Tourism, Growth and Infrastructure Demands: Data Review and Gap Analysis

Andrew Dakers
EcoEng Ltd, Christchurch
dakers@paradise.net.nz

David G. Simmons
Professor of Tourism
Environment, Society and Design Division, Lincoln University.
dsimmons@lincoln.ac.nz

August 2004

ISSN 1175-5385

Tourism Recreation Research and Education Centre (TRREC)
Report No. 58
# Contents

Contents ........................................................................................................................................ i

List of Tables ................................................................................................................................ iii

Acknowledgements .................................................................................................................... v

Executive Summary .................................................................................................................. vii

Chapter 1  Introduction ........................................................................................................... 1

Chapter 2  Types of Infrastructure and Demand Categories .............................................. 5

Chapter 3  Method of Data Assessment ............................................................................... 7

Chapter 4  Tourism Flow Data ............................................................................................... 9

Chapter 5  Infrastructure Matrix ............................................................................................ 11
  5.1 Service: Water Supply ........................................................................................................ 12
  5.2 Service: Wastewater Management .............................................................................. 16
  5.3 Service: Solid Waste Management ............................................................................... 19
  5.4 Service: Energy Supply .................................................................................................. 20
  5.5 Service: Telecommunication Services ......................................................................... 23
  5.6 Service: Transport Network .......................................................................................... 24
  5.7 Service: Parking and Signage ........................................................................................ 28
  5.8 Amenities ........................................................................................................................ 28
  5.9 Services Omitted in this review .................................................................................... 29

Chapter 6  Site Specific Data .................................................................................................. 31
  6.1 Dunedin City Council – Impacts of Freedom Campers .............................................. 31
  6.2 RONZ ............................................................................................................................ 31
  6.3 Northland Sustainable Tourism Project ....................................................................... 32

Chapter 7  Spatial Analysis Facility (SAF), Auckland University ........................................ 33

Chapter 8  Benchmarking ....................................................................................................... 35

Chapter 9  CRC, Australia ...................................................................................................... 37

Chapter 10 Miscellaneous Issues .......................................................................................... 39

Chapter 11 Outcomes of this Review .................................................................................. 41
  11.1 General Findings .......................................................................................................... 41
  11.2 General Recommendations ......................................................................................... 41
  11.3 Data specific findings and recommendations ........................................................... 42

References .................................................................................................................................. 45

Appendix 1 Review Brief ......................................................................................................... 47
Appendix 2  Consultation Details .................................................................................................49
Appendix 3  Summary of Transit New Zealand's 1994 Report .................................................................51
Appendix 4  Summary of Freedom Camping Management Approaches Adopted in New Zealand .........................................................................................................................53
Appendix 5  Agency Contact Details ...............................................................................................57
**List of Tables**

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table 1</td>
<td>Analytical Matrix</td>
</tr>
<tr>
<td>Table 2</td>
<td>Average Rule-of Thumb Water Consumption Per Guest-Night (L/GN) From Two Studies (Hanmer and Akaroa)</td>
</tr>
<tr>
<td>Table 3</td>
<td>Normalised Water Demand (L/GN) Statistics From Three Study Areas (Akaroa, Hanmer and Kaikoura)</td>
</tr>
<tr>
<td>Table 4</td>
<td>Daily Water Use by Non-Accommodation Tourist Related Businesses (m³/day)</td>
</tr>
<tr>
<td>Table 5</td>
<td>Green Globe Potable Water Benchmark Values (L/GN)</td>
</tr>
<tr>
<td>Table 6</td>
<td>Summary of Water Consumption Data Assessment</td>
</tr>
<tr>
<td>Table 7</td>
<td>Property Boundary Values of the Average Crude Wastewater Production Per Guest-night (L/GN)</td>
</tr>
<tr>
<td>Table 8</td>
<td>Property Boundary Values of Normalised Wastewater Production (L/GN) Statistics From Three Study Areas (Akaroa, Hanmer and Kaikoura)</td>
</tr>
<tr>
<td>Table 9</td>
<td>Campervan Survey Results</td>
</tr>
<tr>
<td>Table 10</td>
<td>Summary of Wastewater Yield Data Assessment</td>
</tr>
<tr>
<td>Table 11</td>
<td>Waste Production Data (L/GN)</td>
</tr>
<tr>
<td>Table 12</td>
<td>Green Globe Performance Level Benchmark Values; Solid Wastes</td>
</tr>
<tr>
<td>Table 13</td>
<td>Summary of Waste Yield Data Assessment</td>
</tr>
<tr>
<td>Table 14</td>
<td>Accommodation Energy Demand, (MJ/GN)</td>
</tr>
<tr>
<td>Table 15</td>
<td>Transport Energy Demand, (MJ/pkm)</td>
</tr>
<tr>
<td>Table 16</td>
<td>Green Globe Energy Benchmark Values, (MJ/GN)</td>
</tr>
<tr>
<td>Table 17</td>
<td>Summary of Energy Data Assessment</td>
</tr>
<tr>
<td>Table 18</td>
<td>Summary Assessment of Telecommunication Data</td>
</tr>
<tr>
<td>Table 19</td>
<td>Road Accident Rates as Percent of Drivers With Overseas License</td>
</tr>
<tr>
<td>Table 20</td>
<td>Summary Assessment of Transport Network Data</td>
</tr>
<tr>
<td>Table 21</td>
<td>Summary of Assessment of Parking and Signage</td>
</tr>
<tr>
<td>Table 22</td>
<td>Summary of Assessment of Amenities</td>
</tr>
<tr>
<td>Table 23</td>
<td>Resource Data</td>
</tr>
<tr>
<td>Table 24</td>
<td>Service Data</td>
</tr>
</tbody>
</table>
Acknowledgements

The Ministry of Tourism provided funding for this project.

The authors gratefully acknowledge the individuals and businesses that gave their time to provide much of the information contained within this report. In particular, thanks are due to Dr Ross Cullen, Commerce Division, Lincoln University and Mr Ray Sleeman, The Tourism & Leisure Group Limited, Christchurch.

We also acknowledge the typing and formatting efforts of Michelle Collings, the TRREC Project Administrator.
Executive Summary

The Ministry of Tourism is leading a three-year project that aims to establish the demands placed on New Zealand’s infrastructure by the forecast growth in tourism demand. One of the key outcomes from this work will be the development of a reliable predictive model of tourist demand on infrastructure.

This review contributes to this three-year project and reports on existing knowledge and data on the relationship between tourists and tourism industry behaviour on key infrastructure in New Zealand.

Infrastructure is provided by both the local government and the private sector. This review focuses mainly on public sector rather than private sector infrastructure.

The infrastructures of particular interest in this review are those typically provided by local territorial authorities (TLA) and used by tourists. These include:

- Supply of potable water
- Wastewater management
- Energy supply
- Solid waste management
- Telecommunication services
- Transport network and facilities
- Parking and signage
- Public amenities – toilets, library, information centres

A public service not covered in this review is response and readiness to natural hazards

Relevant (research) reports were reviewed and a number stakeholder groups were contacted and interviewed

The type of data required is "normalised" seasonal data that can be used in modelling to quantitatively evaluate demand tourists will place on the specific infrastructure services. The normalised data (for example litres (L)/guest-night (GN) of wastewater yield from a motel) would be used with tourist flow data (GN) to model seasonal wastewater production profiles for a particular town.

The key findings from this review are:

- There are good data on energy consumption by the tourist sector
- There are some data available on water consumption, wastewater and solid waste production by the tourist sector, however further research would be beneficial.
- There is very little national data on the impact of tourism on telecommunication, road networks, parking, signage and public sector amenities
- The local authority specific data required are tourist flow profiles and the various normalised infrastructure demand data for the different tourism demand categories.
The gaps that exist in the availability of infrastructure demand data were identified as:

- Potable water supply and wastewater production for upper market accommodation (3-5 star hotels).
- Potable water supply and wastewater production for non-accommodation tourist related businesses (e.g. cafés, restaurants, eco-tourism businesses).
- More accurate data on solid waste production data for all tourist related activities.
- There are some gaps in available data for normalised energy demand.
- Tourist demand on services such road networks, parking and signage, council amenities.

The recently released Ministry of Economic and Development report, *Sustainable Development and Infrastructure* (Nov 2003), has highlighted a number of emerging infrastructure scenarios. It is recommended that predictive modelling of tourist sector demand would need to be integrated with these.

Key recommendations include:

- Further work needs to be undertaken to develop and refine an appropriate model that uses tourist flow and normalised infrastructure demand data to provide the desired outcomes for local town tourism planning and management.
- Further research be undertaken to provide a completed set of normalised data on tourist demand water consumption, wastewater and waste production for the various demand categories.
- The DTS and the IVS survey be reviewed to provide more relevant data on tourism impact on, and satisfaction with, the services provided by the various public sector infrastructures.
- The review identifies a number of private and public, local and national, data collection programmes. It is recommended that these programmes be reviewed and opportunities for co-ordination be explored to provide better quality data to assist with infrastructure planning and management. Examples of such programmes are:
  - DTS and IVS
  - Green Globe
  - Road User Survey
  - LTSA Crash Analysis
  - Motor Caravan Association – dump station needs survey (not currently done)
  - Target Zero data collection
  - Recycling Operators of New Zealand Inc. (RONZ)
  - Northland Sustainable Tourism Project
- Opportunities for improved co-ordination and sharing of data collection and monitoring between the private and public sector service providers be explored.
- The Transit New Zealand 1994 report, Long Term Tourism Roading Requirements made a number of recommendations relevant to the interests of this study. It is recommended that Transit New Zealand be approached for an update on the implementation of the reports recommendations.
- Public body readiness and response to natural hazards is a service that the Ministry of Tourism may consider as important and in need of further evaluation.
Chapter 1
Introduction

This is a review of existing data sets and collection programmes for data on the impact of tourism on public sector infrastructure.

In his press release (14 May 04) on the Government announcement of $11 million to support infrastructure development of small towns, Tourism Minister Mark Burton said:

"Tourism is an economic powerhouse, contributing close to 16 per cent of New Zealand’s total export earnings. The sector makes a vital contribution to New Zealand’s economy at the national, regional and local levels, supporting close to one in every ten jobs. Many of these jobs are in small communities where other employment opportunities are often limited.

"We also understand that rapid growth in tourism can place pressures on some of these communities, particularly where rating bases are small. The investment needed to build water and sewerage infrastructure to meet the needs of visitors can be much higher per capita than in larger cities."

Seasonal and regional patterns of demand on the various infrastructures are complex. There are “universal” normalised demands that are independent of season and location. For example the average internal litres of water consumed by one guestnight in a Northland motel in summer is not likely to be too different from a motel with similar facilities and practices located in Southland in the winter. Seasonal and regional differences arise when, for example, external water uses (such as swimming pool demand, landscape irrigation demand) dominate. Clearly towns in low summer rainfall regions are likely to experience higher peak demands on the town water supply scheme than towns in regions of higher summer rainfall. Towns with a large proportion of holiday homes are likely to experience increased holiday water demand, with summer peaks significantly accentuated by both holiday home occupiers and permanent residents watering their gardens and lawns.

