Road safety audit procedures for projects

Guidelines

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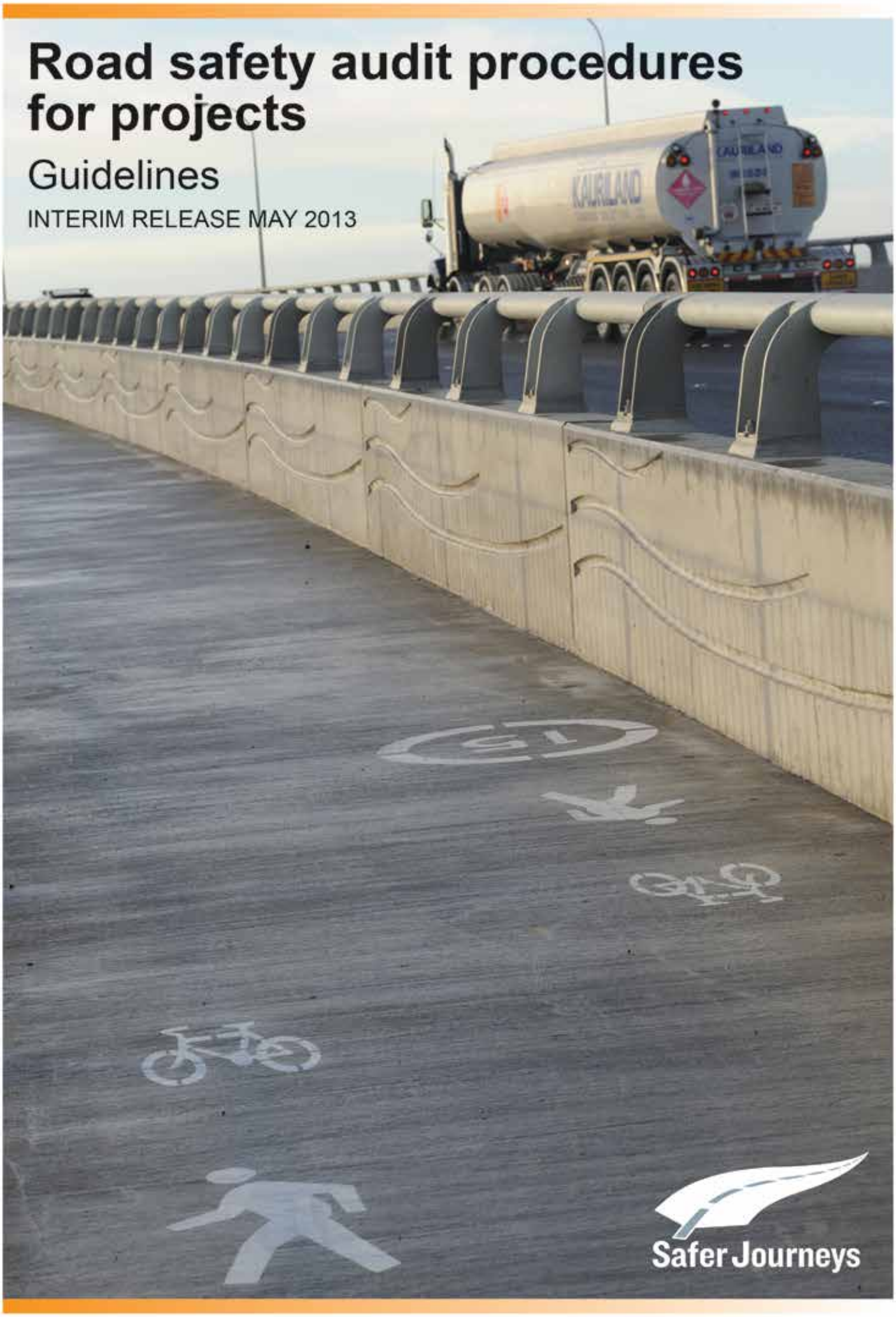

Safer Journeys

ROAD SAFETY AUDIT PROCEDURES FOR PROJECTS

This document provides guidelines for road safety audit procedures in New Zealand. It updates and replaces *Road safety audit procedures for projects. guideline* (Transfund New Zealand. 2004), Transfund New Zealand manual no. TFM9.

It has been produced by a working group as below convened by NZ Transport Agency (NZTA) that is representative of the roading industry.

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This issue is an interim release to operate for a trial period during which we would be grateful for feedback from all users on the merits and deficiencies of these procedures. Please email any comments to RSAuditTrial@nzta.govt.nz.

Austroads has also published road safety audit procedures and these are currently under review with a revision expected to be complete by late 2014. When the revised Austroads procedures are complete, they will be considered alongside the procedures in this document and the experience gained from using these procedures during this trial period. After this, finalised guidelines will be produced.

Written by TDG for the NZ Transport Agency on behalf of the roading industry

NZ TRANSPORT AGENCY
WAKA KOTAHI

TDG

The NZTA is part of, and contributes to, the Safer Journeys programme. Safer Journeys is the government's strategy to guide improvements in road safety over the period 2010–2020. The strategy's vision is a safe road system increasingly free of death and serious injury.

It is a coordinated effort across partner agencies to improve each aspect of road safety – better behaviours, a safer road environment, safer speeds and higher vehicle standards.

For more information, visit www.saferjourneys.govt.nz.

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1. INTRODUCTION

Road safety audit definition

A road safety audit is a term used internationally to describe an independent review of a future road project to identify anything that may affect the road's safety. The audit team considers the safety of all road users and qualitatively reports on road safety issues and opportunities to improve safety.

A road safety audit is intended to help deliver a safe road system and is not a review of compliance with standards.

Objective

The primary objective of a road safety audit is to help ensure a project achieves an outcome consistent with Safer Journeys and the Safe System approach – that is, minimisation of death and serious injury. The road safety audit identifies all areas of a project that are inconsistent with a safe system (refer to section 3) and brings those concerns to the attention of the client, so the client can choose appropriate action(s) based on the risk guidance provided by the safety audit team.

The key objective of a road safety audit is summarised as:

> To deliver completed projects that contribute towards a safe road system that is increasingly free of death and serious injury by identifying and ranking potential safety concerns for all road users and others affected by a road project.

Essential elements

The essential elements of a road safety audit are that the audit:

- focuses on the safety aspects of the project
- is carried out by people who are independent of the client, designer or contractor
- is carried out by people with appropriate experience and training, and who understand the Safe System approach
- is a formal documented process
- considers all potential road users
- requires a formal documented response from the client.

A road safety audit is not intended to be:

- a substitute for a quality control review, a design review or a peer review
- a judgement of the quality of a project (as the project will likely have other components)
- a compliance check with standards, guidelines or drawings and specifications (a separate review is required for this purpose noting that compliance with standards or other documents does not necessarily result in a safe system)
- a redesign of a project

- an informal check, inspection or consultation
- a means of ranking or comparing one project or option over another (although it may form part of the decision process).

Engineering standards and guidelines provide a sound starting point from which a good design can evolve. However, their application alone does not necessarily result in the safest road environment. Road safety audits provide a further means of checking road safety outcomes.

2. BENEFITS OF ROAD SAFETY AUDITS

Road safety audits will:

- help achieve the objectives of a safe system by providing a safer road network with self-explaining roads
- minimise the risk of high-severity crashes that may result from design deficiencies in a proposed road project
- minimise the need for rework and physical remedial works caused by road safety deficiencies at the various stages of project development, including construction
- reduce the whole-of-life costs of the project
- improve the awareness of, and contribute to, improvements in safe design practices.

The cost of a road safety audit and the consequent cost of changing a design are significantly less than the cost of remedial treatments after works have been constructed, or the social cost of road crashes. It is easier to change design plans than to move or alter construction works. However, conducting post-construction road safety audits is still important as the cost of any remedial work may well be less than the cost of crashes that may arise.

3. SAFER JOURNEYS

The road safety strategy Safer Journeys guides road safety initiatives in New Zealand from 2010 to 2020. The long-term goal for road safety is encompassed in the strategic vision as *'a safe road system increasingly free of death and serious injury'.*

Safer Journeys

'A safe road system increasingly free of death and serious injury'

This vision recognises that it is impractical to prevent all road crashes from occurring and focuses efforts on reducing deaths and serious injuries as a consequence of crashes.

In order to achieve this vision Safer Journeys advocates taking a Safe System approach to road safety. The Safe System approach is based on a 'shared responsibility' between system designers and road users, and improving all elements of the road system including roads, speeds, vehicles and road use.

Safe System approach

The Organisation for Economic Co-operation and Development (OECD) has recognised that 'A fundamental policy shift, characterised as the Safe System approach, is required both to consolidate the significant improvements in road safety in recent decades and to generate further gains in the future'. At the heart of the Safe System approach is the recognition that people make mistakes and some crashes are inevitable but that no one should pay for a mistake with their life or limb.

'In a Safe System, a road user who is alert and compliant should not die or be seriously injured while using our roads'

The Safe System approach focuses on creating safe roads, safe speeds, safe vehicles and safe road use.

System designers, system users and the whole community must share responsibility for managing crash forces in order to achieve the Safe System vision. If road users are alert, comply with the road rules and travel at safe speeds, they should be able to rely on the road, roadside features and the vehicle to protect them from death or serious injury.

