I T S

Is Local Government Addressing The Implementation Issues In Road Safety Audit?

by

Peter Daly
Colin Morgan
Phillip Jordan

December 1998

INSTITUTE OF TRANSPORT STUDIES

The Australian Key Centre
in Transport Management

The University of Sydney
and Monash University

NUMBER:	Working Paper ITS-WP-98-21
TITLE:	Is Local Government Addressing the Implementation Issues in Road Safety Audit?

ABSTRACT: This paper examines some of the issues facing local government in the implementation of the road safety audit process. RSA's have been accepted and implemented by state road authorities in Australia but there remains a question mark over their acceptance by local government. Local government implementation is essential if the benefits of RSA are to be maximised. Little research has been done into RSA in Victorian municipalities, and it is this area that this paper examines. Much of the literature currently available suggests that RSA's have great potential to provide benefits both in terms of safety and reduced whole-of-life costs. However, there is a perception amongst many that there is a lack of enthusiasm for RSA amongst local government in Australia. This paper examines the degree and effectiveness of RSA implementation by examining some of the issues of concern. It presents the results of a pilot study of RSA in local government authorities throughout Victoria and makes a number of recommendations to improve the implementation rate and effectiveness of road safety audit in local government.

AUTHOR: Peter Daly
Colin Morgan
Phillip Jordan

INTRODUCTION

For a number of years, authorities have focussed on reactive strategies such as 'blackspot' programs to increase safety. Road Safety Audit (RSA) is a concerted attempt to encourage the safety aspects of projects to be reviewed during the design process. Since its introduction in the UK in the 1980s, Road Safety Audit has been used in an increasing number of countries as organisations recognise the impact it can have on the number and severity of accidents.

This paper aims to explore some of the issues that local government in Australia is currently facing and to assess the level of implementation in Victorian local government authorities. The paper sets the scene by providing a brief overview of the development of RSA internationally.

Australia

Development of RSA in Australia began in 1990 after a Road Hazards Conference in NSW where representatives from the UK outlined their existing RSA program. AUSTROADS began weighing up the benefits and costs of RSA in 1992. They came to the conclusion that RSA had the potential to provide real safety benefits for Australian road users (Jordan, 1994). Consequently, the initial guidelines for RSA were released by AUSTROADS in 1994 (AUSTROADS, 1994) and RSA is now in place in each state road authority. The AUSTROADS Guidelines have provided the basis for road authorities in many other countries but at present, local government in Victoria is under no obligation to implement RSA on their projects.

International implementation of RSA

The concept of RSA originated in the United Kingdom in the 1980s (ITE 1995), but it has only been in the 1990's that various countries have actively implemented the principles of RSA[1]. In response to a national aim to reduce road casualties by one third by the year 2000, the United Kingdom made RSA mandatory from April 1991 for all national trunk roads and motorways (Belcher, 1998).

In New Zealand, Transit New Zealand began pilot RSA projects in 1992 and from 1993 RSA was made mandatory for 20% of state highway projects per year (ITE 1995). However, RSA in New Zealand Local government is not mandatory.

In the United States, 14 states will pilot RSA during 1998 and 1999 (Schertz 1998). Although the United States has yet to formally introduce RSA, many of its comprehensive and coordinated road safety programs are said to have "strong undertones of this concept" (ITE 1995).

In Malaysia, the Public Works Department released RSA Guidelines in 1997. These guidelines recognise the part RSA has to play in the overall road safety strategy in Malaysia, with a policy adopted which "requires RSA to be carried out on all new road projects and that RSA be systematically done on all Federal Routes throughout Malaysia" (Public Works Department ,1997).

In South Africa, RSA Guidelines were released by the Department of Transport for comment and use in March 1997. These guidelines were aimed at impacting the increasing rate of death and serious injury on South African roads. RSA is incorporated in South Africa's Traffic Operations Management System (TOMS) which was due for implementation in September 1997 (Department of Transport South Africa, 1997).

In Greece, the Egnatia Road project is being audited, and a RSA manual is intended to be prepared by July 1998 (Kanellaidis 1998). In Singapore, RSA has been implemented on some projects and the road authorities are committed to formulating a RSA procedure best suited for Singapore's needs. The Land Transport Authority in Singapore is increasingly including RSA requirement in turnkey project tender specifications such as the Telok-Blangah semi-expressway (Chor 1998). Denmark has introduced a RSA procedure and the Netherlands, Portugal and Ireland also seem to be taking an interest in RSA (Bulpitt 1998). Developing countries such as Fiji, Nepal and PNG have, with the aid of international agencies and specialist institutes, also set up RSA processes (Hoque et al 1998).

SOME IMPORTANT ISSUES IN RSA

There are many issues of importance to RSA due to both it's infancy and rapid rate of growth internationally. Issues that are of significance under one socioeconomic environment or national culture are less important under another. Morgan (1998) examines challenges of RSA in varying global, organisational, professional, government, regional and national cultures and makes the remark:

"Thank goodness we in Australia have only six states and not fifty!" (Morgan 1998 page 4).

This section examines some of the issues commonly encountered, with an emphasis on those directly relevant to local government in Australia.

When should Road Safety Audit be implemented?

It is widely recognised both in Britain and Australia that for major projects, it is preferable for RSA to be implemented at each of the four main design stages, whilst for smaller projects RSA should be implemented at agreed stages (Jordan & Barton 1992). There is also the opportunity to conduct an audit on existing roads where necessary. Auditing should begin as early as is practically possible in the design process so that rectification of any safety problems can be done with minimal cost.

The Institute of Highways and Transportation in Britain suggests a four stage audit process (feasibility, preliminary design, detail design and pre-opening), however feasibility audits are not always required by the Department of Transport in Britain because road safety is already considered through public consultation at the strategic and conceptual stages of the scheme.

The South African Guidelines recommend four stages (basic planning, detailed design, pre-opening and existing roads) which takes on board the AUSTROADS suggestion of auditing existing roads, but deems an audit at the feasibility stage is unnecessary because those issues

likely to be identified at the feasibility stage "would be noted at the commencement of the preliminary design and therefore identified at this stage" (DoT South Africa 1997).

Both the British and South African audit processes differ from the five stage process the AUSTROADS and Malaysian Guidelines recommend. O'Brien (1997) suggests that this shift away from the strict 5 stages of audit indicates "that there is a need to revise the nomenclature to be more descriptive of actual practice" (O'Brien, 1997 pp 2).

