

MEMO

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SUBJECT: Proposed District Plan – Chapter 11 (Transport) - Traffic
Modelling

Introduction

This note is a summary of the modelling work undertaken in the Kapiti Coast District over the last 9 years and also provides a more detailed summary of the most recent modelling work commissioned jointly by New Zealand Transport Agency (NZTA) and Council and to explain what it means in terms of Chapter 11 of the Proposed District Plan (PDP) moving forward.

Summary of Modelling Work

Kapiti Traffic Model (Version 1) (KTM1)

Different types of models have been constructed and applied in Kāpiti in recent years, to look at a wide range of issues. The modelling approach is hierarchical, making use of the Wellington Regional Model (WTSM) to ensure a consistency of approach is maintained for input to the SATURN traffic assignment model, which describes and forecast changes in the use of the road network in Kāpiti.

The early SATURN model is referred to as KTM1 (Kāpiti Traffic Model version 1) which was developed by Council. The SATURN model is also used to inform lower level and more localised models, using a variety of programs, for more detailed evaluation and design purposes.

Up to 2007, KTM1 was used for the Western Link Road project development and for the assessment of various plan changes, including for the Airport Plan Change (PC73), the Ngarara Zone (PC79) and the Waikanae North (PC80).

In respect of the Airport, the KTM1 modelling demonstrated the need for two checkpoints on development at the end of selected phases (at 43,050 and 62,500 sq. m GFA), where specific infrastructure was to be provided. A higher GFA threshold (102,900 sq. m) was also identified for a transport assessment to be undertaken, to allow the best way forward to be plotted at that time. These recommendations were incorporated into the operative District Plan.

A variation of KTM1 was also used in the early stages of planning for the Mackays to Peka Peka (M2PP) expressway in 2009/10.

Council also used KTM1 for network assessment and planning purposes up to 2010.

Kapiti Traffic Model (Version 2) (KTM2)

KTM1 was revised by the NZTA for expressway project development purposes to create KTM2 in 2011.

Key features of this model including the model area extending to Otaki, mainly for the purposes of the Peka Peka to Otaki (PP20) project assessment.

KTM2 and associated models were used to estimate the impact of the Expressway in conjunction with potential developments and with possible network changes on SH1 and local roads.

NZTA and Council have used KTM2 for a range of assessment work, including in relation to major developments and PDP assessments, over the period 2011-2014.

Kapiti Traffic Model (Version 3) (KTM3)

KTM3 was developed following approval of the M2PP/PP2O projects, and has been used for a variety of purposes, including town centre, state highway revocation, local network road improvement proposals and potential development effects.

KTM3 has been progressively checked and improved, but remains a strategic traffic management model. The model is used in two ways, mainly using an overall 'composite' growth rate assumption¹, but also to test the effects of 'full' development from individual large traffic generators² to determine their network impact.

Other more detailed models have been employed to test different designs and impacts, on localised intersections and networks: including PARAMICS, VISSIM, TRANSYT, LINSIG and SIDRA.

Recent modelling applications

The SATURN model and lower level models, have recently been used for the following purposes:

- 1) Paraparaumu Town Centre Structure Plan road network / Kāpiti Road Relief Route (KRRR).

SATURN/VISSIM/SIDRA modelling has demonstrated the feasibility of the plan and infrastructure proposals. Options for the road network were considered and on the basis of this an initial application for funding for the KRRR was made in 2015.

- 2) Paraparaumu and Waikanae Town Centre Studies / SH1 Revocation.

SATURN/VISSIM/PARAMICS/LINSIG modelling has demonstrated the feasibility of the Town Centre proposals and is being used to assess SH1 revocation treatments.

- 3) Town Centre Extension PC72A /Coastlands Square.

SATURN /SIDRA modelling established the suitability of the plan change and the need for a threshold limitation on development where a transport assessment is needed. This was presented successfully at an Environment Court Appeal in 2013.

¹ Effectively this means no one site can be developed beyond 50% of its theoretical potential, the reason being to avoid over optimistic growth assumptions leading to unrealistically high levels of traffic growth on the network.

² For example, from Town Centre PC72A and Airport PC73.

Subsequently, a resource consent application (for Phases 1 and 2) was received in 2016 and conditions for development have been recommended by Council.

4) Airport PDP submissions and proposed private plan change.

SATURN / VISSIM / SIDRA modelling has been undertaken, the results of which can be summarised as follows: Further Airport development (beyond 42,500 sq. m GFA) would, under certain circumstances³, lead to a material lowering of levels of service on the road network.