The key relationships and responsibilities of the Safe System approach are depicted in figure 3.1. Together, they make up the four cornerstones of the Safe System approach.

Figure 3.1 Safe System cornerstones

Managing crash forces

The Safe System approach recognises the limitations of the human body's ability to withstand crash forces without death or serious injury and so advocates that crash forces should be managed so they do not exceed those limits. Effectively this means either adequately protecting road users from high crash energies through vehicle and infrastructure design or reducing the impact forces by reducing travel speeds.

Human tolerance to crash forces at different speeds is clearly demonstrated in the probability of survival 'S' curves in figure 3.2 and the appropriate speed thresholds based on those curves given in the bar graph in figure 3.3.

Safe System principles

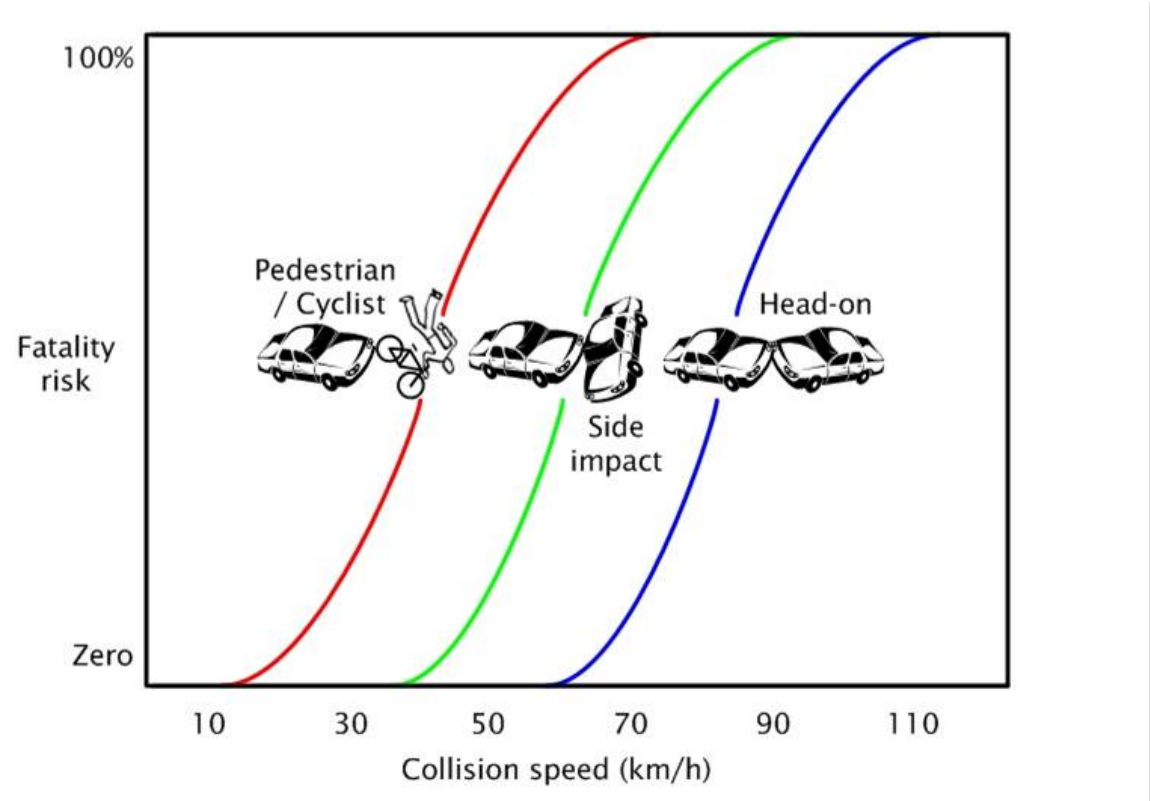
We need to recognise that people make mistakes and some crashes are inevitable

Our bodies have limited ability to withstand crash forces without being seriously injured or killed

System designers and the people who use the roads must all share responsibility for creating a road system where crash forces do not result in death or serious injury

We need to improve the safety of all parts of the system – roads and roadsides, speeds, vehicles, and road users so that if one part fails, other parts will still protect the road user

Figure 3.2 Risk of fatality versus speed



As an example of application, the risk of a pedestrian or cyclist being killed or seriously injured by a car increases significantly when travelling over 30km/h. A safe system would protect pedestrians and cyclists by providing safer road infrastructure, by encouraging the uptake of vehicles that inflict less harm on vulnerable users in a crash, by managing speeds to reduce the risk of serious injury and by both the drivers and the vulnerable user being alert to and aware of the risks associated with their interaction so they can both behave accordingly.

Implications for road safety audit

The role of the safety audit in the current environment is to identify aspects of the project that are inconsistent with both the Safer Journeys vision of a safe road system increasingly free of death and serious injury and with the Safe System approach, ie where deaths and serious injuries may result from road user errors. The decision makers must assess the potential consequences and frequency of these risks and how these could be addressed or eased within a value for money framework. It is recognised that while road safety audits of projects tend to focus on the road and the interrelationship of the driver with the road, all cornerstones of a safe system are important and intertwined.

Safe System focus in safety auditing

Provide forgiving roads and roadsides

Limit crash forces to prevent fatal and serious injuries

Understand road user perception of roads and roadsides

Consider both historic and predictive modelling

Consequently, the ability of the road safety audit procedures to support an ongoing system improvement programme such as the dissemination of current knowledge, feedback from audits and monitoring of performance plays a key role in the delivery of a safe system.

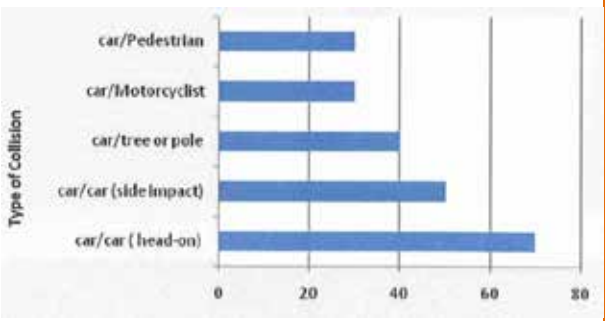
Road safety auditors must be aware of the Safe System guidelines and associated research that are being continually developed with respect to road elements. Asset managers, clients, designers and safety auditors are therefore encouraged to remain current with safety research.

Figure 3.3 contains some examples of the information currently available about how to achieve the Safe System objectives. Note that these examples focus on the provision of forgiving roads and roadsides that are more accommodating of human error, and managing the crash forces to a level that the human body can tolerate without serious injury.

Figure 3.3 Examples of the information currently available about how to achieve the Safe System objectives

Consider safe speeds appropriate to the road environment based on the chance of surviving a particular crash type.

Survivable impact speeds for different scenarios (source: Figure 7 – Australian Road Safety Strategy 2011–2020)



Consider intersection forms that produce safe speeds appropriate to all road users and minimise points of conflict.

Consider appropriate forgiving treatments for motorcyclists, including surfacing, sudden changes in grade and roadside hazards.

Consider using the most forgiving roadside treatments, such as flexible barriers.

Ratio of fatal and serious injuries per injury crash for various roadside hazards and barriers (source: Austroads ST1427 Final Draft)

Hazard type	Fatal/serious injuries per run-off road injury crash (100km/h)
Poles	0.81
Tree (shrub/scrub)	0.75
Fence/Wall	0.55
Embankment	0.53
Rigid barrier	0.50
Semi-rigid barrier	0.60
Flexible barrier	0.33
No hazard hit	0.43

4. TYPES OF PROJECTS THAT MAY BE SAFETY AUDITED

Road safety audits are applicable to all types of road projects, on all types of roads. Projects can be as small as a pedestrian crossing or set of road humps, or as large as a motorway. The scope of audits ranges from everything within the road corridor to specific facilities such as those for cyclists and pedestrians and may be located within a public road, other public property or private property. All projects can benefit from a road safety audit.

Thus it is not the scale of the project that is important. What is critical to achieving the Safe System goal is the scale of any potential risk that may result from the project. For example, a low-cost traffic management scheme that places pedestrians at risk could have a severe crash potential, because pedestrians are vulnerable to injury, particularly at higher traffic speeds.

The method of procurement should not be a deterrent to ensuring that the principles of road safety audits are followed. An example is Design and Construct: for projects of this nature it is important that the independence of auditors is not compromised by the respective objectives of the client and contracted parties. The authority to make decisions about a road safety audit's recommendations and the responsibility for their implementation should be clearly defined in the contract between the client and the contracted parties.

Road safety audits can be conducted on road projects that include, but are not limited to:

- major divided roads
- expressways and motorways
- reconstruction and realignment
- intersection upgrades or installations
- pedestrian and cycle routes and facilities
- temporary traffic management schemes (from a safe system perspective, not as a compliance review)
- local area traffic management schemes (such as commercial areas and residential streets), and their component parts
- intelligent transport systems
- subdivision roads
- minor safety works
- seal extensions, pavement rehabilitation, seal widening.

