Reference Documents	Bridges and culverts (structures)		Bridge Overweight Rating and Posting Weight Limits Assessment, TNZ, June 02.	2	Jun-03	http://www.nzta.govt.nz/resources/bridge-overweight-rating-and-posting-weight-limits-assssment/
Other Reference Documents	Environmental, land use and resource planning		Planning Policy Manual	1	Aug-07	http://www.nzta.govt.nz/resources/planning-policy-manual/
Other Reference Documents	Environmental, land use and resource planning		Planning Practice Guidelines, TNZ, Jul 2002		Jul 2002	
Other Reference Documents	Environmental, land use and resource planning		Trips and parking related to land use, RRU 209, Transfund, 2001		Jun-05	
Other Reference Documents	Environmental, land use and resource planning		Construction Noise and Vibration Management Plan Templates		Jul-05	http://acoustics.nzta.govt.nz/tools/templates
Other Reference Documents	Environmental, land use and resource planning		Construction Noise Calculator		Jul-05	http://acoustics.nzta.govt.nz/node/add/calc-construction-sound

Other Reference Documents	Environmental, land use and resource planning	Construction Noise Monitoring - Report Template(s)	Jul-05	
Other Reference Documents	Environmental, land use and resource planning	Construction Noise - Reversing Alarms Leaflet	Jul-05	
Other Reference Documents	Environmental, land use and resource planning	Construction Noise Monitoring - Scope of Works Template(s)		
Other Reference Documents	Environmental, land use and resource planning	Environmental Design Frameworks: Highway and Network Operations guideline	Jul-05	http://nzta.govt.nz/resources/urban-design/environmental-design-framework/docs/environmental-design-framework.pdf
Other Reference Documents	Environmental, land use and resource planning	GNS Air Particulate Monitoring in Johnstone's Hill Tunnel, Auckland	Jul-05	
Other Reference Documents	Environmental, land use and resource planning	NZHPT Heritage Management Guidelines for Resource Management Practitioners	Jun-05	http://www.historic.org.nz/en/Publications/HeritageMgtGuidelines.aspx
Other Reference Documents	Environmental, land use and resource planning	NZHPT Archaeological Guidelines Series No. 2 Guidelines for Writing archaeological assessments	Jun-05	http://www.historic.org.nz/
Other Reference Documents	Environmental, land use and resource planning	Landscape Web-based training module	Jan-07	http://landscape.learnscape.co.nz/
Other Reference Documents	Environmental, land use and resource planning	NIWA Guidance for the Management of Air Quality in Road Tunnels in NZ	Jul-05	http://www.nzta.govt.nz/resources/air-quality-monitoring/
Other Reference Documents	Environmental, land use and resource planning	NIWA Stocktake of Air Quality in and around State Highway Tunnels	Jul-05	http://www.nzta.govt.nz/resources/air-quality-monitoring/
Other Reference Documents	Environmental, land use and resource planning	NIWA Air Quality Monitoring in the Mt Victoria and The Terrace Tunnels, Wellington	Jul-05	http://www.nzta.govt.nz/resources/air-quality-monitoring/
Other Reference Documents	Environmental, land use and resource planning	NZTA (Emission Impossible) Stocktake of Transport Related Air Pollution Research in NZ	Jul-05	http://www.nzta.govt.nz/resources/air-quality-monitoring/docs/air-quality-in-and-around-tunnels.pdf
Other Reference Documents	Environmental, land use and resource planning	NZTA (NIWA) Research Report 441 - Are the harmful emissions from New Zealand's light duty vehicle fleet?	Jul-05	http://www.nzta.govt.nz/resources/research/reports/441/
Other Reference Documents	Environmental, land use and resource planning	NZTA (Quigley and Watts) Research Report 375 - Applying health impact assessment to land transport planning	Jul-05	http://www.nzta.govt.nz/resources/research/reports/375/
Investment, State Highway and Local Guidelines	Environmental, land use and resource planning	NZTA Reverse Sensitivity Leaflet	Jul-05	http://www.nzta.govt.nz/resources/reverse-sensitivity/docs/reverse-sensitivity.pdf
Other Reference Documents	Environmental, land use and resource planning	NZTA State Highway Noise Improvement Programme - Funding Application Form (SM018 State Highway Annual Plan Instructions Manual - Strategic Plan Initiatives - Section 25.1 and Table API-M9(4))	Jul-05	
Other Reference Documents	Environmental, land use and resource planning	NZTA State Highway Standard - Assessing Road Traffic Noise Effects from Asset Improvement Projects (NZS 6806 Memo - May 10)	Jul-05	
Other Reference Documents	Environmental, land use and resource planning	NZTA Supplementary Guide to Assessing Road Traffic Noise for State Highway Intersection Improvement Projects	Jun-05	
Other Reference Documents	Environmental, land use and resource planning	Noise Barrier Case Studies	Jul-05	
Other Reference Documents	Environmental, land use and resource planning	Noise Barrier Supplier Register	Jul-05	http://acoustics.nzta.govt.nz/barrier-suppliers

Other Reference Documents	Environmental, land use and resource planning	NZTA (Opus CL) Research Report 083 - Road noise generated by concrete block pavements	Jun-05	http://www.nzta.govt.nz/resources/research/reports/83/index.html
Other Reference Documents	Environmental, land use and resource planning	NZTA (Opus CL) Research Report 121 - Validation of Leq model for road traffic noise assessment in NZ	Jun-05	http://www.nzta.govt.nz/resources/research/reports/121/index.html
Other Reference Documents	Environmental, land use and resource planning	NZTA (Opus CL) Research Report 190 - Traffic noise guidelines for low noise areas	Jun-05	http://www.nzta.govt.nz/resources/research/reports/190/index.html
Other Reference Documents	Environmental, land use and resource planning	NZTA (Opus CL) Research Report 292 - Road traffic noise: Determining the influence of New Zealand road surfaces on noise levels community annoyance	Jun-05	http://www.nzta.govt.nz/resources/research/reports/292/
Other Reference Documents	Environmental, land use and resource planning	NZTA (Opus CL) Research Report 326 - Road surface effects on traffic: stage 3 selected bituminous mixes	Jun-05	http://www.nzta.govt.nz/resources/research/reports/326/index.html
Other Reference Documents	Environmental, land use and resource planning	NZTA (Beca / Hegley Acoustics) Research Report 028 - Traffic noise from uninterrupted traffic flows	Jun-05	http://www.nzta.govt.nz/resources/research/reports/28/index.html
Other Reference Documents	Environmental, land use and resource planning	NZTA (TERNZ) Research Report 391 - Low-emission fuel-efficient light vehicles	Jul-05	http://www.nzta.govt.nz/resources/research/reports/391/
Other Reference Documents	Environmental, land use and resource planning	State Highway Construction and Maintenance Noise Leaflets	Jul-05	http://acoustics.nzta.govt.nz/
Other Reference Documents	Environmental, land use and resource planning	State Highway Construction Noise Poster	Jul-05	http://acoustics.nzta.govt.nz/
Other Reference Documents	Environmental, land use and resource planning	Stormwater Web-based training module	Jan-10	http://stormwater.learnscape.co.nz/main.html
Other Reference Documents	Environmental, land use and resource planning	Vibration and Shock: Measurement of vibration in buildings from land based transport and guidance to evaluation of its effect on human beings	Jun-05	
Other Reference Documents	Environmental, land use and resource planning	Your guide to the Consent Compliance Management System (CS-Vue User Guidance)	Jan-11	http://www.nzta.govt.nz/resources/consent-compliance-management-system/
Other Reference Documents	Geometric design (& traffic management)	Background Technical Report for Transit New Zealand's Passing & Overtaking Policy	Jun-06	Contact document owner
Other Reference Documents	Geometric design (& traffic management)	Provisional Passing and Overtaking Guidelines	Jul-08	http://www.nzta.govt.nz/resources/passing-overtaking-guidelines/index.html
Other Reference Documents	Geometric design (& traffic management)	Grade Separated Interchanges, A Design Guide, NAASRA, 1984	1984	NAASRA
Other Reference Documents	Geometric design (& traffic management)	Road Medians, NAASRA 1984	1984	NAASRA
Other Reference Documents	Geometric design (& traffic management)	Site Design for Heavy Vehicle Facilities: Transit Research Report No 32 1994	1994	Standards NZ
Other Reference Documents	Geometric design (& traffic management)	Guide to Traffic Engineering Practice - Part 2, Roadway Capacity: Austroads 1988	1988	Austroads website
Other Reference Documents	Geometric design (& traffic management)	Guide to Traffic Engineering Practice - Part 3, Traffic Studies: Austroads, Aug 2004	2004	Austroads website
Other Reference Documents	Geometric design (& traffic management)	Revision of Guide to Traffic Engineering Practice –Part 8: Traffic Control Devices, July 2006	2006	Austroads website
Other Reference Documents	Geometric design (& traffic management)	Guide to Traffic Engineering Practice - Part 9, Arterial Road Traffic Management: Austroads 1988	1988	Austroads website
Other Reference Documents	Geometric design (& traffic management)	Urban Road Design - Guide to the Geometric Design of Major Urban Roads, Austroads, 2002	2002	Austroads website

Other Reference Documents	Geometric design (& traffic management)		New Zealand Supplement to Austroads Part 14 – Bicycles, TNZ, Apr 2004	Apr 2004	Austroads website
Other Reference Documents	Geometric design (& traffic management)		AS/NZS 2890.1 Parking facilities – Off street car parking		Standards NZ
Other Reference Documents	Geometric design (& traffic management)		Update and Enhancement of Traffic Count Guide, Research Report 202, Transfund, 2002	2002	http://www.nzta.govt.nz/resources/research/reports/202/index.html
Other Reference Documents	Geometric design (& traffic management)		Policy on Geometric Design of Highways and Streets: American Association of State Highway and Transportation Officials 2001	2004	AASHTO
Other Reference Documents	Geometric design (& traffic management)		Roadside Design Guide: American Association of State Highway and Transportation Officials 2002	2002	AASHTO
Other Reference Documents	Maintenance management systems		(updated) RAMM Database Operation Manual, CJN Technologies, 2007	2007	CJN Technologies
Other Reference Documents	Maintenance management systems	Guideline	Maintenances guidelines for local roads 2012	Nov-12	http://www.nzta.govt.nz/resources/maint-guidelines-for-local-roads/index.html
Other Reference Documents	Pavement and surfacing		Bituminous Sealing Manual; Transit New Zealand, 1993 (being phased out)	1993	http://www.nzta.govt.nz/resources/bituminous-emulsion-sealing-manual/order-instructions.html?id=1357
Other Reference Documents	Pavement and surfacing		Bituminous Emulsion Sealing Manual, TNZ, 1994	1994	http://www.nzta.govt.nz/resources/bituminous-emulsion-sealing-manual/
Other Reference Documents	Pavement and surfacing	Chipsealing Practice Note	Chipseal compaction using controlled traffic | 1	Apr-11	http://www.nzta.govt.nz/resources/chipsealing-new-zealand-manual/index.html
Other Reference Documents	Pavement and surfacing	Technical Memorandum	Skid Resistance for New Surfacings	Sep-01	http://www.nzta.govt.nz/resources/macrotexture-requirements/index.html
Other Reference Documents	Quality assurance		Austroads Guide to Field Surveillance of Quality Assurance Contracts, Sep 1995	Sep-95	Austroads website
Other Reference Documents	Road safety hardware technical memorandum		Road Safety Hardware Technical Memorandum TM-2000 Frequently Asked Questions - Barriers & Terminals		
Other Reference Documents	Road safety hardware technical memorandum		Road Safety Hardware Technical Memorandum TM-2001 Safety Barrier Test Level and Length of Need		
Other Reference Documents	Road safety hardware technical memorandum		Road Safety Hardware Technical Memorandum TM-2002 Lapping of W-Beam guardrail		
Other Reference Documents	Road safety hardware technical memorandum		Road Safety Hardware Technical Memorandum TM-2003 Nesting of W-Beam and Thrie-Beam guardrail		
Other Reference Documents	Road safety hardware technical memorandum		Road Safety Hardware Technical Memorandum TM-2004 Buried in Backslope Anchor		
Other Reference Documents	Road safety hardware technical memorandum		Road Safety Hardware Technical Memorandum TM-2005 Weak barrier post backfill		
Other Reference Documents	Road safety hardware technical memorandum		Road Safety Hardware Technical Memorandum TM-2006 Slip base sign support installation		