There have also been suggestions that an audit of roadworks is an important next step, however naming this as a 'stage 6' audit may not be appropriate. In fact, the naming of various 'stages' of road safety audit is the subject of current debate. Discussion at the AUSTROADS International Road Safety Audit Forum (May 1998, Melbourne) was divided over whether an international 'standard' naming system should be numerical or descriptive, although it was generally concluded that the numbering of stages can be dispensed with. Whatever the system (if any) is adopted, it is important to note that the prime criteria should be communication of the intent of the audit.

Implementation

The criteria for implementation of different stages of RSA vary considerably between jurisdictions. For example, in Australia:

- In 1995, NSW audited 20 construction projects within each of the road authority's regions and 20% of the existing road system (ITE 1995).
- VicRoads policy is that all projects over $5M are audited at all stages, 20% of projects under $5M are audited at least in one stage, 10% of maintenance works are reviewed and auditing of existing roads occurred on the worst safety performing portions of the network (ARRB TR, 1996).

In Britain, a study of local government in 1993 found that the method used to determine when to implement RSA was haphazard and that there was a lack of guidance in regards to which projects should be audited (County Surveyors Society, 1993). The study recommended that a threshold of project size and type be set, above which a formal RSA was required, and that more guidance for selecting projects for audit be provided. The 1996 Local Authority Survey in New Zealand identified a belief that RSA's were only justified for high cost projects or projects with safety problems (Appleton 1998).

A concern highlighted in the South African Guidelines is that the British and Australian Guidelines make no allowance for overlap in any of the stages. In cases where projects are fast tracked, construction may commence before final approval of the design is given, and may create difficulties in implementing RSA suggestions (DoT South Africa, 1997). The South African Guidelines suggest that RSA may create significant lag times between each stage of planning and execution.

Who performs a Road Safety Audit?

The team performing a RSA is obviously a crucial part of ensuring the full benefits of the process are realised. It is widely recognised that an audit team should have sufficient experience and/or training not just in the RSA field, but also in the wider areas of road

safety engineering, accident investigation and prevention, traffic engineering, road design and behavioural sciences as appropriate to the project being audited. This enables auditors to handle the wide and varied situations that may arise in an audit.

Accreditation of auditors

In Australia at present, a client has no access to a comprehensive list of auditors from which to choose and can not always be sure that an auditor is qualified. The 1997 Adelaide RSA Summit concluded that an accessible, nationally accepted accreditation system for auditors be developed to address these concerns (Jordan & Croft, 1998).

Appleton (ARRB TR, 1996) in addressing the need for a process of qualification of auditors, stated that he is "more interested in bringing people together to share experiences and therefore extend knowledge". The need for this pooling of experiences is also backed by the findings of a survey of Local Government in Britain (County Surveyors Society 1993). These findings also concluded that a lack of specialist auditors and training opportunities will affect the development of RSA. It seems that these two objectives of an accreditation process and the sharing of experiences can and should be conducted side by side.

A process of qualification and accreditation for auditors has yet to be officially put in place in Victoria. In ARRB TR (1996), O'Brien states that a process of qualification is required to prevent RSA being conducted by those with insufficient experience and expertise. The IMEA (Institute of Municipal Engineering Australia) has indicated that it intends undertaking research within each state to determine the most appropriate process of introducing RSA training into each particular state (Barnes-Gillard 1998). Currently Western Australia, South Australia, Victoria, New South Wales and the Northern Territory have provided, or are continuing to provide, training for RSA in some shape or form (Barnes-Gillard 1998). In Victoria, Monash University ran the first RSA training program in 1993, with courses being provided once or twice a year since 1994. South Australia runs a training course which enables the accreditation of auditors in South Australia. It has been noted that in Australia, RSA training lacks co-ordination, and is in need of firm direction at the national level (Jordan & Croft, 1998).

To be an auditor, the minimum required RSA training and experience has been suggested as :

- successful completion of an approved training course,
- a minimum of 5 years experience in road design, traffic engineering or closely related road safety discipline and
- maintenance of current road safety knowledge and experience.

To lead audits (a Senior Road Safety Auditor), it is suggested that in addition to the above, the auditor should:

- have participated in at least 5 road safety audits under the guidance of a senior road safety auditor, with 3 of the 5 audits to be design audits and the another two to be pre-opening or existing road audits.

This system appears to have wide acceptance nationally and increasingly, internationally.

Selection of auditors

The practice of selecting an auditor based on the lowest price is a product of organisational culture and has quite rightly been questioned. The quality of an audit is, amongst other things, a function of those performing it and if the selection of auditors is taking place solely on cost grounds, the quality of the RSA may not be preserved.

As the AUSTROADS Guidelines make clear, the independence of the auditor is paramount if the benefits of RSA are to be maximised for a particular project. RSA provides an avenue for a fresh, unbiased set of eyes to analyse a project for safety issues.

To increase the perceived 'ownership' of audit benefits by the project designers and to minimise delays in the process, it has been suggested that the design team involve the auditor at the beginning of the project (DoT South Africa, 1997). This involvement however must not affect the overall independence of the auditor which is crucial for RSA to be an effective safety tool. Morgan (1995) makes the warning that the auditor should not have his/her judgement affected by a prior involvement with the project.

Whether or not an individual or a team is assigned to a particular audit is also an important issue. This decision basically comes down to the size and complexity of the project to be audited. Obviously for relatively large projects, more auditors may be warranted, and vice versa for smaller projects. However, it is widely agreed that a wide range of skills, experience and perspective's in an audit team is extremely beneficial and should be used where at all possible. The experience in Britain so far suggests that for a feasibility/layout audit, a three-person team is often adequate (ITE 1995), however it is unlikely that this could or should be universally applied.

Who performs a RSA is primarily dependent on the resources available. The AUSTROADS Guidelines set down three basic alternatives for the audit process :

- Audit by a specialist auditor(s) (most preferred option)
- Audit by other road designers (other than those in original design team)
- Audit within original design team (least preferred option)

The challenge that faces local government in Victoria is to provide appropriate audit independence within the resource constraints experienced. Many local governments outsource a significant amount of their traffic and transport engineering services to consultants. Care must be taken to ensure that appropriate rigour is applied within this process to the independence of audits as well as quality issues within the audit process.

Formality of Road Safety Audit

Whilst noting the majority of local governments in Britain were using RSA, the Local Government survey in Britain (County Surveyors Society 1993), also highlighted problems with differing RSA processes. Some audits were found to be detailed and comprehensive with a high level of formality, whilst others were simply conducted as brief checks with little formality. The report suggested that there is no indication that informal audits are any less effective than formal ones, but the survey did recognise the importance of formality in large

projects which affect many users. The survey found that there was concern about the amount of time and degree of formality involved in RSA.

