

1 Background

1.1 Purpose

The purpose of monitoring safety improvement work is to:

- € ensure road safety has improved
- € identify road safety improvements that work best
- € enhance future crash reduction predictions.

Road controlling authorities are responsible for adopting strategies that will improve safety on their road networks. Part of this commitment must be to assist in monitoring safety improvements.

To assist road controlling authorities, Land Transport NZ has implemented a computer-based crash reduction monitoring system for monitoring and evaluating the effects of safety improvement works. The main task for road controlling authorities is to supply crash location data and implementation details for input into the system.

Note: This monitoring system has been developed to monitor crash locations where physical safety improvements are to be implemented. If no *physical* remedial works are recommended, there is no need to fill out the monitoring forms included in this manual. Road controlling authorities wishing to monitor crash locations with only educational, enforcement or other non-physical works, can use another feature in the crash analysis system called sites of interest (refer to the crash analysis system online help).

Since the development of the crash reduction monitoring system, agreement has been reached between Land Transport NZ and Transit New Zealand that all crash reduction studies will include the completion of monitoring forms as part of the study. Local authorities are encouraged to adopt this practice as well.

Land Transport NZ will provide results of the effects of remedial works on crash reduction.²

1.2 Definition of monitoring forms

Under crash reduction procedures, traffic crash clusters, routes, areas or groupings are investigated. For the purposes of the crash reduction monitoring system, the location of these traffic crashes is called a crash location (CL).

² See Appendix D for examples of monitoring output.

Two monitoring forms should be completed for each crash location investigated. These are:

1.2.1 Crash location form (CL form)

The CL form contains details of the crash location characteristics.³

1.2.2 Problem definition and recommendation form (PR form)

The PR form contains a description of the crash problems at the crash location and recommendations for eliminating or reducing these problems.

It records the number of crashes (both injury and non-injury if used):

- € at the location
- € addressed by remedial works
- € likely to be saved by the remedial works recommended.

The cost of the remedial works is also noted.

One PR form is used for each CL form completed.⁴

Once Land Transport NZ has entered the CL and PR forms in the crash analysis system, an implementation report (IR) will be sent to the road controlling authority. This report is a printout of the recommendations for implementation, with spaces for recording the dates on which works are completed and the actual cost of the works⁵. This report is not produced by the crash analysis system but by a separate process.

1.3 Procedure for monitoring

Crash locations should only be entered into the monitoring system if physical safety improvement works are recommended. Most locations entered to date have been from joint crash reduction studies but locations from other investigations or studies can be entered.

The road controlling authority should check to see if monitoring of the crash location is already being carried out as part of a previous study and determine if, and how, future monitoring is to occur.⁶

³ Refer to section 2, and Appendix B (B1 and B3) for sample forms.

⁴ Refer to section 3, and Appendix B (B2 and B4) for sample forms.

⁵ Refer to section 4, Implementation report.

⁶ Refer to section 1.5, Monitoring previously studied crash locations.

The monitoring system CL forms can be filled out during the initial crash location investigation as they are a record of the 'before' characteristics of the location. Once decisions have been reached on problems at the location and on recommendations for their remedial works, the PR form should be completed.

Any safety improvement works which have occurred at a crash location in addition to the study recommendations should also be coded as recommendations on the PR form, along with the date on which these were implemented, as these may have some effect on the crash history.

The monitoring forms are sent, together with a crash reduction study report or any other relevant report, to the engineering section at the local Land Transport NZ office.

The forms will be entered on the monitoring database which is part of the crash analysis system. Most Land Transport NZ offices have access to the information on this database, as do all organisations with access to the crash analysis system.

Once the data is entered on the database, the appropriate Land Transport NZ office will send the road controlling authority an implementation report (IR).⁷ The IR lists the recommended remedial works in plain English. The road controlling authority should fill in the implementation dates for the completion of remedial works, and when the work is completed, enter the cost on the IR.⁸ The forms should then be returned to the respective Land Transport NZ regional office for the monitoring system data to be updated.

