BIAS AND PREDETERMINATION IN ROAD TRAFFIC MODELLING – THE CASE OF THE F3 TO SYDNEY ORBITAL LINK

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ABSTRACT

The broad corridor options for the orbital link road are specified as **A**, **B** and **C** in **Figure 1**. Sinclair Knight Merz (SKM) favour the **A** options, which involve tunnels under existing roads including Pennant Hills Road.
The promotion of the **A** options is shown to depend on the incorrect use of the four-step transport model particularly in relation to the key issue of heavy vehicle traffic. The bias introduced by such use is consistent with a bureaucratic predetermination to favour the tunnel options.

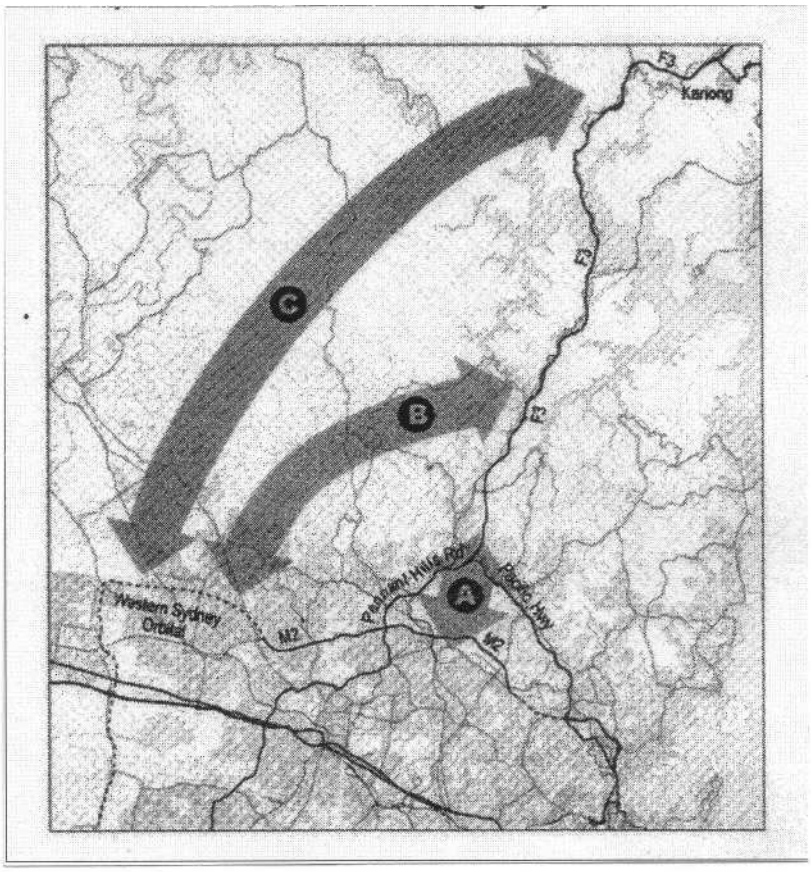

FIGURE 1. The three broad options A, B, & C for the proposed F3 to Sydney Orbital Link (SKM, 2004). This paper is concerned with the treatment of option A which involves tunnels under existing roads.

1. Why the model output cannot be relied upon

The agreement between modelled and observed traffic flows at various locations in the existing road network is shown in Table 4.1 (Appendix A) of the study. For example, RTA counting stations 74.200N and 74.200S monitor the F3 freeway at Edgeworth David Road, Wahroonga The accuracy of the agreement is impressive. What has been carried out is a **calibration** of the model. But calibration of a transport model is different from its **validation**. The calibration process uses traffic data to verify that the model can reproduce accurately the same traffic disposition in the network as that used to develop the model. Validation on the other hand involves verification that the model will produce the correct future output, at the same level of confidence for an independent set of input data. In the present case it is required that the model output produces the traffic flows and their distribution among cars and heavy vehicles in the tunnel link which were not part of the data used to generate the model.

How then can the model be used to predict tunnel usage and the ratio of heavy vehicles to total traffic? The answer to this question is not given in the study, nor can it be given.

The calibrated model is deficient in another aspect. It has not, in its formulation, distinguished between heavy vehicles and cars. Yet in a four-step model, as used in the study and summarised below, it is required, according to **STEP 3** (see Appendix) to introduce a value of modal split between the two types of vehicle. The RTA monitors do not make this distinction between heavy vehicles and cars either, making it easier for SKM to calibrate a deficient model.

Perhaps the bureaucracy holds the simplistic view that if the tunnels were to be built, all heavy vehicles will use them, leaving Pennant Hills Road to cars. But if the private sector were to be involved, the matter of toll diversion would arise. Although figures for diversion are given, they do not distinguish between cars and heavy vehicles. Heavy vehicles are more likely to avoid the toll, encouraging these vehicles to continue using Pennant Hills Road. But It does not really matter whether the model evaluates diversion or not, because its output is comprehensively flawed for the reasons already given.

Nevertheless, the matter of modal split is the key issue on which other factors depend: relief from traffic noise; the design of emission stacks and filtration; and the level of service[1] for motorists and heavy vehicle drivers.

[1] According to AUSTROADS (1988), level of service is a qualitative measure specifying conditions in traffic flow. There are six levels ranging from free flow to flow breakdown. These levels involve consideration of speed, freedom to manoeuvre, comfort, safety and convenience. On Pennant Hills Road, for example, it is a matter of common experience that the level of service is generally poor for motorists because they have to compete for road space with heavy vehicles. Thus, a specific value for lane loading (vehicles per lane per hour) for which the traffic stream consists of cars only would correspond to a higher level of service than the same value for cars mixed with heavy vehicles.

