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TRANSPORTATION SPECIALISTS

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Dear Andy

WELLINGTON REGIONAL TRANSPORT ANALYTICAL TOOLS

This letter provides a summary of the peer review that we have carried out during the refresh of the Wellington regional transport models. The work has broadly covered the update to the Wellington Transport Strategic Model (WTSM) plus the development of a new tool, the Wellington Traffic Assignment Model (WTAM).

The review has taken place throughout the model refresh process, and we reviewed each of the many technical notes at least once. As part of these reviews, we pointed out areas where clarification was required, occasionally we pointed out errors (which were generally minor) and suggested the possibility of alternative approaches, or identified risks and limitations to be considered when using the models. These points (and those provided by you as client reviewer) generally led to the provision of a second version of the technical notes, with the review comments and consultant responses set out in an Appendix (see for example, Appendix F of Version 2 of Technical Note 25 on the WTAM Validation).

Project Purposes

The purposes of the model refresh were described in the Model Specification Report as:

- To improve user confidence in the Analytical Tools
- To produce a high quality, fit for purpose product
- To ensure the updated tools are as simple as possible and transparent, while maintaining flexibility for future changes
- To fix identified weaknesses
- To plug identified functionality gaps by developing and implementing new modules.

Main features of model refresh

The main features of the model refresh have been as follows:

- WTSM remains the central tool for forecasting demands by all modes

- WTSM is a conventional “four stage” transport model and it uses the EMME software which is used throughout the world, and in a number of cities within New Zealand
- There were discussions at an early stage about whether to move (in full or in part) to a tourbased model (Technical Note 6), but it was agreed at the outset that this approach would not be progressed, for reasons outlined in TN6
- The model refresh included the development of a new traffic model, to be called WTAM. This new traffic model is in effect the traffic equivalent of the Wellington Public Transport Model (WPTM), to enable traffic analysis at a finer level of detail than was previously possible via WSTM, and to reduce the previous gap between the strategic WTSM and the detailed Ngauranga to Airport (N2A) AIMSUN model
- New modules within WTSM have included new airport and ferry modules, public transport crowding, park and ride, income segmentation
- Numerous enhancements have been made to WTSM, including a significant increase in the number of zones. This should have reduced the extent to which the loading of demands onto the previous version of the model was “lumpy”
- WTSM was updated to a 2018 base, using new household travel data and numerous types of survey data
- The sample gathered from the Ministry of Transport household interview surveys was lower than expected, at 0.7% of households, due to the Covid 19 lockdowns affecting data collection programmes and the robustness of that data
- The model build also used mobile phone data sourced from QRIOUS, primarily for the WTAM traffic assignment model. Technical Note 24 compared the household travel data against the phone data and concluded that there appeared to be an under representation of short trips with the mobile phone data. This issue was addressed as WTAM was calibrated
- The WTSM model build used a number of values (vehicle operating costs and values of time) from the Monetised Benefits and Costs Manual (MBCM), as set out in Technical Note 22. A new version of the MBCM was subsequently published in 2023 which included significant updates to several values. The model has not been updated to these new values but has continued to be validated to the previous values. This is appropriate, as to change to the new values would have almost inevitably have led to a need to recalibrate other factors and parameters
- While the base model is described as 2018, the data used from a number of sources was not all for that one year, and not all for March 2018. This was unavoidable, in that a good set of data for a single historical year could not be retrospectively compiled, and Technical Note 4 summarised the work that was carried out to “normalise” all data
- While we signed off the many technical notes, the sign off on particular components of the model regularly included comments to the effect that “the proof will be in the (subsequent) satisfactory validation of the model”
- WTSM and WTAM were both subsequently satisfactorily validated to “normal industry standards”, these being what the Transport Model Development Guidelines refer to “model type A” for WTSM and “model type B” for WTAM. Not all validation targets were met, but the results are generally satisfactory.

Key Risks and Limitations

It is common for a review of this nature to highlight potential risks associated with the future uses of the new/updated models. These include:

- As noted above, the ability to collect extra surveys was significantly hampered due to the COVID lockdowns. This issue was unavoidable, due to the circumstances, and Technical Note 24 acknowledged that the small sample could lead to issues in the model development
- While the base models have been satisfactorily validated, the scope of this review has not included future testing of the model. It will be important to review carefully the response of the future models to various tests. Having said that, we acknowledge that Technical Note 30 includes the results of some sensitivity tests that demonstrate that the responses of the base model to a number of tests on changing assumptions generally fall within expected bounds
- The model was developed to reflect travel demands and travel conditions that were observed prior to the COVID pandemic, and corrections may be required to certain parameters, to reflect subsequent changes in travel behaviour. For example, the model could be adjusted to reflect the increase in work from home behaviour, or greater flexibility in travel time, or the greater proportion of on line retail trips with associated increases in delivery trips. However, while adjustments can be made to reflect changes of this nature, it is currently not possible to know the extent to which these changes are temporary or permanent
- The changes in travel behaviour due to COVID represent one form of potentially significant change in behaviour and the nature of other future significant changes in behaviour are clearly not known. WTSM will be able to reflect changes in behaviour due to updates to future assumptions (for example, relating to public transport frequencies, parking costs and parking availability, the relative travel times of the various transport modes, the perception factors around public transport interchanges, etc), but there is likely to be a limit within which the model can be expected to respond plausibly to unknown “other events”
- Other issues may arise with the models once they are placed under greater stress. That is to say, while the base models validate satisfactorily, one cannot know until tests are carried out with greater overall travel demands if the model is close to “falling over” in one respect or another
- Similarly, while the base models have been satisfactorily validated at a regional level, it is likely that there will be some areas that are less well represented, and localised validation checks will be necessary for any localised use of the models
- A further risk relates to the work on income segmentation and the resulting use of the model to test road tolls or congestion charging. Technical note 35 acknowledges the risks relating to tests of this nature
- It should also be acknowledged that the WTAM is a new tool, which will derive changes in demands from WTSM. Technical Note 25 included a section on feeding forecast demands from WTSM through to WTAM, and established that while the two models had been calibrated and validated using different data, the application of WTSM growth to WTAM led to very similar levels of growth (with growth in WTAM being only slightly higher)

- On a related matter, the protocols regarding when to use WTAM instead of or as well as WTSM have yet to be established, and the extent of different outcomes resulting from any future tests using these two models has yet to be established
- In addition, there is a risk that the predicted effects of a certain project or policy change may be different using the new version of WTSM, compared with the predicted effects according to an earlier version of the model. There will need to be discussions around the rate of change to the new model (eg whether or not certain projects should be re-evaluated) and it may be necessary to seek to understand why the two versions of the model are giving different outcomes, if that is indeed the case. For example, are differences due to improved functionality, or different model assumptions, or different levels of validation in a particular area, and so on?

It should be stressed that the above comments on risks and limitations should not be taken as implying criticism of the work of the project team. Rather, it is now normal practice to have a healthy regard for the potential risks or limitations of any new/updated transport modelling tool, to consider the sensitivity of results, and to test a range of scenarios in order to inform decisions around significant transport investment.

As a result of the above, we conclude that the refresh of the Wellington regional transport models has achieved the objectives identified on page 1 above, in that updated tools have been developed that have plugged previously known weaknesses and functionality gaps, with satisfactory validation achieved. While the risks and limitations identified above need to be borne in mind, and the plausibility of the results of initial future model tests will need to be reviewed carefully, we conclude that the modelling tools should provide a robust basis for the strategic assessment of transport investment and policy.

We trust that this letter adequately summarises our review of the Wellington models refresh.

Yours sincerely

Ian Clark
Director

Reference: P:\GWRC\003 Wellington Strategic Transport Models\review of stantec\L1B240117.docx

List of Technical Notes

TN Number	TN Title	Date of final version
1	Specification	6-Nov-20
2	Time period analysis	5-Nov-20
3	Zoning	25-Jun-20
4	Data Analysis	9-Feb-21
4 addendum	Additional Screenlines	9-Feb-21
5	Improve Delay Representation	21-May-21
6	Tour vs Trip Model Survey Summary and Decision	13-Oct-20
7	Parking	24-Feb-21
8	Wellington CBD Mode Share Representation	2-Oct-20
9	Model Input Parameters	8-Mar-21
10	Airport Model	9-May-23
11	Heavy Vehicle Model	16-Jun-21
12	Data Analysis - Land Use	15-Apr-21
13	Park and Ride	26-May-21
14	Ferry Terminals Model	27-May-21
15	WPTM Update	10-Jul-23
16	2018 Interim WTSM Validation	29-Sep-21
17	Model Rebuild Specification	28-Nov-21
18	Vehicle Availability Model	25-Aug-22
19	Trip Production Calculations	11-Oct-22
20	Trip Attraction Model	26-Jun-23
21	Peak Periods and Vehicle Occupancy Models	17-May-23
22	Model Input Parameters	4-Oct-22
23	Active Modes Assignment and Generalised Cost	16-Dec-22
24	Household Travel Survey and Mobile Phone Data	1-Nov-22
25	WTAM	30-Nov-23
26	Family Structure Model	14-Oct-22
27	External Light Vehicle Model	2-Jun-23
28	Road Assignment	Dec-22
29	Public Transport Assignment	4-Jul-23
30	Trip Distribution and Mode Choice	31-Aug-23
31	WTSM Validation	3-Jul-23
32	User Manual	Internal doc
33	Parking Capacity Constraints (CBD + PR)	Internal doc
34	Demonstration Report	Internal doc
35	Income Segmentation	22-Nov-23