Other Reference Documents	Road safety hardware technical memorandum		Road Safety Hardware Technical Memorandum TM-2007 M19 3-Bolt Shear base lighting column installation and maintenance			
Other Reference Documents	State highway operations		Annual Weigh In Motion (WiM) Report		Annually	http://www.nzta.govt.nz/resources/weigh-in-motion/
Other Reference Documents	State highway operations		Traffic Volumes Monthly Report		Monthly	http://www.nzta.govt.nz/resources/state-highway-traffic-growth/
Other Reference Documents	State highway operations		State Highway Traffic Data Booklet		Annually	http://www.nzta.govt.nz/resources/state-highway-traffic-volumes/
Other Reference Documents	Transport Planning	Passing & Overtaking - Research	SVB Evaluation Tool. Beca Infrastructure NZ Ltd (Ian Bone)	2.1	Jun 2009	
Other Reference Documents	Transport Planning	Passing & Overtaking - Research	ITS-Assisted Merging at Passing Lanes. Beca Infrastructure NZ Ltd (Ian Bone)	1.3	10 Jun 2010	
Other Reference Documents	Transport Planning	Passing & Overtaking - Research	Review of Economic Evaluation Manual's Passing Lane Length Factors. Beca Infrastructure NZ Ltd (Ian Bone)	1.1	24 Dec 2010	
Other Reference Documents	Transport Planning	Passing & Overtaking - Research	Operational Evaluation of Representative Passing Lanes against Proposed Guidelines. Opus Central Laboratories (Peter Cenek & Tiffany Lester)		Oct 2008	
Other Reference Documents	Transport Planning	Passing & Overtaking - Research	Pilot Study on Assessing Passing/Overtaking Demand using TMS. MWH NZ Ltd (David Wanty)	Rev No. FINAL	July 2007	
Other Reference Documents	Transport Planning	Passing & Overtaking - Research	NZTA Passing Lane Research. MWH NZ Ltd (David Wanty)	0.2	April 2011	
Other Reference Documents	Pavement and surfacing		New Zealand supplement to Pavement Design: A Guide to the Structural Design of Road Pavements, Austroads: Jun 2004	2	Feb-07	Austroads website
Other Reference Documents	Pavement and surfacing	Technical Memorandum	NZ Supplement to the AAPA National Asphalt Specification (NAS)		Mar-07	http://www.nzta.govt.nz/resources/national-asphalt-specification/index.html
Other Reference Documents	Pavement and surfacing	Technical Memorandum	Interim SH Texture Requirements		May-02	http://www.nzta.govt.nz/resources/macrotexture-requirements/index.html
Other Reference Documents	Pavement and surfacing		Sealed Local Roads Manual: Guidelines to Good Practice, ARRB, 2005		2005	ARRB
Other Reference Documents	Pavement and surfacing		TR8: Manual for maintenance of unsealed roads, NRB, 1986		1986	
Other Reference Documents	Pavement and surfacing		ARRB Unsealed roads manual Guidelines for good practice		2009	ARRB
Other Reference Documents	Safety		KiwiRAP			http://www.kiwirap.org.nz/
Other Reference Documents	Safety		Safety Audit Procedures for existing roads, Transfund, 1998		1998	http://www.nzta.govt.nz/resources/safety-audit-procedures-existing-roads/index.html
Other Reference Documents	Safety		Road Safety Survey Reports, LTSA, 1995 to 2005		2005	http://www.nzta.govt.nz/resources/road-safety-survey/
Other Reference Documents	Safety		TR 11: Recommended Practice for Pedestrian Crossings, NRB, 1988		1998	
Other Reference Documents	Safety		Guidelines for Planting for Road Safety, TNZ, 1991		1991	

Other Reference Documents	Safety		Guide to Traffic Engineering Practice - Part 4.: Treatment of Crash Locations Austroads 2004		2004	Austroads website
Other Reference Documents	Safety		AS/NZS 3845:1999 Road Safety Barrier Systems		1999	Standards NZ
Other Reference Documents	Safety		Local Roads Supplement to TNZ CoPTTM, RCA Forum, 2005		2005	RCA Forum
Other Reference Documents	Safety		Network utilities within the road corridor - a guide to best practice, NZUAG RoadShare, 2004		2004	RoadShare
Other Reference Documents	Safety		NZS HB 2002:2003 : Code of Practice for Working in the Road		2003	Standards NZ
Other Reference Documents	Safety		OSH documents			Dept of Labour
Other Reference Documents	Safety		Draft Guide to Pedestrian Crossing Facilities, Trafinz, 1991		1991	http://www.nzta.govt.nz/resources/pedestrian-planning-guide/resources.html
Other Reference Documents	Safety		Guide to Traffic Engineering Practice, Part 13: Pedestrians, Austroads, 1995		1995	Austroads website
Other Reference Documents	Safety		Network Assessment Guidelines Note			
Other Reference Documents	Safety		Neighbourhood accessibility plans - Information for local authorities planning for or starting projects, LTNZ, Sep 2007		Sep 2007	http://www.nzta.govt.nz/resources/neighbourhood-accessibility-plans/local-authorities/index.html
Other Reference Documents	Safety		Neighbourhood accessibility plans - Operational policy, LTNZ, Jul 2007		Jul 2007	
Other Reference Documents	Safety		Road Safety to 2010 strategy, LTSA/MOT, 2003		Jun-05	http://www.transport.govt.nz/ourwork/Land/landsafety/RoadSafetyto2010Strategy/
Other Reference Documents	Safety		Guidelines for developing and implementing a Safety Management System for road controlling authorities, LTNZ, Nov 2005		Nov 2005	
Other Reference Documents	Signs and markings		Traffic control devices manual, Parking & Advisory signs	1	Draft	
Other Reference Documents	Signs and markings		RSMA Compliance Standard for Traffic Signs, 2003		2003	http://www.rsma.org.nz/FileStore/RSMASTD2003.pdf
Other Reference Documents	Street lighting and traffic signals		AS/NZS 2144:2002 Traffic signal lanterns		2002	Standards NZ
Other Reference Documents	Street lighting and traffic signals		NZS 6701:1983 Code of Practice for Road Lighting		1983	Standards NZ
Other Reference Documents	Street lighting and traffic signals		AS/NZS 1158 : 1997 Road Lighting - Parts 1-3, Updated 1998		1998	Standards NZ
Other Reference Documents	Street lighting and traffic signals		AS/NZS 1158.1.3:1997 Road Lighting – Vehicle Traffic (Category V) Lighting – Guide to design, installation, operation and maintenance		1997	Standards NZ
Other Reference Documents	Bridges and culverts (structures)		Bridge Scour: Water Resource Publications 2001		Aug 2001	See comments
Other Reference Documents	Bridges and culverts (structures)		RSMA Compliance Standard for Traffic Signs: RSMA 2003		2003	http://www.rsma.org.nz/FileStore/RSMASTD2003.pdf
Other Reference Documents	Bridges and culverts (structures)		Waterway Design Parameters: Transfund Research Report, 1997		1997	http://www.nzta.govt.nz/resources/research/reports/88/
Other Reference Documents	Asset management		International Infrastructure Management Manual, NAMS, 2006		2006	http://www.nams.org.nz/
Other Reference Documents	Asset management		NZ Asset Management Asset Valuation and Depreciation Guidelines			

Other Reference Documents	Environmental, land use and resource planning		Guide to Traffic Engineering Practice series, General, Austroads		Austroads website
Other Reference Documents	Environmental, land use and resource planning		Managing road safety and efficiency under the Resource Management Act 1991: Best practice guideline, LTNZ, Mar 2007	Mar 2007	http://www.nzta.govt.nz/resources/managing-road-safety-efficiency-act/
Other Reference Documents	ITS projects and systems		Transit New Zealand National ITS Architecture (under development)		Not available yet
Other Reference Documents	Austroads guides		Waterway Design: A guide to the Hydraulic Design of Bridges, Culverts and Flood ways Austroads, 1994	Jun 1994	Austroads website
Other Reference Documents	Austroads guides		Guide to the Geometric Design of Rural Roads; AUSTROADS, 1989	1989	Austroads website
Other Reference Documents	Austroads guides		Guide to Traffic Engineering Practice, Part 5: Intersections at Grade, Austroads, 2005 (incl Errata Sheet)	2005	Austroads website
Other Reference Documents	Austroads guides		Guide to Traffic Engineering Practice, Part 6: Roundabouts, Austroads, 1993	1993	Austroads website
Other Reference Documents	Austroads guides		Guide Policy for Geometric Design of Freeways and Expressways: Austroads 1976	1976	Austroads website
Other Reference Documents	Austroads guides		Guide to Traffic Engineering Practice - Part 11, Parking: Austroads 1988	Mar 2008	Austroads website
Other Reference Documents	Austroads guides		Guide to Traffic Engineering Practice - Part 14, Bicycles: Austroads 1999	Jan 1999	Austroads website
Other Reference Documents	Austroads guides		Guide to Traffic Engineering Practice - Part 1, Traffic Flow: Austroads 1988	Jan 1988	Austroads website
Other Reference Documents	Austroads guides		Guide to Traffic Engineering Practice - Part 10, Local Area Traffic Management: Austroads, Nov 2004	Nov 2004	Austroads website
Other Reference Documents	Austroads guides		Austroads Guide to Stabilisation in Roadworks, 1998	Feb 2008	Austroads website
Other Reference Documents	Austroads guides		Austroads Guide to Stabilisation in Roadworks -NZ Cover Note Feb 2000	Feb 2000	Austroads website
Other Reference Documents	Austroads guides		Pavement Design: A Guide to the Structural Design of Road Pavements, Austroads: Jun 2004	2005	Austroads website
Other Reference Documents	Austroads guides		(Pavement Design: Austroads) New Zealand supplement to 2004 version	2 Feb2007	Austroads website
Other Reference Documents	Austroads guides		(Pavement Design: Austroads) New Zealand supplement to 1999 version)	May 2000	Austroads website
Other Reference Documents	Austroads guides		Guide to Traffic Engineering Practice - Part 4: Road Crashes, Austroads 2003	2003	Austroads website
Other Reference Documents	Austroads guides		Road Safety Audit (2nd Edition), Austroads, 2002	2002	Austroads website
Other Reference Documents	Austroads guides		Guide to Traffic Engineering Practice, Part 7: Traffic Signals, Austroads, 2003	2003	Austroads website
Archive					
Archive	Signs and markings		Impact Requirements for Traffic Sign Provisional Advice June 2005	Jun-05	http://sh20mountroskill.co.nz/technical/memoranda.jsp
Archive	Administration		Standards and Guidelines Manual, TNZ, Aug 2005		
Archive	Administration		Corporate Services Manual, TNZ, Jul-02	1	
Archive	Administration		Manual of Accounting Policy and Procedures, TNZ		
Archive	Administration		Quality Management System Manual, TNZ, Mar 05	3 Mar 05	
Archive	Equipment		Roadmarking Paint Applicators WITHDRAWN	WITHDRAWN	WITHDRAWN
Archive	Equipment		Certification of Thermoplastic Roadmarking Applicators and Pre-Heating Tanks WITHDRAWN	WITHDRAWN	WITHDRAWN