The 1996 Local authority survey in New Zealand also noted lack of time as a concern, and made the point that some Local authorities believed they were implementing RSA when really they were simply performing informal checks or quality control (Appleton 1998).

Closing the audit loop

The monitoring of audited projects after they have been opened is one area which has been greatly neglected to date, perhaps due to the more focussed efforts to see RSA implemented. This monitoring phase is crucial for all involved in the audit process to learn from an audit, and make improvements to the process. Belcher (1998a) suggests that monitoring should take place 1 and 3 years after opening. However monitoring the completion of the audit *process* is potentially more important to the accumulating RSA knowledge-base. There is little evidence that feedback is provided to auditors after the audit report is studied by the commissioning authority. This 'closing of the audit loop' is important so that auditors are aware of the specific design implications and restrictions of their recommendations and the project designers get maximum benefit from understanding the auditors safety concerns. Brisbane (1998) discusses the use of an audit log to keep track of Corrective Action Requests (CAR's) that follow from a RSA. The audit is not 'closed-out' until an assessment of corrective actions has been made by the auditor or another suitably qualified person. This procedure has potential for increasing the final interaction and learning processes of all parties involved in the audit.

Organisational Culture and Commitment to Road Safety Audit

It is unanimously agreed that for RSA to run as smoothly and as effectively as possible, it is imperative that there is both management and staff commitment to the process. At present, the commitment around Australia varies from state to state due to differing road safety requirements and funding levels, as well as differing relationships between the state and local authorities (Barnes-Gillard 1998). The desired rate of RSA adoption by local government in Australia has not been achieved, with the commitment of senior management in local government being questioned (Jordan & Croft 1998). Without organisational commitment, the process will result in the professionalism of those involved in the design and construction of the project being questioned (ITE 1995). One such sign of commitment which is suggested by the British Local Government Survey (County Surveyors Society 1993) is that management include RSA in their safety plans and procedures.

A factor which is more than likely contributing to the slow implementation of RSA by local government is the inherent culture of an organisation. Morgan (1998) makes several interesting and revealing points regarding this issue. He observes that the current global culture (which affects all levels of an organisation) tends towards the downsizing and deskilling of the workforce as well as a competition and efficiency approach. In relation to RSA in Victorian local government , he argues that there is little evidence of a 'top-down' safety culture supported by adequate road safety skills, with many councils neglecting a core component of an essential council function.

The South African Guidelines claim that initial resistance to the RSA process has declined and RSA is now accepted as standard practice in Great Britain, Australia and New Zealand. Whether or not this statement includes local government is unclear. The Local Government survey conducted in Britain in 1993 (County Surveyors Society 1993) lends more substantial support to the claim in the South African Guidelines. However, the pilot survey of local government in Victoria (reported in this paper) does little to support this (Morgan and Daly, 1998).

Benefits and Costs of Road Safety Audit

Due to the relative infancy of RSA, research quantifying benefits and costs resulting from the process is scarce. However, the limited discussion in the literature available highlights a number of possible benefits, both tangible and intangible. Morgan (1995) summarises these benefits as follows:

- reduced chance of accidents on adjacent network,
- reduced accident severity,
- greater road safety awareness amongst designers,
- reduced need for costly remedial work and
- reduced whole-of-life project cost.

Jordan (1994) lists the major costs resulting from RSA as:

- the cost of the audit itself (primarily the time spent by the auditors),
- redesign costs where required and
- possible increased project costs.

There are numerous examples both in Australia and overseas of where RSA has been implemented successfully in a project. These examples provide valuable information on the magnitude of the benefits and costs likely to result from RSA. This is obviously important because RSA will only be implemented if it is shown to provide a net corporate benefit (Morgan 1995). It should be noted however, that at present there is no evaluation system available to quantify the perceived cost effectiveness of RSA. The information on costs and benefits available to date is based on existing RSA's and on estimates (of varying levels of rigour). However Hannah and Chadfield (1998) report on the development of a 'safety performance index' for existing roads in which risk weighting and exposure variables are assigned to enable road authorities to make comparisons on successive audits. Although this is still a somewhat subjective process, it is possible that a hazard probability/severity model could be a useful tool as a more extensive database is collected.

There may be a perception amongst engineers that a RSA is costly in itself, will lead to delays in the design and approval process and result in additional/altered design features which will have an unreasonable effect on the project cost (Jordan & Barton 1992). Experience in Britain and Australia however is proving this perception to be unfounded. Detailed design and pre-opening audits in Britain typically make up about 1% of the total design cost and usually involve only minor adjustments to the design (Jordan & Barton 1992). In Australia, the audit of a new large project at all stages is estimated to add about 1 to 5 per cent to the overall design costs of the project, which in turn is about 0.05% of the

cost of a major project (O'Brien, 1997). Experience to date shows the cost of a RSA to be around $2000 per stage for a large project, and $1000 per stage for a small project. Considering that design costs for large projects (say $5 million) can be as high as $50,000-$100,000, such small additional costs are insignificant.

Large scheme audits in Britain are said to cost more than twice this (Sabey, 1993 in Jordan, 1994). A survey of Local authorities in Britain has also found that additional construction costs implemented as a result of an audit report made up between 0.24% to 3.36% of the total construction costs, with smaller projects having a greater proportional cost for re-design and construction (Crafter, 1995 in DoT South Africa, 1997). Designers in Britain are also incorporating road safety audit time allowance in the overall project time budget, with the resulting increase in the perception of time efficiency (Jordan & Barton 1992). However, a 1996 survey of local authorities in New Zealand found that half of the respondents not conducting audits cited (amongst other factors) the costs of audits as a reason for not implementing RSA (Appleton 1998a).

Concern that auditors would not take into account the cost of the treatments they recommend has been eased since auditors recognise that their credibility and future employment is dependent on the realism of their recommendations (Jordan, 1994).

Direct benefits are naturally more difficult to quantify due to the infancy of RSA. Most of the findings on the benefits of RSA have qualifying statements attached to them. However, an isolated finding from Scotland (Jordan, 1994) predicts that as a result of RSA, one third of future accidents at road improvements are preventable. It suggests that a 1% accident saving is possible across the country at a very low resource cost. Other research in Britain has suggested that there is the potential for accidents on individual projects to be cut by one third as a result of RSA (ITE 1995).

Another potential benefit of RSA has been the heightened safety awareness of designers. In Britain, safety is now "an explicit factor in all levels of decision making, rather than an implicit consideration as previously" (Jordan & Barton 1992). This is supported by the British Local Government survey (County Surveyors Society 1993) report released in 1993 which observed that there was sufficient evidence to suggest that RSA was having a favourable safety impact on the design of projects. This response was not obvious in a 1996 survey of RSA implementation by New Zealand Local Authorities (Transfund, 1997).