Road safety audits can also be conducted for off-road projects (such as commercial developments) where safety concerns are likely to arise from:

- vehicle–pedestrian conflicts in a new carpark
- increased numbers of pedestrians crossing the adjacent road
- a spillover of parking onto an adjacent busy road
- location of access ways
- restricted visibility or delays where vehicles access the development
- changed public transport circulation and access by users
- changed access/egress/unloading for service vehicles.

5. DEFINITIONS

Road controlling authority (RCA)
The organisation charged with managing the road asset.

Asset manager
The organisation ultimately responsible for managing the asset. For most road projects this will be the RCA.

Client
The organisation commissioning the project. For many road projects this will be either the RCA or the developer.

Project manager
Person delegated to manage the project on behalf of the client.

Safety engineer
Advisor to the client on safety issues. Where the asset manager differs from the client, a safety engineer may be separately engaged to advise each party.

Designer
The team undertaking the investigation, or the design, or the supervision of the construction of the project. 'Designer' is a generic term and may be part of the RCA, consultant or contractor's organisation.

Contractor
The team engaged by the client to construct the project.

Road safety audit team
The team undertaking the audit (refer to section 7 for team members).

Project
Any work that results in a change in nature or use of an asset that is/will be under the control of an asset manager.

Road
In the context of this guideline, the term 'road' refers to any area that may be frequented by either a motorised or a non-motorised member of the public.

Parties to a road safety audit

The parties typically involved in the road safety audit vary but typically include the client, asset manager (where different from the client), designer and/or contractor and the road safety audit team.

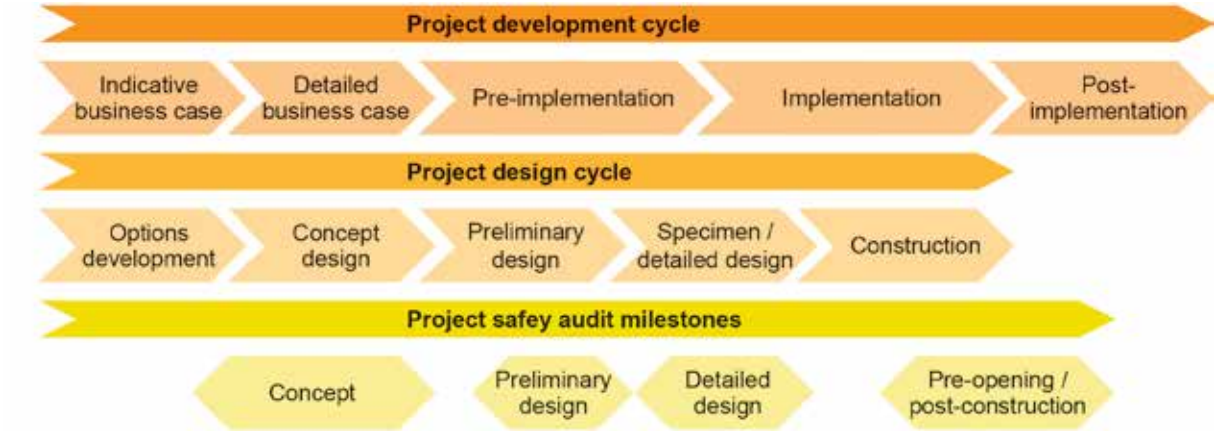
6. WHEN TO UNDERTAKE A ROAD SAFETY AUDIT

A road safety audit should be undertaken at project milestones such as:

- concept stage (part of a business case)
- scheme or preliminary design stage (part of pre-implementation)
- detailed design stage (pre-implementation or implementation)
- pre-opening or post-construction stage (implementation or post-implementation).

These milestones align approximately with the development cycle of a project as depicted in figure 6.1.

Figure 6.1 Road safety audit milestones within project development cycle



These stages should not be seen as rigid, as all projects are not the same and smaller projects will not always follow all the development stages. The stages of a road safety audit should match the project's complexity and actual development stages. However, the earlier an audit is undertaken, the easier and less expensive it is to make changes. A road safety audit only at the post-construction stage should be avoided, as often it is too late to make significant improvements if required.

It is recommended that each road controlling authority embed the requirements for a road safety audit of projects in appropriate policy documents, including but not limited to Asset Plans, Safety Management Systems and Development Codes. As a minimum it is recommended that a road safety audit be undertaken at the design stage for all works within a public space. For requirements specific to a particular road controlling authority, refer to the policy of that authority.

Occasions will arise when a client will consider the need to conduct other types or stages of road safety audit, such as for:

- the design philosophy stage
- intermediate critical milestones – for example, Design and Construct projects may need road safety audits progressively throughout the design process (see 'Requirements for specific procurement models' below)

- traffic management changes in road layout or an environment of a temporary nature such as during physical work (this is not a compliance audit with standards which are separately reviewed and documented in a code of practice, eg COPTTM[1])
- a repeat road safety audit, if major changes result.

Desirably a post-construction road safety audit should be undertaken before opening the project for public use. If in practice this is not possible, the road safety audit should be undertaken as soon after opening as possible. For projects that are constructed in sections, the road safety audit may be conducted at the completion of each section.

Exemption from road safety audit

As noted above, it is not expected that all projects will require all stages to be safety audited. For example, smaller-scale local authority projects may be considered by the asset manager to warrant only a detailed design stage safety audit.

Where an asset manager decides a road safety audit is not required for a particular project or a particular phase of a project then it is recommended that the decision is documented by the asset manager or nominated representatives. An exemption form is provided as appendix C.

When deciding if a road safety audit is warranted, the asset manager will need to refer to the relevant sections of this guideline, including the high-level safety audit checklists provided as appendix E.

Requirements for specific procurement models

Some projects will have specific additional process requirements for reporting, timing and staging such as the Design and Construct, Public–Private Partnerships and/or Alliancing contract models. The specific process to be followed for any particular project will be outlined by the client at the start of the process. The project managers and the safety auditors engaged on such projects should be aware of these procedures, which will be outlined for each project with reference to the NZ Transport Agency's *Project management manual*[2] as appropriate.

The principle of the road safety audit process applies equally to all procurement models. However, for projects where the works are procured (for example, under the Advanced Design and Construction model), additional and more complex road safety audit requirements apply to the specimen design, pre-tender, tender (potentially multiple designs to audit) and post-award stages.

National Land Transport Funding (NLTP) requirements

Further to the recommendations of this guideline, the NZ Transport Agency's policy for projects funded from the National Land Transport Programme (NLTP) current at the time of the request for funding will confirm the mandatory requirements for undertaking road safety audits.

For guidance, the current policy for projects funded under the NLTP is shown in appendix A. It requires road controlling authorities to do one of the following:

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[1] NZ Transport Agency (2012) *Code of practice for temporary traffic management* (COPTTM). NZTA, Wellington.
[2] NZ Transport Agency (2010) *Project management manual*. NZTA, Wellington.

- **Undertake road safety audits at the key stages of a project's development and implementation.** Road safety is a priority for the NZ Transport Agency and road safety audits should be routine and common practice. The audit report and the project manager's responses must be attached to the Transport Investment Online (TIO) funding application.

OR

- **Complete an exemption declaration** that adequately demonstrates the scope of the project and that road safety issues arising from any changes are sufficiently negligible that a road safety audit is not warranted for a particular stage or stages. The exemption declaration must be completed by the road controlling authority's project manager and must be attached to any Transport Investment Online (TIO) funding application. A copy of the exemption form is included as appendix C.

7. ROAD SAFETY AUDIT TEAMS

Selecting the road safety audit team

The most appropriate size of a road safety audit team depends on the complexity of the audit task. There is no optimum number of people suggested, although teams of more than four people can be unmanageable. The benefits of having an audit team, rather than a single person, include:

- the diverse backgrounds, experience, knowledge and approaches of different people
- the cross-fertilisation of ideas through discussion
- simply having more than one pair of eyes.

While skills in road safety engineering are the most crucial attribute, road safety audit teams should possess balanced skills appropriate to the individual projects. In some instances a road safety audit by one person can be appropriate, but that depends on their skills and experience. It is recommended that using a one-person team just to reduce the costs of conducting a road safety audit should be avoided. The cost of undertaking a road safety audit relative to its potential benefits (and client confidence that road safety has been fully considered) is considered small and hence highly cost effective.

For each road safety audit one person in the audit team should be appointed as the road safety audit team leader, to manage the team and process. The client should appoint the audit team following discussion with the team leader. The team leader shall ensure that the audit team (or individual) has the necessary skills and experience appropriate to the complexity and type of project being audited.

While continuity of core members of the road safety audit teams through the stages is desirable, audits at the different stages may require different skills. As well as always having someone familiar with road safety engineering principles and practice, look at including team members with the following skills:

- **Concept and scheme/preliminary design stages**

  The issues to be examined are quite different (broader and often more subtle) than for later stages and these audits should be undertaken only by very experienced safety auditors.

  Include an experienced road design engineer who is familiar with current road design standards and can visualise the layout in three dimensions.

  Include a specialist in any unusual aspect of the project.

  A big picture view is important, taking in the potential for wider implications to all road users and to the adjoining network or interface.

- **Detailed design stage**

  Include person(s) familiar with the types of details required in the project (for example, a person with expertise in motorway design, traffic signals, cycle facilities, etc). They must be able to critically examine the details.

