

5 Investigation procedures

The investigation procedures are well documented in Austroads Pt 4, chapter 8. The following outlines additional information relevant to New Zealand.

5.1 Team selection

A team with the appropriate expertise should undertake the CRS.

The size, selection and organisation of the team usually lies with the RCA and/or the study team leader.

While the size of the team may vary, the importance and benefits of a multi-member team include:

- diverse backgrounds, different approaches and perspectives of different people
- the cross-fertilisation of ideas which can result from discussions
- simply having more pairs of eyes.

The team skills and experience should be relevant to the road network (ie urban versus rural) and identified crash locations.

The types of skills and experience that should be considered include:

- someone experienced in road safety engineering (essential); this person is needed to fulfil the role as team leader. They should have been a team member on several previous CRSs and have suitable training for this role, eg attending a RSEW or a similar course. This person could be the RCA representative, Land Transport NZ's road safety engineer or a consultant
- an RCA representative familiar with the network and its management
- a Police officer who has experience in road safety and who is familiar with the area
- a fresh set of eyes, ie someone unfamiliar with the area of the study but who has experience in similar environments

- other safety engineering personnel who are either experienced team members or observers wishing to extend their knowledge and experience; desirably these members will have attended a RSEW
- a road safety co-ordinator or someone with a road safety education background
- specialists with expertise relevant to the crash locations or crash problems such as:
 - traffic signal experts
 - motorway designers
 - behavioural scientists
 - pavements/surfacing experts (for skid resistance problems).

In determining the team composition, consideration also needs to be given to the overall team size. An ideal team size is three to five people. Teams beyond five can be difficult to arrange transport for and safely manage on-location. One option is to have a larger team in the preliminary investigation meeting and diagnosis phase, with a limited number of people actually involved in the investigations at the crash locations.

5.2 Data collection/introduction report

Sound decision-making requires good background data. Any analysis is only as good as the information available.

Having selected the study locations, the next step is to produce and collate all the background data required. This includes:

- a specific crash listing for each crash location. The team can use both the plain English and coded crash listings. With experience, most investigators prefer to use the coded crash listing reports, as they are easier to scan for commonalities and provide more information in respect to crash and environmental factors. However, the Police, road safety co-ordinators and others not familiar with the coding system will prefer the plain English version. Refer to Appendix B for a copy of Land Transport NZ's *Vehicle movement coding sheet* (VMC) and the environment and driver factor codes. For the most up to date VMC, refer to the Land Transport NZ website
- factor grids (refer to Austroads Pt 4, figure 8.2 'Factor matrix') and/or a detailed crash location summary report
- collision diagrams. Although these can be produced in CAS, manually producing them provides a better understanding of the safety issues and identification of problems, errors in the crash coding, exact crash location and lane use at intersections

- individual TCRs where appropriate (refer 5.3 below) or notes from TCRs
- aerial photographs, maps or plans
- traffic volumes and turning flows where appropriate
- speed survey data if available
- relevant maintenance records – seal age/skid resistance and high speed data measurements if available
- works history of the location: any changes to signs, signals, islands, barriers, chevrons, planting, road markings or type of surfacing within the crash study period
- any traffic signal phasing and timing data
- any relevant previous CRS data.

It is desirable that this data is collated into one document or folder. This is sometimes referred to as an 'introduction report'. Much of the data can be tabulated on a crash location summary sheet that can form the basis of the final study report (refer to Appendix C). The introduction report should also outline how the need for the study was identified and how the crash locations or clusters to be studied were selected.

5.3 Preliminary diagnosis

Crash diagnosis is the foundation on which the selection of effective countermeasures is based. Preliminary diagnosis involves a detailed analysis of all the assembled background data. It should be undertaken as a desktop exercise before going to visit the location. During the diagnosis phase, common factors from the crashes should be identified. This should include consideration of crash movements, directions, time, contributing factors, driver ages, vehicle types, road, weather and traffic conditions.

The most detailed information about a crash is shown on the scanned images of the TCRs, which are available in CAS. These images contain driver and witness comments, crash diagrams and additional information such as driver age, sex, lane position etc that is not available on the coded crash reports. The extent to which TCRs are referenced during the CRS is dependent on circumstances. They should be referenced on studies or locations with a relatively small number of crashes and where it is practical to do so.

For crash locations with a large number of crashes it may be impractical to study all TCRs but reference can still be made to specific TCRs to gain a better understanding of

issues. An example would be to check TCRs to identify whether 'failure to give way' at an intersection was due to an inconspicuous intersection or whether the driver stopped but failed to see the conflicting vehicle.