Each tourist town has its own unique tourist sector profile in terms of seasonal variability, proportion of holiday homes and day visitors relative to its permanent resident population, variable itinerant population, and industrial and commercial demands. For example Akaroa has a relatively small permanent resident population (about 600), a high holiday home component, has a strong seasonal profile (up to 3000 summer holiday visitors with about half being day visitors and the rest over-night visitors) and no industrial demand (Cullen et al. 2003). Kaikoura, on the other hand, has a more significant industrial and commercial sector, a high proportion of day visitors and a low proportion of holiday homes. These district specific profiles determine the quantitative characteristics and profiles of tourist demand on the local infrastructure. Much of the tourist data available in New Zealand reflect the macro (national, regional and annual) rather than the micro scale (district, weekly, use category); and it is the micro scale data that are required for refining the planning of public sector infrastructure such as water supply, wastewater and waste services.

As each town is unique it is necessary that they be studied individually to provide reliable seasonal profiles of tourist flow (over-night and day visitors) and infrastructure demand. Such studies would use both existing data sets and local survey data. The methodologies for
such studies have been detailed in Cullen et al. (2004), and is available in the New Zealand Planning Toolkit (available at www.tourism.govt.nz).

Infrastructure is provided by both the local government and the private sector. This review focuses mainly on public sector rather than private sector infrastructure. However it is recognised that there is some interest in New Zealand in infrastructure services provided by public-private partnerships (PPPs) (refer to IPENZ Informatory Note Ten, December 2002).

Local government’s role in tourism is critical in providing the utilities and infrastructure on which the tourism industry is based. This includes services such as public roads, water, wastewater and waste services, parking and signage, museums, art galleries, sporting facilities, visitor centres, reserves, gardens and other amenities, and sites for development.

There is increasing emphasis on providing infrastructural services that meet sustainability criteria. The recently released Ministry of Economic and Development, Sustainable Development and Infrastructure (Nov 2003) report notes:

> Sustainable development is a goal that emphasises a long-term (intergenerational) and holistic perspective, integrating economic, environmental, social and cultural dimensions (p. 2).

This same report provides some insight into emerging infrastructure scenarios.

> For the transport sector, important trends affecting sustainability will include decarbonisation (reduction in the carbon intensity of transport systems), continuing urban agglomeration and concern with livability, and dematerialisation (reduction in the material intensity of transport systems). Similar trends will be important for energy infrastructure, with concern about energy security and gradual scale reduction accompanying decarbonisation as key issues. In the water sector, scale reduction and decentralisation are also likely, together with integration of the management of urban water services. And in telecommunications, key trends are likely to include the rapid development and merging of technologies, including broadband, and the persistence of the digital divide (p. 3).

The Ministry of Tourism is leading a three year project that aims to establish the demands placed on New Zealand’s infrastructure by the forecast growth in tourism demand. One of the key outcomes from this work will be the development of a reliable predictive model of tourist demand on infrastructure. This model will be a suitable tool to:

- Forecast growth in tourism demand on New Zealand infrastructure.
- Enable infrastructure planning, design and management that is sustainable and integrated with other sector demands.
- Assist with designing structures for infrastructure funding that support sustainable development.

Predictive modelling of tourism demand on infrastructure would need to consider various scenarios ranging for status-quo technologies and systems to innovative and emerging technologies and systems.
This review contributes to this three-year project and reports on existing knowledge and data on the relationship between tourist and tourism industry behaviour on key infrastructure in New Zealand.

Refer to Appendix 1 for the brief for this review.
Chapter 2
Types of Infrastructure and Demand Categories

The infrastructure of particular interest in this review are those typically provided by local territorial authorities (TLA) and used by tourists. These include:

- Supply of potable water
- Wastewater management
- Energy supply
- Solid waste management
- Telecommunication services
- Transport network and facilities
- Parking and signage
- Public amenities – toilets, library, information centres

The different types of tourist activities that can exert a demand on some of these services include:

- Overnight accommodation (by accommodation type) - people staying overnight in one location
- Food and beverage – cafés, restaurants, bars, requirement for food and beverage
- Shopping
- Entertainment events
- Outdoor/adventure activities – ecotourism, transport, tracks, shelters, huts, toilets, water supply, picnic areas
- Use of amenities
- Travel from one location to another

Where sufficient information is available the data will be evaluated in terms of:

- Relevance
- Availability of data
- Quality of data

Finally an assessment of the gaps in available and relevant data will be offered.
Chapter 3
Method of Data Assessment

Several organisations were approached to provide details of the availability of data relevant to this review. These organisations included:

- Lincoln University:
  - Tourism Recreation Research and Education Centre, (TRREC)
  - Transport Studies
- Landcare Crown Research Institute (Dr Susanne Becken and Jeska McNicol)
- School of Geography and Environmental Sciences at the University of Auckland.
- Local Government New Zealand (Wellington)
- Land Transport and Safety Authority (LTSA) (Wellington and Christchurch)
- NZ Automobile Association (Auckland)
- Ministry of Transport (Wellington)
- Transit NZ (Wellington)
- NZ Motor Caravan Association (Auckland)
- Energy Efficiency and Conservation Authority (EECA) (Wellington)
- Tourism Industry Association, New Zealand. TIANZ, (Wellington)
- Christchurch and Canterbury Marketing (CCM)
- ESR Crown Research Institute (Christchurch)
- Ministry of Health (Wellington)
- Ministry for the Environment (Wellington)
- Auckland Regional Council, Environmental Services
- Dunedin City Council
- Business Care National Trust (Wellington)
- Sheraton Hotel (Auckland)
- New Zealand Hotel Council (Wellington)
- Telecom NZ (Wellington)
- TelstraClear (Auckland)

Refer to Appendix 2 for details of the letter sent to the above agencies.

Data quality assessment was based on reviewing the data and making subjective judgements on its quality.

The type of data required is typically "normalised" seasonal data that can be used in modelling with the goal to quantitatively evaluate demand tourists in a town will place on specific infrastructure services. For the purposes of this report “typical” means the average demand value for a category of use, under usual circumstances. The normalised data (for example litres (L)/guest-night (GN) of wastewater yield from a motel) would be used with tourist flow data (GN) to model seasonal wastewater production profiles for a particular town.
Chapter 4
Tourism Flow Data

It is not the aim of this study to review in detail tourism flow data. However having access to these data is essential to model tourism impact on a district's infrastructure. Tourist categories include international and domestic, overnight and day visitors. The attributes and type of tourism flow data required for valid modelling of infrastructure should include: the following:

- District based data.
- Seasonal (monthly) flow patterns.
- For specific peak load events weekly or even daily tourist flow patterns
- Day and overnight visitors flows
- Accommodation preference for the overnight tourists

Statistics New Zealand collect and publish short-term commercial accommodation survey data\(^1\) (Commercial Accommodation Monitor, CAM) and present these as monthly totals for defined regions and territories in New Zealand. Commercial Accommodation Monitor data are for GST registered providers only, (>\$30000 income p.a.) and therefore omit informal or small accommodation providers such as small Bed and Breakfast units.

The CAM data can be easily downloaded as pivot tables from the website of Statistics New Zealand. (http://www.stats.govt.nz). They contain the number of establishments, capacity, occupancy rates, guest nights, guest arrivals, length of stay and some ratios of these variables.

These data give the number of people staying at registered commercial accommodation and can distinguish accommodation category. These data do not necessarily represent the tourist pattern or the accommodation details for the serviced area of a particular town. It is important to identify the boundaries of the serviced area and to be aware that these boundaries can be service specific. For example the boundaries for wastewater-serviced area are likely to be different to the boundaries of the water supply serviced area. However it is possible that these differences are not significant. The CAM data are useful for providing monthly tourism profiles which are likely to reflect the local town’s temporal GN profile. Using such profiles with the guest-night data obtained from snapshot studies (Cullen et al. 2004), a reasonable estimate of guest-nights profile within the serviced area can be simulated.

As mentioned, CAM data have limitations. Depending on the current Statistics New Zealand release policy and confidentiality criteria, customized data may be obtained from Statistics New Zealand (Christchurch Office) at a cost. These data could include information such as number and categories of commercial accommodation establishments, their capacity and guest nights for each category. However for smaller towns, it is likely that confidentiality criteria may prevent the release of the required data.

The Tourism Research Council NZ (TRCNZ) publishes annual tourist flows in the following two forms:

\(^1\) As all businesses are required to provide these data the survey is a census and therefore provides a reliable database.
- Historical travel survey data which are region based tourist flows for both domestic and international tourists.
- Forecasted annual tourist flows (domestic and international) for regions throughout New Zealand. These regional annual data may assist in giving a town or district some indication of tourism growth.

Refer to the TRCNZ website: http://www.trcnz.govt.nz

Planning of services such as water and wastewater services does require precise seasonal tourism flow data. The above data sets (CAM and TRCNZ) may be insufficient in which case a local data collection programme may be necessary, such as the snapshot study process (Cullen et al., 2004) (Planning Toolkit).

Finally, some RTO's provide, on their websites, specific information on visitors to their regions. (http://www.tianz.org.nz/Industry-Facts/NZ-Tourism-Partners.asp).
Chapter 5
Infrastructure Matrix

This review uses the following analytical matrix, (Table 1) to represent a summary of the data sets for the different services across demand categories. Data sources have been categorised according to data availability and for data quality (reliability). For each service category, detailed discussion of data requirements are presented in this Chapter.

The services have been grouped into:
- Primary services – water, wastewater, solid waste, energy and telecommunication
- Other services – transport, parking and signage and public amenities

Table 1
Analytical Matrix

<table>
<thead>
<tr>
<th>Demand Categories</th>
<th>Networked Services</th>
<th>Primary Services</th>
<th>Water Supply</th>
<th>Wastewater</th>
<th>Solid waste</th>
<th>Energy</th>
<th>Telecommunications</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overnight</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accommodation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Day Activities</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food and</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>beverage</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shopping</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Entertainment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eco-tourism and</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>outdoor adventure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amenities</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Travel</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 1
Analytical Matrix

<table>
<thead>
<tr>
<th>Demand Categories</th>
<th>Other Services</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Transport</td>
<td>Parking</td>
<td>Public</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Network</td>
<td>and signage</td>
<td>amenities</td>
<td></td>
</tr>
<tr>
<td>Overnight</td>
<td>p/r</td>
<td>n/-</td>
<td>n/-</td>
<td></td>
</tr>
<tr>
<td>accommodation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Day visitors</td>
<td>p/r</td>
<td>n/-</td>
<td>n/-</td>
<td></td>
</tr>
</tbody>
</table>

Key

<table>
<thead>
<tr>
<th>Availability of Data</th>
<th>Quality of Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>a – available</td>
<td>h - high quality data</td>
</tr>
<tr>
<td>p - partial data set available</td>
<td>r - reasonable quality</td>
</tr>
<tr>
<td>n - no data available</td>
<td>p – poor quality</td>
</tr>
</tbody>
</table>

For example:
- p/r means that there are data available but not a complete set and that the data quality is judged as reasonable.
- n/- means no data are available thus quality is not an issue.
5.1 Service: Water Supply

5.1.1 TRREC Data

Normalised data for water consumption (litres) per guest-night (L/GN) were obtained in recent research carried out by TRREC. This research used snapshot studies in Akaroa, Hanmer and Kaikoura to obtain daily water consumption by different accommodation providers, selected tourist related businesses were also monitored on a daily basis. For the same period guest-nights were recorded by the accommodation providers. Results of this research have been published in Cullen et al. 2003; 2004 and Dakers et al. 2000a. Further results and analyses will be presented at the New Zealand Water and Waste Association (NZWWA) 46th Annual Conference and Expo, 2004, and published in the Conference proceedings, (Dakers et al. 2004b).