Archive	General		Temporary Traffic Control WITHDRAWN		WITHDRAWN	WITHDRAWN
Archive	General		1996 to the Specification for Temporary Traffic Control WITHDRAWN		WITHDRAWN	WITHDRAWN
Archive	General		Temporary Traffic Control WITHDRAWN		WITHDRAWN	WITHDRAWN
Archive	Material		Regional Basecourse Aggregates WITHDRAWN		WITHDRAWN	WITHDRAWN
Archive	Material		Regional Basecourse Aggregates (Nelson Addition) WITHDRAWN		WITHDRAWN	WITHDRAWN
Archive	Material		Regional Basecourse Aggregates (Napier) 1993 WITHDRAWN		WITHDRAWN	WITHDRAWN
Archive	Material		(Auckland) Asphaltic Concrete WITHDRAWN		WITHDRAWN	WITHDRAWN
Archive	Material		Amendment for use with Drum Mixing Plants WITHDRAWN		WITHDRAWN	WITHDRAWN
Archive	Material		W-Section Highway Guardrail WITHDRAWN		WITHDRAWN	WITHDRAWN
Archive	Material		Fibreglass Reinforced Plastic Highway		WITHDRAWN	WITHDRAWN
Archive	Material		Lighting Columns WITHDRAWN		WITHDRAWN	WITHDRAWN
Archive	Material		Road Safety Barrier Systems WITHDRAWN		WITHDRAWN	WITHDRAWN
Archive	Material	Specification	Amendment for Sealing Chips for use with Tauhara Dacite		1995	WITHDRAWN
Archive	Material	Specification	Tauhara Dacite Sealing Chip Notes		1995	WITHDRAWN
Archive	Maintenance	Specification	C Series to SOMAC		2006	WITHDRAWN
Archive	Pavement and surfacing	Performance based chipsealing	NZTA P17 Performance Based Specification for Bituminous Reseals	8	Oct-11	WITHDRAWN
Archive	NZTA programme development policy	Code of practice	Evaluation Procedures for Alternatives to Roading; Land Transport NZ, Mar 2003	3	Mar-03	http://www.nzta.govt.nz/resources/economic-evaluation-manual/volume-2/manual2.html
Archive	NZTA programme development policy	Code of practice	Project Evaluation Manual, Land Transport NZ, 2004		8 Oct 2004	http://www.nzta.govt.nz/resources/economic-evaluation-manual/volume-1/index.html
Archive	Pavement and surfacing	Performance based chipsealing	P17 Changes to Performance Based Specification for Bituminous Reseals	1	Oct-12	http://www.nzta.govt.nz/resources/bituminous-reseals/docs/bituminous-reseals-changes.pdf
Archive	Paving and Surfacing and Construction		Cement Concrete Highway Pavements WITHDRAWN		WITHDRAWN	WITHDRAWN
Archive	Paving and Surfacing and Construction		Fabrication and Assembly of Standard Guardrails and Handrails for Highway Bridges and Bridge Approaches		WITHDRAWN	WITHDRAWN
Archive	Maintenance		Temporary Traffic Control WITHDRAWN		WITHDRAWN	WITHDRAWN
Archive	Maintenance		Repair Potholes		1993	http://www.nzta.govt.nz/resources/repair-potholes/index.html
Archive	Maintenance		Digout Repairs in Flexible Pavements 1995		1995	http://www.nzta.govt.nz/resources/digout-repairs/index.html
Archive	Maintenance		Digout Repairs in Flexible Pavements		1993	http://www.nzta.govt.nz/resources/digout-repairs/index.html
Archive	Maintenance		Repair of Surface Openings and Minor Surface Levelling		1993	http://www.nzta.govt.nz/resources/surface-opening-repair/
Archive	Maintenance		Repair of Surface Openings and Minor Surface Levelling		1992	http://www.nzta.govt.nz/resources/surface-opening-repair/
Archive	Maintenance		Repair of Surface Defects		1995	http://www.nzta.govt.nz/resources/surface-defect-

						repair/index.html
Archive	Maintenance		Repair of Surface Defects		1992	http://www.nzta.govt.nz/resources/surface-defect-repair/index.html
Archive	Maintenance		Repair of Edge Break		1995	http://www.nzta.govt.nz/resources/edge-break-repair/index.html
Archive	Maintenance		Repair of Edge Break		1992	http://www.nzta.govt.nz/resources/edge-break-repair/index.html
Archive	Maintenance		Adjusting Surface Boxes		1992	
Archive	Maintenance		Adjusting Service Corners		1992	
Archive	Maintenance		Emergency Work		1995	http://www.nzta.govt.nz/resources/spec-emergency-work/index.html
Archive	Maintenance		Emergency Work		1992	http://www.nzta.govt.nz/resources/spec-emergency-work/index.html
Archive	Maintenance		Maintenance of Unsealed Shoulders		1995	http://www.nzta.govt.nz/resources/maint-unsealed-shoulders/index.html
Archive	Maintenance		Maintenance of Unsealed Shoulders		1992	http://www.nzta.govt.nz/resources/maint-unsealed-shoulders/index.html
Archive	Maintenance		Unsealed Pavements: Repair of Potholes		1992	http://www.nzta.govt.nz/resources/unsealed-pvmts-repair-potholes/index.html
Archive	Maintenance		Unsealed Pavements: Repair of Potholes		1992	http://www.nzta.govt.nz/resources/unsealed-pvmts-repair-potholes/index.html
Archive	Maintenance		Unsealed Pavements: Surface and Shape Restoration		1995	http://www.nzta.govt.nz/resources/unsealed-pvmts-surface-shape/index.html
Archive	Maintenance		Unsealed Pavements: Surface and Shape Restoration		1991	http://www.nzta.govt.nz/resources/unsealed-pvmts-surface-shape/index.html
Archive	Maintenance		Unsealed Pavements: Digout Repairs		1992	http://www.nzta.govt.nz/resources/unsealed-pvmts-digout-repairs/index.html
Archive	Maintenance		Unsealed Pavements: Digout Repairs		1992	http://www.nzta.govt.nz/resources/unsealed-pvmts-digout-repairs/index.html
Archive	Maintenance		Unsealed Pavements: Supply and Place Maintenance Aggregate		1991	http://www.nzta.govt.nz/resources/unsealed-pvmts-supply-place-maint-aggregate/index.htm
Archive	Maintenance		Unsealed Pavements: Supply and Place Maintenance Aggregate		1991	http://www.nzta.govt.nz/resources/unsealed-pvmts-supply-place-maint-aggregate/index.htm

Archive	Maintenance		Removal of Surface Detritus		1993	http://www.nzta.govt.nz/resources/removal-surface-detritus/index.html
Archive	Maintenance		Removal of Surface Detritus		1992	http://www.nzta.govt.nz/resources/removal-surface-detritus/index.html
Archive	Maintenance		Maintenance of Stormwater Structures		1992	http://www.nzta.govt.nz/resources/maint-stormwater-structures/index.html
Archive	Maintenance		Maintenance of Stormwater Structures		1992	http://www.nzta.govt.nz/resources/maint-stormwater-structures/index.html
Archive	Maintenance		Litter and Rubbish Removal		1993	http://www.nzta.govt.nz/resources/litter-rubbish-removal/index.html
Archive	Maintenance		Litter and Rubbish Removal		1992	http://www.nzta.govt.nz/resources/litter-rubbish-removal/index.html
Archive	Maintenance		Maintenance of Edge Marker Posts		1995	http://www.nzta.govt.nz/resources/maint-edge-marker-posts/index.html
Archive	Maintenance		Maintenance of Edge Marker Posts		1992	http://www.nzta.govt.nz/resources/maint-edge-marker-posts/index.html
Archive	Maintenance		Maintenance of Guardrails and Median Barriers		1991	http://www.nzta.govt.nz/resources/maint-guardrails-med-barriers/index.html
Archive	Maintenance		Vegetation Control including Mowing and Chemical Control		WITHDRAWN	WITHDRAWN
Archive	NZTA procurement policy		Competitive Pricing Procedures General Circulars		Jul-09	http://www.nzta.govt.nz/resources/competitive-pricing-procedures-manual/vol-1/ccp1.html
Archive	NZTA procurement policy		Competitive Pricing Procedures Manual: Volume 1 Physical Works & Professional Services, Transfund, 2002	39	Jun 2002	http://www.nzta.govt.nz/resources/competitive-pricing-procedures-manual/vol-1/index.html
Archive	NZTA programme development policy		[Transfund Standards and Guidelines Manual, Aug 1998.]		1998	http://www.nzta.govt.nz/resources/nzta-register-network-standards-guidelines/
Archive	Pavement and surfacing		Sampling and Testing of Stabilised Materials during Construction February 2001		Draft Feb 2001	

Appendix Two

Te Rapa Alliance Draft

PR-1 Environmental Review Process

Project Name and Location

7.4 General Location and Context

Waikato Expressway – Te Rapa Section Alliance project is for the design and construction of the Waikato Expressway - Te Rapa Section between SH 1 Horotiu and Crawford Rd on Avalon Drive. The project will be delivered by the Te Rapa Alliance, which consists of NZTA, Fulton Hogan and Opus.

The section is approximately 7.5km and includes the following features:

a) An intersection with SH1 at Horotiu;
b) A two lane median divided highway from the intersection at Horotiu to Avalon Drive with earthworks and drainage for a four lane highway, north of the Local Road;
c) A bridge over the NIMT railway and Onion Road Extension;
d) Onion Road Extension northwards to Bern Road;
e) Realignment of a section of Onion Road;
f) Central Road connecting Te Kowhai Road to Onion Road;
g) A bridge carrying Central Road over Te Rapa Bypass;
h) Passing lanes in both directions;
i) Te Kowhai Road Bridge;
j) Local Road Bridge;
k) Grade separated interchange at Gilchrist Street;
l) Gilchrist arterial;
m) Entrance to Wintec and existing Gilchrist Street;
n) Four lane median divided Avalon Drive;
o) Forman Road intersection.

7.5 Site Location, Topography and Land Use

The Bypass designation lies within the Waikato District and Hamilton City (figure 1, 2 & 3). The final route of the Bypass will run southwards from SH1, near Horotiu. It will connect with the existing highway via an interchange with 'on' and 'off' ramps connecting to SH1. The Bypass then continues southwards through Bern Road, before crossing the Main Trunk Railway. The Bypass then runs parallel with the railway line, crossing Ruffel Road, Onion Road and Te Kowhai Road, before joining Avalon Drive near the intersection with Gilchrist Street. Ruffel Road will be realigned to run adjacent to the Bypass and connect with Te Kowhai Road east of the present intersection. Te Kowhai Road will be straightened with access ramps onto the Bypass. A second interchange is proposed for the connection to Avalon Drive. The surrounding land uses adjacent to the highway are productive, flat to rolling and highly modified dairy pasture.