Once the implementation data is complete, analysis of the data will begin. The road controlling authority will be sent location specific outputs and general summary data.⁹

The CL form, the PR form and the IR are each explained in separate sections in this manual (see sections 2 to 4 and Appendix B).

Once the safety improvement work has been completed, the road controlling authority should regularly review the status of the studies and crash locations to determine if monitoring should continue or if further investigation is required.

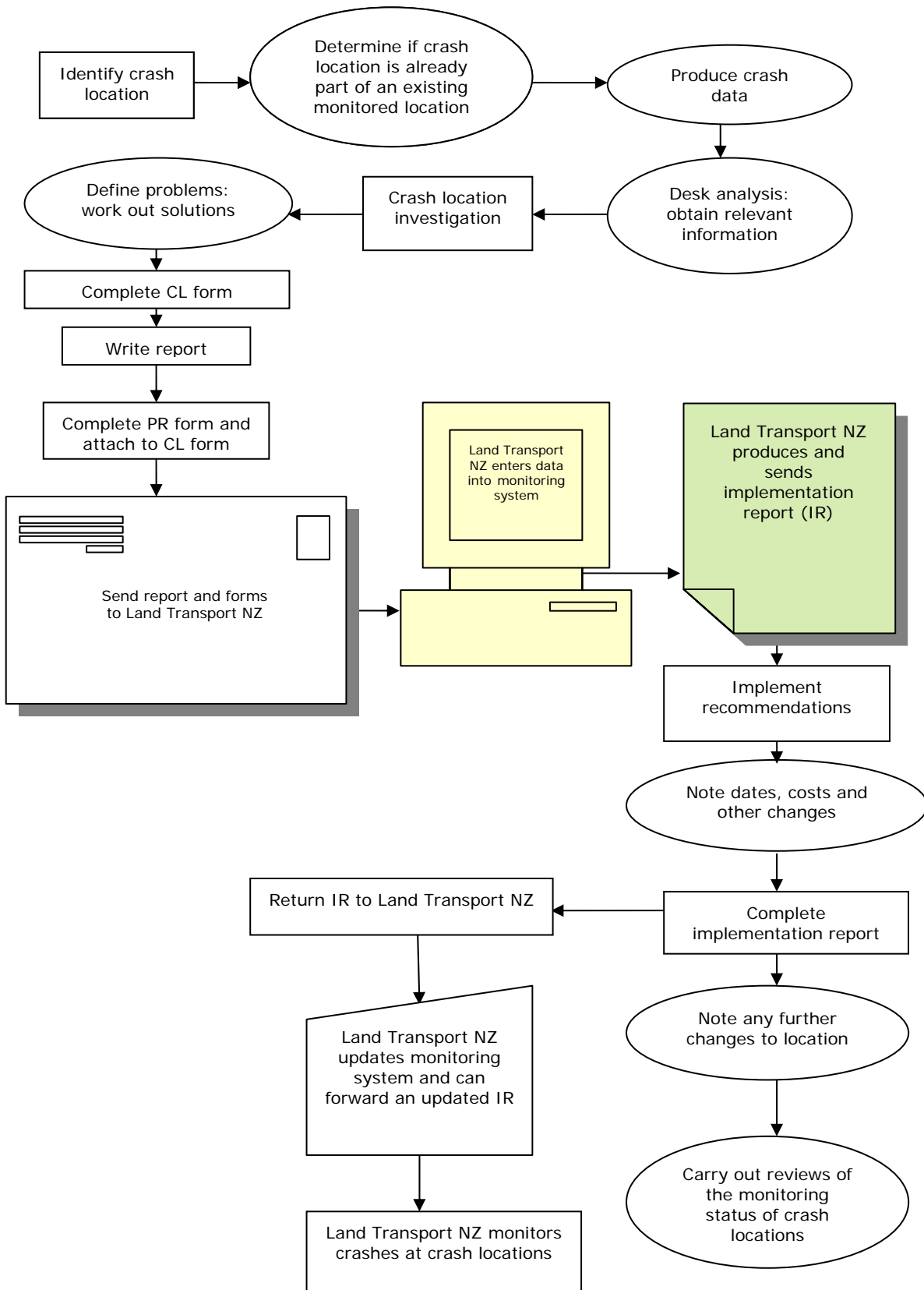
These procedures are explained in the crash reduction flow chart on the next page.