Benefits in less developed countries are potentially much higher given reported fatality rates up to 75 times higher than Western countries and 10-20% growth rate of the vehicle fleet per annum (Hoque et al, 1998). In Thailand, Taneerananon believes that the "occurrence of accidents is almost a pre-requisite for remedial actions" (Taneerananon, P. et al. 1996). The use of the AUSTROADS Guidelines to audit two sites in Thailand and point out a multitude of design issues which may cause accidents (Taneerananon, P. et al. 1996), highlights the potential effectiveness RSA could have in reducing the high accident rate in this location. It is often difficult for less developed countries to begin the implementation of RSA as they lack the national vision, legislation, policies and expertise to start (Hoque et al, 1998). The importation of knowledge from countries with established expertise to conduct audits is increasingly widespread but takes a short-term view. Moves towards self-sufficiency by undertaking training programs to build on local knowledge and expertise (eg. Daly and Ogden, 1996) is a more sustainable solution.

There seems to be circumstantial evidence both in Australia and abroad to confirm the intuitive supposition that RSA is a cost-effective tool to increase road safety. Australia, Britain and New Zealand have all shown that proper implementation of the RSA process can result in benefit cost ratios of greater than 3:1(ITE 1995) and possibly up to 20:1 (Hoque et al, 1998). However, a rigorous evaluation system for quantifying benefits has yet to be formulated and research in this area deserves further attention.

Road safety auditing doesn't require enormous resources. Local government is often hesitant to commit due to the perception of high cost when often this is unfounded. The Local Government survey in Britain (County Surveyors Society 1993) highlighted the need for more resources to be directed into RSA. It concludes that without appropriate resources, the full impact of RSA will not be realised, with other important safety work being neglected by staff to concentrate more on RSA. The 1996 local authority survey in New Zealand supports this with half of the respondents not performing audits, citing (amongst other factors) lack of staff resources for implementation (Appleton 1998).

The slow adoption of RSA by local government in Australia is thought by some to be partially due to poor marketing of RSA's benefits. This poor marketing may in turn be due to the inability to quantify and demonstrate its benefits.

CASE STUDY - IMPLEMENTATION OF RSA BY VICTORIAN LOCAL GOVERNMENT

The above discussion highlights issues likely to be important to local government and demonstrates the understandable paucity of research in this emerging field. A substantial proportion of the effort to introduce, establish and review RSA to date has been at state road authority level.

Recent formal examination of RSA implementation in local government has only been undertaken in New Zealand (Transfund, 1997). Assessment in other countries has so far been restricted to experiences of those working in or with local authorities and speculation.

The AUSTROADS Guidelines for RSA were published in 1994. They were aimed primarily at encouraging local government to undertake RSA in the supposition that state road authorities had higher resource levels and were better able to develop their own procedures. It is now approximately 4 years since they were released and appropriate that the use of RSA by local government be assessed.

This section of the paper summarises some of the main findings of a study undertaken by the Department of Civil Engineering at Monash University (Morgan and Daly, 1998) into the implementation of RSA in Victorian local government .

Survey instrument

A mail-out, mail-back self completion questionnaire was sent to 50 local government authorities in Victoria in early April 1998. The survey was accompanied by a covering

letter on Monash letterhead, which amongst other things, made it clear to respondents that confidentiality would be assured and individual responses would not be identified. A stamp-addressed envelope was also included for return of the survey.

The survey was distributed with four main objectives in mind. These were:

- To determine the degree of RSA implementation in local government throughout Victoria.
- To determine the effectiveness of RSA implementation in local government throughout Victoria.
- To ascertain reasons for any lagging or ineffective implementation of RSA in local government throughout Victoria.
- To provide sufficient information to allow the provision of recommendations which will encourage the effective implementation of RSA in local government throughout Victoria.

The survey was 3 pages long and contained a combination of open ended questions (requiring the respondent to answer in their own words) and structured questions (pre-specifying a set of response alternatives). Open ended questions were provided to allow some additional feedback which would not have been possible with structured questions alone. It was made clear in the survey that if a respondent's local government was not implementing RSA, they were only required to answer certain questions.

Results

The final number of surveys returned was 29 (out of 50 sent out), which equates to 58% response rate. Although the response rate for the survey was reasonable and those returned were almost always completed, the given sample size per response category was sometimes relatively small due to the distribution of answers.

It should be noted that because 21 surveys were not returned by the deadline, the survey results may be influenced by non-response bias. That is, those performing RSA may not have felt the need to respond to the survey and those who are not using or are unconvinced about RSA may have had more incentive to reply. This could result in a distortion of the results and understate the level of RSA. Alternatively, those performing RSA may have had greater incentive to respond than those not implementing it, with a potential distortion indicating greater implementation of RSA than there is in reality. The non-correction of potential bias is explained by the authors in that the survey formed part of a final year undergraduate research project (Morgan and Daly, 1998) with an associated tightly constrained time of completion. However, the survey was designed as a pilot survey and as such achieved it's purpose. The summary of results provided in this section are still likely to be indicative of the general situation existing in local government based on informal clarification sessions with respondents and non-respondents.

It was found that where multiple options were provided for an answer (ie. multiple choice), some respondents chose more than one response. This was also experienced in the 1997 Transfund survey of the uptake of RSA by local authorities in New Zealand which had similar objectives and methodology. All the responses chosen by a respondent for a

particular question were included in the grouped data and any additional comments for each question noted. This should be taken into account when reading the following analysis of results, and a clear distinction should be made between the number of respondents who answered a question, and the number of responses for that question (ie. the number of responses may be greater than the number of respondents for a question).

The remainder of this section discusses responses to a number of questions relevant to this paper.

Proportion of Projects (new and existing) Audited

This question requested an answer from all respondents and asked respondents what percentage of their projects (new and existing) are audited. It was answered by 28 respondents and shows the extent of RSA implementation amongst the respondents. **Figure 1** shows that the majority (17 responses) of municipalities who answered are not implementing RSA. Eleven respondents said there was some degree of RSA implementation, with 9 of these auditing 10% or more of their projects.

