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*South Coast Hinterland District – ITS Implementation Plan*

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**Ferreira. L.**, Pankaj Mahatta, P. and McGregor, F. (1999). ITS implementation plan for the Gold Coast area. Queensland department of Main Roads, South Coast Hinterland District, Nerang, Queensland.

## **SOUTH COAST HINTERLAND DISTRICT– QUEENSLAND MAIN ROADS**

### **ITS IMPLEMENTATION PLAN**

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## SUMMARY

ITS needs to be used to reinforce the planned major changes to the road functional hierarchy in the District, namely:

- the use of Southport-Burleigh Rd. (SBR) as the major regional corridor;
- the removal of through traffic from the GCH;
- the use of Oxley Dr./Olsen Av./Ross St./NBR as another major north-south by-pass;
- the use of Smith St.; NSR/Queen St.; NBR and Reedy Creek Rd. – West Burleigh Road as the major east-west access corridors.

There is a need to integrate the proposed ITS measures into the current related plans for the Pacific Motorway and into the overall traffic control strategies for the area as a whole. In addition, the staging of the proposed plan needs to take into account the planned DMR capital Works Program. An index representing the degree of priority to be attached to each network link was developed to assist in the phased implementation of ITS technologies over the next 5 years. 'ITS Index' is made up of five variables, namely:

- Accident rate factor
- AADT
- Volume/Capacity ratio
- Delay
- % Commercial Vehicles

The main components of the ITS plan are shown diagrammatically in Figure 1. The latter assumes that the high level of ITS implementation on the Pacific Motorway will be extended in time to the remainder of that Highway.

**Proposed CCTV locations**

**H = High Priority**

SBR corridor at:

- ❖ Smith St./High St. (**H**)
- ❖ Nerang-Southport Rd. (**H**)
- ❖ Nerang-Broadbeach Rd (planned by DMR)

Other Corridors

- ❖ GCH/Olsen Ave.
- ❖ GCH/North St. (**H**)
- ❖ Smith St./Olsen Av. (planned by DMR)
- ❖ Nerang-Southport Rd/Olsen Av. (planned by DMR)
- ❖ GCH/Hooker Blv. (**H**)
- ❖ GCH/Reedy Creek Rd. (planned by DMR)
- ❖ Nerang-Broadbeach Rd./Ross St.

### **Proposed VMS Locations**

#### **H = High Priority**

- ◆ GCH/Oxenford Rd.: on Oxenford Rd. southbound
- ◆ GCH/Oxenford Rd.: on GCH southbound (**H**)
- ◆ Smith St./Olsen Ave.: on Smith St. west-east (**H**)
- ◆ Smith St./High St.: on Smith St. both directions
- ◆ GCH/Reedy Creek Rd. Connection: on GCH northbound
- ◆ SBR/Nerang-Broadbeach Rd.: on SBR northbound (**H**)
- ◆ SBR/Nerang-Broadbeach Rd.: on Hooker Blv. east-west (**H**)
- ◆ SBR/Ashmore/Salerno: on SBR northbound and southbound
- ◆ Nerang-Southport Rd./SBR: on Nerang-Southport Rd. west-east
- ◆ Nerang-Southport Rd./Olsen Ave.: on Nerang-Southport Rd. east-west

To assist in the implementation of the road hierarchy system, a new static signage plan should be implemented. This plan needs to reinforce the changes by clearly assigning single road names to corridors and by placing new signs at appropriate locations.

### **Capturing Traffic Data**

The following corridors should be equipped with automatic traffic monitoring capability in priority order:

#### **High Priority**

- ❑ SBR corridor from Smith St. connection to Reedy Creek Rd.
- ❑ Smith St. from Pacific Highway to High St.
- ❑ GCH from Pacific Highway to North St.

#### **Medium Priority**

- ❑ Nerang-Broadbeach Rd/Ross St. to Nerang-Southport Rd.
- ❑ Nerang-Southport Rd from Pacific Highway to SBR
- ❑ Nerang-Broadbeach Rd from Pacific Highway to SBR

The Smith St. link from the Pacific Motorway to Olsen Ave. should be considered as a freeway for monitoring purposes. The GCH along the coastal strip needs to be treated as a local distributor rather than as the major corridor. As a result, the future traffic surveillance priority should be low.

At least one permanent environmental (vehicle emissions) monitoring station should be set up as part of the ITS plan. The most appropriate site for such a station would seem to be on the SBR corridor at the vicinity of Hooker Blv. intersection.

### **Pacific Highway**

The Pacific Motorway project will set the benchmark for freeway incident detection and traffic management in the State. The high level of ITS implementation on the Motorway section will create a significant gap in performance and expectation, relative to the remainder of the Highway. It is recommended that the southern sections of the Pacific Highway be equipped to the equivalent level of traffic data collection and surveillance as the newly upgraded Motorway section, under a staged program.

### **Travel Time Savings**

The travel time benefits of the full implementation of ITS over the network are likely to be of the order of at least 5 percent of vehicle-hours travelled on the affected links. At a discount rate of 6 percent, the total present value of the gross travel time benefit over 10 years is of the order of \$200 million.