⁷ Refer to Appendix B (B5) for an example.

⁸ Refer to Appendix B (B6) for an example.

⁹ This information is distributed via the road safety reports or monitoring report and may be requested by the local authorities. See Appendix D for examples of monitoring output.

1.4 Crash reduction flow chart



1.5 Monitoring previously studied crash locations

The crash reduction study programme began in the mid-1980s and monitoring of these studies has been carried out since the early 1990s. There are currently over 4,000 crash locations in the monitoring database.

Many road controlling authorities have completed a number of studies and continue to carry out studies on a regular cyclic programme. The situation can, therefore, occur where a crash reduction study team may identify and study a crash location that has previously been studied and monitored. A good example of this is where an intersection has been studied previously and is then re-examined as part of a route investigation.

While it may be necessary to re-examine a previously studied crash location due to changing crash patterns, it is important to try and minimise any subsequent multiple monitoring of the same crashes. The main reason for this is to reduce the double counting of crash reductions.

There are a number of options available to study teams when deciding how to monitor a crash location that has already been studied. These options depend on factors such as the implementation status of the previous work, the change in the crash pattern, the length of time involved and the area covered by the crash location.

The following table explains the various options and the likely reasons for selecting that option.

Table 1 Monitoring previously studied crash locations

Monitoring options	Description
Create new monitoring forms for the crash location.	<ul style="list-style-type: none"> € The crash location has been studied before. € All the previous recommended works have been implemented for five or more years (some can be status 4, see page 31). € A stop monitoring date has been added (see section 1.6 and page 32).
Stop monitoring the original crash location and create new monitoring forms.	<ul style="list-style-type: none"> € The new crash location has a different crash selection criteria (but encompasses the majority of original crash location). € All or the majority of the previous recommendations have been implemented. € A new pattern of crashes is occurring. <p><i>Note:</i> Add a stop monitoring date to the original crash location (see section 1.6 and page 32). This should be recorded as one month before the implementation of the first new recommendation. Add any uncompleted recommendations from the original study.</p>

Monitoring options	Description (continued from previous page)
Update the existing implementation report for the crash location (see section 4: Implementation report).	<ul style="list-style-type: none"> ☒ The crash location has been studied before. ☒ The crash selection criteria is the same. ☒ Some or all of the original recommendations have not been implemented (occasionally crash problems can remain even when all work is done). ☒ The crash problem is similar to the original study period (see section 3.5). ☒ The period between studies is not excessive (two to three years). <p><i>Note:</i> Review previous recommendations and revise with new recommendations. Add to the implementation report.</p>
Delete the original crash location from the monitoring database and create new monitoring forms.	<ul style="list-style-type: none"> ☒ None of the original recommendations have been implemented. ☒ There is a long time period between studies.

1.6 Stop monitoring and crash location deletion criteria

Land Transport NZ monitors crashes at crash locations based on the location and implementation details supplied by road controlling authorities. To ensure statistically reliable data is obtained, it is necessary to monitor the location for at least five years after the last recommendation is implemented. Monitoring for a longer period of time may improve this data but traffic and environmental changes may introduce unwanted bias to the result.

A number of road controlling authorities have adopted an annual cycle of crash reduction studies where locations are added or removed from an existing study in the monitoring database. There are a number of situations where changes to a location may negate the need for monitoring to continue.