The most recent VISSIM modelling has shown that acceptable conditions may occur in 2021 but that by 2031 network conditions would be extremely difficult. However, Council has identified that a range of further modelling and clarifications are needed, in respect of Airport development, which mean it remains important for transport assessments to be required at the thresholds specified in the PDP. A more detailed summary of the VISSIM modelling is contained in the following section.

5) Other applications

SATURN modelling has been used for a number of other feasibility investigations and assessments related to the suitability of the road network to support and accommodate PDP related proposals.

VISSIM Modelling in relation of Kapiti Road and the Airport Development Thresholds

Introduction

Kapiti Coast Airport Holdings Ltd (KCAHL) has made a submission relating to the removal of development thresholds (related to infrastructure improvements and Integrated Transport Assessments) under Chapter 11 of the PDP. In order to understand the effects of the KCAHL submission traffic modelling work was undertaken on behalf of both Council and NZTA.

A range of outputs including SATURN/Vissim model files, animation videos, pdf and excel summary files and associated summary reporting is addressed in the Annex.

Councils Review of the Modelling Work

The results as they stand indicate that network operational conditions, as measured by speed, capacity and delay, show:

- in 2021 with an increase in Airport development (from 23,000 to 102,900 sq. m GFA) conditions will be better than 2015⁴.

³ From SIDRA network modelling, dependent on the year, the scale and type of development and whether or not mitigating infrastructure was provided.

⁴ This is not to say that there will not be a worsening of conditions relative to a 2021 scenario without further Airport development.

- by 2031 conditions with an Airport development level of 339,338 sq. m GFA will be extremely difficult⁵.

Demand Levels

It is entirely possible that demand levels may, in practice, be higher than those in the Vissim modelling undertaken to date, as discussed below:

The SATURN model (pm peak - 5-6 pm) used for the demand input to the Vissim model does not represent the busiest hourly period, as the pre-peak model 4-5 pm has 10.6% higher demand levels (based on the ratio of loaded trips in the pre-peak to peak trips).

The evening 5-6 pm peak hour SATURN traffic generation from the six airport zones (82 to 87 inclusive) is also low at 1,262 vehicles, in comparison to the trip generation spreadsheet peak hour total of 1,600 vehicles.

Irrespective of these SATURN model demand issues, the Vissim model flows on Kāpiti Road in 2015 appear to under-predict⁶ demand on Kāpiti Road, see summary table of demand flows below:

Kāpiti Road east of Milne Drive				
	2015 SATURN (vehicles)	2015 VISSIM (vehicles)	Difference	2015 Count (vehicles)
Eastbound	641	576	11.2%	777
Westbound	790	703	12.3%	938
Total	1,430	1,279	11.8%	1,715
Kāpiti Road east of Milne Drive				
	2021 SATURN - (vehicles)	2021 VISSIM (vehicles)	Difference	
Eastbound	1,139	971	17.3%	
Westbound	1,321	1,065	24.0%	
Total	2,459	2,036	20.8%	

The table above indicates 1,715 VPH from a 2015 count while the Vissim model flows on this link in 2015 are 25% lower than the count. Although it is not conclusive, this may be one reason why observing the 2015 animation file for the pm peak, shows Kāpiti Road and SH1 coping easily in the pm peak at all points, when this is not the reality on the ground.

The upshot of this is that higher demand levels need to be sensitivity tested to inform the assessment of potential Airport development effects.

⁵ Conditions are so difficult that the Vissim model did not converge for this year meaning results are not capable of being interpreted in detail.

⁶ It is not yet clear why this is the case, especially for 2015, but it may be related to a combination of validation, flow-averaging and rerouting assumptions.

Other Test Scenarios

The 2021 and 2031 future year Vissim model forecasts are plausible scenarios and useful in assessing potential effects of two levels of Airport development under certain circumstances. However, currently, the Vissim modelling has not tested the effects of alternative scenarios, assumptions and rates of development.

The testing of other scenarios is needed to evaluate the potential effects of development traffic. For example, if:

- Different levels of development were to occur by a certain year, and
- The same level of demand (say 102,900 sq. m GFA) was to occur later than anticipated (say by 2026 instead of 2021)

In both cases, operational traffic effects are likely to be greater than currently forecast by the Vissim modelling, due to the interaction of development traffic with background traffic growth.

Alternative network assumptions also need to be considered. Presently the network improvements, access and traffic management changes in the future year modelling are uncommitted and do not represent a true 'do-minimum scenario' in a network sense.

