

# **PART A: WHAT IS LOCATION REFERENCING?**



# 1 WHAT IS LOCATION REFERENCING?

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## Background

Most aspects of Transit New Zealand's business require accurate and consistent referencing to various aspects of the State Highway network over time. To do this Transit New Zealand, and its predecessors, have used a linear referencing system for many years, which has worked well.

However, with the present demands on reliable location data for analysis and management, particularly in computer databases, it is becoming increasingly difficult and costly to manage. Therefore, in 1999 Transit New Zealand commissioned a project to review and enhance its Location Referencing Management System (LRMS). The outcome was the systems, software and procedures that are documented in this manual.

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## In this Chapter

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## 1.1 What is Location Referencing?

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**Location Referencing** A common question asked by highway engineers is ‘where do I find it?’ For example, a work crew must be able to identify the correct section of pavement to repair, or the location of a blocked culvert. A close second would be the question ‘where am I?’ Both of these questions are answered through location referencing. Location referencing is used to assign a unique address to each location on the road network.

The ‘route position’ is the key to location referencing. A route position defines a position along the highway. It is a unique address given to each location and is expressed as a distance (displacement) from the preceding reference station when travelling in the increasing direction along the route.

Reference stations (RS), roundabout reference stations and ramp reference stations are the primary benchmarks (points where all measurements start). For convenience there are also intermediate reference posts provided between the RS’s, these are called established route positions (ERP) and provide an accurate point to measure from without having to return to the RS. The green band on these signs denotes their accuracy.

RS’s or ERP’s are also used to indicate the start and end of divided carriageways and linear referencing survey start and stop points at large roundabouts.

Kilometre marker posts are included to allow highway users to find events or objects on the network but are not placed or maintained to a suitable accuracy to allow reliable measurement for asset management. These signs contain a black band, which indicates the displacement is less accurate and that the sign should only be used as a location flag or indicator.

Assigning a route position is discussed fully in Chapter **Error!**  
**Reference source not found.**

## 1.2 Purpose and Scope of the Manual

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**Purpose** The focus of this manual is to document the systems, software and procedures that support location referencing within Transit.

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**Scope** This manual is intended to tie together all aspects of the Location Referencing Management System (LRMS), as shown diagrammatically in Figure 1.1. To achieve this, it is set out in four

parts.

**Part A What is Location Referencing**

Provides an introduction to location referencing and the manual.

**Part B Location Referencing Method**

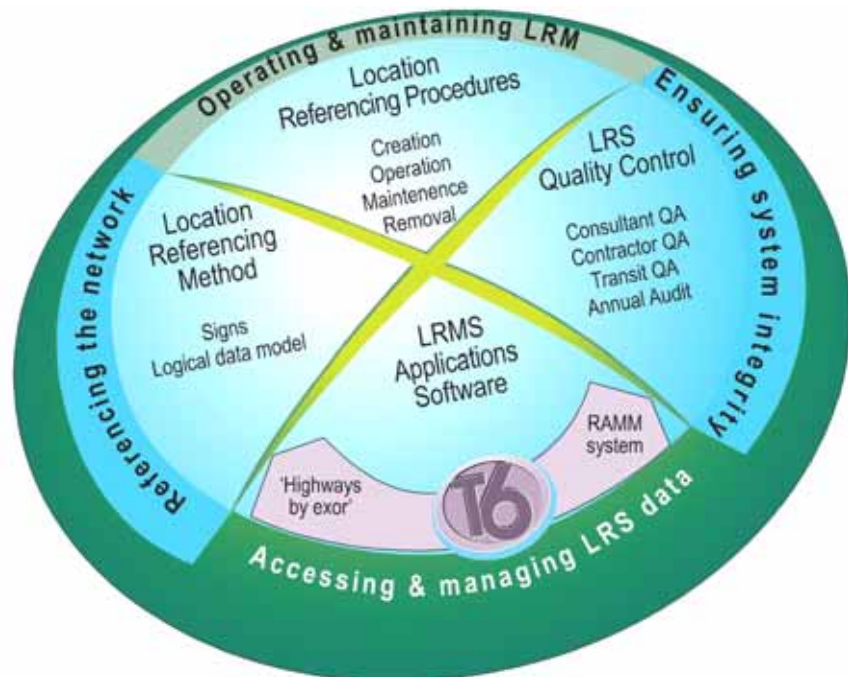
Describes the technique used to identify points on (or segments of) the road and the physical signs placed on the network for this purpose.