Figure 1: General Site Location New Zealand

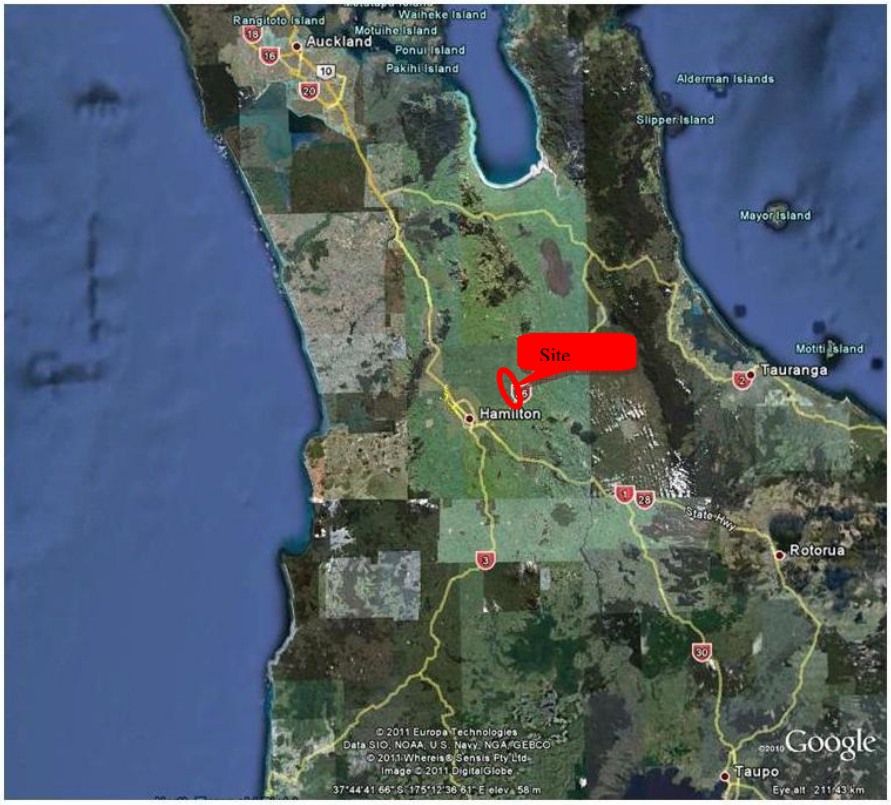

Figure 2: General Site Location Waikato

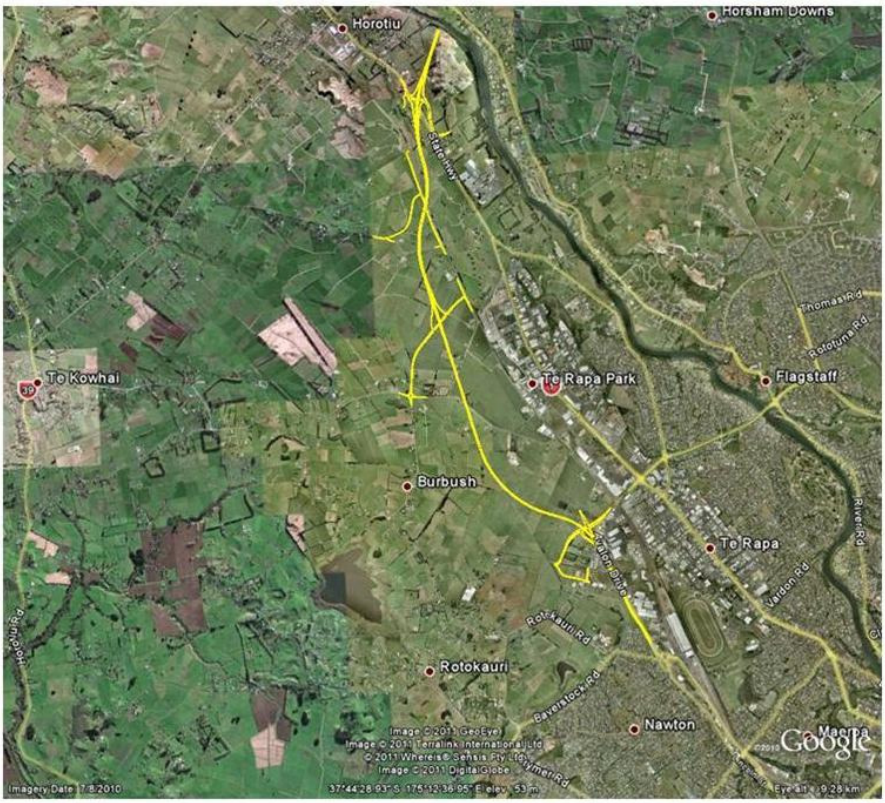

Figure 3: General Site Location Hamilton

Key Stakeholders

- Waikato Regional Council Regulatory Agency http://www.waikatoregion.govt.nz
- Hamilton City Council Regulatory Agency and Client http://www.hamilton.co.nz
- Waikato District Council Regulatory Agency and Client http://www.waikatodistrict.govt.nz
- New Zealand Transport Authority Alliance Member – Regulatory Agency and Client http://www.nzta.govt.nz
- Fulton Hogan Alliance Member – Contractor http://www.fultonhogan.com
- Opus Alliance Member – Designer http://www.opus.co.nz
- Waikato-Tainui Stakeholder – Iwi http://www.tainui.co.nz
- Kiwi Rail Stakeholder – National Rail http://www.kiwirail.co.nz
- Local Land Owners Stakeholder

Required Documentation

7.6 TRA Plans and Reports

- SH1 Te Rapa Bypass Notice of Requirement (incorporating s92 responses)
- Te Rapa Bypass Resource Consent Application (2007)
- Hearing decision
- Application for Northgate
- Hearing Decision - Northgate Development Ltd

7.7 Local and Regional Authority Consents

- Resource Consent Certificate 117706
- Resource Consent Certificate 117707
- Resource Consent Certificate 117708
- Resource Consent Certificate 117709
- Resource Consent Certificate 117710
- Resource Consent Certificate 117711
- Resource Consent Certificate 117712
- NoR Conditions Annexure A - Final

NOTE:

The Northgate Development Ltd Resource Consent Certificates (120395, 120396, 120397, 120398, 120399, 120750 and 111148) and the Schedule of Recommended Conditions of Waikato District Council Land Use Consent are attached to the back of the Hearing Decision - Northgate Development Ltd report.

Appendix Three

Te Rapa Alliance Draft

AE-3 Context Sensitive Solutions 2011

Introduction

Required Documentation

Create a short white paper (narrative) document describing the following:

1. **The purpose and need for the project**

The New Zealand Government has announced seven Roads of National Significance (RoNS) projects, which have been identified as essential routes that require priority treatment to achieve economic growth and productivity. The Waikato Expressway – SH1 is one of the seven RoNS projects announced (SARHA, 2010).

The RoNS have been identified as the most essential routes from a nation-wide perspective that require significant development to reduce congestion, improve safety and support economic growth. The purpose of the Government nominating these roads as "nationally significant" is to ensure they are given priority by NZ Transport Agency (NZTA) in developing the National Land Transport Program (NLTP) (SARHA, 2010).

The Te Rapa section of the Waikato Expressway begins in Avalon Drive in the north-western corner of Hamilton City and extends into Waikato District. It will connect with the existing SH1 and the future Ngaruawahia section to the north of Bern Rd, Horotiu.

When complete the Waikato Expressway will be the key transport corridor, connecting Auckland to the agricultural and business centres of Waikato and Bay of Plenty. The Expressway will improve economic growth and productivity through more efficient movement of people and freight. Other benefits will include reducing travel times between Auckland and Tirau by 35 minutes, reducing significantly the number of fatal and serious injury crashes, reduce fuel costs, reduce traffic congestion within smaller communities like Huntly, Ngaruawahia and Cambridge and increasing the highway's capacity and passing opportunities. The Te Rapa section will improve economic growth and productivity by connecting the business centres in the north western corner of Hamilton City to those in Auckland and the Bay of Plenty.

Connecting Avalon Drive to the existing SH1 and the Ngaruawahia section of the Waikato Expressway will allow more efficient movement of people and freight, improve safety and reduce traffic congestion by directing traffic away from the existing local road network

Links:

- National State Highway Strategy 2007.pdf
- SARHA - Full Economic Assessment Report.pdf
-

2. **The planning horizon and proposed timeline or schedule for project completion.**

The Te Rapa section is currently in the Final Design and Construction stage. Construction has now commenced and completion is scheduled for 2013.

Links:

- Te Rapa Alliance Project Programme (Greenroads).pdf
- Project Design Plan.pdf

3. **A list or organizational chart of the management structure for the project: this includes, project planners, design professionals, consultants, agency leads, and other stakeholders involved.**

The project will be design, construction and delivered by the Te Rapa Alliance, which consists of the Fulton Hogan, New Zealand Transport Authority (NZTA) and Opus International Consultants (Opus).

Links:

- Organisation Chart Construction Phase April2011.pdf

Key Stakeholders

- New Zealand Transport Authority Regulatory http://www.nzta.govt.nz — Alliance Member – Agency and Client
- Fulton Hogan Contractor http://www.fultonhogan.com — Alliance Member –
- Opus Designer http://www.opus.co.nz — Alliance Member –
- Waikato Regional Council http://www.waikatoregion.govt.nz — Regulatory Agency
- Hamilton City Council and Client http://www.hamilton.co.nz — Regulatory Agency
- Waikato District Council and Client http://www.waikatodistrict.govt.nz — Regulatory Agency
- Waikato-Tainui http://www.tainui.co.nz — Stakeholder – Iwi
- Kiwi Rail National http://www.kiwirail.co.nz — Stakeholder – Railway
- Local Land Owners — Stakeholder

4. **The elements of the decision making process used.**

5. **The local and regional context and issues surrounding the project, including applicable jurisdictional regulations and policies.**

The SH1 Te Rapa Bypass Notice of Requirement addresses these issues.

Links:

- SH1 Te Rapa Bypass Notice of Requirement (incorporating s92 responses)

6. **The public involvement process for CSD and results of this process.**

The SH1 Te Rapa Bypass Notice of Requirement Section 6 – Integration of the Project with Alternative Land Transport Options, Sections 7 – Consideration of Alternatives and Section 9 – Consultation addresses these issues.

Links:

- SH1 Te Rapa Bypass Notice of Requirement (incorporating s92 responses)

7. **The transportation modes considered and results of this consideration.**

8. **The visual and aesthetic components of the project.**

The SH1 Te Rapa Bypass Notice of Requirement Section 8 – Assessment of Environmental Effects subsection 8.4 – Landscape/Visual addresses these issues.

Links:

- SH1 Te Rapa Bypass Notice of Requirement (incorporating s92 responses)

9. **The plan for long-term on-going monitoring during operations (if any).**

10. **The final alternatives and design elements chosen for implementation (a summary is sufficient).**

Appendix Four

Te Rapa Alliance Draft

Greenroads info for Pavement Reuse Avalon Drive 2011(excel spreadsheet)

AVALON DRIVE - GREENROADS INFORMATION

Location	Ormsby Lane	Gilchrist St	Tasman Road	Avalon East tie in	On Ramp tie in	Avalon Drive	Avalon Curves
Chainage	All	Last 100m	Last 100m	60-230	760-860	7300-8550	7840-8250
length of pavement which is being recycled (m)	150	100	100	170	100	1250	410
Total Area of existing pavement (m^2)	600	600	1000	1615	1500	15000	4100
Total Volume of existing pavement (m^3 solid)	180	180	300	565.25	525	6750	1435
PAVEMENT RE-USE							
Total volume of re-used pavement (m^3 solid)	180	90	300	242.25	225	~	1435
Computed % of the total re-used volume	100%	50%	100%	43%	43%	~	100%
How structure was re-used	Insitu fill	Insitu fill	Subbase	Subbase	Subbase	~	Note 1
Where was it re-used	In Place	In place	Tasman Cul de Sac	In Place	In Place	~	In Place
RECYCLED MATERIALS							
Type of recycling	~	Cement Stabilsing	~	FBS Stabilsing	Cement Stabilsing	FBS/Cement Stabilsing	
Total weight of each material used (m^3 solid)						?	
Total weight of recycled materials (m^3 solid)		90		323	300	6750	
Copy of the approved mix design for the pavement materials	See Rev 8 Pavement design						
Supporting test documents such as plant proportioning records	See QA for Stabilsing						
Manufacturers documentation for products that state the actual recycled material content	See QA for Stabilsing						

AVALON DRIVE - GREENROADS INFORMATION	
Location	Gilchrist St
Chainage	Last 100m
length of pavement which is being recycled (m)	100
Total Area of existing pavement (m^2)	600
Total Volume of existing pavement (m^3 solid)	180
PAVEMENT RE-USE	
Material	basecourse
Total volume of re-used pavement (m^3 solid)	90
Computed % of the total re-used volume	50%
How structure was re-used	Insitu fill
Where was it re-used	In place
RECYCLED MATERIALS	
Material	wearing course
Type of recycling	Cement Stabilsing
Total weight of each material used (m^3 solid)	
Total weight of recycled materials (m^3 solid)	90
Total Volume Re-Used or Recycled (m^3 solid)	180
Total % Re-Used or Recycled	100.00%

Appendix Five

Te Rapa Alliance Draft

Re-Use Recycle 2011(excel spreadsheet)