TCRs are also referenced if something such as the crash location, vehicle direction or some other factor appears incorrect on the crash coding. Any incorrect data must be brought to the attention of Land Transport NZ so that it can be corrected. TCRs contain confidential and personal information such as names, addresses etc and must not be published in any reports. Individuals who are identified in TCRs must not be contacted under any circumstances.

Notes from the TCRs can be added to the collision diagram or crash listing as useful references for the team. It is often not necessary to copy the whole TCR.

During the diagnosis phase, care needs to be taken not to prematurely judge the total problems and treatments. Instead, potential problems/causes etc should be identified for discussion and confirmation at the location. The location visits often reveal contributing factors and features that cannot be identified from the crash records.

5.4 Preparation for field inspections

5.4.1 Items required

The following data and equipment is required for the field inspection:

- introduction report/background data referred to in 5.2 above
- copies of TCRs where appropriate
- a map to find the location and understand the adjacent roading network and environment
- a camera for a visual record of locations and problems
- a measuring wheel to find precise locations, measure visibility distances, road widths etc. This is preferable to a tape measure for safety reasons
- appropriate vehicle for the team numbers and with the required safety equipment
- a copy of the traffic management plan (TMP)
- high visibility jackets for all team members that comply with the RCA's TMP requirements or the *Code of practice for temporary traffic management (COPTTM)*

- weather protective gear, ie raincoats, umbrellas, sunblock, etc as needed to comply with health and safety plans
- monitoring forms (see section 9).

The following optional additional items may also be needed, depending on the particular location or crash problem that has been identified:

- an electronic level if one is available to check gradients, crossfalls etc
- a light test meter, if required, for night-time inspections in urban areas or intersections
- an audio tape recorder
- a video camera
- a laser speed/distance measuring device.

5.4.2 Traffic management plan (TMP)

A TMP must be prepared and approved in accordance with the RCA's requirements such as the COPTTM. The TMP sets out the protective equipment and procedures required for the team members, where and how they can operate. The study team should be briefed on the TMP prior to the location visit and should preferably sign the document to declare that they are familiar with its requirements (while Appendix D provides an outline of a TMP, the relevant RCA must be contacted to establish their specific requirements).

5.5 Field inspections

All field inspections must be undertaken in a safe manner and in accordance with the TMP.

Field inspections are a detailed examination of the location and driver behaviour. They should not be rushed. The physical details of the locations can be obtained under any convenient conditions, but a visit should be undertaken during conditions that are prevalent for most of the crashes, eg peak hour traffic, day/night and possibly in wet conditions if appropriate.

Field inspections should commence with a drive-over from all directions to observe the environment. It is desirable to have a team member unfamiliar with the area drive so that they respond to the messages from the environment as opposed to 'local

knowledge' (gained from driving over the route previously). Other team members should observe the driver's actions and responses, noting vehicle speeds, travel path etc.

On completion of the drive-over, the vehicle should be parked in a safe and preferably inconspicuous location, to avoid influencing other traffic and driver behaviour. The team should observe the traffic behaviour while remaining as inconspicuous as possible.

Where appropriate, walk over the location and inspect the layout and facilities at close quarters taking photographs depicting observed problems and potential remedial works. These activities must be undertaken in a safe manner, in accordance with the TMP, preferably clear of the traffic lanes. If stepping onto the carriageway, team members should always move to avoid traffic and not expect traffic to slow down or move for them.

Photographs or even video recordings are invaluable for referencing use in reports, identifying problems and solutions, and simply as a record of features at the location for subsequent referral. Having the front seat passenger take photographs while traversing a crash location is often a useful tool for depicting the driver's view of the location.

Field investigations should desirably be limited to a maximum duration of three days. Experience has shown that focus and quality are difficult to maintain over longer periods.

5.6 Follow-up investigations

Follow-up investigations at a subsequent time and date may be required to:

- observe driver behaviour and traffic flow in different conditions from the initial visit to the location
- take more detailed location measurements and photographs
- measure traffic speeds, skid resistance, road geometry, lighting levels etc
- consult other experts.

It may be more appropriate that specific testing to confirm suspected deficiencies is recommended by the CRS team as a separate exercise prior to the final design and implementation of remedial works.

5.7 Problem identification

Before leaving the location, the team should consolidate ideas, define the problem and note the deficiencies of the location or features contributing to the problem. It is also desirable to discuss potential solutions on-location to determine if they are practical and the potential effects, construction issues, costs etc.

Austrroads Pt 4, tables 8.1 and 8.2 provide good checklists for the field inspections and guidance on possible crash contributing factors that should be considered.

A further discussion, consolidation of ideas and proposals can be undertaken in the office following the inspections or follow-up investigations if necessary. It can be quite useful not to make final decisions immediately after the initial location visits as it often takes time for ideas to gel and a solution may not be initially obvious.