Figure 1 Proposed ITS Plan



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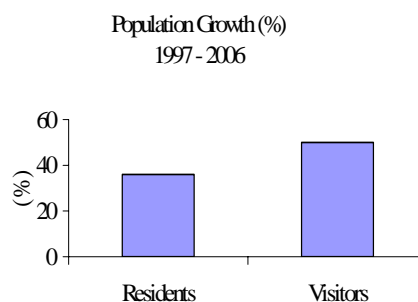
## 1. INTRODUCTION

### 1.1 Background

The Gold Coast is a rapidly growing area of South East Queensland which attracts a high proportion of local, interstate and overseas visitors. The resident population of the area, which is currently around 357000, is augmented by 50000 visitors on an average day. A projected population of around 650000 and 120000 residents and visitors respectively, has been recently put forward for the year 2031(VLC, 1998). The projected annual growth for the next 5 years is around 3.2 percent pa. yielding a population of around 500000 residents and 75000 visitors by 2006. This represents an increase of 36 and 50 percent from 1997 to 2006, for residents and visitors respectively.

ITS is a generic terminology commonly used to refer to the application of information technologies (computer software/hardware and communications) to enhance the efficiency of the existing road infrastructure in general. More specifically, ITS is aimed mainly at reducing traffic delays, vehicle operating costs and emissions, as well as reducing road traffic accidents.

In the context of this study, ITS is primarily focussed on Advanced Traveller Information Systems (ATIS) and Advanced Traffic Management Systems (ATMS);. ATIS refers to the use of various means to supply drivers with traffic information regarding delays, incidents and alternative routes as they travel through the network; as well as the provision of information to drivers before a trip is made. ATMS provide information and data for the purposes of monitoring and surveillance and to implement traffic control strategies. Both ATIS and ATMS need to be at an adequate level in order to detect and clear incidents effectively and speedily. Therefore, incident management plans require widespread and comprehensive deployment of ITS.



The project is aimed at identifying the opportunities for applying ATIS and ATMS in the study area in a phased implementation over the next 5 years. Such ITS based technologies are generally seen as providing the greatest short-term benefit in terms of reduced delays caused as a direct result of road accidents and incidents. In addition, ATIS is seen to be particularly well suited to areas such as the Gold Coast, with a high proportion of visitors who are unfamiliar with the road network and prevailing traffic flow conditions. Whilst hard evidence is not available, from data on visitor nights and visitor travel patterns (mode used and trips undertaken) we estimate that visitors make up close to 20 percent of vehicle-kms travelled in and through the study area. The holding of special sporting and other events which attract high levels of vehicle trips and require

extensive road closures and traffic circulation changes, is also seen as a potential to use ITS to good advantage.

## **1.2 Objectives of the Current Study**

The study brief has set out the following main objectives:

- (i) To recommend the phased introduction of a package of ITS measures which are seen as the most appropriate for the study area in the next 5 years;
- (ii) To quantify the likely net benefits from implementing the package of measures identified above; and to attach likely levels of accuracy/certainty to those net benefits.

This initial report deals mainly with the first of the two objectives. The evaluation methodology is put forward here but no detailed evaluation is reported.

## **1.3 The Study Area**

The study area for the purposes of this project is the area bounded by the Pacific Highway; Oxenford-Southport Rd; Pacific Ocean and the NSW/QLD border. The study area is shown in Figure 2, which also shows the definition of the 21 Sectors used to analyse travel patterns (Section 2.2). At this stage, the ITS implementation strategy is confined to the following roads:

- Gold Coast Highway
- Pacific Highway
- Southport-Burleigh Rd
- Oxenford-Southport Rd.
- Nerang-Southport Rd.
- Nerang-Broadbeach Rd.
- Reedy Creek Rd.
- Smith St Connection Rd.

Figure 1 shows a diagrammatic representation of the study area road network.