Location	Gilchrist St	Ormsby Lane	Gilchrist St	Tasman Road	Avalon East tie in	On Ramp tie in	Avalon Drive	Avalon Curves	Te Kowhai Road	Ruffell Road	Onion Road	Bern Road	State Highway 1 / Hutchinson Road
Chainage	last 100m	All	Last 100m	Last 100m	60-230	760-860	7300-8550	7840-8250					
length of pavement which is being recycled (m)	100	150	100	100	170	100	1250	410					
Total Area of existing pavement (m^2)	600	600	600	1000	1615	1500	15000	4100					
Total Volume of existing pavement (m^3 solid)	180	180	180	300	565.25	525	6750	1435					
PAVEMENT RE-USE													
Base course													
Total volume of re-used pavement (m^3 solid)	90	180	90	300	242.25	225		1435					
Computed % of the total re-used volume	50%	100%	50%	100%	43%	43%	~	100%					
How structure was re-used	Insitu fill	Insitu fill	Insitu fill	Subbase	Subbase	Subbase	~	Note 1					
Where was it re-used	In place	In Place	In place	Tasman Cul de Sac	In Place	In Place	~	In Place					
Subbase													
Total volume of re-used pavement (m^3 solid)													
Computed % of the total re-used volume													
How structure was re-used													
Where was it re-used													
Other													
Total volume of re-used pavement (m^3 solid)													
Computed % of the total re-used volume													
How structure was re-used													
Where was it re-used													
RECYCLED MATERIALS													
Base course													
Type of recycling	Cement Stabilsing	~	Cement Stabilsing	~	FBS Stabilsing	Cement Stabilsing	FBS/Cement Stabilsing						
Total weight of each material used (m^3 solid)							?						
Total weight of recycled materials (m^3 solid)	90		90		323	300	6750						
Subbase													
Type of recycling													
Total weight of each material used (m^3 solid)													
Total weight of recycled materials (m^3 solid)													
Other													
Type of recycling													
Total weight of each material used (m^3 solid)													
Total weight of recycled materials (m^3 solid)													
Total Volume Re-Used or Recycled (m^3 solid)	180	180	180	300	565.25	525	6750	1435					
Total % Re-Used or Recycled	100%	100%	100%	100%	100%	100%	100%	100%					
Copy of the approved mix design for the pavement materials	See Rev 8 Pavement design												
Supporting test documents such as plant proportioning records	See QA for Stabilsing												
Manufacturers documentation for products that state the actual recycled material content	See QA for Stabilsing												

NOTES

1. We have left the road structure in place, and topsoiled over it. There is a new slip road that HCC will construct in 2-5 years time, which will follow this alignment. The existing road will be used for a subgrade/subbase for the new road

Appendix Six

Te Rapa Alliance Draft

Materials Cost and Distance 2011 (excel spreadsheet)

Materials and Components	Aggregate							
Source	Ngahinapouri							
Weight (tonne)	2,400							
Radial Distance (km)	30							
Cost of Material ($/tonne)	7.5							
Cost of Freight if Applicable ($ or $/km)	-							
Cost	$ 18,000.00							

Materials and Components	Base	Subbase	Stabilizer - Concrete	Foam Bitumen	Foam Bitumen - Cement	Foam Bitumen - Bitumen (l)	Tack Coat	Tack Coat - Emulsion	Structure Asphalt	Chipseal (m2)	Chip	Bitumen,Adhesive	Cartage
Source	Huntly	Huntly	Tauranga	Tauranga	Tauranga	Tauranga	Tauranga	Tauranga	Tauranga				
Weight (tonne)	40532	23464	1782	32550 (m2)	174468	325500	228426 (m2)	11626	5856	446977			
Radial Distance (km)	30	30	116		116	116	116	116	116				
Cost of Material ($/tonne)	26.49	20.5	263.05		0.263	1.234		11	111.04				
Cost of Freight if Applicable ($ or $/km)													
Cost	$ 1,073,692.68	$ 481,012.00	$ 468,755.10		$ 45,885.08	$ 401,667.00		$ 127,886.00	$ 650,250.24	$ -	$ 308,414.13	$ 1,077,262.77	$ 44,697.70

Structural

Materials and Components	Cement	Sand	Stone	Water	steel	timber
From	Whangerei	Horatu	Huntly	Horatu	Glenbrook	Local/Hamilton
Weight (tonne)	2900.0	7800.0	8900.0	1400.0	3950.0	50.0
Radial Distance (km)	300.0	5.0	30.0	1.0	140.0	15.0
Cost of Material ($/tonne)	250	20	30	0.5	2600	1500
Cost	$ 725,000.00	$ 156,000.00	$ 267,000.00	$ 700.00	$ 10,270,000.00	$ 75,000.00

Appendix Seven

Greenroads Detailed A-Lined Assessment Report

Dated 10/7/12

Greenroads

DETAILED ASSESSMENT REPORT

Te Rapa Bypass

Version 1.5 Pilot Project

PREPARED FOR

New Zealand Transport Agency

DATE

10/7/2012

8201 164th Ave NE, Suite 200 | Redmond, WA 98052 | greenroads.org

CONTENTS

INTRODUCTION

Greenroads Foundation spoke with authorized representatives New Zealand Transport Agency (NZTA) on several occasions to discuss the Te Rapa Bypass Project for purposes of this Greenroads Pilot Project Assessment. The goal of the assessment is to determine the potential Greenroads Rating for the Te Rapa Bypass Project located in Hamilton, New Zealand. The Te Rapa Bypass Pilot Project is the second of several assessments included in the NZTA Greenroads Pilot Program.

ABOUT THE ASSESSMENT

This Detailed Pilot Project Assessment summarizes our understanding of both Phases of the Project, the potential Greenroads Rating for each Phase, and our recommendations to the Project Team. More information on the process of Project Rating, eligibility, and segmentation of large projects is available in the *Greenroads Project Handbook* (greenroads.org/files/244.pdf).

A brief description of the Greenroads Rating System is provided in Appendix A, the evaluation method used in this Assessment is attached in Appendix B, and the completed and annotated Greenroads Scorecards are located in Appendix C.

ASSESSMENT OBJECTIVES

The specific objectives of this Detailed Pilot Project Assessment are to:

1. Understand the general intentions of the Project Team at NZTA.
2. Identify areas where the Project may achieve points based on Standard Project Documentation.
3. Identify other potential areas where the Project may achieve points.
4. Identify potential new ideas that can be considered as Custom Credits.

Using the information provided, a Greenroads Scorecard is completed for the Project that reflects the general state of the Project as well as its potential for certification.

PROJECT DESCRIPTION

The Te Rapa Bypass Project will provide a northern connection to the City of Hamilton's western corridor and will support the rapid growth which is occurring in the north and north-western areas of the city.

The new route is a 6-kilometer bypass of the existing section of State Highway 1 between Hutchinson Road in Horotiu and Gilchrist Street, at the northern end of Avalon Drive near Wintec campus. The Project also includes the four-laning of Avalon Drive between Gilchrist Street and the Rotokauri Roundabout, at the northern end of the Avalon Drive Bypass.

PROJECT REFERENCES

This Assessment was based on several web meetings with representatives of the Project Team and a brief review of the following Project documents:

- Contract No. NZTA 2/03-016/601 Waikato Expressway Te Rapa Section Project Alliance Agreement dated September 2009.
- Transit New Zealand: SH1 Te Rapa Bypass, Notice of Requirement dated January 2008.
- Transit New Zealand: SH1 Avalon Drive Bypass Stormwater Management System Project Review dated May 2008.
- SH1 Avalon Drive Bypass Stormwater Management System Comparison with Proposed NZTA Stormwater Treatment Standard Requirements dated October 2008.
- Best Practice Project Design Plan. Waikato Expressway – Te Rapa Section dated March 30, 2010.
- Roads of National Significance Economic Assessments Review dated July 2010.
- Waikato Expressway Te Rapa Section – Cross Drainage Culverts dated May 2010.
- Waikato Expressway Te Rapa Section – Cross Drainage Culverts Design Report dated July 2010.
- Operational Noise Mitigation Plan dated August 23, 2010
- Quality Management Plan Draft.
- Waste Management Plan Draft.
- Fulton Hogan ISO 9001:2008 certification.
- Opus International Consultants LTD ISO 9001:2008 certification.
- Draft Walking and Cycling Strategy, Te Rapa Bypass. New Zealand Transport Agency. Dated October 2009.
- Landscaping and Urban Design Masterplan.
- Te Rapa Bypass Investigation, Preliminary Geotechnical. Geotechnical Report No. 2307 dated May 7, 2004.
- Kaos Street Lighting Catalogue
- Te Rapa Alliance, AE-3 Context Sensitive Solutions documentation.
- Te Rapa Alliance, PR-1 Environmental Review Process documentation.
- Te Rapa Bypass Alliance – Organisational Structure dated April 2011.
- Pavement and Surfacing Summary – Avalon Drive dated July 13, 2011.
- Greenroads info for Pavement Use Avalon.xlsx
- Materials Cost and Distance.xlsx
- Re-use Recycle.xlsx
- http://www.nzta.govt.nz/projects/te-rapa/overview.html

SCORE SUMMARY

A Greenroads Scorecard is attached that reflects our understanding of the Project intent and potential achievement level in Greenroads. A minimum of 32 points is required for certification. The highlights of the Scorecard are summarized below:

- The project has demonstrated intent to meet **7 of the 11 Project Requirements.**
- A total of **2 points do not appear to be practical** for Te Rapa Bypass to achieve due to the nature of the Project and would probably be considered inappropriate design choices.
- Te Rapa Bypass has demonstrated intent to meet **8 Voluntary Credits totaling 18 points,** with additional points possible for a few of these credits. This number of points does not meet the minimum requirements for a Certification award.
- **Eight credits were identified as economical opportunities to earn up to 16 additional points.** These credits are potentially feasible based on the documents provided and Greenroads believes are possible to implement with minimal to no additional construction cost, or will require minimal design team effort or time. These credits are in **boldface** in the scorecard. A few of these activities may actually be performed on the Project, but this was not clear in the reference documents for this report.
- **Twenty-two credits were identified as opportunities for Te Rapa Bypass to earn an additional 72 points;** however, the majority of these activities are likely to add substantial cost or require significant scope changes due to Phase II's current status. A few of these activities may actually be performed on the Project, but it was not clear in the reference documents for this report.
- **No Custom Credits were identified for this project.**

CATEGORY SUMMARY

Figure 1 shows a summary of where points may be achieved with the current intent that has be shown and where economical additions may be made. This does not represent all achievable points, as the Project may already be on track to achieve points for credits that Greenroads staff has not seen documentation for. A majority of the submitted documents were more broadly scopes planning and policy documents. Many Greenroads credits require very specific project documents and even some post-construction as-built documents.

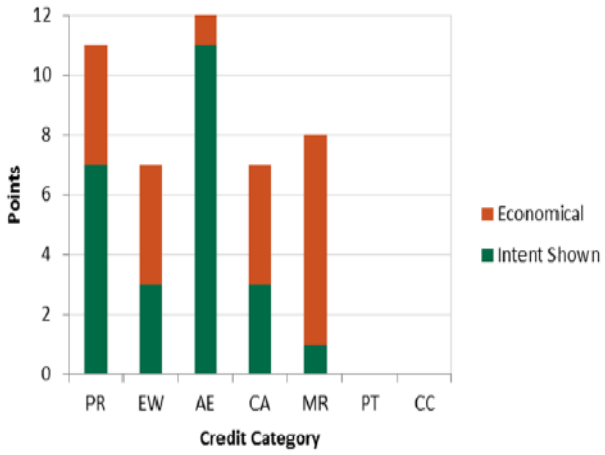

Figure 1. Te Rapa Bypass Project

PROJECT REQUIREMENTS

The Te Rapa Bypass project appears to intend to meet 7 of the 11 Project Requirements.

- Specific credit documentation was not provided for review in this Assessment. For Certification, each of the 11 PR items would need to be documented completely in order to qualify for Certification Award.
- For the credits in which intent was not shown, the Project Team may need to make changes to ensure that that all the Project Requirements are completed on the Project. If all Project Requirements are implemented early on the Project, Certification may not be feasible.