Around 60% of Victorian municipalities responding to this survey do not use RSA's and around 40% do at least one audit per project. This is very similar to the levels of safety auditing in New Zealand (Transfund, 1997), where 66% (49 responses) of local authorities were reported as not doing safety audits and 34% (25 responses) auditing projects in at least one stage.
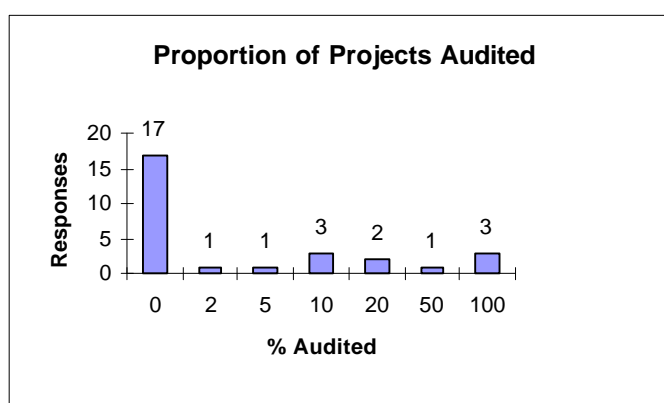

Figure 1: Proportion of projects audited

Of those municipalities in Victoria who do undertake safety audits, there is a significantly lower level of implementation than in New Zealand. Municipalities auditing 50% or more of projects comprise 36% of the sample (compared to 60%, 15 responses in New Zealand) and those auditing less than 50 % comprise 64% of the sample (40%, 10 responses in NZ). Those purporting to audit 100% of projects comprise 27% of the Victorian sample (3 from 11) and 20% of the New Zealand sample (5 from 25). It should again be stressed that as we are dealing with modest samples, small changes to responses appear to be large percentage changes.

Some respondents provided additional information related to this question. One stated that that their municipality doesn't have official RSA's but generally use good design principles learned from attending RSA workshops. Another municipality had taken RSA very seriously, awarding a 3 year contract to a consultant to audit all new projects at more than one stage and on 20 existing sites per year.

Determining Factor in deciding which projects to Audit

An answer for this question was requested only from those performing audits and asked the respondents to select from a list the factor they considered most important when determining which projects are audited. Eight responses were given, with some choosing more than one of the options provided. The results are shown in **Figure 2**.
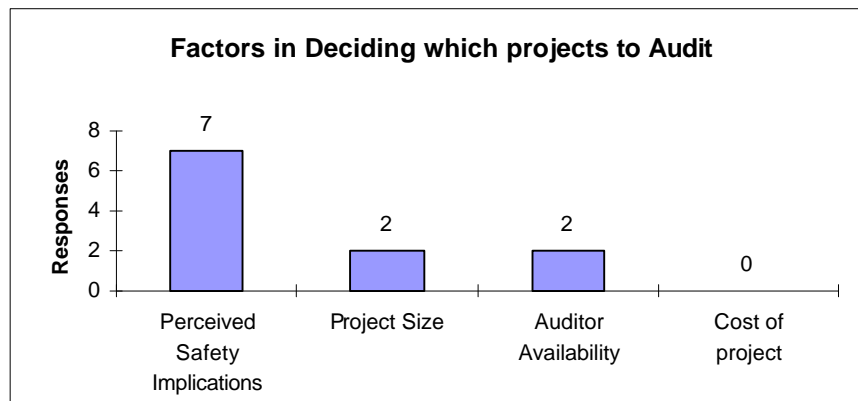
Figure 2: Factors in deciding which projects to audit

These show that the perceived safety implications of a particular project is a key factor in determining which projects to audit. The relatively low response for project size, cost of project and auditor availability should be noted. One respondent observed that often VicRoads request a RSA on externally funded projects, in which case there is little choice but to conduct a RSA.

The NZ study found that 38% (12 responses from 32) of reasons given by the 25 local authorities which undertake RSA's suggest that it is undertaken when there is a safety problem ("projects with a crash history, or for safety reasons"). This compares to 64% (7 from 11 responses) in this study.

The importance of "perceived safety implications" has both positive and negative implications. It is good that local government recognises that safety audit has the potential to increase safety (as this is perhaps the main reason they are doing it) and this is to be encouraged. However, it is necessary that a balance between design audits and existing

road audits is made. The survey reveals that the majority of respondents are carrying out design audits (see later).

The potential for unsafe design to slip through the audit selection process would ideally be minimised. It is unclear what proportion of the sample falls into this category. The ability of the designer/selector to assess the potentially safety and decide whether a project needs to be audited is limited if they do not have audit experience. Preconceived notions of 'safety' and 'unsafety' based on prior experience may be flawed. It is preferable for all projects to be submitted to at least one road safety audit during the design phase.

Who performs the Audit?

This question requested an answer only from those performing audits and asked for a selection of who performs the audit from a list of possible responses. Eleven municipalities gave responses. The results are shown in **Figure 3**.

Figure 3: Person performing road safety audit

It should be noted that some respondents chose more than one response, and therefore different auditors are being used within certain municipalities (eg. specialist(s) within councils for some audits and specialist(s) outside council for other audits).

The use of external specialists appears to be the favoured option with 43% of audits done by consultants. In the NZ survey, 68% of the sample reported input from consultants with consultants alone responsible for 28%. Around 57% of Victorian municipalities make use of internal resources to perform audits, compared to around 72% in the NZ sample.

The most concerning aspect of the Victorian study is the number of respondents using someone within the project design team to perform the audit (3 responses). Although the actual number is low, it points towards an undesirable practice that should be discouraged. The independence of the auditor is a key element in the RSA concept and the use of the project designer to conduct the audit diminishes the independence of the audit considerably. One respondent selected the "other" option and stated that the infrastructure and assets team members performed their audits. A comparison of this with earlier data indicates that 4

out of the 11 municipalities performing RSA's have questionable independence within the audit process.

Minimum Experience/Accreditation of Auditors

This question asked those performing audits to specify the minimum level of experience and/or training of those performing RSA's. The results are shown in **Figure 4**.
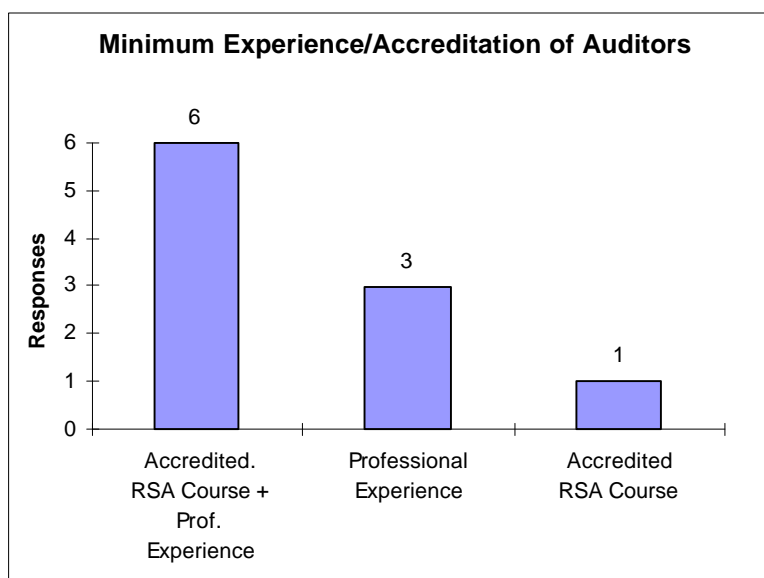
Figure 4: Minimum experience/accreditation of auditors

Eleven respondents answered this question, with one stating they didn't know what the minimum level of experience and/or accreditation the auditors had.

