Travel Time Study of Auckland Arterial Road Network using GPS Data

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SkyCity Auckland
Previous studies focused on the Auckland Motorway and Highway Network.

Previous studies used Congestion Index to represent the performance of routes.

The 2008 Pilot study proposed the study of the Auckland arterial network.
Objectives

1. Determine the number of runs required for accurate data collection in the Auckland Region

2. Measure the performance of Auckland Arterial Roads using Level of Service ratings

3. Rank route sections for monitoring and strategic upgrading
Scope of study
Equipment used
Data collection
Analysis of data and results
Concluding remarks
Recommendations
### Scope – Study Area

<table>
<thead>
<tr>
<th>Routes</th>
<th>Direction</th>
<th>Route ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>Great South Road</td>
<td>City Bound</td>
<td>GSR_CB</td>
</tr>
<tr>
<td></td>
<td>South Bound</td>
<td>GSR_SB</td>
</tr>
<tr>
<td>Mission Bay Route</td>
<td>City Bound</td>
<td>MBR_CB</td>
</tr>
<tr>
<td></td>
<td>East Bound</td>
<td>MBR_EB</td>
</tr>
<tr>
<td>New North Road</td>
<td>City Bound</td>
<td>NNR_CB</td>
</tr>
<tr>
<td></td>
<td>West Bound</td>
<td>NNR_WB</td>
</tr>
</tbody>
</table>
Test Car and Equipments

- GPS receiver
- Pocket PC

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Transit Travel Time Indicator Report – March 2006
Required Number of Runs
Sample size (Confidence Interval Method)

\[ n = \left[ \frac{Z_{a/2}/\sigma}{E} \right]^2 \]

Number of run > 30 => Satisfactory based on Central Limit Theory

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For each route

For each route, the number of runs is represented graphically. The graph shows the number of runs for different routes, categorized into different confidence levels: 95% Conf +/- 1.6kph, 90% Conf +/- 2.4kph, 80% Conf +/- 4.8kph, and Actual Runs. The routes are labeled as GSR_CB, GSR_SB, MBR_CB, MBR_EB, NNR_CB, and NNR_WB.

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Req. Number of Runs

For MBR_CB Route

Number of Runs

Section Number

- 90% Conf +/- 2.4kph
- 80% Conf +/- 4.8kph
- Actual Runs

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For GSR_CB Route

- 90% Conf +/- 2.4kph
- 80% Conf +/- 4.8kph
- Actual Runs

Number of Runs

Section Number
Number of Stops

For GSR_CB Route

Mean Speed (km/h)

RUN 1 | RUN 2 | RUN 3 | RUN 4 | RUN 5

0 | 5 | 10 | 15 | 20

# of Stops | Mean Speed

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For NNR_CB Route

- 90% Conf +/- 2.4kph
- 80% Conf +/- 4.8kph
- Actual Runs

Section Number

- Number of Runs

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Section-wise Performance

LOS

AM INBOUND
(HCM2000 LOS RATING)

LOS A
LOS B
LOS C
LOS D
LOS E
LOS F

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Mean Speed
Average Delay

\[
\text{Average Delay} = \frac{\text{Section Delay (Min)}}{\text{Section Length (km)}}
\]
## Section-wise Ranking

### RANKING ORDER % MEAN SPEED OVER FFS ACHieved Km/h LOS FFS Rating % Section Route Section

<table>
<thead>
<tr>
<th>Km/h</th>
<th>LOS</th>
<th>FFS</th>
<th>Rating %</th>
<th>Section</th>
<th>Route</th>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.46</td>
<td>F</td>
<td>49.08</td>
<td>21.3%</td>
<td>Apriana Ave - St Heliers Bay Rd</td>
<td>MBR_CB</td>
<td>9</td>
</tr>
<tr>
<td>11.96</td>
<td>F</td>
<td>50.05</td>
<td>23.9%</td>
<td>St Georges - Blockhouse Bay Rd</td>
<td>NNR_CB</td>
<td>2</td>
</tr>
<tr>
<td>11.10</td>
<td>F</td>
<td>44.26</td>
<td>25.1%</td>
<td>Ti Rakau Dr - Jellicoe Rd</td>
<td>MBR_EB</td>
<td>1</td>
</tr>
<tr>
<td>14.00</td>
<td>F</td>
<td>54.72</td>
<td>25.6%</td>
<td>Symonds – Alfred</td>
<td>MBR_CB</td>
<td>1</td>
</tr>
<tr>
<td>13.20</td>
<td>F</td>
<td>50.21</td>
<td>26.3%</td>
<td>Woodward Rd - Mt Albert Rd</td>
<td>NNR_CB</td>
<td>4</td>
</tr>
<tr>
<td>14.97</td>
<td>F</td>
<td>51.66</td>
<td>29.0%</td>
<td>Symonds – Alfred</td>
<td>MBR_EB</td>
<td>11</td>
</tr>
<tr>
<td>14.48</td>
<td>F</td>
<td>49.57</td>
<td>29.2%</td>
<td>Khyber Pass Rd - Alfred St</td>
<td>NNR_CB</td>
<td>8</td>
</tr>
<tr>
<td>16.68</td>
<td>F</td>
<td>50.69</td>
<td>32.9%</td>
<td>St Lukes Rd - Sandringham Rd</td>
<td>NNR_CB</td>
<td>6</td>
</tr>
<tr>
<td>11.47</td>
<td>F</td>
<td>16.58</td>
<td>69.2%</td>
<td>Broadway – Remuera</td>
<td>GSR_SB</td>
<td>6</td>
</tr>
</tbody>
</table>

**Rating % = \left(\frac{\text{mean speed}}{\text{free flow speed}} \times 100\right)**

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The 2008 Pilot study achieved the 3 objectives

1. Determine the run requirement for future studies.
   - 5 Runs is the minimum for future network study
   - 10 Runs is the maximum for highly variable routes

2. Measure the performance of the network
   - Worst route was the New North Road City Bound route
3. Rank the sections travelled

Worst section was Mission Bay City Bound route section 9
- Ti Rakau Drive to Apirana Ave
For Future Research

- Research into the link between section length and the required number of runs
- Comparison of pilot study with future years to establish measurable trends
- Increasing the study area to the wider arterial network & comparison of Auckland performance with international cities
Any Questions?