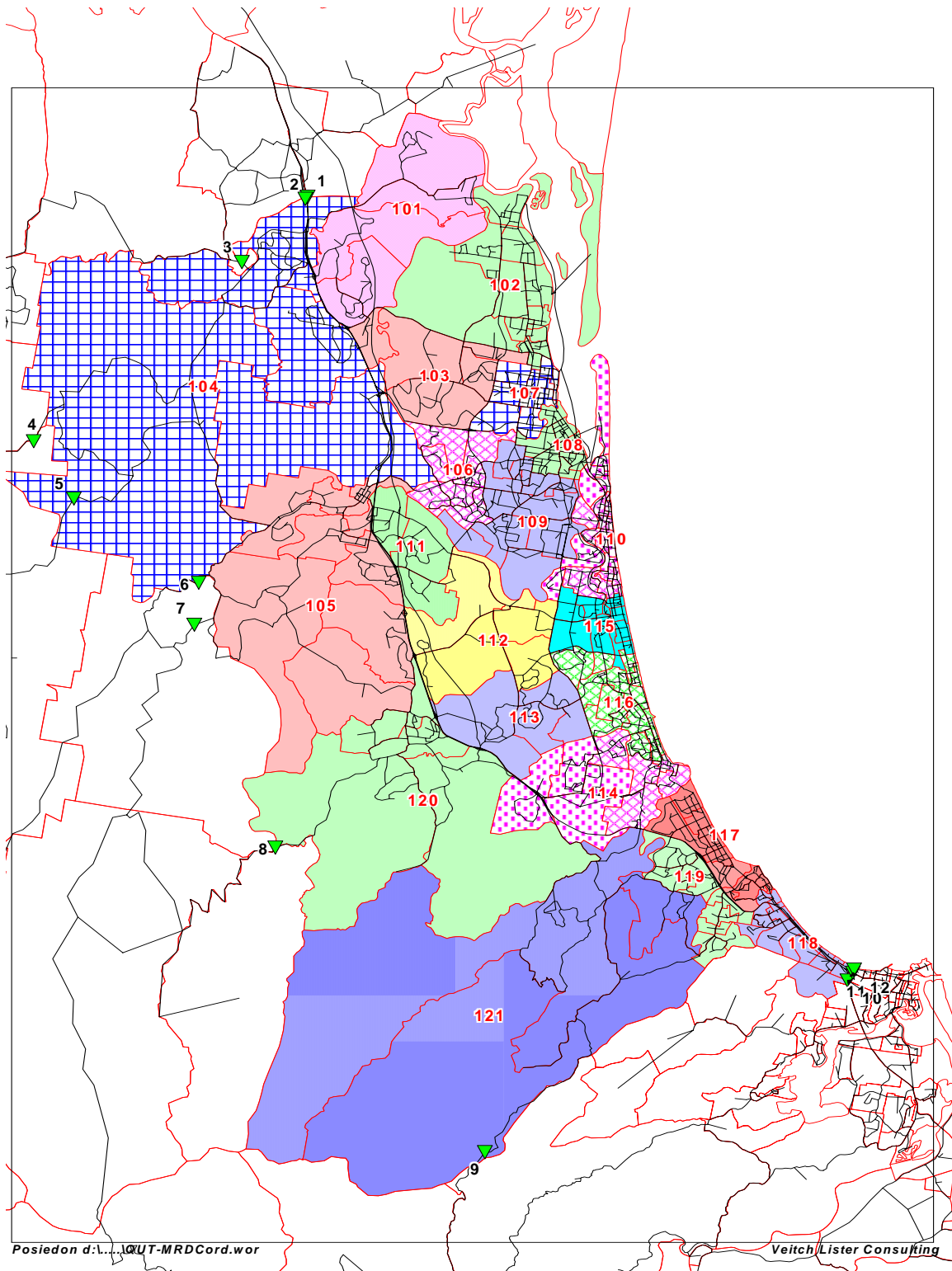
## **1.4 Structure of this Report**

The next section deals with the data analysis undertaken to establish the current patterns of travel demand, as well as the performance of the road network. Current and likely future levels of service are discussed at this stage. Appendix B contains a spreadsheet which details the analysis performed and the data used. Section 2 also deals with the analysis of accident data and the identification of accident blackspots. Appendix C is a spreadsheet which was developed to deal with the analysis of accident data.

Section 3 discusses the development of the ITS plan and puts forward the main elements of that plan after setting out some guiding principles. Advanced Traffic Management Systems and Advanced Traveller Information Systems are highlighted. Locations are identified for VMS, CCTVs and traffic sensors to capture volume, occupancy and speeds.

Finally, in Section 4, the evaluation of ITS measures is discussed, including the evaluation methodology and the main benefits to be derived.

**Figure 2. Study area, Sectors and Cordon Points**



## 2. EXISTING CONDITIONS

### 2.1 Private Vehicle Demand Pattern

In order to quantify the net benefits from those Advanced Traveller Information measures aimed at altering the route choice behaviour of drivers, such as VMS, it is necessary to estimate the likely population of drivers to which the route diversion advisory messages will apply. It is also necessary to estimate the proportion of that population likely to change behaviour as a result of those messages.

Therefore, to determine the most appropriate locations to implement those measures and their likely impact, there is a need to construct a matrix of vehicle trips through the network, at least at a broad level of detail. Such an aggregate Origin-Destination (OD) matrix was obtained from DMR (SCHD) using available data from past transportation studies. For the purposes of the current study, the study area was divided into 21 sectors and 12 external cordon points were identified as making up the entry and exit points for all external trips. Figure 1 shows the definition of the sectors and the location of the external points. The 1996 24-hour vehicle trip matrix estimated from a previous modelling exercise is shown in appendix A. Although this is not an observed matrix it should reflect the broad pattern of vehicle trips both within and through the area.

A summary of the overall statistics for the study area is shown in Table 1. Of the 240 million annual vehicle trips, 7 percent have origins or destinations outside the study area. Even though the Sectors used here are large in size, the total intra-Sector trips represent only 15 percent of the total matrix. A very significant number of trips (655000/day) cross one or more Sectors.