ENVIRONMENT & WATER

Te Rapa Bypass demonstrated intent to achieve 3 points of a total 21 possible in the EW Category.

- The project showed the intent to achieve the Light Pollution credit.
- Drainage credits offer this Project a great opportunity to earn additional points depending on how the segment boundaries are defined. Documentation indicates Stormwater runoff will be treated but it was unclear how treatment will occur or to what extent.
- Stormwater cost analyses and site vegetation should also be considered easy options for additional points.

ACCESS & EQUITY

Te Rapa Bypass demonstrated intent to meet 11 points of a total 30 possible in the AE Category.

- A majority of the points come from the inclusion of Context Sensitive Solutions and the installation of new bicycle and pedestrian facilities.
- The project has indicated the intent to perform safety audits on the Project.
- The project could potentially add points at a low cost by including facilities that draw attention to the nearby historical and cultural Iwi sites.

CONSTRUCTION ACTIVITIES

Te Rapa Bypass demonstrated intent to meet 3 points of a total 14 possible in the CA Category.

- Documentation indicates that recycling will be done and that a Waste Management Plan will be used. The Waste Management Plan should be expanded to include the recycling as well to earn this point.
- CA-2 Environmental Training, CA-6 Paving Emissions Reduction, and CA-7 Water Use Tracking should be considered as an easy option for the Project to earn points.

MATERIALS & RESOURCES

Te Rapa Bypass demonstrated intent to meet 1 point of a total 23 possible in the MR Category. Materials choices have an enormous impact on lifetime energy and emissions associated with the Project. Additional points are likely to be available for higher levels of effort in this category.

- Documentation indicated that at least 50% of the existing project pavement will be re-used and that the remaining will be recycled. Calculations should be completed to confirm that the re-use percentage isn't higher and thus deserving additional credit. It could not be determine if the Project deserves points for recycling, as calculations were not shown to determine how much of the new pavement materials will be from recycling.
- Documentation also indicated that many materials will be sourced locally, but it could not be determined if the amount shown would merit points for the Regional Materials credit. Additional calculations are required.
- Diligent tracking of recycled content, reused materials, and materials suppliers and sources will be important for the Project.

PAVEMENT TECHNOLOGIES

Te Rapa Bypass did not demonstrate intent to earn any of a total 20 possible in the PT Category.

- Long-life pavement may be achieved with the current pavement design. Calculations should be done to see if the Project is already deserving of these 5 points.

CUSTOM CREDITS

No Custom Credits were identified for Te Rapa Bypass. Several Custom Credits have been recently developed that may or may not be appropriate for this Project.

Some Custom Credits that may be applicable for this Project, or future similar projects, are:

- Freight Access
- Pavement Smoothness
- Native Revegetation (potentially an alternate to EW-6 Habitat Restoration)
- Educated Professionals
- Alternative Energy
- Low Emitting Materials
- Workzone Safety

DISCUSSION

Based our understanding of the intent of the Project Team, it appears a minimum rating of **Greenroads Bronze** could be reasonably achieved with some additional effort. **A Silver Rating** is also likely to be within reach since credit specific documents were not reviewed, but is likely to be more challenging.

To achieve a certification award, all activities must be formally documented according to the current version of the *Greenroads Manual*. Importantly, all of the Project Requirements must be completed and documented. Due to the current stage of the Project, it may be difficult to pursue further recognition. **At this time, Greenroads does not recommend Certification is pursued for Te Rapa Bypass.**

HOW THIS PROJECT COMPARES

The Te Rapa Bypass project scores about average compared to other typical highway projects. Generally, most projects complete between 4-7 Project Requirements and earn between 15-25 points in Voluntary Credits. These statistics are based on a sample of about 120 projects from across the U.S. and Canada that use current best practices and design standards and were built within the last 10 years. Table 1 shows how Your Project compares to other projects within this sample set based on some of the descriptive characteristics of the project.

Table 1. Project's Rating Position Compared to Other Projects

Your Project		Score (w/o CC)	Rating	
Te Rapa Bypass		18	None	
Your Project's Reasonable Potential				
Te Rapa Bypass		34	Bronze	
	No. Projects	**Score (w/o CC)**	**Rating**	**Rating Range**
US Projects	120	25 ± 1	None	None
US Projects Reasonable Potential	120	59 ± 17	Gold	Bronze – Evergreen
Greenroads Projects Certified to Date	4	40 ± 6	Bronze	Bronze – Silver
DBB Projects	98	25 ± 1	None	None
Alternative Delivery Projects	22	31 ± 2	None	None – Bronze
Urban Projects	40	28 ± 1	None	None
Projects with Budgets >$100 mil	18	32 ± 2	Bronze	None – Bronze
Projects with Sustainability Emphasis	37	29 ± 1	None	None

Based on other project experience, Te Rapa Bypass has two characteristics that are commonly helpful to position the project to be successful at sustainability:

- Projects that use **alternative contracting approaches,** such as the alliance structure used for Te Rapa Bypass, tend to outperform conventional design-bid-build projects.
- **Large budget projects (more than $10 million USD)** also typically have significant financial leverage to do more sustainable activities. Much of this has to do with the amount of social capital required to move the Project forward in a community.

POTENTIAL ADAPTATION NEEDS

One goal of the NZTA Pilot Program is to understand what, if any, variations in local regulations exist between the United States and New Zealand. U.S. environmental and social regulations form the foundational concepts in the current version of the Greenroads Rating System, and may not be appropriate to apply in the context of New Zealand without adaptation or additional recognition of regional standards of practice.

The results of this Detailed Pilot Project have provided valuable information on how Greenroads can apply to New Zealand projects.

- In general, a more detailed analysis is needed for certain credits than others.
- For the submitted documents, it appears that New Zealand design and construction standards align well with the existing Greenroads credit requirements. However, while standard project documents provide excellent information to fulfill the purpose of a Pilot Assessment, these documents do not often meet the explicit documentation criteria included in each Greenroads credit. For formal Project Certification, it is likely that special documentation (i.e. a short narrative describing the activity) would either be provided to Greenroads or that Greenroads credit would be more clearly embedded into the standard documentation, such as through the specifications.
- A greater understanding of some typical New Zealand design and construction practices could help determine whether the current Greenroads credits can be achieved. For example, not enough information was available for EW-2 Runoff Flow Control and EW-3 Runoff Quality to determine if New Zealand's stormwater management practices meet Greenroads requirements. Specifically, stormwater regulations in the U.S. have also become more stringent recently with the broader encouragement of low impact development techniques. It is not clear if New Zealand environmental regulations meet these standards that are set by the U.S. Enviromental Protection Agency.
- It is unclear if New Zealand projects will have any special difficulty with completing the current set of 11 Project Requirements because documentation was not available on this Project to address all of them.

RECOMMENDATIONS FOR FUTURE PROJECTS

There are numerous design opportunities that should be considered throughout design and construction decision-making that may be helpful in positioning future projects for successful certification that are similar in size, purpose and nature to Te Rapa Bypass. For this Project and most projects, additional sustainability opportunities appear to be available in the areas of increased environmental stewardship in design and creative materials management.

Below are some specific recommendations for the Project Team:

1. As with this project, we recommend that the 11 Greenroads Project Requirements are addressed early in project planning and design. Incorporating Project Requirements PR-4 through PR-7 into the specifications and technical drawings is an excellent way to ensure that they will be completed.
2. Often the greatest potential to earn points involves considering stormwater management beyond completion of construction. For this project, there was not enough information to determine accurately whether these activities are being done. Generally, the Environment & Water category offers a huge potential for reducing environmental impacts over the life of roadway projects.
3. Materials management often provides great opportunities for innovation and cost savings, especially with increased use of recycled materials, reused site materials, and creative waste management activities.
4. This Project did not identify any Custom Credit opportunities. A sample of Custom Credit ideas on record with Greenroads are listed in the latest version of the Errata for the *Greenroads Manual.*

LIMITATIONS OF ASSESSMENT

- Documents provided were not reviewed for detailed compliance with specifications in the *Greenroads Manual*.
- The results and recommendations provided in this study are only applicable to the version of the Rating System used to complete this assessment: *Greenroads Manual v1.5* (dated February 4, 2011).
- This project is very large and complex. The resulting scores of this assessment may not apply to the whole project and may not accurately reflect actual certification scores for certain parts of the Project where features are discontinuous. For certification, a Certification Plan would be required. The purpose of a Certification Plan is to determine how to certify the Project most cost-effectively by identifying which activities apply sitewide and which are specific to certain segments.
- The reported score is not intended to be interpreted as an actual earned Rating, completed Certification review, or Registration of this project. Rather, the score reflects the current potential score of the Project based on the documents provided for our review and verbal conversation with the Project Manager and other representatives of the Project Team. Successful completion of a Pilot Project Assessment does not indicate that the Project is Certified.
- The completed Scorecard is intended to serve as guidance and as a learning tool for the Project Team and may be publicized in accordance with the Greenroads Trademark & Copyright Policy as a "Pilot Project." However, under no circumstances shall any Project Team member claim that this project has been certified by Greenroads Foundation as a result of this Assessment.
- Greenroads respects reasonable requests for confidentiality, and reserves the right to publish, distribute or otherwise use such confidential project data to assess the Project in aggregate with other projects, without exposing any distinguishing information about the Project's identity.

APPENDIX A

About the Greenroads Rating Program

Greenroads

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PROJECT RATING PROGRAM

8201 164th Ave NE, Suite 200 | Redmond, WA 98052 | greenroads.org

BACKGROUND

The Greenroads® Rating System is a collection of sustainability best practices, called "credits," that apply to roadway design and construction, much like the Leadership in Energy and Environmental Design (LEED®) Rating Systems for green buildings. Completing these activities can earn points toward a total score, called a "Rating," that can be used as an indicator of the overall sustainability of the project.

A Greenroad is defined as roadway project that has been designed and constructed to a level of sustainability that is substantially higher than current common practice.

The Greenroads Project Rating Program is one of three charitable programs for transportation infrastructure administered by the 501(c)(3) non-profit organization, Greenroads Foundation. The Project Rating Program includes two core services for projects to get a Greenroads Rating: Project Certification and Project Assessment.

Certification is a rigorous, independent, third-party review of project documentation according to the standard in the most current *Greenroads Manual*. The Certification process is intended to be somewhat challenging in order to recognize projects that go far beyond the conventional practice for sustainable design and construction. Projects that successfully complete the Certification process are eligible for Certification Award and recognition as a "Greenroad."

Greenroads Assessments are less stringent and shorter turnaround: they rely on standard project documentation at-hand and are used most often as stepping stones on the path to certify a project in the future. Assessments are also used for completed projects as a benchmarking tool and for all projects located outside of the United States as part of Greenroads Pilot Program efforts.

Since 2007, Greenroads has been tested on over 125 design and construction projects around the world of various types, shapes, sizes and stages of design and construction. Projects from all over the United States and internationally are participating in the Greenroads Project Rating Program and joining the Foundation in its efforts toward making our transportation infrastructure more sustainable.

RATING SYSTEM DETAILS

Greenroads sustainability credits are divided into two types: mandatory and voluntary. Projects pursuing Certification must complete 11 mandatory credits (Project Requirements) in order to qualify for a Certification Award. There are 37 other Voluntary Credits that when complete, earn points toward one of four Certification Awards: Bronze, Silver, Gold and Evergreen.

Credits are grouped into six Categories, with one additional Category that allows projects to earn points for innovative activities that are currently not recognized in the Rating System.