The Akaroa study involved three 4-day snapshot studies of daily measurement while the Hanmer and Kaikoura studies involved four 7-day snapshot studies for each town. The snapshot studies were undertaken at different times in the year to assist understanding of tourism seasonality. The total number of properties surveyed in these 3 town studies was:

- 2 hotels;
- 27 motels;
- 9 backpackers;
- 16 bed and breakfast;
- 5 camping grounds;
- 9 cafés;
- 6 restaurants;
- 4 fast foods outlets;
- 3 bakeries;
- 4 service stations;
- 2 commercial laundries;
- 2 public toilets;
- 2 swimming pools;
- 2 public bars; and
- 13 small business outlets such as tourist shops and offices.

The water consumption data collected in the TRREC studies in Akaroa, Kaikoura and Hanmer were analysed to give typical water consumption data. The resulting consumption values enable two approaches to the approximate estimate water consumption by the visitors. These are:

1. Using total guest-nights (GN) for the town and using the consumption values in the Table 2.
2. Using guest-night data for each accommodation category and using typical consumption data in Table 3.
Table 2
Average Rule-of Thumb Water Consumption Per Guest-Night (L/GN)
From Two Studies (Hanmer and Akaroa)

<table>
<thead>
<tr>
<th></th>
<th>Off Peak Season (winter)</th>
<th>Peak Season (summer)</th>
</tr>
</thead>
<tbody>
<tr>
<td>For Accommodation Businesses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water consumption, L/GN</td>
<td>175</td>
<td>275</td>
</tr>
</tbody>
</table>

To estimate approximate total L/GN to include service demand due to non-accommodation visitor related businesses add 20% to the above values.

These values are the averaged crude L/GN obtained from the snapshot studies conducted for Hanmer and Kaikoura. Crude L/GN for each town was the average L/GN of all accommodation provider categories that were measured each day of the snapshot period.

Cullen et al., 2004.

Table 3
Normalised Water Demand (L/GN) Statistics From Three Study Areas (Akaroa, Hanmer and Kaikoura)

<table>
<thead>
<tr>
<th>Accommodation Category</th>
<th>Winter</th>
<th>Summer</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Median</td>
</tr>
<tr>
<td>Motel</td>
<td>180</td>
<td>175</td>
</tr>
<tr>
<td>Hosted Accommodation (B&amp;B)</td>
<td>170</td>
<td>184</td>
</tr>
<tr>
<td>Backpackers</td>
<td>150</td>
<td>150</td>
</tr>
<tr>
<td>Camping Ground</td>
<td>150</td>
<td>144</td>
</tr>
</tbody>
</table>

Cullen et al., 2004.

It is recommended that these data be used for desktop studies to enable the investigator to create an approximate quantitative picture of the relative demand tourism places on the town’s water services for each of the seasons. Note that these values represent consumption at the property boundary.

Water consumption by non-accommodation tourist related businesses is presented in Table 4. It was not possible to normalise these data (for example as litres per customer) as the relevant daily consumer data was not available; only the total water consumption per day data were available. Apart from those businesses with high water consuming urinals, the median consumption values can be usefully used as rule-of-thumb daily consumption.

Specific allowance should be made for high water demand activities specific to the town; for example, public swimming pools and/or theme parks with water consuming activities.
Table 4
Daily Water Use by Non-Accommodation Tourist Related Businesses (m³/day)

<table>
<thead>
<tr>
<th>Public toilets</th>
<th>Hotels with public bars</th>
<th>Cafés</th>
<th>Café/restaurant</th>
<th>Restaurant</th>
<th>Fast food outlets</th>
<th>Auto service stations</th>
<th>Bakery</th>
<th>Laundry</th>
<th>Wharf</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>15.8</td>
<td>7.8</td>
<td>1.3</td>
<td>5.0</td>
<td>1.2</td>
<td>1.5</td>
<td>2.1</td>
<td>1.3</td>
<td>9.1</td>
</tr>
<tr>
<td>Median</td>
<td>15</td>
<td>4.9</td>
<td>1.1</td>
<td>2.8</td>
<td>1.0</td>
<td>1.0</td>
<td>0.9</td>
<td>1.1</td>
<td>3.7</td>
</tr>
<tr>
<td>Minimum</td>
<td>6.6</td>
<td>0.56</td>
<td>0.36</td>
<td>1.2</td>
<td>0.24</td>
<td>0.19</td>
<td>0.22</td>
<td>0.66</td>
<td>2.8</td>
</tr>
<tr>
<td>Maximum</td>
<td>31.4</td>
<td>29.1</td>
<td>5.8</td>
<td>13.9</td>
<td>2.5</td>
<td>14.6</td>
<td>7.0</td>
<td>2.5</td>
<td>26.7</td>
</tr>
<tr>
<td>Sample Size</td>
<td>28</td>
<td>55</td>
<td>39</td>
<td>42</td>
<td>38</td>
<td>77</td>
<td>53</td>
<td>38</td>
<td>8</td>
</tr>
</tbody>
</table>

Water consumption (m³/day)

Dakers et al., 2004b.

The limitations of these data are:
- Water consumption per guest-night (L/GN) varies between accommodation type, business type and external water demands (e.g., garden irrigation) and between towns.
- Peak demand periods may be poorly quantified.
- Using data from Table 2 would not provide sufficient data to enable modelling and optimising improved cost allocation and charging structures. With reliable GN data, the water consumption data from Table 3 would enable better modelling.
- The sample size of some of the non-accommodation businesses were small and water consumption can be highly variable.
- Due to lack of daily consumer flows this data could not be normalised.

To obtain high quality data for accurate modelling it would be necessary to conduct field surveys (snapshot studies, Cullen et al., 2004) in the specific town. Any variability of typical normalised seasonal data across the regions is likely to be driven by climate, rather than geographical location. This is particularly so for the summer demand which will be effected by landscape irrigation demands. There is no known analysis of data that would profiles regional variability for New Zealand. Halabi and Pan (2002) reviewed various tools for forecasting public supply water consumption and regional variability and pointed out that such analysis was difficult and always involves a degree of uncertainty or risk. While not specifically looking at the tourist sector, they noted that several factors and drivers have significant impacts on water demand, including population, land-use, socioeconomic factors, housing characteristics, water-use efficiency, weather and climate, price, and conservation programmes.

5.1.2 Green Globe 21

Green Globe 21 (http://www.greenglobe21.com/) offers an international benchmarking and certification programme to support sustainable travel and tourism. It is based on Agenda 21 and principles for Sustainable Development.

Green Globe provides some national performance level benchmark values for potable water consumption. These data are given in Table 5.
Table 5
Green Globe Potable Water Benchmark Values (L/GN)

<table>
<thead>
<tr>
<th></th>
<th>Potable Water, L/GN</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline</td>
</tr>
<tr>
<td>Hotels</td>
<td>700</td>
</tr>
<tr>
<td>Motel</td>
<td>250</td>
</tr>
<tr>
<td>B&amp;B</td>
<td>300</td>
</tr>
<tr>
<td>Hostels</td>
<td>250</td>
</tr>
<tr>
<td>Restaurants</td>
<td>350</td>
</tr>
</tbody>
</table>

Table 6
Summary of Water Consumption Data Assessment

<table>
<thead>
<tr>
<th>Relevance</th>
<th>Normalised data for water consumption is important to enable modelling of tourist demand on the water supply services of a town.</th>
</tr>
</thead>
</table>
| Data Quality | o In general terms data are of reasonable quality.  
 o The TRREC accommodation data provides a good estimate of water consumed per guest-night for a number of accommodation categories. Data for water consumption in upper market accommodation (3-5 star hotels) is lacking.  
 o Data on water consumption by non-accommodation tourist related businesses are judged as being of low quality.  
 o The source and quality of the Green Globe data are unknown. It is likely to be based on overseas research and could well have been derived from centralised flow data rather than property boundary data.  |
| Data Availability | o TRREC data is available from Cullen et al. 2004 and Dakers et al. 2004a and 2004b.  
 o Limited Green Globe data are available from their website: http://www.greenglobe21.com  |
| Data and Information Gaps | More research is recommended for the following areas:  
 o Effect of specific on-site activities such as; water saving, spas, laundry and swimming pools.  
 o Upper market accommodation  
 o Normalising tourist related non-accommodation businesses water consumption data.  |
5.2 Service: Wastewater Management

5.2.1 TRREC Data

The high suspended solids content of raw wastewater makes it very difficult to directly measure daily wastewater yield at the property boundary. Therefore there is no good quality wastewater yield data set for the various demand categories listed in the matrix shown in Table 1.

The approach taken in the TRREC snapshot studies in Akaroa, Hanmer and Kaikoura was to determine daily internal water use and assume that this correlated with wastewater yield from the property boundary. This is generally accepted as a sound assumption. It should be noted that wastewater yield to a centralised wastewater treatment plant is usually significantly inflated by leakage into the sewer pipe network from groundwater (infiltration) and surface stormwater (inflow). Thus any published normalised data based on the flow volumes to a community wastewater treatment plant will most likely be significantly higher than the equivalent flow data from the property boundary.

Results of the TRREC research has been published in Cullen et al., 2003; 2004 and Dakers et al., 2004a. Further results and analyses will be presented at the New Zealand Water and Waste Association (NZWWA) 46th Annual Conference and Expo, 2004, and published in the Conference proceedings, (Dakers et al., 2004b).

For total district wastewater, there are two approaches to obtain approximate estimates of wastewater production by tourists. These are:
1. Estimating total guest-night (GN) for the town and using consumption values in Table 7
2. Using guest-night data for each accommodation category and using typical consumption data in Table 8.

### Table 7
Property Boundary Values of the Average Crude Wastewater Production Per Guest-night (L/GN).

<table>
<thead>
<tr>
<th>Wastewater Production, L/GN</th>
<th>All Season</th>
</tr>
</thead>
<tbody>
<tr>
<td>175</td>
<td></td>
</tr>
</tbody>
</table>

- To estimate approximate total L/GN to include service demand due to non-accommodation tourist related businesses add 20% to the above values.
- These values are the averaged crude L/GN obtained from the snapshot studies conducted for Hanmer and Kaikoura where crude L/GN for each town was the average L/GN of all accommodation provider categories that were measured each day of the of the snapshot period.