The majority of respondents reported that attendance at a RSA course <u>and</u> professional experience were the minimum credentials of their auditors. Three respondents stated the minimum as professional experience only, whilst one respondent reported that an accredited RSA course was the minimum credentials for their auditors. It should be noted that this last respondent uses someone from within the project design team to perform their audits.

Victoria is developing an accreditation scheme and runs regular workshops (in which VicRoads has a significant presence). The miswording of the question (referring to accreditation when none exists) does not seem to have biased response, with respondents assuming the workshops run are accredited.

Stages in the design process where RSA is implemented

This question asked the respondents to indicate where in the design process RSA is being implemented and the percentage of total audited projects audited at each stage. As it was assumed Victorian local government would be more familiar with the current nomenclature, the 'stages' of audit from the AUSTROADS guidelines were used rather than more generic descriptive terms that are now favoured. The question was misinterpreted by many respondents. Nevertheless, it was obvious the way in which the question had been interpreted once a number of surveys had been examined, and as such the question was still

valid. Not surprisingly, this question provided an extremely wide range of responses. Ten of the 11 respondents performing audits answered this question. Because responses were rarely the same, the grouping of data was impractical. Some respondents also included other options not provided in the question (eg. existing road audit, post-opening audit). Table 1 shows the range of responses. It is interesting to note that 50% of municipalities undertaking audits (5 responses) did them by the draft design stage and 70% (7 responses) by the detailed design stage.

Table 1. Stages in the design process where RSA is implemented.

Stages and % of total	Number of responses
100% at Pre-opening	1
50% at Detailed, 50% at Pre-opening	1
100% Existing Roads	1
100% Detailed and Pre-Opening	1
100% Feasibility and Draft and Detailed	2
5% Feasibility, 35% Draft, 60% Detailed	1
25% at each stage listed on survey	1
20% Draft, 80% Post-Opening	1
100% Draft and Detailed	1

Perceived Impact on Accident Level/Severity

Of the 11 respondents performing audits, 10 answered this question relating to the perceived impact of RSA on the accident level/severity. It is obvious from the results (**Figure 5**) that the majority of responses indicated that the perceived impact of RSA on the accident level/severity is positive. Only 2 responses rated the perceived impact as "none" or "none-minimal", with the other 8 responses rating the perceived impact as "minimal to reasonable" (3 responses), "reasonable" (3 responses) or "reasonable to very significant" (2 responses).
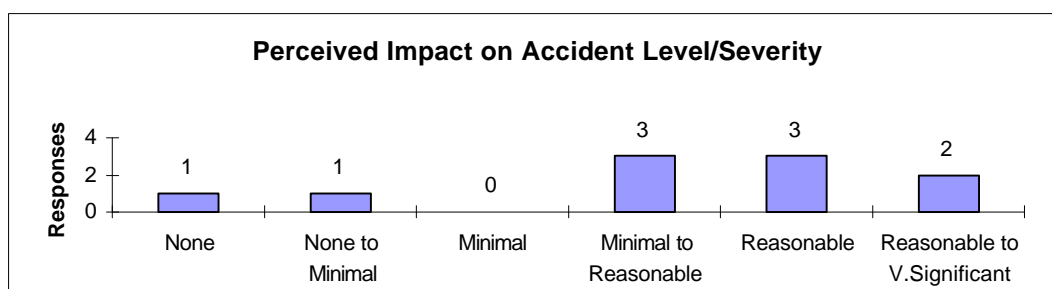
Figure 5: Perceived impact of road safety audit on accident level/severity

One respondent who rated the perceived impact as "none to minimal" added that at present there were too few audits performed to accurately consider the perceived impact of RSA on the accident level/severity. It is also interesting to note that the municipality that rated the perceived impact of RSA on the accident level/severity as "none" also indicated in other questions that it:

- did not use the AUSTROADS Guidelines,

- used designers (not specialist auditors) from within the council and
- did not use their one trained auditor for audits.

Therefore it may not be seen as such a surprise that this municipality perceived no impact on the accident level/severity.