Weekend demands indicate the longest travel times on Kāpiti Road although higher weekend development related turning flows have not yet been fully modelled⁷ in Vissim.

The effect of the Airport Private Plan Change has not yet been separately modelled in Vissim.

To establish potential effects it is important to have a do-minimum level of Airport development traffic at future years to compare with alternative growth forecasts, this means a 23,000 sq. m GFA scenario is required for future years, including 2021 and 2031.

Other Issues

There are other issues that would benefit from further exploration in association with the Vissim modelling, including:

- A check on saturation flow equivalents /alternative route assumptions and gap acceptance behaviour, would appear to be helpful (based on reviewing summary results and observing animation files).
- Amenity/environmental/safety effects of traffic rerouting from the Airport to use local roads and the Raumati corridor need further exploration – the analysis to date is very traffic capacity focussed.

Risks and consequences

The risks to Council of future Airport development causing issues on the local road network requiring investment are substantial.

⁷ An "indicative or high level" model has been constructed in Vissim to represent Saturday mid-day flows based on factored weekday inter-peak demand levels.

Any one of the issues identified above (in paragraphs 8 to 13 inclusive) could result in forecasts of Airport development traffic effects being greater than those indicated in the 2021 Vissim model 102,900 sq. m GFA scenario.

Requiring transport assessments at the 43,050, 62,500 and 102,900 sq. m GFA thresholds as proposed in the PDP is a sensible and needed provision. It is unclear whether or not KAHL have changed their position as in the latest evidence to the PDP Hearing traffic evidence, it is stated⁸ that current modelling based assessments: *...“should result in a set of revised development thresholds for the Airport which ...will allow development within the Airport area to be treated in a collective manner.”*

Effective and timely infrastructure planning is highly unlikely to occur through the alternative approach to threshold assessment, individual RMA resource consent application process for individual sites.

Way forward

The latest SATURN modelling work has been incorporated into SIDRA network modelling and comparisons with the VISSIM modelling work have been made as a consistency check, where possible. The Council PDP Chapter 6 Memo and Annexure reflect both the new and earlier SIDRA network results.



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⁸ Tim Kelly, Transportation Issues, Chapter 11, 14 June 2016 (paragraph 23)

Annex

Introduction

- A.1 This Annex adds to and summarises the position regarding modelling following the issue of the Kāpiti Landings Modelling Scenario Testing Memorandum⁹, 04-08-2016:
- A.2 The Vissim modelling indicates that in 2021 problems may be less than expected, but also that by 2031 Airport development will contribute to a substantial reduction in local road network levels of service.
- Aspects requiring further investigation:**
- A.3 The low Saturn and Vissim flows on Kāpiti road issues and 2015 discrepancy indicates a possible structural problem with the Vissim modelling. The future year (2021) differences between the Saturn and Vissim outputs are probably affected by the same issue, which could be due to assumptions affecting traffic re-routing. A check on what is going on here is needed and this is a priority ahead of any additional testing using the Vissim model.
- A.4 The effect of Saturday turning flow pressures to/from commercial /retail activities on Kāpiti Road remains unknown.
- A.5 Network and masterplan assumptions used in the modelling may not eventuate and may not represent a worst case.
- A.6 Checks are also needed on saturation flows/gap acceptance/ driver behaviour to ensure these are consistent with Austroads guidelines and are otherwise appropriate for Kāpiti conditions.
- A.7 No DM (23k sq. m GFA) development comparisons (for 2021) are available to allow comparisons to be made to establish the effects Airport development is likely to generate.
- A.8 There are other aspects that need to be explored before Council would be in a position to take a definitive view on the merits of waiving the currently proposed Airport development transport assessment threshold requirements, namely:
- A range of other potential scenarios need to be considered (years and development levels).
 - Outcome of the M2PP opening needs to be understood.
 - Outcome of the Airport private plan change proposal is needed as this may change threshold requirement levels.
 - 2031 Vissim model convergence is needed.

Conclusions

- A.9 In advance of understanding the aspects referred to above (A3-A8 inclusive), the current Vissim modelling must be regarded as inconclusive¹⁰.
- A.10 Other modelling using SIDRA network modelling indicates that for a range of scenarios, Airport development would cause a material change in LOS warranting infrastructure investment.

⁹ No detailed results in the form of model and analysis files have yet been provided/examined.

¹⁰ This does not imply that the recent Vissim modelling was expected to be conclusive.