Cullen et al., (2004)
Table 8
Property Boundary Values of Normalised Wastewater Production (L/GN)
Statistics From Three Study Areas (Akaroa, Hanmer and Kaikoura)

<table>
<thead>
<tr>
<th>Accommodation Category</th>
<th>Wastewater L/GN</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
</tr>
<tr>
<td>Motel</td>
<td>180</td>
</tr>
<tr>
<td>Bed and Breakfast</td>
<td>170</td>
</tr>
<tr>
<td>Backpackers</td>
<td>150</td>
</tr>
<tr>
<td>Camping Ground</td>
<td>150</td>
</tr>
</tbody>
</table>

Cullen et al., (2004)

Note that the property boundary values means the quantity yielded at the property boundary (not at the wastewater treatment plant)

These wastewater data are subject to similar limitation as the water consumption data i.e.:

- Water consumption per guest-night (L/GN), and therefore wastewater production varies between accommodation type, business type and between towns.
- Using data from Table 7 would not provide sufficient data to enable modelling and optimising improved cost allocation and charging structures. With reliable GN data, the water consumption data from Table 8 would enable better modelling.

To obtain high quality data for accurate modelling it would be necessary to conduct field surveys (snapshot studies, Cullen et al. 2004) in any specific town.

5.2.2 Green Globe
Green Globe provides no benchmark values for normalised wastewater yield.

5.2.3 Campervan Wastewater
Lincoln University Research
There are both domestic and international tourists who use campervans. In 1999, a Lincoln University postgraduate student surveyed the behaviour of NZ Motor Caravan Association members, (Smith 2000). Campervans are fitted with toilets and holding tanks that contain both black and greywater. The capacity of these holding tanks can vary from 20L to 45L and the typical daily volume of wastewater produced by campervan occupants was 4L of blackwater and 1 to 17L of greywater.

The results of this survey indicate that out of a total of 110 campervan visits to natural sites, there were 63 unmanaged discharges of wastewater (either black or greywater). This suggests a need for wastewater services at popular campervan sites.
Table 9
Campervan Survey Results

<table>
<thead>
<tr>
<th>Sites</th>
<th>Number of Each Type Visited</th>
<th>Number of Overnight Travellers</th>
<th>No. of Times Blackwater was Discharged</th>
<th>No. of Times Greywater was Discharged</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remote locations</td>
<td>50</td>
<td>154</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>Beaches</td>
<td>22</td>
<td>102</td>
<td>10</td>
<td>14</td>
</tr>
<tr>
<td>Lakes</td>
<td>21</td>
<td>119</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>Rivers</td>
<td>8</td>
<td>44</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Mountains</td>
<td>5</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forests</td>
<td>4</td>
<td>9</td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

In November 1999, Smith asked members of the NZ Motor Caravan Association to complete a survey detailing their travel patterns and behaviour (Smith, 2000).

The NZ Motor Caravan Association
The NZ Motor Caravan Association (http://www.nzmca.org.nz/index.html) has a website with good information on dump station location throughout NZ and how campervan operators should manage the wastes and wastewater.

Table 10
Summary of Wastewater Yield Data Assessment

<table>
<thead>
<tr>
<th>Relevance</th>
<th>Normalised data for wastewater production is important to enable modelling of tourist demand on the wastewater services of a town.</th>
</tr>
</thead>
</table>
| Data quality               | o Data quality is reasonable. The TRREC accommodation data is based on internal water consumption data. This is a valid assumption and provides wastewater data of reasonable quality. Data for upper market accommodation (3-5 star hotels) are lacking.  
  o Data on wastewater production by non-accommodation tourist related businesses are less reliable. It reasonable to assume that most of water consumed will enter the wastewater stream thus the data in Table 4 will provide a reasonable estimate of wastewater yield. |
| Data availability          | TRREC data are available from Cullen et al. 2004 and Dakers et al. 2004a and 2004b.                              |
| Data and Information Gaps  | More research is recommended for the following areas:  
  o Upper market accommodation wastewater yields  
  o Effect of on-site wastewater reduction measures such as water saving.  
  o Normalising tourist related non-accommodation businesses wastewater data. |
5.3 Service: Solid Waste Management

There are very limited normalised tourist related waste data available in New Zealand. This, in part, is due to the diverse nature of the waste collection services and the difficulty in measuring solid waste streams. Waste management systems and monitoring programmes vary significantly from town to town. For example the public sector waste management systems may consist some or all of the following:

- Street collection of domestic rubbish
- Street collection of recyclables
- Street bin rubbish
- Community recycling stations
- Commercial and industrial (tourism and non-tourism) rubbish
- Commercial and industrial (tourism and non-tourism) recyclables
- Contracted private collection and transport of rubbish, greenwaste and recyclables to landfill, transfer station or recycling centre

This review has identified two main sources of limited data sets; TRREC research and Green Globe.

5.3.1 TRREC

The three-town Canterbury study referred to earlier (Cullen et al., 2004) did provide some data. The data of litres of solid waste per guest night, in Table 11 are average rates based on snapshot studies done in Kaikoura where a University hostel, a camping ground and one motel were monitored for 7 to 14 days.

<table>
<thead>
<tr>
<th>Waste Production Data (L/GN)</th>
</tr>
</thead>
<tbody>
<tr>
<td>University Hostel</td>
</tr>
<tr>
<td>-------------------</td>
</tr>
<tr>
<td>Recyclables</td>
</tr>
<tr>
<td>Rubbish</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

The TRREC studies did show a strong correlation between tourism daily flows and the volume of waste collected from street bins.

These data have been reported in Cullen et al. 2003, Cullen et al., 2004 and Dakers et al., 2004a.

5.3.2 Green Globe

Green Globe provides some national performance level benchmark values for solid waste generation. These data are given in Table 12.
Table 12
Green Globe Performance Level Benchmark Values; Solid Wastes.

<table>
<thead>
<tr>
<th>Wastes, L/GN</th>
<th>Baseline</th>
<th>Best Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hotels</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Motel</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>B&amp;B</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Hostels</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>L pa/customer pa</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Restaurants</td>
<td>3</td>
<td>0.8</td>
</tr>
</tbody>
</table>

Table 13
Summary of Waste Yield Data Assessment

<table>
<thead>
<tr>
<th>Relevance</th>
<th>Normalised data for solid waste production is important to enable modelling of tourist demand on the waste services of a town.</th>
</tr>
</thead>
</table>
| Data quality | o The TRREC data is of low quality largely due to the difficulty and expense in collecting and quantifying normalised waste yield.  
               o The quality of the Green Globe data is unknown. No details were provided as to how, or from where, the data were derived.  |
| Data availability | o TRREC data are available from Cullen et al. 2004 and Dakers et al 2004a.  
                             o Limited Green Globe data are available from their website: http://www.greenglobe21.com |
| Data and Information Gaps | Additional research needs to be done to obtain good quality normalised waste yields from all tourist related businesses and for different solid waste categories (e.g. recyclables, green wastes, putrescibles, rubbish). This would involve both direct data field surveys and analysing existing data from various agencies. |

5.4 Service: Energy Supply

5.4.1 EECA

The most extensive research and data collection in normalised energy demand by the tourist sector is the work done Susanne Becken in her PhD (Becken, 2002). The latest and most relevant research done by Landcare under contract to EECA was published in Becken et al., 2003. This report noted that:

Transport and accommodation are the largest contributors to energy use (23.1 PJ of a total of 27.5 PJ consumed by tourism in 1997/98, Patterson & McDonald, 2002), with transport being the key driver (Becken, 2002). EECA’s intention was to conduct further analyses on these data to determine any change in overall consumption ……..
In this research, operators in the hotel, motel and backpacker accommodation categories were asked to provide information on their business and the amount of electricity, fossil fuel and other solid fuel consumed in their operations. Similarly, transport providers were asked to supply data on fuel consumption and load factors, where information was not able to be accessed from publications. Information gained in these surveys was translated into energy efficiencies (energy use per unit of output, i.e. MJ/passenger-kilometre [MJ/pkm] and MJ/visitor-night) and compared for the two reference years (1999 and 2001).

The transport modes included in the study were road, rail, sea and air. Energy demand data were obtained by surveying selected transport providers. As noted in the report:

For the current study representatives from TranzRail, Tranzlink, Air New Zealand, and the remaining transport categories (except recreational boats and ferries other than Tranzlink) were contacted to update information collected previously. The Ministry of Transport were contacted to provide updated information of fuel consumption of private and rental cars (also required for the hitchhiking category) but were unable to provide the required information.

The research used the industry analyses to determine normalised energy demand for the different tourism sectors along with both domestic and international tourist behaviour using DTS and IVS data – extracted and customised by Pip Forer, at the Spatial Analysis Facility at the University of Auckland - to create a national tourism energy demand picture. The research did not attempt to analyse energy demand at the regional or district level.

Becken noted that:

Inaccuracies are inherent in the data, mainly as a result of false reporting on the part of the tourists.... For example, tourists confused different modes of transport (e.g. Cook Strait ferry with a cruise ship) or obviously left out parts of their trip (i.e. the number of nights reported did not match the arrival and departure dates).

Normalised data
The EECA study (Becken et al., 2003) has provided some useful data on energy demand by tourists through accommodation and transport activities. Average data are tabulated in Table 14 and Table 15. The detailed data are tabulated in Appendix C and D of their report for accommodation and transport demands respectively.

These data were based on a relatively limited survey of companies. It is also important to note that the following data were provided by selected passenger transport providers.

Table 14
Accommodation Energy Demand, (MJ/GN).

<table>
<thead>
<tr>
<th>Accommodation Type</th>
<th>MJ per Guest-night</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hotel</td>
<td>145</td>
</tr>
<tr>
<td>Motel</td>
<td>50</td>
</tr>
<tr>
<td>Backpackers</td>
<td>40</td>
</tr>
</tbody>
</table>

21
Table 15
Transport Energy Demand, (MJ/pkm).

<table>
<thead>
<tr>
<th>Transport Category</th>
<th>1999 MJ/pkm</th>
<th>2001 MJ/pkm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other ferries</td>
<td>3.53</td>
<td>NA</td>
</tr>
<tr>
<td>Domestic Air</td>
<td>3.19</td>
<td>2.54</td>
</tr>
<tr>
<td>Cook Strait ferry</td>
<td>3.08</td>
<td>2.63</td>
</tr>
<tr>
<td>Camper van</td>
<td>2.06</td>
<td>2.39</td>
</tr>
<tr>
<td>Recreational boat</td>
<td>1.75</td>
<td>1.75</td>
</tr>
<tr>
<td>Train</td>
<td>1.44</td>
<td>0.38</td>
</tr>
<tr>
<td>Private car</td>
<td>1.03</td>
<td>1.03</td>
</tr>
<tr>
<td>Hitchhiking</td>
<td>1.03</td>
<td>1.03</td>
</tr>
<tr>
<td>Coach (tour bus)</td>
<td>1.01</td>
<td>0.32</td>
</tr>
<tr>
<td>Rental car</td>
<td>0.94</td>
<td>0.94</td>
</tr>
<tr>
<td>Scheduled coach</td>
<td>0.75</td>
<td>0.51</td>
</tr>
<tr>
<td>Motorcycle</td>
<td>0.87</td>
<td>0.87</td>
</tr>
<tr>
<td>Shuttle bus, van</td>
<td>0.59</td>
<td>0.56</td>
</tr>
<tr>
<td>Backpacker bus</td>
<td>0.58</td>
<td>0.39</td>
</tr>
</tbody>
</table>

5.4.2 Green Globe

Green Globe performance level benchmark values are given in Table 16.