**Part C Location Referencing Procedures**

Details the procedures to be followed for the creation, operation and maintenance, and removal of all facets of the system and outlines the quality control measures that ensure the system is of the highest quality.

**Part D LRMS Software Application**

Supplies information on the roles and capabilities of the software used in the management of the LRS.



**Figure 1.1 Location Referencing Management System**

### 1.3 Link to Other Manuals

**Link**

There are numerous documents defining the LRMS. This manual serves as a link, cross-referencing relevant manuals, proforma, and maintenance specifications as shown in Figure 1.2 Link with Other Manuals. It is therefore a ‘one stop shop’ on LRMS, providing you with the scope and understanding and pointing to the

detail.

## Current Versions

This manual should therefore be used in conjunction with the relevant Transit New Zealand specifications and guidelines and the appropriate software user manuals.

The current version of all Transit New Zealand standards, criteria or guidelines referred to in this manual can be determined from the *Standards and Guidelines Manual*, Transit.

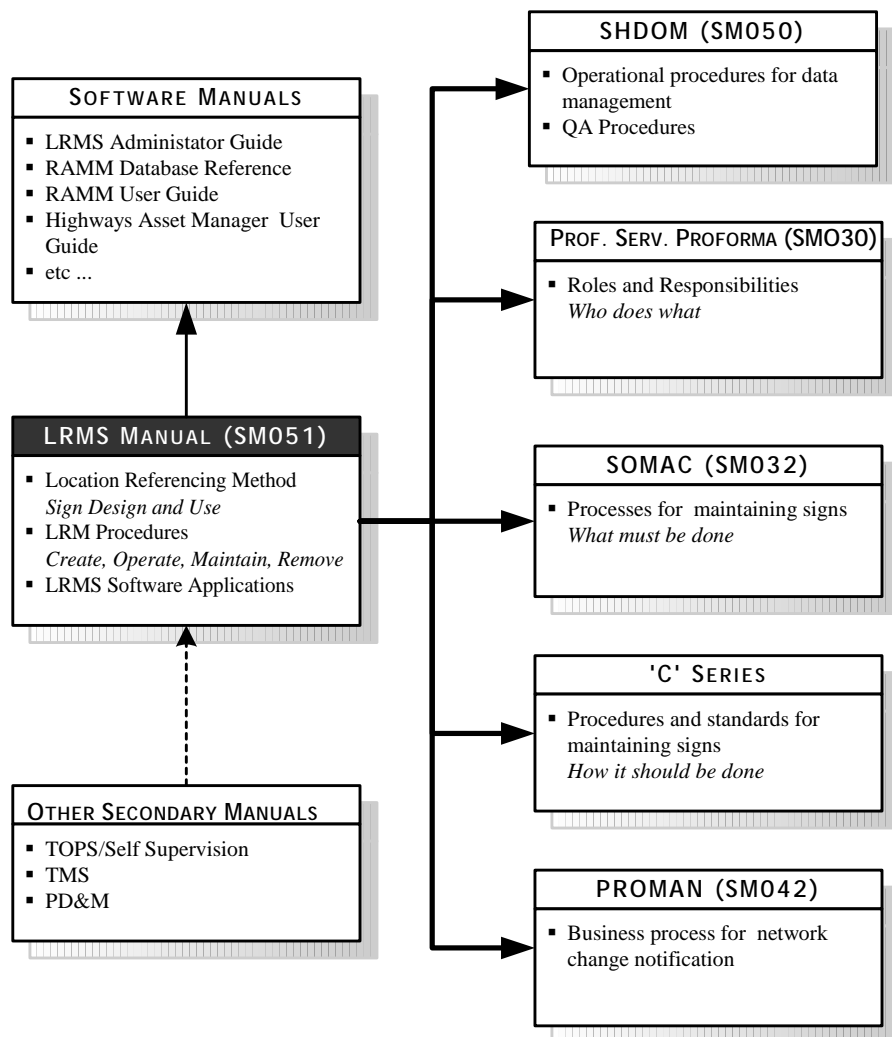


Figure 1.2 Link with Other Manuals

## 1.4 Policy

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### Application

All State Highways shall have the system of distance marking set out in the following manner.