**Table 1. Overall Study area O-D Statistics**

Overall Measure	Daily (000's)	Annual <sup>1</sup> (million)
Total veh. trips	770	240
Total person trips <sup>2</sup>	1100	348
Total vehicle hours <sup>3</sup>	205	64
Total VKT <sup>4</sup>	9600	3003
Total value of travel time <sup>5</sup> (\$)	2250	704
External cordon trips (%)	7%	
Intra-Sector trips (%)	15%	
Trips crossing one or more Sectors	655	204

Assumptions:

- 1 - annualised factor = 312
- 2 - veh. occupancy = 1.45
- 3 - average trip time = 16 mins (VLC, 1998)
- 4 - average trip distance = 12.5 kms (VLC, 1998)
- 5 - value of time = 11 \$/hr

Some of the more significant movements, in terms of identifying locations for possible VMS signs and assessing their impacts, are represented by through trips in general and north-south trips in particular. In addition, those longer trips whose destination or origin is the coastal strip, will be likely targets for VMS applications.

A total of 9 Sectors (out of 21 Sectors and 12 cordon points), make up 62 percent of total trip origins. All but one of those 9 Sectors are in the coastal areas of the Gold Coast. The coastal Sectors represent 50 percent of all trip origins and 56 percent of total destinations. Trips entering the area via the Pacific Highway represent 3 percent of the total matrix. Around 30 percent of those trips have destinations in the coastal strip from Southport to Burleigh Heads. Similarly, 40 percent of trips entering the study area from the south, have a destination in a Sector which is not in the vicinity of the southern cordon points. The major attracting Sectors are shown in Table 2.

**Table 2. The most Significant Sectors**

<b>Sector</b>	<b>Percent total trip attractions</b>
110 - Surfers paradise	13.9
109 - Bundall	8.5
115 - Broadbeach	8.0
108 - Southport	7.4
102 – Runaway Bay/Biggera Waters	5.5
116 – Miami/Mermaid Beach	4.9
114 - Burleigh	4.6
117 – Palm Beach	4.0

There is a significant proportion of daily trips from the northern areas of the Gold Coast which have destinations in the coastal or in the southern Sectors. This proportion varies from 20 to 40 percent of all trips from the northern Sectors. For example, some 35 percent of trips from Sectors 103 and 106 (Ashmore/Parkwood) have destinations in the coastal sectors to the South.

## **2.2 The Road Network**

Existing Main Roads data on travel times though the network and historical traffic volume data, were analysed to determine the network performance levels for average daily conditions, as well as peak period conditions. The detailed results are contained in a spreadsheet which accompanies this report and which will be referred to as Appendix B. A set of network maps are also contained in appendix B showing the data related to the major road network links in graphical form. Appendix B shows the following information for each link:

“Link Data”sheet:

- average daily traffic by direction
- peak season daily traffic by direction
- average weekday traffic by direction
- 5 year projections for average and peak season daily traffic
- V/C ratios
- peak-hour AADT and degree of saturation
- link length and posted speed
- free-flow travel time and travel time from DMR surveys
- average delays per vehicle and per person.

The following network diagrams are also shown in Appendix B (one diagram per sheet):

- node identification diagram
- link AADT in bar-chart form
- link volumes at high season in bar-chart form
- % commercial vehicles in bar-chart form
- link average annual weekday traffic in data form

Accident data is shown in Appendix C and will be discussed in Section 2.3.

### ***2.2.1 Current Network Performance***

The network, whilst coping adequately with current traffic demand, is subjected to some periods of recurrent congestion, as well as to periods of oversaturated traffic flow conditions due to: road accidents and other incidents; special events such as the Indy Car race and the Gold Coast Marathon; and high traffic volumes at peak holiday periods.

A recent report to MR has identified the major issues as being largely related to the lack of a well defined road functional hierarchy (VLC, 1998). Most of the roads serving a major regional function, such as the Gold Coast Highway (GCH), Smith St., Southport-Burleigh Rd (SBR), and Nerang-Broadbeach Rd (NBR), also serve other lower order functions including local access. As a result, through traffic often shares the same road links with local and visitor flows.

As the major centres of Southport and Coolangatta have expanded, there has been an increasing need to provide for East-West access to the coastal strip, on what has historically been a North-South pattern of development and main traffic flows.

The highest current volume/capacity (V/C) ratios can be seen in the GCH; SBR; NBR to SBR; and Oxley Dr./Olsen Ave.

### ***2.2.2 Future Network Performance***

There are a number of proposed changes to the management of traffic flows through the network (VLC, 1998). These changes, together with known changes in land use which will significantly affect the O-D vehicle trip matrix, will need to be taken into account when recommending and assessing ITS measures.

The amount of travel in the study area is forecast to increase by 100 percent from 8 million VKT in 1995 to 16 million VKT in 2011 (GCCC, 1998). The average vehicle trip distance is expected to increase from 12 kms. to 15 kms. during the same period, whilst the average vehicle trip travel times are forecast to increase from 15 to 25 minutes.

Continuing growth in commercial and other employment generators along the coastal strip is expected to be accompanied by significant residential development in the hinterland regions of the study area. This will place increasing pressure on major East-West traffic demand.