Table 16
Green Globe Energy Benchmark Values, (MJ/GN)

<table>
<thead>
<tr>
<th>Energy. MJ/GN</th>
<th>Baseline</th>
<th>Best Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hotels</td>
<td>300-350</td>
<td>140-160</td>
</tr>
<tr>
<td>Motel</td>
<td>150-175</td>
<td>70-80</td>
</tr>
<tr>
<td>B&amp;B</td>
<td>215-250</td>
<td>115-100</td>
</tr>
<tr>
<td>Hostels</td>
<td>150-175</td>
<td>70-80</td>
</tr>
<tr>
<td>Restaurants</td>
<td>3-3.4</td>
<td>1.3-1.5</td>
</tr>
<tr>
<td>MJ pa/customer pa</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 17
Summary of Energy Data Assessment

<table>
<thead>
<tr>
<th>Relevance</th>
<th>The provision of energy services is mostly the responsibility of private rather than the public operators, for both the transport and accommodation sectors.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Quality</td>
<td></td>
</tr>
<tr>
<td>o The Becken data (Becken et al., 2003) is good quality given the limitations and assumptions that underpin the research.</td>
<td></td>
</tr>
<tr>
<td>o The quality of the Green Globe data is unknown. No details were provided as to how, or from where, the data was derived.</td>
<td></td>
</tr>
<tr>
<td>o Green Globe data are significantly higher than the EECA values</td>
<td></td>
</tr>
<tr>
<td>Data Availability</td>
<td></td>
</tr>
<tr>
<td>o EECA data are available from Becken et al., 2003</td>
<td></td>
</tr>
<tr>
<td>o The Green Globe data are available from their website: <a href="http://www.greenglobe21.com">http://www.greenglobe21.com</a></td>
<td></td>
</tr>
<tr>
<td>Data and Information Gaps</td>
<td></td>
</tr>
<tr>
<td>o Not all accommodation categories were covered in the EECA report. Further research is required to obtain these data</td>
<td></td>
</tr>
<tr>
<td>o It is recommended that a more detailed review of the energy data be done to explain the discrepancy between EECA and Green Globe normalise data for accommodation energy demand</td>
<td></td>
</tr>
</tbody>
</table>

5.5 Service: Telecommunication Services

There is no known data on the demand tourists place on the telecommunication infrastructure. John Moriarty (pers comm.) from TIANZ and a telecommunication engineer, noted that a number rural areas do have telecommunication network problems (internet access, email services and public phones), while services in the main urban centres in New Zealand are generally of a high standard.

The Accounts Manager in each of Telecom New Zealand regional offices have detailed knowledge about local telecommunication services and needs. For smaller account holders the local business associations may hold some information.

At the time of writing this review there had been no responses from TelstraClear.
Table 18
Summary Assessment of Telecommunication Data

| Relevance | Communication services are becoming increasingly important to tourists. With developments in mobile phone technology and the internet, tourist expectation for quality service will increase. These services are mostly provided by the private rather than the public sector. |
| Data Quality | No data available |
| Data Availability | No data available |
| Data and Information Gaps | Consideration should be given to updating existing national surveys (IVS and DTS) to provide the required tourist satisfaction data with respect to communication services.
Where regional data is required benchmarking surveys may be necessary as done for Christchurch and Canterbury Marketing by the Tourism & Leisure Group Limited in 2001. |

5.6 Service: Transport Network

State highway and expressway roading networks are provided by Transit NZ while district roading is the responsibility of the Territorial Local Authority.

The transport infrastructure encompasses a wide range of services including, for example, roading, rail, ports air and sea. In terms of this review of available data on the impact of tourism on infrastructure, it will be necessary to be more specific about the scope and nature of the data required. There are a number of local and national institutions who may have some specific and relevant data, however this will require time to locate and evaluate.

The Secretary of Transport of the Ministry of Transport responded to say that he was unable to provide any information and requested that we should advise the Ministry of the scope of the transport infrastructure you are investigating, such as roads, rail, ports etc, to enable us to reply to this request at a later stage.

Some specific data sources that are relevant to this review are outlined below.

5.6.1 Spatial Analysis Facility (SAF)

This facility is based at the School of Geography, Auckland University. SAF can provide customized data sets that will assist with assessing tourism loading on roading system. Refer to Section 7 for more details about SAF.

5.6.2 IVS/DTS

The IVS (survey size 5000-6000/yr) and the DTS (survey size about 15,000/yr) collect data on where visitors stay each night and their daily mode of transport. This data could be used to obtain an assessment of tourist demand on regional transport systems.
5.6.3 Road User Survey

Each year Transit NZ undertakes a road user satisfaction survey and publishes this in the State Highway Satisfaction Survey. This survey of 1000 people uses a random telephoning method which will exclude international tourists who would be unlisted. The sample size is too small to create an accurate national picture or to isolate local problem areas.

This limited survey does not distinguish tourists’ (domestic or international) road network satisfaction. The driver categories surveyed include drivers of commercial truck and cars and private cars. The analysis includes male and female driver categories and specific age groups. Regional profiles are also available in this report.

5.6.4 Land Transport Safety Authority, LTSA.

Road Accident Data

The Land Transport Safety Authority (LTSA) have a comprehensive data set on accidents in New Zealand. These data are available from the Crash Analysis System (CAS) (http://www.ltsa.govt.nz/research/cas/index.html) and include information on the nationality of the driver. Data can be broken down by local authority. Analysis of these data would give an indication of areas of difficulty for international drivers. The data are readily available to TLA.

International drivers and road safety

The Land Transport Safety Authority recently commissioned and released the report ‘Tourist Road Safety in Otago and Southland’.

In their media release (http://www.ltsa.govt.nz/media/2004/040629.html) LTSA state:

This report is the most comprehensive of its kind relating to tourist drivers in New Zealand. The qualitative study, commissioned from the University of Otago, examines the driving experiences of over 500 international tourists in summer and winter conditions. The study covered the major tourist nationalities from places such as the UK, Europe, Australia and Asia. The report is available on the LTSA website: www.ltsa.govt.nz.

While tourists represent very small numbers compared to New Zealanders in terms of crash involvement on a national basis, regional trends show that the percentage of crashes involving all types of overseas drivers is higher in key tourist regions of the country such as Northland, Nelson and Marlborough, the West Coast, Otago and Southland.

“The research shows that while most overseas tourists are highly educated, experienced drivers who have few concerns about driving here, there is a lack of awareness of the differences in New Zealand driving conditions," said Liz Taylor-Read, LTSA General Manager of Communications and Education.

With the exception of Asian tourists, only a small percentage of overseas visitors actively searched for information on New Zealand’s road rules before getting behind the wheel.
“New Zealand’s reputation as a first rate tourist destination means that overseas visitors expect to be able to drive easily when they get here, but this research shows that they experience difficulties with our winding and narrow roads, our unique give way rules and in many cases driving on the left.

“With over 600,000 tourists currently driving on our roads every year, and a projected growth in tourists of 5.7% each year to 2009, it’s essential to plan for how we can all help overseas visitors have a safe and enjoyable driving experience,” Ms Taylor-Read said.

“We also need to work with Transit New Zealand, local authorities and the police to see if there are engineering or enforcement solutions that will help visitors once they’ve started driving,” Ms Taylor-Read said

The LTSA propose to form an advisory group with representatives from the rental car and visitor industries to look at developing effective information resources for international tourists and the best ways of delivering them.

### 5.6.5 Lincoln University Transport Studies Road Accident Report

In April 2004 the Transport Studies Group at Lincoln University prepared a client report on accidents involving visitors to New Zealand from right hand drive countries (Mersch and Thull, 2004). The report found national data on accident rates (fatal and non-fatal) relating to drivers with international drivers licences, however none was regionalised. As can be seen in Table 19 there is an increasing trend of the percentage of accident involving drivers with overseas licenses. These data quoted by Mersch and Thull were originally presented in a report by Page et al (2001).

<table>
<thead>
<tr>
<th>Year</th>
<th>Fatal Accidents</th>
<th>Non-fatal Accidents</th>
</tr>
</thead>
<tbody>
<tr>
<td>1988</td>
<td>0.3</td>
<td>1.2</td>
</tr>
<tr>
<td>1989</td>
<td>0.5</td>
<td>1.3</td>
</tr>
<tr>
<td>1990</td>
<td>1.6</td>
<td>1.7</td>
</tr>
<tr>
<td>1991</td>
<td>1.2</td>
<td>1.6</td>
</tr>
<tr>
<td>1992</td>
<td>1.4</td>
<td>1.7</td>
</tr>
<tr>
<td>1993</td>
<td>1.1</td>
<td>1.7</td>
</tr>
<tr>
<td>1994</td>
<td>1.2</td>
<td>1.8</td>
</tr>
<tr>
<td>1995</td>
<td>2.5</td>
<td>1.8</td>
</tr>
<tr>
<td>1996</td>
<td>2.3</td>
<td>2.1</td>
</tr>
<tr>
<td>1997</td>
<td>2.4</td>
<td>1.9</td>
</tr>
<tr>
<td>1998</td>
<td>2.0</td>
<td>2.1</td>
</tr>
</tbody>
</table>
5.6.6 Transit New Zealand

Transit New Zealand conform to an extensive set of standards and guidelines. The full scope of these standards and guidelines (Standards and Guidelines Manual) can be downloaded from http://www.transit.govt.nz/technical_information/index.jsp?_FRAME_INCLUDES=content_view_manual.jsp&primary_key=34.

Transit New Zealand referred to two earlier reports:

The latter report recommended:
- *That the tourism industry and the Ministry of Commerce carry out on a regular basis a tourist expectation survey, with questions covering attitudes to New Zealand roads.*
- *That the tourism industry and the Ministry of Commerce conduct surveys of international and domestic tourist travel patterns to provide updated and improved data for the analysis of tourist travel.*

Refer to Appendix 3 for a summary of this report.