The monitoring system allows locations to be:

- A** flagged with a stop monitoring date
- B** transferred from an existing study to a different study, or placed in a separate study containing redundant locations (flagged with a stop monitoring date)
- C** deleted completely from the monitoring system.

The following lists the criteria to be considered when deciding if a location should be flagged, transferred or deleted from the monitoring database.

- ∄ Five calendar years have elapsed since the last of the original study recommendations or any subsequent major recommendation were implemented. **A, B** (*optional*).

Note: Land Transport NZ periodically completes a check of the database for totally completed locations and automatically adds a stop monitoring date six years after the last implementation date.
- ∄ The location has been replaced partially or completely by a new crash reduction study location. **A, B** (*optional*).

Note: Any recommendations from the previous study implemented within the new study period must be coded on the monitoring form of the new location as prior works and a date provided (status 5, refer section 4.9). The stop monitoring date for the previous location will be the date the first recommendation from the new location is implemented.
- ∄ Other works at the location have been implemented, which completely change the location characteristics resulting from the original works. In this case, continuing to monitor the location would give incorrect information. For example, all the original works were implemented one year after the report was completed and three years later there was major reconstruction work at the same location. This additional work is likely to affect the location in a different manner, so monitoring should not continue at this time. The location will be monitored from the date of completion of implementation of the *original* works, to the date of the new changes (ie the date monitoring should stop), giving the results of the effects of the original works. **A, B** (*optional*).
- ∄ Major realignment or reconstruction work, not recommended in the study, has significantly altered the location. **A, B** (*optional*)

Note: Monitoring could continue if the road controlling authority wants to monitor the effects of the major works. The works must be coded into the monitoring database and a date provided (status 5). Any stop monitoring date will be the completion date of the major work.
- ∄ None of the original major recommendations were, or will be, implemented. **C**¹⁰
- ∄ For state highways: the location is no longer on a designated state highway. **B**

Note: Consideration should be given to transferring the location to an appropriate local authority study. An appropriate reference should be added to the environmental changes section of the implementation report (see section 4.12).

¹⁰ Crash locations will only be deleted with the agreement of the road controlling authority and Land Transport NZ.

1.7 Monitoring system analysis

Land Transport NZ monitors the effectiveness of the crash reduction study programme and the safety improvement works implemented. The results of this analysis are available in the following ways:

Road safety reports

These reports provide summary information about all the crash locations being monitored in a road controlling authority's area of responsibility. Information on the number of crash locations and the percentage implemented is provided together with the percentage reduction in injury crashes. National data also provides a comparison. These reports are produced annually and are sent to road controlling authorities.

Crash analysis system

The crash analysis system, which is freely available to road controlling authorities, includes a feature that allows details of crash locations to be viewed and mapped as well as identifying and analysing crashes that occur at them. Output can include crash listings, summary listings, factor grids, collision diagrams, maps, tabulations and calculated crash reductions. The system also includes two specialised monitoring reports – a monitoring site reduction report and a monitoring summary report. The crash analysis system online help system gives a description of these outputs.

Monitoring system analysis reports

These are a series of reports that provide analysis of the overall effectiveness of the programme and a selected number of specific safety interventions. They provide details of the crash reductions resulting from the implementation of the safety recommendations. Details are provided for a number of various factors, such as reductions by:

- € crash type
- € speed limit area (urban/open)
- € crash location type (intersection, route, area, etc)
- € road type (local/state highway)
- € road user type (pedestrian/cyclist/driver, etc).

The reports are available on the Land Transport NZ website:

www.landtransport.govt.nz

Road controlling authority monitoring reports

Land Transport NZ has developed a format for reporting on all crash locations in a road controlling authority area. These reports include data on the status of implementation as recorded in the monitoring database. They have been developed to encourage and

improve feedback from road controlling authorities on the implementation of safety improvements.

Examples of the various outputs are included in Appendix D.