MR and the GCCC have a number of planned major projects aimed mainly at:

1. Increasing network capacity so that the links which are expected to come under stress within the next 5 years can accommodate the expected demand (eg: Pacific Highway south of Nielsens Rd., GCH, SBR, NBR, Nerang-Southport Rd (NSR), Smith St., Oxley Dr., Olsen Ave. and Ross St.).
2. Reducing accident risk at blackspots
3. Changing the road hierarchy system in a significant way such that:
  - The GCH becomes the major public transport corridor and provides local access only without through traffic;
  - SBR becomes the main north-south through corridor providing a high speed alternative to the GCH;
  - There is provision for a north-south by-pass in the northern area in the form of Oxley Dr./Olsen Ave./Ross St.
4. Undertaking a number of intersection and link upgrading projects in order to achieve 3. Above.

The proposed major network changes have implications for the ITS plan components, as well as the timing of their implementation. Whilst ITS can be used to facilitate the changes, the optimum timing from practical and cost perspectives, needs to be related to the introduction of specific projects. These implications are discussed in detail in Section 3.

## **2.3 Accidents and Incidents**

### ***2.3.1 Historical Accident Data Analysis***

The level of, and clearance times for, accidents on the network by type of accident needs to be analysed for incident management and planning purposes. Accident data was made available from historical DMR records on a GIS database (MAPINFO) from 1992 to 1998. The type of accidents analysed were: fatal accidents; injury accidents and property

damage accidents. Over 10,000 records were analysed and Appendix C shows the results of all accident analysis in tabular form and in network diagram format. Appendix C shows the average annual accidents per link, based on DMR statistics, and divided into fatal, injury and property damage.

On average, there were 1448 incidents p.a. with 28 being fatal (2 percent). There were some 850 persons p.a. requiring hospitalisation or medical treatment, (60 percent). Accidents on divided roads accounted for 45 percent of all incidents. Each of the accident worksheets in Appendix C will now be briefly discussed.

- **“Blackspots”** worksheet shows the results of the analysis undertaken to identify the major intersection accident blackspots. At these 44 blackspots, the number of incident types is also identified to give an indication of the severity of the incidents at these locations. The cut-off point was arbitrarily chosen as those that gave more than 50 different incident types. It is likely that these locations will produce the majority of congestion in the future when incidents occur.
- The various on and off ramps for the Pacific Highway between Oxenford and the Gold Coast Highway have the most accidents, but a relatively low number of injuries. The “Blackspot” worksheet ranks intersections according to number of accidents.
- The **“Accident Sites”** worksheet displays the blackspots graphically in rank order. This sheet indicates which roads are the most likely to have an incident. From this it can be determined where a VMS would be best placed so traffic can avoid the incident. There are eight of these major incident places along the Gold Coast Highway right at Surfers Paradise. Further down the GCH at Broadbeach where the NBR joins there is another cluster of blackspots.
- **“Speed and Numbers”** worksheet. When comparing incident types (fatals, hospitalisations, etc) with the speed limits and the locations, approximately 80 percent of all incident types occur within 50m of an intersection. This would lend support to the perception that intersections are the most dangerous places. As expected, the majority of incidents occur in a 60 k/h zone.
- **“Year and Month”** worksheet. Inspection of the incident numbers and incident types by month does not indicate any trend that a particular month is more likely to have an incident, or as having a recurring cycle.

### ***2.3.2 Incident Detection and Clearance***

From discussion with the local Police it was found that:

- (a) With the exception of major incidents, (dual tanker rollovers, etc) most incidents on the Pacific Highway take 2 to 3 hours to clear, ie from reporting to traffic flow being returned to normal.

- (b) Fatal accidents require a longer clearance time (3 plus hours), as measurements and other information need to be made.
- (c) The Gold Coast Roads are similar, taking two hours to clear, as there are not as many lanes.
- (d) Incidents tend to be near intersections, causing differing delays on all roads. Delay is the same for injury or property damage.
- (e) A heavy vehicle broken down (thrown gearbox, etc) causes as much congestion as a major incident because it blocks the shoulder and one lane, and still needs a crane from Brisbane.
- (f) More heavy recovery vehicle positions need to be established.
- (g) Need for VMS information to be within the 1<sup>st</sup> 15 minutes to avoid the huge build up of blocked traffic, which also stops emergency vehicle access to the site.
- (h) A major priority is from whom and how the message is initiated, eg by first 'official' on scene, or by a CCTV controller, or through 000 call response being on sent to Traffic Control.
- (i) Experienced personnel on scene can generally give an estimate as to clearance times.
- (j) At present information is handed out to local radio stations, etc, but by the time they broadcast it, the delays have started to build up.
- (k) For Pacific highway, VMS information needs to be back to the Brisbane river so that the alternative routes can be used (eg, Beenleigh, Canungra, Beaudesert). Message to state accident site, delay time anticipated and alternative route.
- (l) Investigations into an American system of drive-by filming from which measurements can be made is being done.
- (m) Generally, it seems the police would welcome ITS systems, such as VMS and CCTV, as well as road sensors for IMS. It also seems that they would welcome more information as to what is being proposed, and the opportunity to participate in the process.