- **Pre-opening or post-construction stage**

  Consider including members such as: a police officer who has experience in traffic and safety, an advocate for pedestrians and/or cyclists, a maintenance engineer, someone familiar with traffic control devices, etc.

Specialist safety auditors may need to be co-opted onto the safety audit team for specific areas of expertise such as for traffic signals, lighting, cycle facilities, temporary traffic management, etc. Those team members who are engaged because of their road safety engineering experience should have specialist knowledge relevant to the project.

Experience in road safety engineering is the key essential ingredient in any road safety audit team. Ideally this should be linked to an understanding of:

- the application of Safe System principles to road design and safety audits, including safe roads, safe speeds and safe road use principles – they should be able to recognise situations where road use errors with the potential for fatal or serious injury outcomes are most likely to occur
- crash reduction studies
- traffic engineering and management of traffic and other road users
- road design and road construction/maintenance techniques.

In applying the Safe System approach, a person who has an understanding of road user behaviour and human perception is also likely to be able to develop road safety audit skills. This understanding is, in fact, a very desirable skill because of the highly interactive nature of the road user with the other elements of the Safe System.

The most successful auditors are able to use their skills to see the road project from the point of view of the different types of ‘customer’ or road user.

To support the ongoing development of road safety auditors, the inclusion of observers within the audit team is encouraged.

Independence of auditors

Road safety auditors must be independent of the client, designer or contractor, so that the project outcome is viewed with fresh eyes and is unbiased.

The client has the ultimate responsibility for accepting that the level of independence is adequate and credible. To avoid an inappropriate ‘culture’ of the designer or contractor being incorporated, auditors should be commissioned from other organisations.

The NZ Transport Agency requires road safety auditors to be appointed separately from the Professional Services Contract drawn up for all projects.

Experience and skills: team leader, team members and observers

Team leader

Team leaders should possess:

- a good understanding of the Safe System approach, preferably by attending some form of training course
- demonstrated management and reporting skills
- a wide range of road safety engineering experience
- crash reduction study skills
- a record of participation as a team member in a range of relevant formal road safety audits (at least five formal road safety audits, including at least three for the same stage of audit)
- experience in a relevant road design, road construction or traffic engineering field (typically five years minimum but team leaders for audits of more complicated projects should have significantly more experience)
- up-to-date professional experience and knowledge of current research.

Experience in other regions of New Zealand or other countries can also benefit a client, as the auditor will be more able to challenge inadequate local practices.

Team members

Team members may be more varied in their backgrounds than the team leader and should have experience that achieves the balance required for the audit.

Team members should possess:

- a good understanding of the Safe System approach, preferably by attending some form of training course
- road safety engineering experience
- crash reduction study skills
- experience in a relevant road design, road construction or traffic engineering field (typically three years minimum)
- up-to-date professional experience and knowledge of current research.

Team members should have attended a road safety audit training course and participated in road safety audits as an observer, preferably for different project stages.

Observers

Observers can be included in a road safety audit for a variety of reasons, such as a training exercise in order to be considered as future road safety audit team members, or simply to observe the process. They may come from a variety of backgrounds. However, those aspiring to become team members and ultimately team leaders should note the criteria above.

8. THE SAFETY AUDIT PROCESS

Figure 8.1 shows the steps of the road safety audit process and responsibilities.

Once a decision has been made to undertake a road safety audit and the audit team has been selected and appointed, the audit team will work through the process. If a decision is made not to undertake an audit then this should be documented (see 'Exemption from road safety audit' in section 6).

Project information

The client/designer should provide the road safety audit team with all the project information, preferably at least one week before the audit is undertaken. Drawings and documents appropriate to the audit and other supporting information would normally include:

- information on project scope and objectives
- stage and scope of the road safety audit
- previous audits, responses and client decisions
- project assessment reports
- traffic data
- crash data
- design report or statement covering the standards adopted.

Desirably a road safety audit should not proceed until drawings and documents are complete, unless specifically exempt by the client to facilitate progress (eg Design and Construct).

A checklist for information relevant and desirable to each stage of an audit is attached as appendix D.

Individual team members should familiarise themselves with the documentation before the briefing meeting.

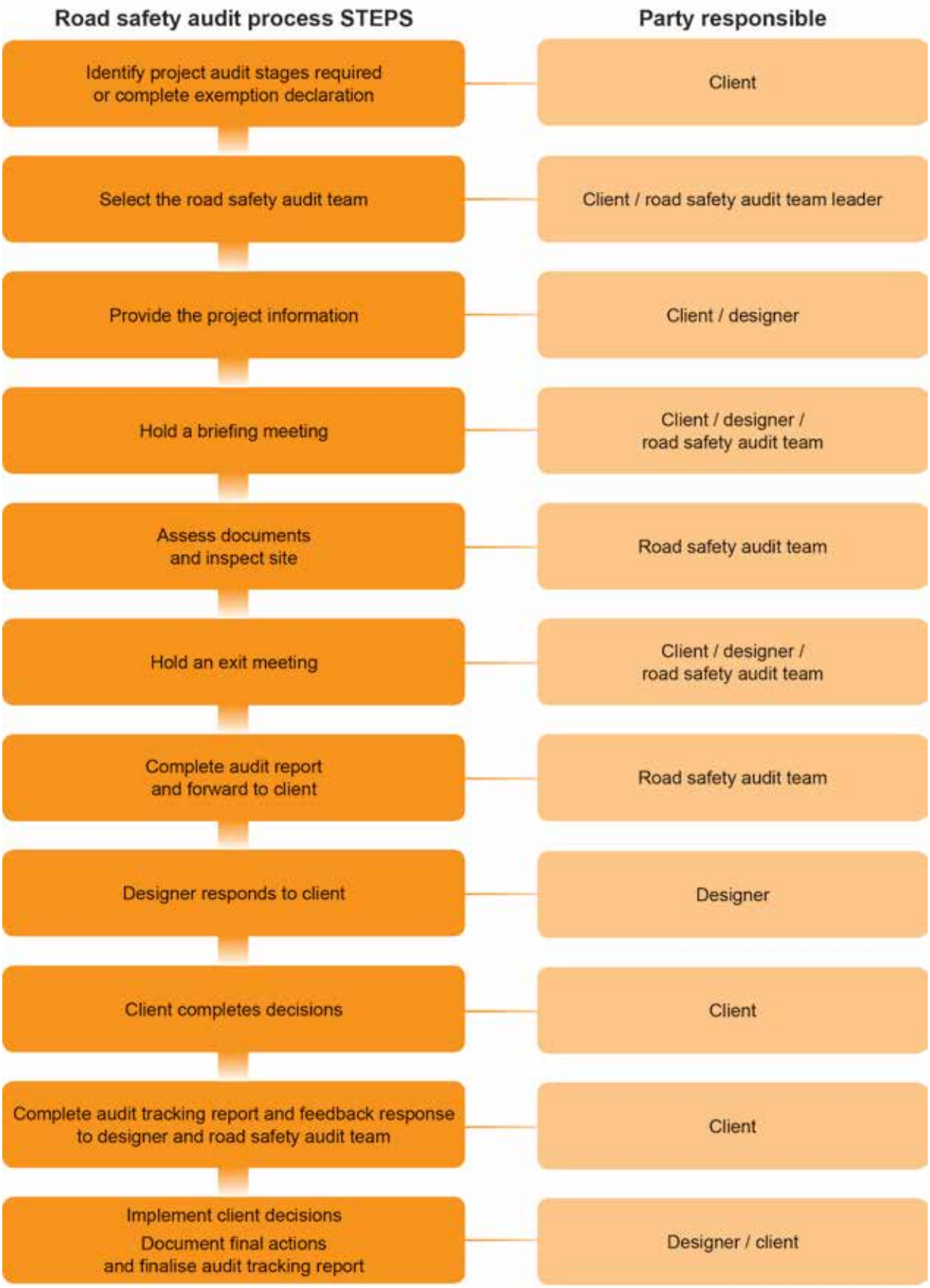
Briefing meeting

Communication between the parties throughout the audit process is very important as it helps foster trust and credibility in the process.

Whether the briefing meeting is necessary often depends on the scale and complexity of the project. However, it is desirable as it provides an opportunity:

- for all parties to meet and establish lines of communication
- for the designer and client to brief the road safety audit team on issues, constraints and specific areas that require comment
- for the road safety audit team to seek additional data and discuss any initial observations from reading the background information
- to discuss the programme for completion of the audit and delivery of the report
- to determine the protocol for delivery of the report.

Figure 8.1 The steps in a road safety audit



Document assessment

This phase takes place in parallel with the site inspections. The road safety audit team discusses their initial observations and reviews the documents in detail. The issues generally considered in the various stages of the audit are outlined in the checklists contained in appendices D and E.

In this phase, specific tasks may be allocated to various team members, eg one team member may review the geometry of the road, while others review the drainage and lighting, delineation, etc.

Site inspection

Inspections of the site are a key component of a road safety audit and are recommended for each stage of an audit.

An inspection provides the opportunity to see how the proposal interacts with its surroundings and to visualise impediments and conflicts for all road users.

