Phase 1

Traffic Management System Design Documents

INTRODUCTION:

TRAFFIC MANAGEMENT SYSTEMS (TMS)

Traffic Management Systems (TMS) use a variety of technologies to manage traffic flows and the effects of congestion on the roading network. Traffic Management Systems do this by addressing the traffic management effects of accidents and slow moving or queuing vehicles, planned events and extreme weather.

TMS include, ramp signaling, dynamic lane management, variable speed limits, incident detection, vehicle activated signs and adaptive traffic signal control. Many of the systems are usually integrated to gain maximum benefit.

Managing the allocation of road space is an important concept that is becoming increasingly relevant as it is not feasible or cost-effective to continue to accommodate the growth of urban traffic by constructing additional roads. It is widely acknowledged that a large part of added road capacity is often quickly absorbed by 'induced' demand.

OBJECTIVES:

This section focuses on the application of TMS and how it can be used to achieve Travel Demand Management (TDM) goals.

*minimize congestion and traffic jams

*collect and analysis traffic data for decision making

*provide an real time information to drive and autorities

*Ensure safe and effective traffic flow

Application of TMS:

TMS measures can be applied in urban, peri-urban, and rural areas, as appropriate. TMS systems are often used on the state highway network, and are likely to operate across different organisational boundaries.

Roading authorities wanting to introduce TMS should work closely with the New Zealand Transport Agency, regional authorities (including cross boundary) the police and wider emergency services, passenger transport operators and other stakeholders in order to consider wider network implications.

In addition to this, planned measures by the local road authority that may displace extra vehicles onto the state highway network, will need to be assessed in terms of their implications for TMS applications on the state highway system.

Tools For Traffic Management System:

Automatic

Incident

Detection

(AID)

Incident detection tools are designed to reduce the time taken in identifying and reacting to incidents on the network. If combined with other TMS and Traveler Information Services (TIS) it can improve network efficiency by minimising congestion. It can also contribute to reduced response times for emergency vehicles and also minimise the chances of secondary accidents occurring.

Automatic Incident Detection (AID) is usually implemented through the use of sensors or detectors and aims to detect traffic incidents along major roadways. Sensors are usually divided into two categories; intrusive (buried within the road) and non-intrusive (not buried within the road).

Intrusive sensors such as inductive loop detectors (ILD) are installed at regular intervals along the road and gather information on each vehicle in order to detect abnormal changes in traffic movements and therefore identify incidents.

Non-intrusive technologies such as video incident detection

(VID) or closed circuit television (CCTV) are installed on poles or overhead gantries and detect incidents through observation of changes in the general traffic flow.

Other technologies such as microwave detectors have been used in place of ILD to detect speed of vehicles. The detectors are spaced every 100m and identify incidents by observing a sudden drop in speed, as opposed to a gradual decline in speed

*over a longer time.

*Ramp

*signalling/

Metering

Ramp signals are essentially traffic lights at motorway on-ramps that manage the flow of traffic onto the motorway during peak periods. When lights are red, vehicles stop and wait for the green signal. When lights turn green, two cars (one from each lane) are able to drive down the ramp to merge easily with motorway traffic. Ramp signals run on a quick cycle, only a few seconds between green lights. Ramp signals do not have to operate all the time and can be switched on when necessary, especially during morning and afternoon peaks and other busy times.

Ramp metering can be a cost effective tool in improving the throughput of a motorway and overall road network. It is most effective when applied system wide along a corridor that balances the needs of maximising motorway throughput in addition to effective queue management.

There are a number of equity issues that need to be taken into account when ramp metering is installed. Using traffic signals as a similar example, if a minor road meets a major road, and the major road is operating at capacity, it might be most efficient (in terms of minimal total delay) to give 100% of the green time to the major road and 0% to the minor road. However traffic signals alternate back and forth to ensure equity of road users so that travellers on minor roads do not have to have an excessive wait. A similar limit on individual

delay, even at the expense of overall motorway efficiency, may be necessary for ramp meters to be equitable.

As well as benefits there are some disadvantages to ramp metering. Ramp metering can result in longer wait times to enter the motorway.

Another issue that relates to the on-ramps design is the length from the signals to the motorway. Some on-ramps have short gaps between the signals and the motorway that a suitable merging speed can not be reached. In situations like this ramp signals can result in more congestion.

While ramp flow meters can help at the margins, delaying the onset of motorway breakdowns and the recovery of freer flowing conditions, making the motorway flow smoother, it cannot eliminate congestion entirely. It has been found that ramp meters are particularly helpful for longer trips.

Ramp signaling is used worldwide, it has been successfully used for over 40 years in some cities including the United States, Germany, Canada, Belgium and England.

Variable

message

signs

Variable message signs (VMS) can be used to alert drivers to traffic incidents ahead, congestion, events, parking availability and weather conditions.

There are three broad categories of information that can be displayed via VMSs:

• control (e.g. lane control, prescribing control)

• warning (e.g. weather conditions, incidents, congestion, road works, road closures)

• information (e.g. useful traffic/weather information, network messages, safety messages)

The benefits of providing real time travel information include:

• a reduction in driver frustration

• allowing drivers to choose to use alternative routes

• a reduction in congestion

• improved safety

Variable

Speed Limits

Variable Speed Limits (VSL) and advisory speeds are designed to

‘smooth traffic flow’ by introducing a temporary speed limit based on traffic volumes and hence delay the start of congestion conditions. Other outcomes include enhanced safety and reduced vehicle emissions.

VSL systems primarily aim to reduce incidents by managing the posted speed limits for congested or hazardous situations.

The benefits of variable speed signs is that they:

• improve journey times

• smooth traffic flow by minimising vehicles stopping and starting

• reduce accidents

• produce environmental benefits through fewer emissions

5

Lane control Lane control aims to enhance the efficiency of the highway through ensuring best use of existing road space. There are several types of lane control that can be implemented including:

• tidal flow operations for peak periods

• part time running lanes

• lane management for specific vehicle types e.g. bus priority lanes

7

• lane management systems e.g. overhead lane control matrix signs

• dynamic road markings

Lane Control with movable barrier – Auckland Harbour Bridge

Adaptive

traffic signal

control

Adaptive traffic signals can improve network efficiency by optimising signal timings and balancing traffic flows. This is achieved through automatic updating of cycle times that highlight changes in traffic distribution and volumes.

Adaptive Traffic signal control enable traffic signal controlled junctions to interact with each other. Such tools include Sydney Coordinated Adaptive Traffic System (SCATS).

Adaptive traffic signal control systems seek to optimise traffic flow by considering traffic flow at multiple sites rather than a single junction's performance. This area wide approach can bring significant traffic management benefits including reduced congestion and faster more reliable. A

Conclusion:

1. Valuable insights for future urban planning.

2. Please note that this document provides a high-level overview of the proposed solution. Further
3. Details and specifications would be required for a comprehensive implementation plan.
4. If you have specific requirements or need more detailed information, please let me know, and I can
5. Provide additional details or adjustments to the plan.