### Table 20
Summary Assessment of Transport Network Data

<table>
<thead>
<tr>
<th>Relevance</th>
<th>An efficient, convenient and safe transport network is a very important service for tourism and is a major responsibility of public sector providers.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Quality</td>
<td>The specific data that are available is likely to be of good quality e.g. data from SAF and CAS.</td>
</tr>
<tr>
<td>Data Availability</td>
<td>CAS data are readily available. SAF data would be available by arrangement.</td>
</tr>
<tr>
<td>Data and Information Gaps</td>
<td>o There are three data types that could be useful to public sector planners responsible for providing a high quality transport network service to tourist. These include:</td>
</tr>
<tr>
<td></td>
<td>▪ Road use intensity data to identify “hotspots” with regions.</td>
</tr>
<tr>
<td></td>
<td>▪ Road safety</td>
</tr>
<tr>
<td></td>
<td>▪ User satisfaction</td>
</tr>
<tr>
<td></td>
<td>o Consideration should be given to updating existing national surveys (IVS and DTS) to provide the required tourist satisfaction and use intensity data with respect to road network services.</td>
</tr>
<tr>
<td></td>
<td>o Where regional data is required benchmarking surveys may be necessary as done for Christchurch and Canterbury Marketing by the Tourism &amp; Leisure Group Limited in 2001</td>
</tr>
<tr>
<td></td>
<td>o The <em>State Highway Satisfaction Survey</em> would need substantial upgrading to provide useful tourist specific data.</td>
</tr>
</tbody>
</table>
5.7 Service: Parking and Signage

There are no known national data sets on the demand tourists place on parking and signage services. These issues are not referred to in the DTS or IVS.

All signs and road markings are covered by the Traffic Regulations. TRANSIT and LTSA use the Manual of Traffic Signs and Marking (MOTSAM) providing signage for non-standard tourist features. MOTSAM has been developed from American and Australian motorway, freeway and expressway standards and best practice. Part 1 (MOTSAM 1) sets the standards for signage while Part 2 (MOTSAM 2) provides standards for road markings. The Touring Route Signing Policy, (Ref: SI1-0001, part of MOTSAM 1) sets the signage standards for touring routes and heritage trails.

At the same time Local Authorities will have their own local road signage regulations and criteria. LTSA noted that there could be better co-ordination between the various tourist providers and signage providers.

The benchmarking survey was done for Christchurch and Canterbury Marketing (CCM) by the Tourism & Leisure Group Limited in 2001 addressed the degree of satisfaction of tourist in Christchurch with parking and signage. Refer to Section 8 for more details.

<table>
<thead>
<tr>
<th>Table 21</th>
<th>Summary of Assessment of Parking and Signage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Relevance</strong></td>
<td>Effective, appropriate and convenient parking and signage are important services for tourism and are the responsibility of both public and private sector.</td>
</tr>
<tr>
<td><strong>Data Quality</strong></td>
<td>There are no significant data for evaluation.</td>
</tr>
<tr>
<td><strong>Data Availability</strong></td>
<td>NA</td>
</tr>
</tbody>
</table>
| **Data and Information Gaps** | o Consideration should be given to updating existing national surveys (IVS and DTS) to provide the required tourist satisfaction data for these services.  
o Where regional data is required benchmarking surveys may be necessary as done for Christchurch and Canterbury Marketing by the Tourism & Leisure Group Limited in 2001 |

5.8 Amenities

Amenities include facilities such as libraries, parks, visitor information centres, museums and galleries. Apart from visitor information centres, there is no known national data on the demand tourists place on the various public sector amenities. These issues are not referred to in the DTS or IVS. Most visitor information centres measure and record daily door counts.

It is possible individual TLA or specific amenity providers have undertaken their own surveys of visitor demand on their specific services.
The benchmarking survey was done for Christchurch and Canterbury Marketing by the Tourism & Leisure Group Limited in 2001 addressed the degree of satisfaction of tourist in Christchurch with amenities such as the Visitors Centre, museum and public toilets. Refer to Section 8 for more details.

### Table 22
**Summary of Assessment of Amenities**

<table>
<thead>
<tr>
<th>Relevance</th>
<th>Public amenities provide important services to tourists</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Quality</td>
<td>This review found no significant data on the impact of tourism on services provided by public amenities.</td>
</tr>
<tr>
<td>Data Availability</td>
<td>NA</td>
</tr>
</tbody>
</table>
| Data and Information Gaps | o Consideration should be given to updating existing national surveys (IVS and DTS) to provide the required tourist satisfaction data for these services.  
o Where regional data is required benchmarking surveys may be necessary as done for Christchurch and Canterbury Marketing by the Tourism & Leisure Group Limited in 2001 |

5.9 **Services Omitted in this review**

At a late stage in this review it was noted that in New Zealand there are a number of popular tourist centres and transport systems that are at risk to natural hazards such as flooding, earthquakes, tsunami and volcanic activity. This review has not evaluated data and information on the public service of response and readiness to natural hazards in the key high-risk regions.
Chapter 6  
Site Specific Data

In carrying out this review it became evident that there are individual Councils and tourist businesses that have site-specific data. This is particularly so for tourist businesses who belong to Green Globe. They are required to submit, on an annual basis, data on water consumption, waste production and energy demand. Green Globe businesses have detailed data and may be prepared to make these available.

6.1 Dunedin City Council – Impacts of Freedom Campers

The DCC have just completed research on the impact of freedom campers on the Otago Peninsula. The report has been released and will be presented to the Council's Community Development in late July pending consideration and comments from the Otago Peninsula Community Board. The report is due to be considered by committee on 24 August 2004.

This project involved a University of Otago postgraduate student employed by the Dunedin City Council monitoring the impacts of freedom campers on the Otago Peninsula over the summer, between 1 December 2003 and the end of February 2004. Regular surveys were undertaken and details recorded of the type, numbers and location of vehicles involved. Site inspections on the following day were carried out to assess impacts. While led by the Council, the research was done in conjunction with other key bodies, including the Department of Conservation, Otago Regional Council and Otakou Marae. Volunteers from the Community Board and other local interests collected data from some 20 key locations that were perceived to be affected by freedom camping.

The report noted that of the total number of casual vehicles camping overnight on the Peninsula, only one third were rental campervans, while more than half were sleeping in vans, cars or other vehicles without toilet facilities. The study found that while the numbers and impacts of freedom campers at most locations are currently not significant (with an average of eight campers per night on the Peninsula), there are concentrations of campers at some key locations.

Refer to Appendix 4 for a summary of freedom camping management approaches adopted by a number of local authorities in NZ

6.2 RONZ

The Recycling Operators of NZ Inc. (RONZ) represents recycling service providers, operators and educators in the recovered materials and recycling industry. RONZ is currently working with the Top 10 Holiday Parks and the Youth Hostel Association of New Zealand to promote and support recycling systems.
6.3 Northland Sustainable Tourism Project

The Ministry for the Environment is working with Northland tourism to promote sustainable business practices in the region. This project is centred on a partnership between the Ministry, Enterprise Northland and six representative tourism businesses, and is due for completion at the end of June 2004.

A sustainability charter was drafted by Northland late in 2003, and is currently being 'road tested' by the six businesses. As part of this process, each business has undergone a sustainability performance assessment. These assessments have taken a broad focus stemming from the draft charter, but explicitly include "innovatively working on waste issues".

Northland's tourism sector has identified waste management as an area worthy of on-going investigation and work. Upstream waste minimisation via suppliers, establishing and expanding recycling systems, and opportunities around organic waste are all potential areas that have arisen during business assessments.
Chapter 7
Spatial Analysis Facility (SAF), Auckland University

Professor Pip Forer is the Director of the Spatial Analysis Facility, School of Geography and Environmental Science, University of Auckland. Starting with 1992 IVS data Professor Forer has used GIS (geographic information systems) and other tools to analyse, visualise and report on a range of data that express tourist visitation, movements and flows. The outcomes include data bases derived from two national core data sets (IVS and DTS), and from customised survey data in two regional areas (Northland and Westland).

Subject to sample size and location, one property of these data sets is an ability to identify broad, and sometimes quite local, patterns of tourist demand for different profiles of tourists. These results may assist TA’s in initially assessing the size of tourist visitation and the impacts of tourists on road network and other public sector infrastructure. It may also illustrate patterns of infrastructural demand at potential overnight stops, attractions or along transit corridors.

SAF currently have five potentially relevant data sets. These five data sets all use the concept of identifying and modelling individual tourist itineraries as indicated from survey work, and then aggregating these to give broad tourist flow patterns. They differ in how the original movement details are described. The analyses based on national core data sets are being extended forward in time as funds allow. The five data sets are:

1. Route structures of the International Visitor Survey data (IVS) over a period from 1992, and continuously for the past for seven yrs (1997 to 2003 incl.). These identify patterns of likely tourist presence, typically for large areas in any single year but with inter-year aggregation to allow finer spatial resolution.

2. Route structures of the Domestic Travel Survey (DTS) data for three yrs (1999 to 2001 inclusive). These identify travel hinterlands for major population centers as well as patterns of likely tourist presence, typically for large areas in any single year but with inter-year aggregation to allow finer spatial resolution.

3. The 1998 Survey of 1,000 visitors to the Northland Peninsula is a survey of visitor movement in Northland, captured by a site survey and validated against national core data sets. It captures specific routes taken by respondents and all major and overnight stops as well as a wide range of profile data.

4. The 1999-2001 survey of 2,500 tourists to the West Coast is a cordon survey in which respondents were asked to record exact routes and all stops over 5 minutes duration. It is validated against national core data sets.

5. Derived Stopping Propensity Patterns is a data set which provides a general description of likelihood of daytime stopping along tourist corridors, based on international itineraries and known overnight stays. This is currently an indicative pattern based on a ‘time into journey’ measure.
Chapter 8
Benchmarking

A methodology recently employed by the Tourism & Leisure Group Limited, may have application for assessing and monitoring the impact of infrastructure on tourist satisfaction (The Tourism & Leisure Group Limited, 2001). In 2001 a bench marking survey was undertaken for Christchurch and Canterbury Marketing.

This was the first survey of its kind in New Zealand, with 578 completed questionnaires. Visitors to the city were asked a range of questions, such as, where they came from, why they came to Christchurch, where they stayed, and for how long. However the survey also included questions about public infrastructure such as:

- What was their main form of transport.
- Had respondents used any city centre car parks and how easy they found it to park.
- What attractions did respondents visits such as, Botanic Gardens, the Arts Centre, Canterbury Museum, Christchurch Tram.
- Was public transport and signage adequate.

The Director of Tourism & Leisure Group Limited pointed out that destination benchmarking was pioneered by the Southern Tourist Board (STB) of the English Tourism Council and that than 40 cities are currently involved in destination benchmarking in the UK, (Sleeman, 2004). One of the spin-offs of this has been the subsequent development of best practice guidelines for some of the services provided to tourists. A Destination Benchmarking section is included in the tourism planning toolkit.
Chapter 9
CRC, Australia

The Sustainable Tourism CRC (STCRC) was established under the Australian Government’s Cooperative Research Centres Program to underpin the development of a dynamic, internationally competitive, and sustainable tourism industry. The STCRC is a not-for-profit company owned by its industry, government and university.

STCRC’s integrated, multidisciplinary research programme is focused on three key areas:

- Sustainable Destinations
- Sustainable Enterprises
- Sustainable Resources

CRC worked closely with Green Globe and it is clear that through the Green Globe benchmarking, monitoring and auditing programmes, a considerable data set on water, energy and waste will be collected.

CRC do not appear to have relevant data. A CRC research report by Lydia J Kavanagh titled “Water management and sustainability at Queensland Tourist Resorts” was summarized as:

Water management at tourist locations that are not connected to mains water and/or the sewer system (remote resorts) should be sustainable and effect both economical and ecological benefits. A survey of 80 resorts in Queensland and New South Wales not connected to sewer and/or to mains water was undertaken.