The road safety audit team should complete the necessary health and safety requirements, briefing, etc, and be adequately equipped with safety vests, cameras, measuring equipment and whatever else they will need.

The inspection should include adjacent sections of road, so that interface and consistency with the project are considered. Inspections should be undertaken in the range of traffic and environmental conditions likely to be expected, where possible. Both night-time and daytime inspections are desirable, with night-time inspections being essential in the post-construction stage.

During the inspection, the high-level checklists (appendix E) can be referenced, to ensure that no concerns are overlooked. Observed practice is that experienced auditors use the checklists as a backup at the end of inspections, while less experienced auditors will use the checklists throughout the inspection.

Exit meeting

As with the briefing meeting, the need for an exit meeting depends on the project, but it is desirable. It provides the opportunity to:

- seek clarification on concerns
- give preliminary feedback to the designer and client about the safety concerns identified (particularly those that require urgent attention)
- discuss the reasons behind concerns
- informally discuss possible solutions to the problems
- resolve misunderstandings or errors of fact.

Report writing

The primary task of the road safety audit report is to succinctly report on aspects of the project which involve road safety concerns, and to make recommendations about corrective actions.

Recommendations may indicate the nature or direction of a solution but they do *not* specify the details of how to solve the concern. Responsibility for the solution rests with the designer.

The road safety concerns should be listed in a logical order with a numbering system that makes them easy to refer to in follow-up reports. One way of doing this is to list the items in the order given in the appropriate checklist (see appendix E of this guideline). However, this system may not always provide the greatest clarity. For example, where a number of distinct intersections or interchanges occur, they may be best discussed in turn.

All road safety concerns identified in the report should be of sufficient importance to require action. Issues from previous road safety audit reports that have been responded to, and a decision made by the client, do not need to be repeated in subsequent audits. The report should not be cluttered with trivial matters. Aspects like amenity or aesthetics, which are unrelated to road safety, should not be mentioned. Likewise traffic capacity issues should not be discussed unless they have a bearing on road safety. To help the designers and client gauge the importance of the road safety concerns raised, a simple ranking system is desirable.

By their nature, road safety audit reports appear to be negative documents as they typically raise only concerns. Positive design elements are not necessarily mentioned, as the assumption is that all designs contain good elements. However, a notable or excellent element which improves safety can be mentioned, if appropriate.

Issues to be considered in a safety audit

Safety aspects to be considered during an audit are listed in the high-level checklists supplied in appendix D. Each stage of the audit has its own checklist. The checklists are not exhaustive. Other aspects may also be considered.

Checklists are only an aid. They should not replace thorough and complete consideration of road safety issues.

More detailed checklists are available in other publications, including the Austroads *Guide to road safety, part 6: Road safety audit*. For more specialised checklists, eg for pedestrians and cyclists, useful information is contained in the Federal Highway Administration (FHWA) publications *Pedestrian road safety audit guidelines and prompt lists* and *Bicycle road safety audit guidelines and prompt lists* respectively.

Contents of a report

Road safety audit reports could contain the following information.

- Introduction
  - Title
  - Brief description of the road safety audit process undertaken
  - Clear statement of what is being audited
  - Road safety audit team: names and affiliations
  - Dates that the road safety audit was carried out
  - Brief description of the project and its objectives
- Project information
  - A list of drawings and documents made available for the audit
  - Other supporting information used
  - Plans which identify the extent of work
- Findings and recommendations
  - Sequential listing of safety concerns and recommendations, including photos (use of which is to be encouraged), annotating findings on a suitable set of plans, where emphasis is desirable
  - Ranking of concerns to aid designers and project managers
  - Referencing system so that the findings are easily identified, eg by using the checklist topics in appendix E of this guideline
- Formal statement
  - A draft report should be circulated to team members for comment, review and agreement. As the road safety audit team has a position of independence, a draft of the report does not have to be provided to the client or designer for comment
  - A signed and dated statement by the auditors
- Response and decision reporting
  - Record of the designer response, safety engineer response, client decision and action taken for each item in the road safety audit report (it is expected that the report will remain a live document until all items have been decided and the final report signed by the project manager)
  - Final report with responses and decisions forwarded to the client to record designer's response and client's decision

Even if an audit does not identify any safety concerns, a short report should still be documented.

An example of the format of a report is attached as appendix B.

A suggested ranking system

The ranking system used should be defined in the report, and should take into account the likely frequency of a crash occurring, and the likely outcome. With the adoption of the Safe System, the emphasis is on avoiding the more severe casualty outcomes. The recommended ranking of safety concerns is outlined below. The safety concerns may be ranked based on documented or perceived risk. Risk may be documented in available crash research. Perceived risk may be based on the expected crash frequency (all severities) and the expected severity of the outcomes.

The expected crash frequency is qualitatively assessed on the basis of expected exposure and the likelihood of a crash resulting from the presence of the issue. The severity of a crash outcome is qualitatively assessed on the basis of factors such as expected speeds, type of collision and type of vehicle involved.

Reference to historic crash rates or other research for similar elements of projects, or projects as a whole, can help with understanding the likely crash types, frequency and severity that may result from a particular concern.

While the frequency of crashes in the assessment is necessarily qualitative, some quantitative assessment will help put things into perspective and assist with some relativity and consistency across audits and New Zealand. An example may be that an issue that could result in the likelihood of more than one crash per year may be deemed as 'frequent' while one crash in 10 years may be considered as 'infrequent'. The frequency and severity ratings are used together to develop a combined qualitative ranking for each safety concern using the Assessment Matrix in Table 8.1 below. The qualitative assessment requires professional judgement and a wide range of experience in projects of all sizes and locations.

Table 8.1 Concern Assessment Rating Matrix

Severity (likelihood of death or serious injury)	**Frequency** (probability of a crash)			
	Frequent	Common	Occasional	Infrequent
Very likely	Serious	Serious	Significant	Moderate
Likely	Serious	Significant	Moderate	Moderate
Unlikely	Significant	Moderate	Minor	Minor
Very unlikely	Moderate	Minor	Minor	Minor

It is recommended that, in addition to the overall rating, the severity and frequency ratings be individually noted for each issue in the road safety audit report to assist the project manager with their decision (see the report template in appendix B).

While all safety concerns should be considered for action, the client or nominated project manager will decide what course of action will be adopted based on the guidance given in this ranking process, and also by considering factors other than safety. As a guide, a suggested action for each concern category is given in table 8.2.

Table 8.2 Concern categories

Concern	Suggested action
Serious	Major safety concern that must be addressed and requires changes to avoid serious safety consequences
Significant	Significant concern that should be addressed and requires changes to avoid serious safety consequences
Moderate	Moderate concern that should be addressed to improve safety
Minor	Minor concern that should be addressed where practical to improve safety

In addition to the ranked safety issues it is appropriate for the road safety audit team to provide additional comments about items that may have a safety implication but lie outside the scope of the road safety audit. A comment may include: items where the safety implications are not yet clear due to insufficient detail for the stage of project; items outside the scope of the audit such as existing issues not impacted by the project; an opportunity for improved safety that is not necessarily linked to the project itself, or drawing/signage issues that should be addressed but are not necessarily safety related. While typically comments do not require a specific recommendation, in some instances suggestions may be given by the auditors.

9. RESPONSES TO REPORTS

Road safety audit team report to the client

For each audit, the road safety audit team will deliver the written report in electronic format directly to the client, incorporating fields for the tracking of responses. The team will provide hard copies if requested. The report shall be delivered in both a secure signed format as well as an editable format to assist with subsequent responses.

The client refers the audit report to the designer (and/or contractor) and seeks a response to the report's recommendations.

Designer reports to the client

The designer's response to the client will:

- clarify whether they agree or otherwise with each safety audit issue raised in the report and recommend whether each audit recommendation should be adopted
- document the reason for the designer's views (addressing the safety issue raised and not relying on compliance with standards)
- identify the cost and implications of implementing each audit recommendation.

The reasons for suggesting that a road safety audit recommendation is to be rejected should be more detailed than the reasons for accepting it.

Client advises the designer and road safety audit team

It is the client who makes the final decision about whether recommendations are to be adopted. The client may seek independent safety advice. Where a recommendation is not adopted, the reasons should be documented by the client.

In many instances the client and the asset manager will either be the same entity or directly linked. In cases where the client is a third party, such as for a development, then the designer's response should be provided to the asset manager for their comment before the client makes the final decision.

For each audit team recommendation that is accepted, the client shall brief the designer to make the necessary changes and/or additions. As a result of this instruction the designer shall action the approved amendments. The client may ask their safety engineer to comment to aid with this decision.

Decision tracking is an important part of the road safety audit process. A decision tracking table is embedded into the report format at the end of each set of recommendations to be completed by the designer, safety engineer and client (see an example in appendix B). The decision tracking table documents:

- the designer's response
- the client's decision (and in some cases as noted above, the asset manager's comment)
- the action taken.

A copy of the report, including the designer's response to the client and the client's decision on each recommendation, shall be given to the road safety audit team leader as part of the important feedback loop. The road safety audit team leader will disseminate this to team members. **The feedback loop is an essential part of the process so that safety auditors can judge whether their recommendations are considered appropriate.**

If major changes result, the client may consider the need for a further road safety audit.