Important Notes

- Mandatory activities (Project Requirements) are not worth points
- All 11 Project Requirements must be completed to be eligible for a Certification Award
- Voluntary activities (all other credits) are worth between 1 to 5 points based on lifecycle impact

Table 1. Greenroads Credit Categories and Intent

Category Name	Intent
Project Requirements	Encourage environmentally responsible decision-making processes, have management plans in place for construction, establish a minimum baseline for every project that applies for certification.
Environment & Water	Promote best practices related to stormwater management and ecological resources within the project boundary
Access & Equity	Promote safety, access, and mobility improvements and features for users and operations of the roadway
Construction Activities	Promote responsible construction management, reduce use of fossil fuels and improve health and safety of construction workers
Materials & Resources	Promote responsible materials and energy management by combinations of recycling, reusing, and reducing both virgin and waste materials
Pavement Technologies	Highlight specific pavement engineering innovations and ideas or broad types of technologies or techniques which are well-established in practice and have direct sustainability benefits
Custom Credits	Recognize the implementation of sustainable or innovative ideas not included in the current version of the Rating System.

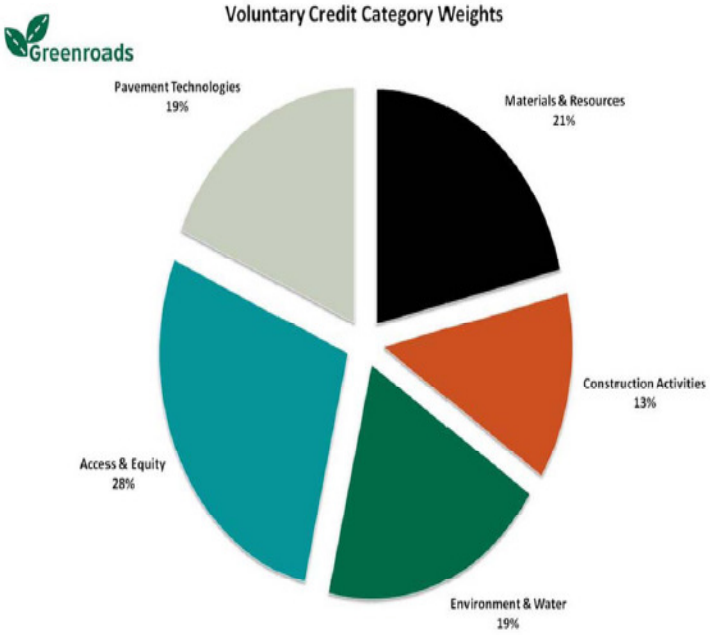

Figure 1. Relative Weights of Greenroads Credit Categories (108 Points Possible, Does Not Show Custom Credits)

MORE INFORMATION

More detailed information, including the full and abridged versions of the *Greenroads Manual*, which details the activities that are part of the Rating System, and the Project Handbook, which describes the details of the Project Rating Program, can be found on the Greenroads Website: http://www.greenroads.org.

Greenroads

LIST OF CREDITS (V1.5)

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CREDIT SUMMARY

The Greenroads Rating System v1.5 *Manual* has:

- 11 Project Requirements.
- 37 Voluntary Credits. 1 to 5 points each, 108 maximum possible.
- 118 total maximum points including 10 points for optional Custom Credit activities.

PROJECT REQUIREMENTS

To be eligible for a Certification Award, all 11 Project Requirements must be completed and documented. There are no points for any of these activities.

No.	Title	Pts.	Description
PR-1	Environmental Review Process	Req	Complete a comprehensive environmental review
PR-2	Lifecycle Cost Analysis (LCCA)	Req	Perform LCCA for pavement/bridge section
PR-3	Lifecycle Inventory (LCI)	Req	Perform LCI of pavement/bridge materials
PR-4	Quality Control Plan	Req	Have a formal contractor quality control plan
PR-5	Noise Mitigation Plan	Req	Have a construction noise mitigation plan
PR-6	Waste Management Plan	Req	Have a plan to divert C&D waste from landfill
PR-7	Pollution Prevention Plan	Req	Have a TESC/SWPPP
PR-8	Low Impact Development (LID)	Req	Complete a LID feasibility study
PR-9	Pavement Management System	Req	Have a pavement/bridge management system
PR-10	Site Maintenance Plan	Req	Have a roadside maintenance plan
PR-11	Educational Outreach	Req	Publicize sustainability information for project

ENVIRONMENT & WATER

No.	Title	Pts.	Description
EW-1	Environmental Management System	2	ISO 14001 certification for general contractor
EW-2	Runoff Flow Control	1-3	Reduce runoff quantity
EW-3	Runoff Quality	1-3	Treat stormwater to a higher level of quality
EW-4	Stormwater Cost Analysis	1	Conduct an LCCA for stormwater elements
EW-5	Site Vegetation	1-3	Use native low/no water vegetation
EW-6	Habitat Restoration	3	Restore habitat beyond what is required
EW-7	Ecological Connectivity	1 or 3	Connect habitat across roadways
EW-8	Light Pollution	3	Discourage light pollution

ACCESS & EQUITY

No.	Title	Pts.	Description
AE-1	Safety Audit	1-2	Perform roadway safety audit
AE-2	Intelligent Transportation Systems (ITS)	2-5	Implement ITS solutions
AE-3	Context Sensitive Solutions	5	Plan for context sensitive solutions
AE-4	Traffic Emissions Reduction	5	Reduce emissions with quantifiable methods
AE-5	Pedestrian Access	1-2	Provide/improve pedestrian accessibility
AE-6	Bicycle Access	1-2	Provide/improve bicycle accessibility
AE-7	Transit Access	1-5	Provide/improve transit accessibility
AE-8	Scenic Views	1-2	Provide views of scenery or vistas
AE-9	Cultural Outreach	1-2	Promote art/culture/community values

For credit details, including documentation requirements, visit greenroads.org/manual.

Greenroads

LIST OF CREDITS (V1.5)

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CONSTRUCTION ACTIVITIES

No.	Title	Pts.	Description
CA-1	Quality Management System	2	ISO 9001 certification for general contractor
CA-2	Environmental Training	1	Provide environmental training
CA-3	Site Recycling Plan	1	Have a plan to divert waste from landfill
CA-4	Fossil Fuel Reduction	1-2	Use alternative fuels in construction equipment
CA-5	Equipment Emissions Reduction	1-2	Meet EPA Tier 4 standards for non-road equip.
CA-6	Paving Emissions Reduction	1	Use pavers that meet NIOSH requirements
CA-7	Water Tracking	2	Develop data on water use in construction
CA-8	Contractor Warranty	3	Warranty on the constructed pavement

MATERIALS & RESOURCES

No.	Title	Pts.	Description
MR-1	Life Cycle Assessment (LCA)	2	Conduct a detailed LCA of the entire project
MR-2	Pavement Reuse	1-5	Reuse existing pavement sections
MR-3	Earthwork Balance	1	Use native soil rather than import fill

APPENDIX B

Scoring Method

Greenroads

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BASIC ASSESSMENT – STANDARD SCORECARD

The Greenroads Standard Scorecard (simply "Scorecard") is completed using the approaches described below for Project Requirements, Voluntary Credits and Custom Credits.

PROJECT REQUIREMENTS

Project Requirements are evaluated based on the intent shown by actual Project documents or by verbal confirmation of intent. If clear intent is present, the Scorecard shows an "x" in the "Y(es)" column. If not, the "x" is placed in the "?" column. By design, it is *possible* to complete all 11 Project Requirements, so none will receive an "x" in the "N(o)" column. We recognize that this perspective is optimistic and that special constraints or local requirements may make some activities more difficult or onerous to document if certification is pursued.

- Demonstrating intent to complete a Project Requirement is sufficient for the purposes of this review. Most, if not all, Project Requirements can be addressed early in project decision-making. However, the complete documentation for all Project Requirements would be required if any future certification is to be pursued.
- For projects that are finalizing design or in construction at the time Greenroads is considered, it may be difficult or simply cost-prohibitive to meet the documentation requirements for certification (if desired). However, the goal of this review is to demonstrate the maximum project potential so that credits can be considered next time.
- Project Requirements carry no point value and do not add or subtract from the total score.

VOLUNTARY CREDITS

Voluntary Credits are evaluated based on the intent shown by actual Project documents or by verbal confirmation of intent. If clear intent is present, the Scorecard shows a number in the "Y(es)" column for the number of points achieved. If not, a number is placed in the "?" column, meaning that many points could be considered as feasible for the Project. A number for the remaining points is placed in the "N(o)" column only if those points would not be reasonable or practical for the Project based on known constraints and scope.

- Demonstrating intent alone to complete Voluntary Credits is sufficient for purposes of this review. This is because the elected Voluntary Credits can often change throughout the design and construction process and the purpose of this assessment is to demonstrate a potential score. Again, the approach used makes the required documentation needs very transparent for future certification efforts while also highlighting notable opportunities.
- Credits marked as "Y" or "?" in bolded text could potentially reduce cost or be completed at minimal or no additional cost to the initial construction price.
- Voluntary Credits carry a variety of values and range from 1 to 5 points. Please refer to the Greenroads *Manual* for further details on how Voluntary Credits are weighted.

CUSTOM CREDITS

Potential **Custom Credits** are evaluated similarly to the Voluntary Credits, but typically these are verbally described activities instead of documented activities. Custom Credits are submitted by registered projects pursuing certification and subjected to rigorous review prior to their approval for broad use in other projects. For purposes of this assessment, the Scorecard shows short titles that represent the basic concept of proposed Custom Credits as well as an estimated number of points. Points for Custom Credits are assigned according to the existing weighting scheme used in the *Greenroads Manual*.

DETAILED ASSESSMENT – ANNOTATED SCORECARD

An annotated version of the Standard Scorecard is provided for Detailed Assessments and Detailed Pilot Projects. The purpose of the Annotated Scorecard is to add depth to the information provided in the Standard Scorecard.

EFFORT TO COMPLETE

Greenroads estimates the level of effort that is anticipated or perceived to be needed to complete and document the credit given the context of the Project. The "Effort to Complete" section on the Annotated Scorecard reflects this estimate of effort the credit were to be pursued during Project Certification.

Specifically, Greenroads defines "effort" needed in the context of Project Certification by any of the following.

- Amount of documentation required by Greenroads
- Amount of time to provide and generate documentation that is in addition to standard project documentation
- Amount of resources that may or may not be physically available or accessible to complete a task, implement a technology or practice, or to document them
- Amount of money involved in earning and documenting a Greenroads credit
- Conflicts with existing regulatory standards, if any
- Conflicts with implementing Greenroads credits in the design process, if any
- Conflicts with implementing Greenroads credits in the construction process, if any
- Any learning curve that might be associated with a particular credit, requiring additional time investment

Scale

Effort is evaluated on a scale of low to high, and credits which were not appropriate or applicable to a particular project are marked as "N/A". For Project Requirements, an "X" is used to indicate associated effort. For Voluntary Credits, points are shown according to their relative difficulty to achieve and their applicable point spread according to the *Greenroads Manual*.

Educated Estimate

The estimate of effort is based on our understanding of the Project, the existing research for a particular credit, experience with other projects, and the demonstrated intent to complete the credit based the stated goals of the Project Team in conversation or as otherwise demonstrated in documents provided for the Assessment.

However, estimated points in the Annotated Scorecard or the Standard Scorecard may not reflect actual Project conditions or its position for successful certification because documentation reviewed for Assessment purposes is limited. The estimates provided by Greenroads in no way imply that the Project *will* earn any particular credit and the information shown in the Scorecards should not be presumed to be a guarantee or statement of future approval under any circumstances.

NOTES

Specific comments about each credit are provided by the Greenroads Reviewer indicating where the intent was identified in the provided documents (if any) and some special comments regarding the credit for the Project Team to consider. This section does not influence the final computation of Greenroads Rating.