This report did not provide any consumption data. Instead it offered conceptual options for more sustainable water use.

Dean Carson, Head of the Centre for Regional Tourism Research, Southern Cross University prepared a CRC report titled "Local government indicators of sustainable management of tourism". He was contacted and was unable to provide any leads to useful relevant data.
Chapter 10
Miscellaneous Issues

Transit New Zealand’s *Waste and Energy Management Policy* was approved by the Transit Board in August 2003, and is one of the ways Transit contributes to government policies such as the New Zealand Waste Strategy, the National Energy Efficiency and Conservation Strategy, and the New Zealand Transport Strategy.
Chapter 11  
Outcomes of this Review

11.1 General Findings

- The Ministry of Transport requires a comprehensive data set to enable the development of a reliable predictive model of tourist demand on infrastructure in New Zealand. This data set should include both tourist flow data and normalised infrastructure impact data.
- Market Economics (Doug Fairgray) offer a service to model tourism flow. To apply their modelling to service demand, normalised service demand data will be required at the level of a district, sub-district or serviced catchment.
- Modelling tourism demand on infrastructure is town specific and is driven by both peak seasonal and average annual demand. Peak demand tends to drive capital costs while average demand tends to drive operating costs. The local authority specific data required are tourist flow profiles and the various normalised infrastructure demand data for the different tourism demand categories.
- To enable Councils to plan for the tourist demand on their various infrastructures, reliable data, including tourist flow data, are required for the area bounded by the serviced area. (Note: regional tourist data often extend beyond these boundaries.)
- Acquisition of seasonal local data will be a problem for some districts and may require specific surveys.
- The seasonal profiles of tourist demands is mostly driven by the seasonality of tourist flows, although in the case of water consumption, external water use (e.g. landscape irrigation, swimming pool and boat washing) is also a factor to consider.
- Predictive modelling of tourism demand on infrastructure would need to consider various scenarios ranging for status-quo technologies and systems to the more innovative and emerging technologies and systems.

11.2 General Recommendations

This review offers the following general recommendations:

- Further work needs to be undertaken to develop and refine an appropriate model that uses tourist flow and normalised infrastructure demand data to provide the desired outcomes.
- The review identifies a number of public and private, local and national, data collections programmes. It is recommended that some of these programmes be reviewed, and opportunities for co-ordination be explored, to provide better quality data to assist with infrastructure planning and management. Examples of such programme are:
  - DTS and IVS
  - Green Globe
  - Road User Survey (Transit NZ)
  - LTSA Crash Analysis
  - Target Zero data collection
  - Recycling Operators of NZ Inc. (RONZ)
A number of agencies contacted during this review expressed strong interest in the Ministry of Tourism’s project on tourism demand on infrastructure. Those that particularly expressed a willingness to co-operate included:

- LTSA
- Transit New Zealand

For key contact details refer Appendix 5.

### 11.2.1 Opportunities at the Interface

This review has identified that responsibility for infrastructural services to tourist lie with either the public bodies or private businesses. It is also became clear from this review that there are very real opportunities to improve services at the private and public sector interface. Examples of these opportunities that arose from this review include:

- LTSA, Motor Caravan Association and accommodation businesses to provide driver safety education and travel route information to tourist road users.
- Private accommodation providers and council to provide visitors with information on public amenities and town solid waste management and recycling services.

### 11.3 Data specific findings and recommendations

The data reviewed fall into two broad categories:

1. Resource data – water, wastewater, waste and energy
2. Service data - road networks, signs and parking, telecommunication and amenities.

Responsibility for the provision of infrastructure services lies with:

1. The public sector
2. Private sector
3. Both private and public sector

While the primary focus of this review has been the public sector services, other services such as (the currently privatised) energy demand have also been reviewed.

The Ministry needs to decide the extent of its interest with those services that are not solely the responsibility of the public sector e.g. energy supply and telecommunications.
## Table 23
Resource Data

<table>
<thead>
<tr>
<th>Data type</th>
<th>Key Findings</th>
<th>Recommendations</th>
</tr>
</thead>
</table>
| **Water Consumption Data.** | TRREC research reports provide a useful data set. These are no other significant data set. For water demand and wastewater yield existing available normalised data is not complete for all use categories. | More research is recommended for the following areas:  
  o Effect of specific on-site activities such as; water saving, spas, laundry and swimming pools.  
  o Upper market (4 and 5 star) accommodation.  
  o Normalising tourist related non-accommodation businesses water consumption data (e.g. restaurants, cafés). |
| **Wastewater Yield Data** | The Motor Caravan Association, (NZ) is a very good source of information for where additional dumpsite services are most needed. | More research is recommended for the following areas:  
  o Effect of on-site wastewater reduction measures such as water saving.  
  o Upper market (4 and 5 star) accommodation wastewater yields.  
  o Normalising tourist related non-accommodation businesses wastewater data.  
  o Investigate the possibility of co-operation with the Motor Caravan Association, (NZ) to formalise a survey of dump station needs on a national scale. |
| **Solid Waste Production Data** | Normalised solid waste data for the various use categories is lacking. | More research to obtain good quality normalised waste yields from all tourist related businesses and for different solid waste categories (e.g. recyclables, green wastes, putrescibles, rubbish). Co-ordinate with:  
  o Green Globe  
  o Target Zero data collection  
  o Recycling Operators of NZ Inc. (RONZ)  
  o Northland Sustainable Tourism Project |
<p>| <strong>Energy Consumption Data</strong> | Landcare Crown Research Institute report for EECA is the most comprehensive data source for normalised energy consumption data by tourist accommodation and tourist transport providers. | Further research is required to obtain accommodation energy consumption data for missing accommodation categories as well as tourist related non-accommodation businesses. |</p>
<table>
<thead>
<tr>
<th>Data type</th>
<th>Key Findings</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Telecommunication Services</strong></td>
<td>There is no significant data set on the impact of tourism on these services. Data on capacity of energy supply was not reviewed in this study.</td>
<td>Consideration should be given to updating existing national surveys (IVS and DTS) to provide the required tourist satisfaction data with respect to communication services. Where regional data is required benchmarking surveys may be necessary as done.</td>
</tr>
</tbody>
</table>
| **Road Networks**         | o There are three data types that could be useful to public sector planners responsible for providing a high quality transport network service to tourist. These include:  
|                           |  ▪ Road use intensity data to identify “hotspots” with regions.  
|                           |  ▪ Road safety and accident rates  
|                           |  ▪ User satisfaction  
|                           | o There is no significant data set on the impact of tourism on road network services.  
|                           | o The LTSA Crash Analysis System (CAS) data maybe useful to find local “hotspots” of road services creating accidents and other difficulties for international drivers. | Services in the transport network category and many and varied. It is recommended that the Ministry of Tourism define more specifically the scope of the transport infrastructure service that is of relevance to the tourism industry. Where regional data are required benchmarking surveys may be necessary. Investigate the option of upgrading the State Highway Satisfaction Survey to provide useful tourist specific data. |
| **Parking and Signage and Amenities** | There is no significant data set on the impact of tourism on these services.                                                                                                                                  | Consideration should be given to updating existing national surveys (IVS and DTS) to provide the required tourist satisfaction data for these services. Where regional data are required benchmarking surveys may be necessary. |
References


Connell Wagner Ltd., 2003, personal communication


Appendix 1
Review Brief

Review Proposal
The Ministry of Tourism is leading a three-year project that aims to establish the demands placed on New Zealand’s infrastructure by the forecast growth in tourism demand. One of the key outcomes from this work will be the development of a reliable predictive model of tourist demand on infrastructure. This model will be a suitable tool to:

- Forecast growth in tourism demand on NZ infrastructure.
- Enable infrastructure planning, design and management that is sustainable and integrated with other sector demands.
- Assist with designing structures for infrastructure funding that supports sustainable development.

The outcome of this particular review proposal will be an important contribution to this three-year project.

Review Outcome
The outcome of this proposal will be a report that reviews existing knowledge and data on the relationship between tourist and tourism industry behaviour on key infrastructure in New Zealand. Benefits of integration with other national initiatives and strategies on infrastructure will be investigated and reported.

Method
Infrastructural services and tourist related demand categories would be identified. For example:

The infrastructural services.
- Supply of potable water
- Wastewater management
- Energy supply
- Solid waste management
- Telecommunication services
- Transport network and facilities

Tourist related demand categories.
- Overnight accommodation (by accommodation type)
- Day activities (for day visitors and overnight visitors)
  - Food and beverage – cafés, restaurants, bars,
  - Shopping
  - Eco-tourism activities
  - Entertainment
  - Outdoor/adventure activities – transport, tracks, shelters, huts, toilets, water supply, picnic areas
- Public services – toilets, library, information centres.
- Travel (by mode)

A matrix of key infrastructural service and tourist related demand categories would be constructed. Each cell will be evaluated in terms of:
- Existing data, and ‘rule of thumb’ estimates, if appropriate
- Relevancy
- Availability of existing data
- Data quality
- Data and information gaps
- Comment on approaches to filling gaps

The project will review all relevant reports and data bases on NZ tourism and relevant infrastructural services along with visitor characteristics and behaviour.

Principle data sources will be a review of FRST tourism planning case studies, work on resource efficiencies in the tourism sector (Landcare Research), web searches and direct approach to the CRC for sustainable tourism (Australia), of which we are an associate member.
Appendix 2
Consultation Details

The following correspondence was either faxed or emailed to the various stakeholders:

To: <name / organisation>

From: Andrew Dakers
Date: <Date>

Subject: Tourism and Infrastructure

My reason for contacting you is that I would like to discuss, with an appropriate person within <organisation> a project that I am currently doing for the Ministry of Tourism.

The Ministry of Tourism is leading a three year project that aims to establish the demands placed on New Zealand’s infrastructure by the forecast growth in tourism demand. One of the key outcomes from this work will be the development of a reliable predictive model of tourist demand on infrastructure.

I have been contracted, through the Tourism Research Recreation and Education Centre (TRREC) at Lincoln University, to assist with an initial scoping exercise – basically to review what data and information is currently available.

The specific objective of my current assignment is to carryout a review of existing knowledge and data on the relationship between tourist and tourism industry behaviour on key public sector infrastructural services in NZ. The services we will be focussing on are:

- Supply of potable water
- Wastewater management
- Energy supply
- Solid waste management
- Telecommunication services
- Transport network and facilities
- Amenities such as – public toilets, Information Centres, Parks and Reserves, library and others
- Parking and signage

I would like to talk to someone within your organisation about the existence, or non existence, of any relevant data on <state specific infrastructure> that should be recognised in this review.

I do not want the actual data but would like the following information about any such data;

- Location details of the data
- Type of data and categories
- Quality, age and scope of data
- Terms of access to the data

If the <organisation> is willing to assist me with this review I would appreciate the name and contact details of an appropriate person I could ring and talk to. If it is easier you can respond to me by email: Dakers@paradise.net.nz.