10. POST-AUDIT FEEDBACK

A key part of maintaining a safe system requires a self-improvement process. Integral to this is the dissemination of knowledge gained either from the road safety audit process or following project construction.

The following actions should be considered to promote the healthy sharing of knowledge within the industry either formally or informally:

- Regularly review previous audit reports to identify recurring issues or issues for industry-wide dissemination.
- Disseminate information relating to road safety audits or road safety generally to the industry by either direct communication with interested parties or a website.
- From the review process identify issues that should be considered for a review of standards or guidelines.

It is also recommended that the safety performance of project sites is monitored following the post-construction audit to verify the effectiveness of decisions made.

APPENDICES

Appendix A: NZTA requirements

The NZTA requirements for receiving funding from the NLTP are specified in the planning and investment knowledge base – www.pikb.co.nz. The requirements for road safety audits are specified in the section 'Preparing a transport programme for input to the RLTP and developing activities for funding approval – general guidance'.

As at May 2013 this guidance states:

> **Safety audits**
>
> The NZTA requires that a safety audit procedure must be applied to the development of any improvement or renewal activity that involves vehicular traffic, and/or walking and/or cycling, proposed for funding assistance from the NLTP (National Land Transport Programme adopted by the NZTA under section 19 of the LTMA, as from time to time amended or varied). It does not apply to auditing of the existing network or specialist applications, such as traffic control at roadwork sites.
>
> Safety audits must be undertaken at key stages of a project's development. The latest audit report and the project manager's response to issues are to be attached to any Transport Investment Online funding application.
>
> If the project manager considers there is justification for not conducting a safety audit at a particular stage, then they must complete an exemption declaration for that stage, keep it on file for audit purposes and attach it to any Transport Investment Online funding application.

Please note this guidance is subject to change so for the latest requirements always check the knowledge base.

Appendix B: Example safety audit report

The following pages show an example of a road safety audit report.

A Word template is available on the NZTA's website at www.nzta.govt.nz/resources/road-safety-audit-procedures/

NZTA

STATE HIGHWAY EXPRESSWAY PROJECT

PRELIMINARY DESIGN STAGE Road Safety Audit

Safety Audit Report

Date: December 2012

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Appendix A: Audit Drawings

1. Background

1.1 Safety Audit Procedure

A road safety audit is a term used internationally to describe an independent review of a future road project to identify any safety concerns that may affect the safety performance. The audit team considers the safety of all road users and qualitatively reports on road safety issues or opportunities for safety improvement.

A road safety audit is therefore a formal examination of a road project, or any type of project which affects road users (including cyclists, pedestrians, mobility impaired etc), carried out by an independent competent team who identify and document road safety concerns.

A road safety audit is intended to help deliver a safe road system and is not a review of compliance with standards.

The primary objective of a road safety audit is to deliver a project that achieves an outcome consistent with Safer Journeys and the Safe System approach, that is, minimisation of death and serious injury. The road safety audit is a safety review used to identify all areas of a project that are inconsistent with a safe system and bring those concerns to the attention of the client in order that the client can make a value judgement as to appropriate action(s) based on the risk guidance provided by the safety audit team.

The key objective of a road safety audit is summarised as:

> *To deliver completed projects that contribute towards a safe road system that is increasingly free of death and serious injury by identifying and ranking potential safety concerns for all road users and others affected by a road project*.

A road safety audit should desirably be undertaken at project milestones such as:

- ☐ Concept Stage (part of Business Case);
- ☐ Scheme or Preliminary Design Stage (part of Pre-Implementation);
- ☐ Detailed Design Stage (Pre-implementation / Implementation); and
- ☐ Pre-Opening / Post-Construction Stage (Implementation / Post-Implementation).

A road safety audit is not intended as a technical or financial audit and does not substitute for a design check on standards or guidelines. Any recommended treatment of an identified safety concern is intended to be indicative only, and to focus the designer on the type of improvements that might be appropriate. It is not intended to be prescriptive and other ways of improving the road safety or operational problems identified should also be considered.

In accordance with the procedures set down in the "*NZTA Road Safety Audit Procedures for Projects Guideline",* (dated…..)", the audit report should be submitted to the client who will instruct the designer to respond. The designer should consider the report and comment to the client on each of any concerns identified, including their cost implications where appropriate, and make a recommendation to either accept or reject the audit report recommendation.

For each audit team recommendation that is accepted, the client shall make the final decision and brief the designer to make the necessary changes and/or additions. As a result of this instruction the designer shall action the approved amendments. The client may involve a safety engineer to provide commentary to aid with the decision.

Decision tracking is an important part of the road safety audit process. A decision tracking table is embedded into the report format at the end of each set of recommendations to be completed by the designer, safety engineer and client for each issue documenting the designer response, client decision (and asset manager's comments in the case where the client and asset manager are not one and the same) and action taken.

A copy of the report including the designer's response to the client and the client's decision on each recommendation shall be given to the road safety audit team leader as part of the important feedback loop. The road safety audit team leader will disseminate this to team members.

1.2 The Safety Audit Team

The road safety audit was carried out in accordance with the "*NZTA Road Safety Audit Procedure for Projects Guideline",* (dated…….), by

- ☐ Name, Position, Company;
- ☐ Name, Position, Company; and
- ☐ Name, Position, Company.

The Safety Audit Team (SAT) met at the client offices, sometown to review the drawings on some date. The designer's representative A Designer briefed the safety audit team on the project and clarified the scope of the audit. A site inspection was subsequently undertaken on a date.

An exit meeting was held with A designer and P Manager on a date.

1.3 Report Format

The potential road safety problems identified have been ranked as follows:-

The expected crash frequency is qualitatively assessed on the basis of expected exposure (how many road users will be exposed to a safety issue) and the likelihood of a crash resulting from the presence of the issue. The severity of a crash outcome is qualitatively assessed on the basis of factors such as expected speeds, type of collision, and type of vehicle involved.

Reference to historic crash rates or other research for similar elements of projects, or projects as a whole, have been drawn on where appropriate to assist in understanding the likely crash types, frequency and likely severity that may result from a particular concern.

The frequency and severity ratings are used together to develop a combined qualitative ranking for each safety issue using the Concern Assessment Rating Matrix in Table 1 below. The qualitative assessment requires professional judgement and a wide range of experience in projects of all sizes and locations.

Severity (Likelihood of Death or Serious Injury Consequence)	Frequency (Probability of a Crash)			
	Frequent	**Common**	**Occasional**	**Infrequent**
Very Likely	Serious	Serious	Significant	Moderate
Likely	Serious	Significant	Moderate	Moderate
Unlikely	Significant	Moderate	Minor	Minor
Very Unlikely	Moderate	Minor	Minor	Minor

Table 1: Concern Assessment Rating Matrix

While all safety concerns should be considered for action, the client or nominated project manager will make the decision as to what course of action will be adopted based on the guidance given in this ranking process with consideration to factors other than safety alone. As a guide a suggested action for each concern category is given in Table 2 below.

CONCERN	Suggested Action
Serious	A major safety concern that must be addressed and requires changes to avoid serious safety consequence.
Significant	Significant concern that should be addressed and requires changes to avoid serious safety consequences
Moderate	Moderate concern that should be addressed to improve safety
Minor	Minor concern that should be addressed where practical to improve safety.

Table 2: Risk Categories

In addition to the ranked safety issues it is appropriate for the safety audit team to provide additional comments with respect to items that may have a safety implication but lie outside the scope of the safety audit. A comment may include items where the safety implications are not yet clear due to insufficient detail for the stage of project, items outside the scope of the audit such as existing issues not impacted by the project or an opportunity for improved safety but not necessarily linked to the project itself. While typically comments do not require a specific recommendation, in some instances suggestions may be given by the auditors.

1.4 Scope of Audit

This audit is a Preliminary Design Stage Safety Audit of SH 1001 Expressway drawings produced by ABC Consultants on behalf of NZTA.

A previous Road Safety Audit was carried out on earlier scheme stage drawings for the project.

1.5 Documents Provided

The SAT has been provided with the following documents for this audit:

- ☐ Preliminary Design Drawings, ABC Consultants, numbered 123 to 456 and dated DATE as appended.
- ☐ Copy of previous audit report incorporating responses and client decision.

Also provided for background information only:

- ☐ Expressway Section Preliminary Design Report
- ☐ Traffic Modelling Report

1.6 Disclaimer

The findings and recommendations in this report are based on an examination of available relevant plans, the specified road and its environs, and the opinions of the SAT. However, it must be recognised that eliminating safety concerns cannot be guaranteed since no road can be regarded as absolutely safe and no warranty is implied that all safety issues have been identified in this report. Safety audits do not constitute a design review nor an assessment of standards with respect to engineering or planning documents.

Readers are urged to seek specific technical advice on matters raised and not rely solely on the report.

While every effort has been made to ensure the accuracy of the report, it is made available on the basis that anyone relying on it does so at their own risk without any liability to the safety audit team or their organisations.

1.7 Project Description

The SH 1001 Expressway is a 10km length of expressway which links existing sections of expressway from nowhere to somewhere.

A 110km/h design speed has been provided throughout and the steepest grade is 5.0% with horizontal curves of 900m minimum radius.