### **3. ITS IMPLEMENTATION**

#### **3.1 Guiding Principles**

The task of developing an ITS plan for the study area should be informed by the most recent developments in ITS, either planned by or implemented in other areas of DMR and by other road authorities and planning agencies elsewhere in Australia. However, the available technology (hardware and software) should be considered only as a means to tackle specific problems or potential future problems. The plan should not be confined to a specific set of predetermined ITS solutions. Instead, it should address the short to medium-term needs of the study area road network and make recommendations in the light of those needs, the available technology and associated implementation costs.

The following issues need to be considered when selecting the most appropriate package of measures:

ITS needs to be used to reinforce the planned major changes to the road functional hierarchy, namely:

- the use of SBR as the major regional corridor;
- the removal of through traffic from the GCH;
- the use of Oxley Dr./Olsen Av./Ross St./NBR as another major north-south by-pass;
- the use of Smith St.; NSR/Queen St.; NBR and Reedy Creek Rd. – West Burleigh Road as the major east-west access corridors.

There is a need to integrate the proposed ITS measures into the current related plans for the Pacific Motorway (Main Roads, 1999) and into the overall traffic control strategies for the area as a whole.

- (1) Any current plans by the Gold Coast City Council directed at the future implementation of ITS for road based public transport in the area, need to be taken into account.

### **3.2 Proposed ITS implementation Plan**

The proposed package of measures includes:

- (a) those which should be implemented in the short-term (1 to 2 years) such as: enhanced surveillance capabilities; speed and traffic count data collection; improved incident detection and clearance capabilities; and dynamic advice to drivers at strategic locations; and
- (b) those which should be implemented in the medium-term (3 to 5 years) such as: internet based Advanced Traveller Information Systems which can be accessed by drivers either at home, at hotels or Kiosks or in-vehicle.

The proposed measures will be discussed under those two main categories.

#### **3.2.1 Advanced Traffic Management Systems**

The ITS measures proposed here exclude the development of traffic control systems and related software, in accordance with the consultancy brief.

The measures proposed include:

- Data acquisition on prevailing traffic flow conditions. These could be either dual induction loops or video based systems to obtain speed, volume and occupancy data;
- Surveillance monitoring of traffic flow conditions at strategic locations (eg: the use of CCTVs);
- The use of strategically placed Variable Message Signs (VMS) aimed at conveying information to drivers regarding prevailing traffic flow conditions, incidents and alternative routes available.

The proposed deployment of these measures has been arrived at using the guiding principles dealt with in section 3.1, as well as:

- (a) The level of current and expected congestion on links and at intersections;
- (b) The accident ‘blackspots’ analysis discussed in section 2; and
- (c) The DMR planned major capital projects.

### ***Link Priority Index for ITS implementation***

An index representing the degree of priority to be attached to each network link was developed to assist in the phased implementation of ITS technologies over the next 5 years. Appendix B has details of the methodology used and the results obtained.

The model used here assigns each link a relative priority referred to as the 'ITS Index'. The latter is made up of five variables which have been projected for the next 5 years, namely:

- Accident rate factor
- AADT
- Volume/Capacity ratio
- Delay
- % Commercial Vehicles

The index uses an accident rate factor which is a composite of fatal, injury and property accidents for the link. The clearance time of fatal accidents is assumed to be 3 times that for other types of accidents. Different weighting factors can be assigned to each one of the five variables to reflect: (a) the specific ITS measure being proposed; and (b) the overall relative importance of each variable.

The following weights (out of 10) were used to calculate an overall ITS priority index:

- Accident rate factor 10
- AADT 8
- V/C Ratio 7
- Delays 2
- % CV 4

A sensitivity analysis was conducted on the use of different weights for each factor. The results obtained show that the proposed locations for ITS treatments and associated priorities do not vary significantly, unless the weights are substantially altered.

The ITS index based approach was used in conjunction with the guiding principles defined earlier to arrive at the proposed implementation plan.

The links that have the highest accident rates are the GCH between Queen St and The Pacific Highway south of Burleigh and SBR between Queen St and Hooker Blv. The latter is also one of the most congested areas of the network. Given that most of the delays and accidents/incidents take place at intersections, the latter should receive high priority in terms of CCTV installation.

Given the future road hierarchy plans and levels of congestion and accident rates, the following intersections should be targeted for CCTV installation, subject to overcoming potential practical installation problems.

Proposed CCTV locations	
<b>H = High Priority</b>	
<u>SBR corridor at:</u>	
❖	Smith St./High St. (H)
❖	Nerang-Southport Rd. (H)
❖	Nerang-Broadbeach Rd (planned by DMR)
<u>Other Corridors</u>	
❖	GCH/Olsen Ave.
❖	GCH/North St. (H)
❖	Smith St./Olsen Av. (planned by DMR)
❖	Nerang-Southport Rd/Olsen Av. (planned by DMR)
❖	GCH/Hooker Blv. (H)
❖	GCH/Reedy Creek Rd. (planned by DMR)
❖	Nerang-Broadbeach Rd./Ross St.

Web cameras are being installed north of Ashmore Rd. and at GCH/Pacific Highway intersection.