Perceived Impact on Whole-of-Life Project Costs

This question sought the perceived impact of RSA on the whole-of-life costs of projects. The question was answered by 8 of the 11 respondents performing audits. The important point to note about the results (**Figure 6**) is that none of the 8 responses indicate a negative perceived impact on the whole-of-life costs of projects. The perceived impact responses ranged from "no effect" (3 responses) to "no effect to noticeably positive" (1 response) to "noticeably positive" (4 responses). No responses rated the perceived impact above
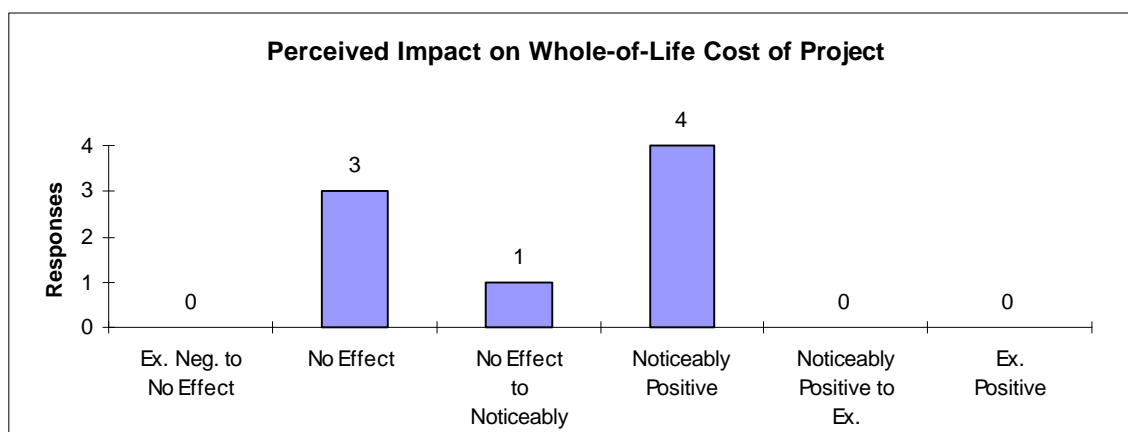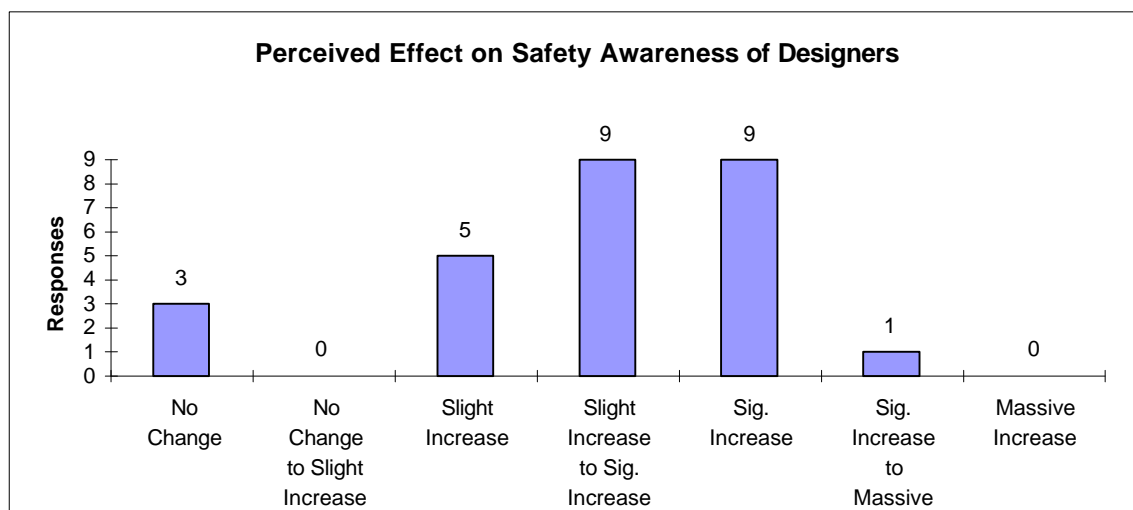

Figure 6: Perceived impact of road safety audit on whole-of-life costs

Effect of Road Safety Audit on Safety Awareness of Designers

This question asked for the perceived effect of RSA on the safety awareness of designers and requested an answer from all respondents as it was believed that even if some local governments were not implementing RSA, designers' knowledge of the RSA concept may have changed their awareness of safety in design.

Of the 29 respondents, 27 supplied an answer to this question. The results are shown in **Figure 7**. Only 3 responses said RSA had had no effect on the safety awareness of designers. The other 24 responses rated the effect of RSA on the safety awareness of designers as a "slight increase" (5 responses), a "slight increase to significant increase" (9 responses), a "significant increase" (9 responses) or a "significant increase to massive

Perceived Effect on Safety Awareness of Designers

Figure 7: Perceived effect of road safety audit on safety awareness of designers

It is interesting to note that of the 17 respondents not implementing RSA (as discussed earlier), 14 of them said the perceived effect of RSA on the safety awareness of designers was positive. The other 3 not implementing RSA observed no change in awareness. Therefore, all those respondents currently not implementing RSA perceived a non-negative impact on the safety awareness of designers.

Additional Comments

An open-ended question at the end of the survey form invited all respondents to make additional comments concerning RSA. Thirteen respondents made additional comments, with some covering more than one issue. It would be fair to say that the majority of comments were of a dissatisfied nature. Comments received in this question, which have not been included in the analysis of previous questions are given below.

- Two respondents, both of whom are not implementing RSA, stated that a major reason for not implementing RSA was the perception that the benefits were not able to be quantified. One of these respondents added that the difficulty in measuring the benefits made it hard to justify the additional costs of a RSA.
- One respondent whose municipality was not implementing RSA felt there needed to be more information provided on the "benefits and approximate costs which will be added to a project at each stage."
- The cost of RSA was obviously a concern to some municipalities, with 4 respondents (1 implementing RSA) providing additional information which criticised the perceived high cost of RSA implementation, especially given the limited resources and funding levels.
- Three respondents (1 implementing RSA) observed that the additional time and resulting delays produced by the RSA process were a disadvantage, especially with projects having tight time constraints.
- One respondent not implementing RSA felt that rural local government has not been involved in the RSA program.
- One respondent performing RSA criticised the high cost of RSA training courses, which has limited the number of staff able to attend.

- One respondent, who stated that 0% of projects are audited, said that RSA is conducted "on site specific problem spots."

These comments provide some interesting insight into RSA implementation in Victorian local government. However, there was one point which was difficult to illustrate by isolated analysis of each question. By reading each of the survey forms returned, there were numerous situations in which an answer to one question was inconsistent with an answer to another question or to an additional comment made. ie. there was an apparent contradiction. This may indicate a misunderstanding amongst many municipalities of what exactly the RSA concept is and what implementation involves. In particular, it seems that some municipalities believe that a casual safety check is the same as a RSA.

CONCLUSIONS AND RECOMMENDATIONS

The state of RSA implementation in local government throughout Victoria was investigated by a pilot survey of 50 Victorian municipalities. Of these, 29 completed and returned the survey, providing valuable insight into the current situation.

Research to date has generally concluded that the use of RSA, when implemented correctly, can have a positive impact on both the accident level and accident severity. The literature also indicates that RSA is a cost effective, preventative safety tool, although there is a lack of information available on the rigorous quantification of the benefits of RSA.

From this study of the adoption of RSA in Victorian municipalities, it is apparent that the majority of responding municipalities throughout Victoria are not making full use of the RSA process. Most municipalities appear to lack a full understanding of the RSA process. Further research must be undertaken to clarify the issues that this pilot survey has raised, especially addressing the reasons for non-implementation.

It is also apparent that there is a scarcity of information in relation to the quantification of the benefits of RSA, and that this is proving to be a major impediment to the implementation of RSA by local government. It is concluded that the perceived impact on the accident level/severity, whole-of-life costs and safety awareness of designers is positive, however it is recognised that local government is unlikely to be convinced of the full benefits of RSA until more 'concrete' information is available to demonstrate the cost effectiveness of RSA. Therefore, further research into quantifying the benefits of RSA is strongly recommended.

The lack of effective marketing of RSA is seen as a major contributor to the slow adoption of RSA in many municipalities. The production and subsequent distribution of a set of RSA Guidelines has not brought about the necessary awareness and knowledge of the RSA process in local government. The AUSTROADS Guidelines have been in circulation for approximately four years and this paper provides further evidence that Victorian Local Government is yet to be convinced about RSA. It is believed that RSA needs to be more effectively marketed (especially given the resistance to culture change in local government) with the use of a small team of experienced auditors conducting pilot audits and training workshops with practical examples.