Two grade-separated interchanges are proposed, one at each end of the project and all local road crossings are grade-separated.

The changes to the design since the previous scheme stage audit were described to the audit team at the briefing as:

- ☐ Incorporation of a safe system approach including safety barriers on each shoulder and the median.

No departures from the RONS standards were noted.

2. Safety Audit Findings

2.1 Main Alignment

2.1.1 Adjacent Local Road – Headlights **Moderate**

Adjacent Road is proposed to be re-aligned and follow the mainline over a distance of approximately 600m which has the potential for headlights from any vehicles on the side road at night to confuse or blind oncoming traffic. Even in daylight hours some form of physical separation of these facilities is recommended to avoid driver confusion in the form of a raised berm to provide backdrop to the main alignment.

The designers have advised that it is intended to include a barrier and screening with landscaping in the detailed design yet to be completed.

Recommendation:

Provide a physical separation between Adjacent Road and the mainline, such as a raised berm, and if headlights are a potential conflict with the mainline then provide screening.

Frequency Rating:	**Infrequent**	*Severity Rating*:	**Likely**

Designer Response: *Agree with audit recommendation that a visual barrier is required to provide a backdrop to the main alignment and provide screening of vehicles on Adjacent Road. As long as the vegetation or other screen is effective then we propose that these be acceptable solutions. The expressway left hand edge safe system barrier provides physical separation and curve backdrop.*

Safety Engineer: *Agree with designer*

Client Decision: *Agree with designer*

Action Taken: *Changes implemented as per Client Decision and has been included as a requirement in the detailed design.*

2.1.2 Long "Steep" Grades **Minor**

A long grade of 5.2% over a length of 1500m is proposed. This long grade will slow heavy vehicles and result in a speed differential between the slowest heavy vehicles and a faster car. It is recognised that newer heavy vehicles and unladen heavy vehicles are capable of maintaining higher speeds which means that frequently the heavy vehicles will themselves be overtaking the slower vehicles. These slower vehicles will reduce the level of service on the uphill road section with a corresponding increase in frustration of following drivers and potentially leading to erratic driver behaviour i.e. potential for fast lane changing due to high speed differential.

Recommendation:

Assess the effect the long grade on the level of service and associated safety ramifications based on the expected volume of heavy vehicles and consider the need for a crawler lane.

Frequency Rating:	**Occasional**	*Severity Rating*:	**Unlikely**

Designer Response: *Proposed uphill gradients and lengths are longer than desirable and will affect truck speeds. However, due to traffic volumes being relatively modest, there are no capacity issues. No crawler lanes are proposed.*

Safety Engineer: *Agree with designer*

Client Decision: *Agree with designer*

Action Taken: *No changes to design required.*

2.1.3 Accesses off Mainline **Moderate**

A potential access and/or maintenance vehicle pull off has been identified directly off the mainline, namely at xxxm to the Random Scenic Reserve. Drivers will not be anticipating any vehicles pulling out from the shoulder in this high speed expressway environment and no direct access is recommended to the mainline at any point along the alignment. It also requires a break in the otherwise nearly continuous roadside barrier which is a safety concern as it exposes traffic to potential roadside hazards.

Recommendation:

If access to the Random Reserve is required then provide access from the local road network as opposed to the expressway.

Frequency Rating:	**Occasional**	*Severity Rating*:	**Likely**

Designer Response: *A commitment to provide access to the reserve for the purposes of pest control has been made in correspondence. Use of this access by the public will not be permitted. Alternative access is not practical. The access will be used very infrequently and operational restrictions could be applied to ensure safe use. We recommend that safe use of the access be addressed in the Asset Owners Manual.*

Safety Engineer: *Agree with designer*

Client Decision: *Agree with designer*

Action Taken: *Recommended forwarded to asset owner.*

2.2 Cross-Section

2.2.1 Cyclist Provisions **Moderate**

Cyclists are noted to be specifically provided for on adjacent sections of highway and it is understood they may also be permitted to use this section. However, this will be a high speed expressway and ideally cyclists would not be permitted on the expressway where they are at risk from the traffic and in particular fast moving heavy vehicles. Cyclists are vulnerable users in this environment.

For this particular section of the expressway, the old alignment will provide a suitable lower volume alternative to the expressway and it is recommended that consideration be given to discouraging general use of the expressway as a cyclist route which could be achieved by appropriate signage at each end of the section, directing cyclists to use the off-expressway routes. While this would not completely remove the potential for cyclist movement along the main line, it may minimise the use of the main line to those unfamiliar with the area.

Recommendation:

Consider provision of cycle routes separate from the expressway for the full length of the section with safe and appropriately designed and signed entry and exit points.

Frequency Rating: **Infrequent** *Severity Rating*: **Very Likely**

Designer Response: *Cyclists may use this section of the expressway as with any other. Banning them would require a change in NZTA policy and in this case the off-expressway route is obvious and easy to find using the interchange guide signs without the need for additional signs specifically for cyclists.*

Standard provisions for crossing interchange ramps will be included for those cyclists who choose to use the expressway.

Safety Engineer: *Additional signage would reinforce the desired route for cyclists and should be considered.*

Client Decision: *Include additional direction signage.*

Action Taken: *Additional signage has been included in contract requirements.*

2.2.2 Wire Rope/Rigid Barrier Transition **Comment**

Where wire rope barrier is transitioned to rigid barrier the wire rope barrier passes in front of the rigid barrier nose and no details were available for this stage of safety audit. The wire rope barrier system adopted will need to be designed to ensure its deflection is within the available space in front of the rigid barrier.

Frequency Rating:	**NA**	*Severity Rating*:	**NA**

Designer Response: *Agree*

Safety Engineer: *Agree*

Client Decision: *Agree*

Action Taken: *Transition design is included as a requirement of detailed design.*

2.3 Interchanges

2.3.1 Eastern Interchange - Interchange Spacing **Significant**

The proposed eastern interchange is less than 2.0km from the Other interchange to the north making the distance between ramp tapers estimated at around 1 km. Ideally interchange spacing in a rural setting should be significantly greater to ensure that driver decisions, lane changes and associated signage can be safely accommodated.

While ideally the spacing should be increased, it may be possible to demonstrate the safety of the proposed layout by way of a study of the relative traffic volumes and likely weaving movements between these two interchanges to understand whether there are any safety issues with the proposed spacing.

Recommendation:

Consider increasing the spacing between interchanges.

Frequency Rating:	**Common**	*Severity Rating*:	**Likely**

Designer Response: *Traffic weaving behaviour has been studied using modelling and the outcomes deemed acceptable by NZTA without requiring changes to the project.*

Safety Engineer: *Need to record evidence of modelling.*

Client Decision: *Agree with designer. Documentation of modelling to be provided.*

Action Taken: *Modelling documentation forwarded to NZTA on xx date.*

2.3.2 Northern Interchange – Southbound On-Ramp **Minor**

The suitability of the northbound on-ramp length is interdependent on the final ramp gradients yet to be designed. The preliminary design indicates the on-ramp length may be barely sufficient for a vehicle and particularly a heavy vehicle to comfortably reach the speed of the adjacent through traffic. There is a need to check the length of ramp is suitable for the final ramp grades adopted, the design vehicle and the expected speeds of traffic.

Recommendation:

Consider lengthening the northern interchange southbound on-ramp to provide adequate space for heavy vehicles to accelerate to the speed of adjacent through traffic and use standard merge taper layouts.

Frequency Rating: **Occasional** *Severity Rating*: **Unlikely**

Designer Response: *The on-ramp length illustrated in the design is about 250m measured from roundabout to entry ramp nose. Given the relatively low traffic volumes on the ramp and given that an increase in ramp length will impact on the width of the bridge, the ramp length could be considered by NZTA to be adequate*

Safety Engineer: *Consider the safety benefits of lengthening the ramp.*

Client Decision: *Designer to provide cost/benefit analysis for extension of the ramp.*

Action Taken: *yet to be completed.*

2.3.3 Local Road Noise Wall **Moderate**

A noise wall is proposed on Local Road RHS over distance 100 – 200m which appears to be very close to the traffic lane although difficult to ascertain with the given information. The location of the noise wall may adversely affect the forward sight distance on Local Road and the property accesses at xxm. The detailed design of the noise wall will need to consider an offset to the traffic lane to ensure that both forward sight distance and access sight distance is appropriate to the prevailing speeds of vehicles.

Recommendation:

Consider offsetting the noise wall to provide adequate forward sight distance and sight distance for the accesses.

Frequency Rating:	**Occasional**	*Severity Rating*:	**Likely**

Designer Response: *Agree*

Safety Engineer: *Agree with designer*

Client Decision: *Agree with designer*

Action Taken: *Changes implemented as per Client Decision.*

2.3.4 Pedestrians on Structures **Significant**

None of the local road structures over the expressway include provision for pedestrians. While the SAT are not aware of any significant numbers of pedestrians on these routes, there is the potential for pedestrian demand at Local Road overbridge where there are a number of property accesses on each side of the bridge which may generate a demand.

With no facilities, the pedestrians would be forced to share the carriageway with vehicular traffic in the vicinity of limited sight lines due to the vertical crest curves making these road users particularly vulnerable.