### Automated Traffic Data Collection

Data essential for effective incident detection and management include volume, speed and occupancy. With such data available at adequate coverage, it is possible to use purpose designed software to detect incidents automatically. Such data can be automatically collected using either conventional dual loop detectors or via video based systems. Since the traffic control system provides traffic volume and occupancy data at signalised intersections, the main effort should be to install data monitoring capability along road links on each of the main north-south and east-west corridors. Installation should be on the basis that sensors should be spaced at least 1000 metres centres on major arterials for automatic detection and 500 metres on freeways. In the final ITS plan, the Smith St. link from the pacific Motorway to Olsen Ave. should be considered as a

freeway for monitoring purposes. The following corridors should be equipped with automatic traffic monitoring capability (in priority order):

- ❑ SBR corridor from Smith St. connection to Reedy Creek Rd.
- ❑ Smith St. from Pacific Highway to High St.
- ❑ GCH from Pacific Highway to North St.
- ❑ Nerang-Broadbeach Rd/Ross St. to Nerang-Southport Rd.
- ❑ Nerang-Southport Rd from Pacific Highway to SBR
- ❑ Nerang-Broadbeach Rd from Pacific Highway to SBR

The GCH along the coastal strip needs to be treated as a local distributor rather than as the major corridor. As a result, the future traffic surveillance priority should be low. In terms of traffic incident detection, it is possible that, as a major public transport corridor, buses could be used as mobile detectors for major incidents.

The Pacific Highway from Neilsens Rd. to the NSW border is discussed separately below.

At least one permanent **environmental (vehicle emissions) monitoring station** should be set up as part of the ITS plan. This would complement the environmental stations being planned as part of the Pacific Motorway project. The most appropriate site for such a station would seem to be on the **SBR corridor at the vicinity of Hooker Blv.** intersection. The final site should be selected in consultation with the Queensland EPA.

### **Pacific Highway**

The Pacific Motorway project will set the benchmark for freeway incident detection and traffic management capability in the region and in the State. Traffic projections point to the need to increase corridor capacity south of Neilsens Rd. towards the end of the next 5 year planning period. Given that new facilities with significant increases in capacity tend to attract induced traffic which is not usually well predicted, it is likely that the level of service on the southern part of the corridor will deteriorate rapidly at peak times.

It is, therefore, recommended that the southern sections of the Pacific Highway be eventually equipped to the same level of traffic data collection and surveillance as the newly upgraded Motorway section. Traffic speeds, volumes and occupancy for incident detection purposes should be put in place to the same level of coverage (ie. approximately 500m centres for dual loops (or alternative video data system). Incidence verification and general traffic condition monitoring via CCTV coverage should also follow the standards set by the Motorway project. This also applies to the deployment of VMS.

### **3.2.2 Advanced Traveller Information Systems**

#### ***Pre-trip planning***

Internet based Traveler Advice Kiosks (TAK) to provide information on:

- real-time congestion maps;
- travel times to major attractors;
- alternative routes (scenic routes);
- CCTV images of current traffic conditions;
- Public Transport timetables and maps.

TAKs could be set up at major trip generators/attractors, major service stations, theme parks, hotels, shopping malls, etc. In the medium-term MR could consider joint ventures with private sector to deliver traffic and other information to visitors at the dashboard. (theme parks; car hire companies, etc.)

### ***Information en-route***

- (1) In the medium-term Internet based dashboard congestion maps and route advice can be made available to drivers in-vehicle, either to the dashboard or to hand-held devices.
- (2) VMS can be used for delay warnings; incidents/accidents warnings; alternative route advice; current speeds and other traffic related information. If used to avoid high congestion points or high accident locations, the signs should be located upstream of those sites and be spaced at least 1.2 kms apart (Douglas, 1998).

#### **Proposed VMS Locations**

##### **H = High Priority**

- ◆ GCH/Oxenford Rd.: on Oxenford Rd. southbound
- ◆ GCH/Oxenford Rd.: on GCH southbound (**H**)
- ◆ Smith St./Olsen Ave.: on Smith St. west-east (**H**)
- ◆ Smith St./High St.: on Smith St. both directions
- ◆ GCH/Reedy Creek Rd. Connection: on GCH northbound
- ◆ SBR/Nerang-Broadbeach Rd.: on SBR northbound (**H**)
- ◆ SBR/Nerang-Broadbeach Rd.: on Hooker Blv. east-west (**H**)
- ◆ SBR/Ashmore/Salerno: on SBR northbound and southbound
- ◆ Nerang-Southport Rd./SBR: on Nerang-Southport Rd. west-east
- ◆ Nerang-Southport Rd./Olsen Ave.: on Nerang-Southport Rd. east-west

These locations have been selected on the basis of traffic density, origin-destination patterns and major alternative routes closely available. In addition, in order to fulfill incident avoidance strategies, those longer links, which are not covered above and which are major corridors, should be equipped with appropriately spaced VMS between intersections. The use of movable VMS would seem to offer short-term flexibility in this

regard. Such signs could also be used on demand to cater for special events and roadworks related traffic disruptions.