Municipalities manage more than 80% of Australia's road network and have a vital role to play in road safety. It is disappointing to see the limited progress in the implementation of RSA in local government over the four years to date. Will it require legislation, tied funding arrangements or a significant legal liability issue to force Councils to adopt a full and comprehensive RSA process? Local government must confront the issues that are preventing greater implementation of road safety audit and proactively determine how they can meet the challenges.

The RSA process itself is low cost and simple to adopt. It is time, for the sake of all road users on our roads, for local government to get more serious about road safety audit.

ENDNOTES

1 For a more comprehensive review of the development of RSA internationally, see (for example) Bullpit (1998) and papers in Sessions 1 and 2 of the *Proc. AUSTROADS International RSA Forum* May 1998, Hilton on the Park, Melbourne Australia.

REFERENCES

Appleton, I. (1998) What priority safety? *Proc. of AUSTROADS International Road Safety Audit Forum*, May 1998. Hilton on the Park. Melbourne, Australia.

Appleton, I. (1998a) Benefits/evaluation of road safety audit. *Proc. of AUSTROADS International Road Safety Audit Forum*, May 1998. Hilton on the Park. Melbourne, Australia.

ARRB TR (1996). Summary of Existing Roads Safety Audit Workshop, *Proc. Combined 18th ARRB TR Conf and Transit NZ Land Transport Symposium*. Part 1, pp. 121-125. 2nd-6th September. Christchurch, New Zealand.

AUSTROADS (1994). Road Safety Audit Guidelines. (AUSTROADS. Sydney, Australia).

Barnes-Gillard, S. (1998). The role of local government in road safety audits. *Proc. of AUSTROADS International Road Safety Audit Forum*, May 1998. Hilton on the Park. Melbourne, Australia.

Belcher, M. (1998). Adoption of road safety audit by local government in the UK. *Proc. of AUSTROADS International Road Safety Audit Forum*, May 1998. Hilton on the Park. Melbourne, Australia.

Belcher, M. (1998a). Origins of road safety audit and current issues in the UK. *Proc. of AUSTROADS International Road Safety Audit Forum*, May 1998. Hilton on the Park. Melbourne, Australia.

Brisbane, G. (1998). Responding to audits: the need to close the loop. *Proc. of AUSTROADS International Road Safety Audit Forum*, May 1998. Hilton on the Park. Melbourne, Australia.

Bulpitt, M. (1998) Safety audit - An overview. *Proc. of AUSTROADS International Road Safety Audit Forum*, May 1998. Hilton on the Park. Melbourne, Australia.

Chor, C.H. (1998). Present status of road safety audits in Singapore. *Proc. of AUSTROADS International Road Safety Audit Forum*, May 1998. Hilton on the Park. Melbourne, Australia.

County Surveyors Society (1993). *The Current State of Road Safety Audit in Great Britain.*, Report no. ENV/3-93. (County Surveyors Society. Great Britain).

Daly, P.S. and Ogden, K.W. (1996). Road safety training program for Southern Thailand. *Course Notes*. (Institute of Transport Studies, Monash University. Melbourne, Australia).

Department of Transport (South Africa) (1997). *Road Safety Audits - Guidelines for South African Road Authorities*. March 1997. (DoT. South Africa).

Hannah, J.T. and Chadfield, E. (1998). Safety auditing of existing roads in New Zealand. *Proc. of AUSTROADS International Road Safety Audit Forum*, May 1998. Hilton on the Park. Melbourne, Australia.

Hoque M.M., McDonald, M. and Hall, R.D. (1998). Relevance and introduction of road safety audit in developing countries. *Proc. of AUSTROADS International Road Safety Audit Forum*, May 1998. Hilton on the Park. Melbourne, Australia.

ITE Technical Committee 4S-7 (1995) Road safety audit: A new tool for accident prevention. *ITE Journal*, No. 2, pp. 15-22.

Jordan, P.W. (1994) Road safety audit : The AUSTROADS project. *Road and Transport Research,* No. 4, pp.5-11.

Jordan, P.W. & Barton, E.V. (1992). Road safety audit - What is it and why do we need it?, , *Proc. Combined 18th ARRB TR Conf and Transit NZ Land Transport Symposium.* Part 4, pp.67-80. 2nd-6th September. Christchurch, New Zealand.

Jordan P. & Croft P. (1998). Road safety audit - Origins and current issues in Australia. *Proc. of AUSTROADS International Road Safety Audit Forum*, May 1998. Hilton on the Park. Melbourne, Australia.

Kanellaidis, G. et al. (1998). Development of safety audit guidelines for application in Greek motorways. *Proc. of AUSTROADS International Road Safety Audit Forum*, May 1998. Hilton on the Park. Melbourne, Australia.

Morgan, C. and Daly, P.S. (1998). Road safety audit implementation in Victorian Local Government. *Final Year Research Project.* (Department of Civil Engineering. Monash University. Melbourne, Australia).

Morgan, R. (1998). Organisational culture : An impediment to effective road safety audit. *Proc. of AUSTROADS International Road Safety Audit Forum*, May 1998. Hilton on the Park. Melbourne, Australia.

Morgan, R. (1995). Incorporating road safety audit into the Development Approvals Process. *Institution of Engineers Australia / Institute of Transportation Engineers Seminar on Traffic aspects of development approvals.* September 13th 1995. VicRoads Kew. Melbourne, Australia.

O'Brien A. (1997). Road safety audit - The benefits and costs. *IMEA Training Course Notes.* December 1997. (IMEA. Melbourne, Australia).

Public Works Department (Malaysia) (1997). *Road Safety Audit - Guidelines for the Safety Audit of Roads and Road Projects in Malaysia.* (JKR. South Africa).

Schertz, G. (1998). Status of road safety audits in the United States of America. *Proc. of AUSTROADS International Road Safety Audit Forum*, May 1998. Hilton on the Park. Melbourne, Australia.

Taneerananon, P., Pleumpiromnad, P. and Mesuwan, C. (1996). Safety Auditing of Roads in Thailand. *Proc. Combined 18th ARRB TR Conf and Transit NZ Land Transport Symposium*. Part 5, pp. 423-438. 2nd-6th September. Christchurch, New Zealand.

Transfund (1997). Survey of the uptake of safety audit by local authorities. Transfund Report Number RA95/475S. (Transfund, New Zealand).

ACKNOWLEDGEMENTS