The authors of the SKM study were clearly aware of the heavy vehicle problem. For example, on page 110, the heavy vehicle count on the F3 in 2002 is quoted as 7000 /day. This corresponds to an average hourly volume of 292. Independent counts obtained in 1989 by community groups living near the F3 showed an hourly average of 241. But these averages conceal very large variations in the HV counts. In the latter case the minimum was 71 and the maximum 461.This data is illustrated in **Figure 2** below.

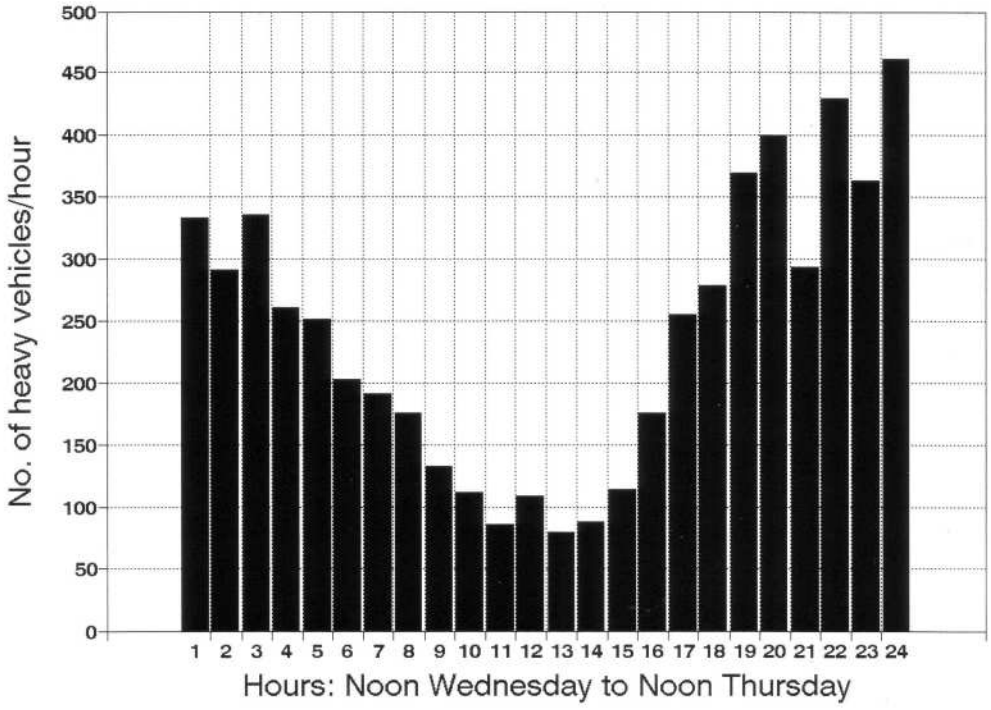

FIGURE 2. A typical set of heavy vehicle counts in both directions along the F3 Freeway at Wahroonga during midweek the year of opening (1989). Data by courtesy of Less Expressway Noise (LEN) [Filename: Traffic 2H2WTRK)].

The SKM study would have been expected to show the existence of similar large fluctuations, but it failed to do so. Obviously the larger values will correspond to a reduced level of service compared with the smaller ones.

2. The Albury External Bypass Road

There are remarkable parallels between the bureaucratic treatment of the Albury external bypass route and the F3 to Sydney Orbital Link. Both projects were the subject of bias, although as is shown below, in the case of the Albury bypass road, the bias was fortunately corrected.

In 1996, a Commission of Inquiry was jointly established between the Victorian and NSW road authorities to evaluate the case for a road to bypass Albury on the border of NSW and Victoria.

Evidence given by SKM to the Commission favoured the highway route through the centre of Albury rather than by-pass the town. The author gave evidence that as the calibrated model did not include the bypass, the potential usage of the bypass by heavy vehicles could not be satisfactorily established. Despite this evidence, the Commission rejected the case for the bypass on the grounds of cost and this affected the economic performance in terms of benefit-to-cost ratio. This decision meant, inter alia, that the Albury community was denied some relief from heavy vehicle noise at night, even though a survey had already established that sleep disturbance was a very significant problem. This example shows how a biased model can have serious environmental consequences.

In 2001, independent auditors appointed by the then Minister, the Hon. John Anderson, discovered “several serious flaws in the original traffic and economic analysis”. The original cost estimate for the internal route was found to be seriously biased. The original cost was claimed to be $200m in 1998 but in 2000 the cost was $500m. Revision of the analysis led to reinstatement of the external bypass. (Statements by Hon. John Anderson, then Minister for Transport and Regional Services).

3. Concluding remarks

This paper has summarized objective reasons why the **A** options should be abandoned. It is unfortunate that AUSROADS, apparently impressed with the SKM findings, has come to the demonstrably erroneous conclusion that the **A** options are preferred.

However, the bureaucracy needs to understand that it is not in the public interest to accept unsound technical arguments in dealing with such an important issue as the establishment of a section of the national highway route. Such acceptance would lead the public to believe that there is an unstated agenda involved in the choice of routes and a predetermination to proceed irrespective of any contrary arguments raised.

5 March 2006

APPENDIX

SUMMARY OF THE FOUR STEP MODELLING PROCESS

STEP 1 : Trip production/attraction

1. Divide region into zones. Use survey to identify the travel characteristic of each zone.
2. Determine where journeys begin and end
3. Determine factors which influence trip generation
4. Establish the main corridors of movement

STEP 2 : Trip distribution

Having determined the number of trips produced (or attracted) by the various zones, these must then be distributed among the various zones-answering the question in STEP 1 (2): where to?

STEP 3: Modal split

⟶Specify modal split between heavy vehicles and cars.

STEP 4 : Trip assignment

What route - minimum time and distance paths?

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