APPENDIX C

Greenroads Scorecards

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Project Name	12NZ00001 Te Rapa Bypass
Location (City, State)	Hamilton, New Zealand
Project Manager	Robert Mitchell
Project Budget	168.0 million (USD)
Current Status (Circle)	Construction

Project Requirements (PR)	PR Max: 11	7	4	0
No.	Title	Y	?	N
PR-1	Environmental Review Process	Req	x	
PR-2	Lifecycle Cost Analysis	Req		x
PR-3	Lifecycle Inventory	Req		x
PR-4	Quality Control Plan	Req	x	
PR-5	Noise Mitigation Plan	Req	x	
PR-6	Waste Management Plan	Req	x	
PR-7	Pollution Prevention Plan	Req		x
PR-8	Low-Impact Development	Req	x	
PR-9	Pavement Management System	Req	x	
PR-10	Site Maintenance Plan	Req	x	
PR-11	Educational Outreach	Req		x

Environment & Water (EW)	EW Max: 21	3	18	0
		Y	?	N
EW-1	Environmental Management System	2		2	
EW-2	Runoff Flow Control	1 - 3		3	
EW-3	Runoff Quality	1 - 3		3	
EW-4	Stormwater Cost Analysis	1		1	
EW-5	Site Vegetation	1 - 3		3	
EW-6	Habitat Restoration	3		3	
EW-7	Ecological Connectivity	1 - 3		3	
EW-8	Light Pollution	3	3		

Access & Equity (AE)	AE Subtotal: 30	11	17	2
		Y	?	N
AE-1	Safety Audit	1 - 2	2		
AE-2	Intelligent Transportation Systems	2 - 5		5	
AE-3	Context Sensitive Solutions	5	5		
AE-4	Traffic Emissions Reduction	5		5	
AE-5	Pedestrian Access	1 - 2	2		
AE-6	Bicycle Access	1 - 2	2		
AE-7	Transit & HOV Access	1 - 5		3	2
AE-8	Scenic Views	2		2	
AE-9	Cultural Outreach	1 - 2		2	

Construction Activities (CA)	CA Max: 14	3	11	0
No.	Title	Y	?	N
CA-1	Quality Management System	2	2		
CA-2	Environmental Training	1		1	
CA-3	Site Recycling Plan	1	1		
CA-4	Fossil Fuel Reduction	1 - 2		2	
CA-5	Equipment Emission Reduction	1 - 2		2	
CA-6	Paving Emission Reduction	1		1	
CA-7	Water Use Tracking	2		2	
CA-8	Contractor Warranty	3		3	

Materials & Resources (MR)	MR Max: 23	1	22	0
		Y	?	N
MR-1	Lifecycle Assessment	2		2	
MR-2	Pavement Reuse	4- 5	1	4	
MR-3	Earthwork Balance	1		1	
MR-4	Recycled Materials	1 - 5		5	
MR-5	Regional Materials	1 - 5		5	
MR-6	Energy Efficiency	5		5	

Pavement Technologies (PT)	PT Max: 20	0	20	0
		Y	?	N
PT-1	Long-Life Pavement	5		5	
PT-2	Permeable Pavement	3		3	
PT-3	Warm Mix Asphalt	3		3	
PT-4	Cool Pavement	5		5	
PT-5	Quiet Pavement	2 - 3		3	
PT-6	Pavement Performance Tracking	1		1	

Custom Credit (CC)	CC Max: 10	0	0	10
		Y	?	N
CC-1		1 - 5			
CC-2		1 - 5			
CC-3		1 - 5			

All 11 PR Met?	No		
Greenroads Total (Max 118)	18	88	12

Project Name	12NZ00001 Te Rapa Bypass
Location (City, State)	Hamilton, New Zealand
Team Manager	Robert Mitchell
Project Budget	$168 million
Current Status	Construction

The "Intent" category shows if documents were provided that demonstrates the project intends to meet the goal of a credit.
The "Effort" category indicates the amount of effort (in time or documentation) the reviewer believes will be required for the project achieve a credit.

Project Requirements (PR)			Intent		Effort to Complete				Notes
No.	Title		Yes	No	Low	Med	High	N/A	
PR-1	Environmental Review Process	*Req*	X		X				A preliminary submission document was submitted for this credit.
PR-2	Lifecycle Cost Analysis	*Req*		X	X				No documentation was available for this credit.
PR-3	Lifecycle Inventory	*Req*		X	X				No documentation was available for this credit.
PR-4	Quality Control Plan	*Req*	X		X				The Transit New Zealand Notice of Requirement indicates that this will be completed for the project. A draft QCP was also submitted.
PR-5	Noise Mitigation Plan	*Req*	X		X				An Operational Noise Mitigation Plan was submitted.
PR-6	Waste Management Plan	*Req*	X		X				A draft Waste Management Plan was submitted.
PR-7	Pollution Prevention Plan	*Req*		X	X				No documentation was available for this credit.
PR-8	Low-Impact Development	*Req*	X		X				The submitted Appendices indicate that LID was taken into acount in the project design. This includes Hydrologic and Geotechnical Reports.
PR-9	Pavement Management System	*Req*	X		X				The Project Alliance Agreement Sections S5-18 and S5-19 indicate that there are pavement and bridge management systems in place that will be utilized on this project.
PR-10	Site Maintenance Plan	*Req*	X		X				The Project Alliance Agreement indicates that a site maintenance plan will be implemented on the project.
PR-11	Educational Outreach	*Req*		X	X				No documentation was available for this credit.
PR Max: 11					**11**	**0**	**0**	**0**	

Project Name	12NZ00001 Te Rapa Bypass
Location (City, State)	Hamilton, New Zealand
Team Manager	Robert Mitchell
Project Budget	$168 million
Current Status	Construction

The "Intent" category shows if documents were provided that demonstrates the project intends to meet the goal of a credit.
The "Effort" category indicates the amount of effort (in time or documentation) the reviewer believes will be required for the project achieve a credit.

Environment & Water (EW)			Intent		Effort to Complete				Notes
No.	Title	Pts.	Yes	No	Low	Med	High	N/A	
EW-1	Environmental Management System	2		X		2			No documentation was available for this credit.
EW-2	Runoff Flow Control	1-3		X		2	1		Documentation indicates that stormwater treatment will occur, but did not show specifically how treatment will occur or to what extent. The drainage design would need to be submitted to earn this credit.
EW-3	Runoff Quality	1-3		X		2	1		Documentation indicates that stormwater treatment will occur, but did not show specifically how treatment will occur or to what extent. The drainage design would need to be submitted to earn this credit.
EW-4	Stormwater Cost Analysis	1		X	1				No documentation was available for this credit.
EW-5	Site Vegetation	1-3		X	3				The Transit New Zealand Notice of Requirement document indicates that some revegetation may be done using native species, but additional documentation would be required to confirm that ONLY native species, non-invasive species, and/or plantings not requiring irrigation were used.
EW-6	Habitat Restoration	3		X			3		No documentation was available for this credit.
EW-7	Ecological Connectivity	1-3		X			3		No documentation was available for this credit.
EW-8	Light Pollution	3	X		3				Cut sheet submitted of Kaos Lighting fixtures indicates that the project will try to minimize light pollution. Documentation showing that this meets Dark Sky Certification will need to be submitted to confirm these points.
	EW Max: 21				7	6	8	0	

Project Name	12NZ00001 Te Rapa Bypass
Location (City, State)	Hamilton, New Zealand
Team Manager	Robert Mitchell
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Current Status	Construction

The "Intent" category shows if documents were provided that demonstrates the project intends to meet the goal of a credit.
The "Effort" category indicates the amount of effort (in time or documentation) the reviewer believes will be required for the project achieve a credit.

Access & Equity (AE)			Intent		Effort to Complete				Notes
No.	Title	Pts.	Yes	No	Low	Med	High	N/A	
AE-1	Safety Audit	1-2	X		2				The Project Alliance Agreement section S5-17 indicates that safety audits will be completed before and after construction.
AE-2	Intelligent Transportation Systems	2-5		X		5			No documentation was available for this credit.
AE-3	Context Sensitive Solutions	5	X		5				A draft CSS document has been submitted.
AE-4	Traffic Emissions Reduction	5		X			5		No documentation was available for this credit.
AE-5	Pedestrian Access	1-2	X		2				The Draft Walking and Cycling Strategy document indicates that improvements for pedestrians and bicycles will be installed.
AE-6	Bicycle Access	1-2	X		2				The Draft Walking and Cycling Strategy document indicates that improvements for pedestrians and bicycles will be installed.
AE-7	Transit & HOV Access	1-5		X		3		2	The Notice of Requirements indicates that the new route may help local transit. Documentation did not show any specific transit installations that would confirm this credit could be achieved.
AE-8	Scenic Views	2		X			2		No documentation was available for this credit.
AE-9	Cultural Outreach	1-2		X	1		1		Many of the documents indicate that there may be culturally significant Iwi sites nearby, but it has not been indicated whether the project includes any installations to recognize this.
AE Max: 30					12	8	8	2	

Project Name	12NZ00001 Te Rapa Bypass
Location (City, State)	Hamilton, New Zealand
Team Manager	Robert Mitchell
Project Budget	$168 million
Current Status	Construction

The "Intent" category shows if documents were provided that demonstrates the project intends to meet the goal of a credit.
The "Effort" category indicates the amount of effort (in time or documentation) the reviewer believes will be required for the project achieve a credit.

Construction Activities (CA)			Intent		Effort to Complete				Notes
No.	Title	Pts.	Yes	No	Low	Med	High	N/A	
CA-1	Quality Management System	2	X		2				ISO 9001:2008 certifications for both Opus and Fulton Hogan have been submitted.
CA-2	Environmental Training	1		X	1				No documentation was available for this credit.
CA-3	Site Recycling Plan	1	X		1				A draft Waste Management Plan was submitted, as well as documentation showing intent to recycle materials on the project. This WMP should include the recycled materials.
CA-4	Fossil Fuel Reduction	2		X			2		No documentation was available for this credit.
CA-5	Equipment Emission Reduction	2		X			2		No documentation was available for this credit.
CA-6	Paving Emission Reduction	1		X	1				No documentation was available for this credit.
CA-7	Water Use Tracking	2		X	2				No documentation was available for this credit.
CA-8	Contractor Warranty	3		X			3		No documentation was available for this credit.
CA Max: 14					7	0	7	0	

Project Name	12NZ00001 Te Rapa Bypass
Location (City, State)	Hamilton, New Zealand
Team Manager	Robert Mitchell
Project Budget	$168 million
Current Status	Construction

The "Intent" category shows if documents were provided that demonstrates the project intends to meet the goal of a credit.
The "Effort" category indicates the amount of effort (in time or documentation) the reviewer believes will be required for the project achieve a credit.

Materials & Resources (MR)			Intent		Effort to Complete				Notes
No.	Title	Pts.	Yes	No	Low	Med	High	N/A	
MR-1	Lifecycle Assessment	*2*		X		2			No documentation was available for this credit.
MR-2	Pavement Reuse	*1-5*	X		1		4		Documentation was submitted indicating that at least 50% of the existing pavement structure will be re-used on the project. This would be sufficient to earn 1 point. Additional calculations should be completed to confirm that the re-use does not merit more points.
MR-3	Earthwork Balance	*1*		X			1		No documentation was available for this credit.
MR-4	Recycled Materials	*1-5*		X	2		3		Documentation was submitted indicated that pavement materials will be recycled on the project, but it is unknown what the recycled content of the newly placed pavement materials will be. It is possible the project is on track to achieve points, but additional documentation is required.
MR-5	Regional Materials	*1-5*		X	5				Documentation was submitted showing that some of the materials were sourced locally, but the documentation did not indicate what percentage of materials were local. Points may be easily achieved upon completing the calculation.
MR-6	Energy Efficiency	*5*		X		5			No documentation was available for this credit.
MR Max: 23					8	7	8	0	

Project Name	12NZ00001 Te Rapa Bypass
Location (City, State)	Hamilton, New Zealand
Team Manager	Robert Mitchell
Project Budget	$168 million
Current Status	Construction

The "Intent" category shows if documents were provided that demonstrates the project intends to meet the goal of a credit.
The "Effort" category indicates the amount of effort (in time or documentation) the reviewer believes will be required for the project achieve a credit.

Custom Credit (CC)			Intent		Effort to Complete				Notes
No.	Title	Pts.	Yes	No	Low	Med	High	N/A	
CC-1		*1-5*							
CC-2		*1-5*							
CC Max: 10					0	0	0	0	