Thankyou

Yours truly,

Andrew Dakers
Director
**Appendix 3**  
*Summary of Transit New Zealand's 1994 Report*

This is a summary of the key points in the Transit New Zealand report *Long Term Tourism Roading Requirements* - a report of a Task Force convened by Ministry of Commerce and Transit New Zealand, dated December 1994.


Topic reviewed and key findings:

<table>
<thead>
<tr>
<th>Topic</th>
<th>Findings and Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Transport Modes and Trends</strong></td>
<td>The most popular forms of transport were domestic air and private car, with rental cars and organised coaches also used by a significant percentage of visitors. The report concluded that demands for all forms of transport are likely to increase.</td>
</tr>
</tbody>
</table>
| **Tourism and Roading**     | IVS and DTS are not well designed to provide good data on the demand tourist place on the roading network – limitations were identified. Estimates of state highway tourist flows were done using IVS and DTS, however it was noted that the results were an underestimate. There were no detailed data on tourist day trips. It was recommended;  
  o *That the tourism industry and the Ministry of Commerce (now MED) carry out on a regular basis a tourist expectation survey, with questions covering attitudes to New Zealand roads.*  
  o *That the tourism industry and the Ministry of Commerce (now MED) conduct surveys of international and domestic tourist travel patterns to provide updated and improved data for the analysis of tourist travel.* |
| **Road Improvements**       | IVS and DTS provided some information on tourist usage of state highways – however the Task Force concluded that there was no information on tourist demand on local roads.  
  The report did provide a list of local roads needing improvement. (Table 4.3 in their report).  
  New routes were recommended.                                                                                                                                                                                                                                                                 |


<table>
<thead>
<tr>
<th>Topic</th>
<th>Findings and Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road Safety</td>
<td>The report noted that a potential increase in tourist related road accidents. A number of recommendations involving LTSA, rental vehicle operators, Transit NZ and Territorial Authorities were made in the report.</td>
</tr>
</tbody>
</table>
| Roadside Amenities and Landscaping | Recommendations were made with respect to:  
  - Rest areas – location, facilities and design  
  - Provision of toilet facilities  
  - Information centres  
  - Motorist service areas  
  - National parks and reserves  
  - Roadside vegetation and landscaping  
  - Adopt-a highway concepts                                                                                                                   |
| Road signing                 | The report recommended that *Transit New Zealand in conjunction with the tourism industry, identifies an appropriate authority in the tourism industry to offer advice as to which particular tourist features and establishments should have location signs* |
| Funding                      | The report made recommendation as to funding responsibilities for the various recommended projects.                                                                                                                       |
Appendix 4
Summary of Freedom Camping Management Approaches Adopted in New Zealand

(Extract from: Dunedin City Council Report on Freedom Camping, 20 July 04)

THAMES COROMANDEL – PROHIBIT CAMPING & RIGOROUSLY ENFORCE
Freedom camping is prohibited on reserves and road berms on Thames Coromandel Peninsula, by means of a local by-law. During the busy period (Labour Weekend to Easter) compliance with the by-law is monitored and enforced by up to 20 Council contract enforcement officers who patrol daily. The Council also has a large number of honorary by-law officers. In the quiet season, the by-law is enforced by responding to complaints, rather than patrolling.

Freedom camping was permitted some years ago – but is now banned due to waste disposal impacts and the difficulties of enforcing regulations, which permitted freedom camping by vans with waste holding capacity and prohibited those without. “No camping” signs were found to be ineffective.

QUEENSTOWN LAKES – PROHIBIT CAMPING VIA BY-LAW
Queenstown – Lakes District have in place by-laws which prohibit camping in public spaces. Enforcement of the by-law, moving campers on, is contracted out. Civic Corp report only limited success in Queenstown, over the 2 years which the contract has been running. The after-hours patrolling has been not been successful in part because the programme is complaints driven, requiring someone to complain before action is taken.
Civic Corp report a more successful approach in Wanaka. Again enforcement is contracted out, but to a local contractor. In Wanaka there are daily patrols at around 10 pm, and there is support from the visitor industry. Campers are moved on and advised where they might legally camp. The foreshore area is targeted and campers know they will be moved on.

KAIKOURA DISTRICT - GENTLE ENFORCEMENT & PROVISION OF FACILITY
Camping is prohibited on the foreshore and enforced by parking wardens patrolling at 8 pm and in the mornings directing people to the camping grounds. The officers leave leaflets which set out the rules. A small waste facility is provided by the Council, sufficient for 5-6 vans.

TAUPO DISTRICT - INVESTIGATING A MORE PROMOTIONAL APPROACH
Do not regard freedom camping as a major problem, but are encouraged by camping ground owners to prohibit the activity. They enforce (NZ standard) bylaws by adopting a “gentle” approach, placing user-friendly “Hello Campers” leaflets on vans, advising them that it is illegal to free camp and stating where camping grounds are. Taupo are investigating revising their documentation to reflect the more promotional approach adopted by Tasman District Council.
SOUTHLAND DISTRICT COUNCIL
Southland District Council have adopted a permissive approach, enacting a bylaw which specifies approved freedom camping locations and permitted length of stay, ranging from one night to twenty-eight days. Signage is used to designate prohibited freedom camping sites. The Council relies on the local community to assist with monitoring of the bylaw. Community notify the police or the Council if campers have contravened the bylaw.

TASMAN DISTRICT COUNCIL – A USER FRIENDLY APPROACH
While encouraging campers and travellers to use camping grounds as much as possible, Tasman District acknowledge “the economic and social benefits that campers bring to the district”.

Tasman permit freedom camping for self-contained vehicles, but restrict it to council-controlled public land (excluding some “prohibited areas”) and publish 6 rules relating to motor homes. The main requirements are (i) that campervans must have a minimum 3 day capacity toilet and grey water storage facility and (ii) freedom camping is limited to a maximum of 2 nights per month in any single location. Tasman have a policy on self-contained motor homes on their website and publish a user-friendly leaflet for distribution to campers. Enforcement of the policy is contracted out.

GISBORNE DISTRICT – PROMOTE AREA FOR FREEDOM CAMPING
Gisborne District promote their area for freedom camping, stating,-
“Gisborne District is one of the last bastions for freedom camping within New Zealand”.

They allow freedom camping in designated areas (specified beaches and areas) with a permit, which is valid for 28 continuous days. There is no charge for the permit, obtainable from the Council offices, but campers are asked to make a donation. Freedom campers, including caravans, tents, house buses and caravans, are allowed between Labour Weekend and Easter as long as they provide their own toilets. Only “approved” campervans and mobile homes, are allowed.

A waste management station is provided within Gisborne City by the Council and private operators for toilet waste. A user-friendly leaflet which details the freedom camping regulations, the sites where freedom camping is permitted and the locations of the toilet waste sites, is distributed by the District Council office. Council officers are employed throughout the freedom camping period to provide information and enforcement, where necessary.

CENTRAL OTAGO DISTRICT
Central Otago District Council also welcomes freedom campers. Freedom camping is permitted on all Council land except those areas with specific “No camping” signs, subject to certain restrictions. All rubbish must be removed from the site and campers must adhere to safe fire safety practices.

As with Gisborne and Tasman Districts, freedom camping in Central Otago District is time limited (to two consecutive nights per month in one location). Freedom camping is also limited to vehicles with 3 day capacity for toilet and wash water. Locations of dump stations are signposted, and include both camping grounds and service stations.
REGIONAL APPROACH - WEST COAST
Three districts in the West Coast region are currently working together to produce a regional guide to waste disposal sites for freedom campers. It is planned that the leaflet be distributed via visitor information centres and petrol stations.
# Appendix 5
## Agency Contact Details

<table>
<thead>
<tr>
<th>Agency</th>
<th>Contact details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dunedin City Council</td>
<td>Nicola Johnston, Corporate Policy Analyst. 03 474 3327, <a href="mailto:Nicola.johnston@dcc.govt.nz">Nicola.johnston@dcc.govt.nz</a></td>
</tr>
<tr>
<td>Energy Efficiency and Conservation Authority (EECA) (Wellington)</td>
<td>Heather Staley, Chief Executive and Nikki Brown Executive Assistant T: 04 470 2202 • F: 04 499 5330 • M: 027 281 4798</td>
</tr>
<tr>
<td>ESR Crown Research Institute, Christchurch</td>
<td>Jan Gregor, 351 6019, <a href="mailto:Jan.Gregor@esr.cri.nz">Jan.Gregor@esr.cri.nz</a></td>
</tr>
<tr>
<td>Landcare Research, CRI, Lincoln.</td>
<td>Jeska McNicol, <a href="mailto:McNicolj@landcareresearch.co.nz">McNicolj@landcareresearch.co.nz</a> 03 3256700</td>
</tr>
<tr>
<td>Local Government NZ, (Wellington)</td>
<td>Tim Davin, <a href="mailto:kylie.hawley@lgnz.co.nz">kylie.hawley@lgnz.co.nz</a> 04-924 1200</td>
</tr>
<tr>
<td>LTSA</td>
<td></td>
</tr>
</tbody>
</table>
| o Bob Gibson, Wellington Office, 04 931 8766.  
| o Steve Parry, Chch Office. 03 363 5666 (CAS)  
| o Mary Macpherson, Senior Communication Advisor. Wellington Office, 04 931 8881 marym@ltsa.govt.nz [http://www.ltsa.govt.nz](http://www.ltsa.govt.nz) |
| Ministry for the Environment | Francois Barton 04 917 7504 |
| Ministry of Health, Wellington | John Harding, 04 496 2000. (ext 4928) |
| Ministry of Transport, | Robin Dunlop, Secretary for Transport and Elizabeth Anderson 04 498 0649 |
| NZ Hotel Council. | Jenny Langely. [Exec@nzhc.org.nz](mailto:Exec@nzhc.org.nz) 04 472 4660 |
| NZ Local Government (NZLG) | Tim Davin [kylie.hawley@lgnz.co.nz](mailto:kylie.hawley@lgnz.co.nz) |
| Spatial Analysis Facility, School of Geography and Environmental at the University of Auckland | Prof Pip Forer, [p.forer@auckland.ac.nz](mailto:p.forer@auckland.ac.nz) 09 373 7599 ext 5183 |
| Telecom NZ | Niki Chave Business Manager - Carrier Relations  
| | Telecom New Zealand  
| | Email: [niki.chave@telecom.co.nz](mailto:niki.chave@telecom.co.nz)  
| | Mobile 027 2028189 |
| TIANZ | John Moriarty, Chief Executive Officer  
<p>| | DDI: 04 495 0816 |</p>
<table>
<thead>
<tr>
<th>Agency</th>
<th>Contact details</th>
</tr>
</thead>
</table>
| Transit New Zealand          | Rick van Barneveld, CEO. Wellington  
Dave Bates, Network Operations Manager, Wellington  
Pat Lakeman, Corporate Strategy and Communication Officer.  
04 496 6650 |
| Transport Studies, Lincoln University | Prof Chris Kissling and Dr Jean-Paul Thull  
03 325-2811 |