Recommendation:

Consider provision of pedestrian facilities on all bridge structures.

Frequency Rating:	**Occasional**	*Severity Rating*:	**Very Likely**

Designer Response: *Given the low pedestrian demand we do not agree that this is a significant safety issue. Standards meet district requirements agreed for this project. Visibility to pedestrians will be excellent.*

Safety Engineer: *Need verification as to actual pedestrian demands.*

Client Decision: *Agree with designer subject to documentation of pedestrian demands*

Action Taken: *No changes required (pedestrian data has been supplied)*

3. Audit Statement

We certify that we have used the available plans, and have examined the specified roads and their environment, to identify features of the project we have been asked to look at that could be changed, removed or modified in order to improve safety. The problems identified have been noted in this report.

Signed:…….. Date:
Name, Qualification
Position, Company

Signed:..... Date:
Name, Qualification
Position, Company

Signed:……. Date:
Name, Qualification
Position, Company

Designer: *Name…… Position……..*

Signature…….. Date…….

Safety Engineer: *Name…… Position……..*

Signature…….. Date…….

Project Manager: *Name…… Position……..*

Signature…….. Date…….

Action Completed: *Name…… Position……..*

Signature…….. Date…….

Project Manager to distribute audit report incorporating decision to designer, Safety Audit Team Leader, Safety Engineer and project file. Date:……..

Appendix A

Audit Drawings

Appendix C: Exemption form

Road Safety Audit Exemption Form

NZ TRANSPORT AGENCY
WAKA KOTAHI

File reference	Example
Project name	Road Rehabilitation
Project stage	Design
RCA	Auditville Council

Brief project description and location:

Pavement reconstruction of 2km of Valley Road (from SH 72 intersection to Coopers Lane) in Auditville.

Exemption rationale:

Pavement works only, with no change in road geometrics, width, traffic facilities, streetscape or traffic movements.

Declaration:

Having checked the above project with reference to the relevant procedures as laid down in Road Safety Audit Procedures for Projects - Guidelines, 2013. I consider that the proposals will not have an adverse effect on the safety of road users over a significant period. Therefore I consider that an independent road safety audit is not required for this stage.

Recommended by (project manager):		**Endorsed by (safety engineer):**	
Name	Jimmy Tarmac	Name	Fergus Brodie
Position	Asset Manager Auditville Council	Position	Senior Safety Engineer, Auditville Council
Signature		Signature	
Date	xx/xx/xxxx	Date	xx/xx/xxxx

Appendix D: Road safety audit brief – checklist

INFORMATION DESIRABLE FOR EACH STAGE OF ROAD SAFETY AUDIT

Stages 1 and 2: Concept/scheme/preliminary design

- Scheme assessment report covering purpose of the project, problem description, scope of the work, preliminary design philosophy, project description, and any anticipated departures from standards.
- Location plan.
- General arrangement drawings.
- Crash and traffic flow data (current and projected).

Stage 3: Detailed design

- Design report covering purpose of the project, scope of the work, design philosophy, design description, background information, and any departures from standards.
- Copies of stages 1 and/or stage 2 road safety audit reports and completed decision tracking forms.
- Detailed drawings showing (as applicable):
  - Layout
  - Long sections
  - Typical and detailed cross sections
  - Pavements and kerbs
  - Signs and markings
  - Traffic signals
  - Lighting
  - Barriers
  - Drainage
  - Structures
  - Landscaping.
- Crash and traffic flow data (current and projected).

Stage 4: Pre-opening/post-construction

- Design report covering purpose of the project, scope of the work, design philosophy, design description, background information, and any departures from standards.
- Copies of stage 3 road safety audit report and completed decision tracking form.
- Location plan and key layout drawings including signs, markings, signals, lighting, barriers, landscaping.

Appendix E: High-level road safety audit – checklists

Stage 1: Feasibility/concept

General

- Consistency of standards with the adjacent road network, especially at tie-ins
- Secondary effects on surrounding road network
- Major generators of traffic
- Type and degree of access to property and developments
- Potential for serious crashes (side impact, head-on, hit hazards)
- Safe accommodation for vulnerable road users (pedestrians and cyclists)
- Relative safety performance between options being considered
- Staging requirements

Design issues

- Design standards
- Design speed
- Design volume and traffic characteristics
- Impact of standard of route on safety (ref design flows and speed)
- Overtaking opportunities
- Consistency of intersection arrangements and access control
- Number of intersections (public and private) re safe access
- Location of intersections and accesses in relation of horizontal and vertical alignments
- Horizontal and vertical alignments consistent with visibility requirements along the route and at intersections/accesses
- Facilities for pedestrians and cyclists

Environmental

- Sunrise/sunset glare, fog, ice, wind conditions

Stage 2: Scheme/preliminary design

General

- Review changes since stage 1 road safety audit
- Departures from standards
- Adjacent developments and major generators of traffic

- Type and degree of access to property and developments
- Potential for serious crashes (side impact, head-on, hit hazards)
- Safe accommodation of vulnerable road users (pedestrians and cyclists)
- Hazard protection/management
- Drainage requirements
- Lighting provision
- Services
- Landscaping
- Emergency vehicles
- Staging of the works
- Ongoing maintenance
- Future widening and/or realignment issues

Design – general

- Design standards
- Roadway layout
- Typical cross sections and issues of cross-section variations
- Traversability of side slopes
- Shoulders and edge treatment
- Concept of road marking and signage for road user perception and guidance
- Facilities for pedestrians and cyclists
- Overtaking facilities and merges
- Property accesses
- Rest areas

Alignment

- Geometry of horizontal and vertical alignments re sight lines, especially where combined
- Readability of the alignment
- Tie in with existing road(s)
- Sight lines obstructed by physical features (including landscaping)
- Location and type of pedestrian crossing facilities

Intersections

- Appropriateness of type of intersection
- Layout

- Minimising conflict points (including private accesses) re crash risk
- Conspicuousness and perception of intersections on all approaches
- Control of approach speed
- Sight lines from side roads and accesses
- Provisions for turning traffic
- Provisions for pedestrians and cyclists to safely cross roads

Special requirements

- Facilities for mobility and visually impaired
- Passenger transport facilities
- Truck tracking and manoeuvring
- Motorcyclists
- Farm equipment and stock movements

Environmental

- Sunrise/sunset glare, fog, ice, wind conditions

Stage 3: Detailed design

(Note: the scope for altering alignment or intersection designs is less extensive at this stage)

General

- Review stage 2 road safety audit and decisions
- Review changes since stage 2 road safety audit
- Adjacent developments and major generators of traffic
- Type and degree of access to property and developments
- Potential for serious crashes (side impact, head-on, hit hazards)
- Safe accommodation of vulnerable road users (pedestrians and cyclists)
- Hazard protection/management
- Surface treatment/skid resistance
- Drainage design
- Lighting design
- Services
- Landscaping
- Emergency management and breakdowns
- Emergency vehicles access

- Staging of the works
- Ongoing maintenance
- Future widening and/or realignment issues

Design – general

- Design standards
- Roadway layout
- Typical cross sections and issues of cross-section variations
- Traversability of side slopes
- Shoulders and edge treatment
- Pavement type (including approaches to intersections and thresholds)
- Kerb types
- Facilities for pedestrians and cyclists
- Overtaking facilities and merges
- Rest areas
- Property accesses

Alignment

- Detail of geometry of horizontal and vertical alignments
- Readability of the alignment
- Tie in with existing road(s)
- Treatment of bridges and culverts
- Sight lines obstructed by physical features (including landscaping)
- Location and type of pedestrian crossing facilities

Intersections

- Layout
- Detailed geometric design
- Minimising conflict points (including private accesses) re crash risk
- Conspicuousness and perception of intersections on all approaches
- Traffic signals design
- Roundabout design
- Control of approach speed
- Sight lines from side roads and accesses
- Provisions for turning traffic

- Provisions for pedestrians and cyclists to safely cross roads

Signs and markings

- Regulatory and warning signage
- Direction/guidance signage
- Locations of signs without obscuring visibility
- Pavement marking and delineation
- Consistency of signing and marking information
- Threshold signage/marking

Physical objects

- Placement of all poles
- Median and roadside barriers

Landscaping

- Location of trees re potential collisions
- Choice of plant species
- Ability to maintain planted areas safely

Special requirements

- Facilities for mobility and visually impaired
- Passenger transport facilities
- Truck tracking and manoeuvring
- Motorcyclists
- Farm equipment and stock movements

Environmental

- Sunrise/sunset glare, fog, ice, wind conditions

Stage 4: Post-construction

General

- Review stage 3 road safety audit and decisions in order to allow for any design changes
- Inspect from the viewpoint of the different road users:
  - Private vehicle drivers
  - Truck drivers
  - Passenger transport operators
  - Pedestrians

  - Cyclists
  - Mobility and visually impaired
- Inspect in both daylight and darkness
- Checklist for stage 3 provides an appropriate reminder

Additional matters

- Visibility of markings including contrast with surface treatment
- Visibility of signs and signals re vegetation and other objects
- Readability of alignment and intersections
- Conspicuousness of intersections
- Visibility at all potential points of conflict
- Protection of hazards