Reference stations, roundabout reference stations, ramp reference stations, established route positions, and kilometre marker posts are required on all motorways and both urban and rural sections of the highway.

## 1.5 Key Definitions and Acronyms

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### Introduction

For clarity, the definitions of some of the commonly used terms and acronyms in this manual are given in this chapter.

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### BDI

Bridge Information System

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### Common Highways

Sections of road which form part of two highway routes (e.g. SH1 and SH3) are known as Common Highway sections. Attribute information is stored against the major (lower numbered) highway.

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### Divided Carriageways

Divided carriageways follow separate alignments (i.e. the carriageways are different lengths) or are physically separated by a median with a length greater than 300 metres.

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### Established Route Position (ERP)

Intermediate benchmark along a State Highway that is marked by ERP signs to an accuracy within  $\pm 0.1\%$ . They occur:

- At intervals ranging between 3km and 5km;
  - For marking divided carriageways and large roundabouts.
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### Increasing/Decreasing Direction

This is short for “the direction of increasing/decreasing route measure”. Increasing direction refers to the direction of positive displacement from an RS and conversely the decreasing direction is the direction along a highway when travelling towards RS 0. The increasing direction is defined in the state highway declaration.

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### Kilometre Marker Post (KMP)

A location reference sign placed at one-kilometre intervals along the road to an accuracy of  $\pm 100$  m. Previously known as a route position marker.

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<b>Linear Position</b>	Refers to a distance (displacement) and direction from a known point e.g. +50m from RS 260 on SH 1. Applied in terms of linear vs spatial referencing.
<b>Location Referencing</b>	Abbreviated <b>LR</b> .
<b>Location Reference Management System (LRMS)</b>	The complete process to manage the location reference system. This ensures that the responsible person updates the applicable data at the correct time so that it is available to all relevant users.
<b>Location Reference Method (LRM)</b>	The technique used to identify a specific point (location) or segment of road, either in the field or in the office.
<b>Location Referencing Procedures (LRP)</b>	The total set of procedures for determining and retaining a record of specific points along a highway. This includes the location reference method(s) together with the procedures for storing, maintaining, retrieving and removing the information about points and segments on the road.
<b>LRMS Administrator</b>	The Transit staff member responsible for maintaining Transit's LRMS.
<b>LRMS Software Application</b>	This provides functionality to manage the LRMS. Transit New Zealand currently uses the "Highways by Exor" software package.
<b>Network Update Form (NUF)</b>	The standard form used to record and track updates to location referencing associated with a change to the road network. This document provides the source information for all parties when maintaining the network.
<b>NOMAD</b>	National Optimisation of Maintenance Allocation by Decades. This is a module in RAMM for managing the forward works programme.
<b>NMA</b>	Network Management Area.
<b>NMC</b>	Network Management Consultant.
<b>Offset</b>	Applies to measurements taken perpendicular to the increasing road direction. For example the sign has an "offset" of 1.2 m from the seal edge or 6.2m from the centreline. Offsets to the left are often



expressed as negatives if no “side” attribute is recorded.

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**Project Data**

Project data refers to a snapshot of RAMM inventory associated with a “project” section of highway. The data is in a suitable format for loading into Transit’s asset register.

**PROMAN**

Project Management application used by Transit New Zealand.

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**RAMM**

Road Asset Maintenance Management application used by all the Road Authorities in New Zealand.

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**Route Position**

Route position (RP) is the “address” format for describing a linear position e.g. 01N-0260/0.50.

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**Reference Station**

Reference stations (RS) are “bench marks” along a highway. They generally occur at approximately 16 km intervals, at the junction of State Highways and at Territorial Regional Boundaries. They also occur at the start of ramps, at the end of highways and at large roundabouts. They are marked by reference station signs. Their true position is approximated with a spatial coordinate.

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**Reference Station Length**

The portion of State Highway between two reference stations is referred to as the ‘reference station length’.

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**SDMS Consultant**

Spatial Data Management System Consultant. The consultant responsible for managing and updating the GIS road centreline for Transit NZ.

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**SOMAC**

The documentation for the Standardisation of Maintenance Contracts.

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**Spatial**

Gives an address consisting of a set of geographic co-ordinates (latitude/longitude). The most common co-ordinate system used is currently NZMG.

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**TOPS**

Transit New Zealand’s Overweight Permit System.

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