To assist in the implementation of the road hierarchy system, a new static signage plan should be implemented. This plan needs to reinforce the changes by clearly assigning single road names to corridors and by placing new signs at appropriate locations.

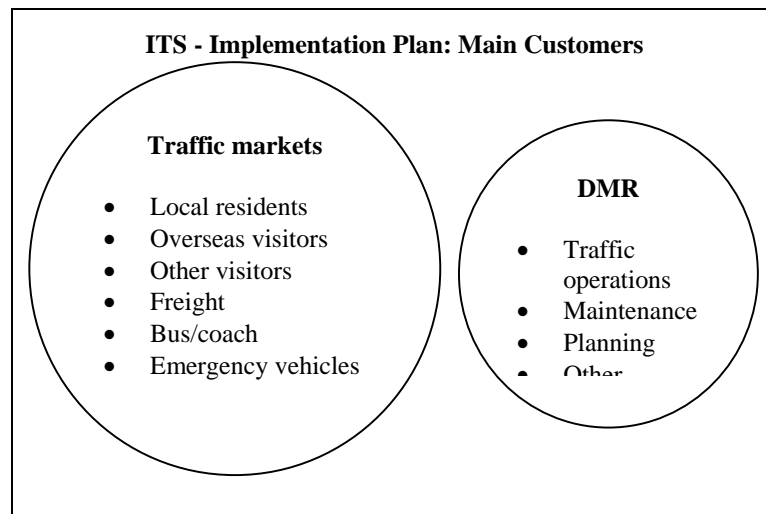
## 4. ITS EVALUATION

### 4.1 Evaluation framework

The main reasons to undertake an evaluation of ITS proposals are:

- to justify the implementation plan;
- to add credibility to the implementation plan. There is often a gap between the public perception of the performance of the network and the results obtained by the traffic engineers; and
- to use the evaluation results to help design the system and to define the detailed needs for a data collection plan (eg. automated continuous monitoring)

There is a need to assess the impacts on all ‘customers’. There is also a need to assess impacts for peak times (season, etc.); incidents/accidents and not just for the average day.



Although emerging ITS measures have received considerable attention by road authorities world-wide, quantification of the net benefit of each measure is lagging behind technological advances (ARUP, 1998). As a result, the economic justification of the more commonly advocated measures is very often sketchy and lacking in detail. It is

accepted that a full cost-benefit analysis of each proposed measure will be impractical due to the uncertain nature of the tangible benefits and the presence of a range of intangible benefits whose monetary valuation is at best dubious. As a result, it is proposed that benefits be quantified whenever feasible. The likely level of uncertainty of each benefit should also be given at this stage.

## **4.2 Costs and Benefits**

### ***Costs***

Capital/implementation; operations and maintenance; hardware and software needs; human resource costs and training implications.

### ***Benefits***

The main benefits are likely to be in terms of:

- (a) travel time savings through enhanced accident/incident detection, improved clearance times and re-routing of traffic;
- (b) travel time savings as a result of improved traffic management during special events;
- (c) travel time savings through reduced levels of recurrent congestion;
- (d) Given the high proportion of visitors, unfamiliarity with the area may be leading to unnecessary VKT. Need to estimate the extent to which VMS/internet based route advice will lead to a reduction in VKT.
- (e) improved road safety;
- (f) reduced vehicle operating costs; and
- (g) reduced vehicle emissions (AATSE, 1997)

The travel time benefits of the full implementation of ITS over the network are likely to be of the order of at least 5 percent of vehicle-hours travelled on the affected links (ARUP, 1998). The estimates in Table 1 show total travel in the Study area of around 64 million hours annually. Assuming that ITS will affect at least 80 percent of that total, the savings in travel time will be at least \$28 million annually. At a discount rate of 6 percent, the total present value of the gross travel time benefit over 10 years is of the order of \$200 million.

The adverse impacts of some of the measures might include:

- (a) increased vehicle-kms. travelled through re-routing;
- (b) loss of amenity in the local street network through an increase in diverted traffic.

Tangible benefits should be valued according to conventional Main Roads evaluation procedures regarding values of time and accidents by type of accident. All impacts which cannot be quantified in monetary terms or otherwise, should be identified in a qualitative manner.

Benefits from dynamic traffic advisory systems designed to alter route choice behaviour are particularly difficult to quantify. A number of European and US studies have attempted to measure the impact of such advice on driver behaviour. Given the unique characteristics of drivers in the study area road network, with its significant visitor population and the lack of a predominant commuter market, it is unlikely that the results of overseas studies can be directly transferred to the Gold Coast.

A commonsense and conservative approach should be adopted by estimating the target driver population in each case and the likely level of adherence to given route advice.

### ***Other benefits***

- Benefits to tourism and the local economy in general. ITS will create an image and a vision for the area as being at the leading edge: forward looking, 21<sup>st</sup> century image. Gold Coast is a window to the world at INDY/special events – ITS will help sell the area as a tourist destination.
- Freight flows efficiency gains
- Public Transport efficiency/ level of service gains
- Movement of emergency vehicles: effectiveness

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