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LATENT DEMAND FOR URBAN PUBLIC TRANSPORT

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Abstract:

Limited public capital has necessitated a shift in planners' concern from grand new transport systems to incremental plans.

Data assembled to design the SATS system for Sydney is manipulated to identify corridors for system improvement on the basis of both absolute and relative response.

Latent demand for public transport is estimated by projecting an "idealised" system for Sydney, such that a uniform relationship exists between private car travel times and transit times. The difference between patronage on the "idealised" system and the present system indicates significant latent demand in corridors with different functions and disparities in existing service levels.

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INTRODUCTION

In the sixties and early seventies, Sydney undertook a transport study involving massive data collection and model building to generate a transport system of the grand scale (SATS 1971). Capital was assumed to be in almost endless supply. Such a grandiose scheme was not unusual to transport. Another State body with a role in urban development, the State Planning Authority, proposed in the Sydney Region Outline Plan development of the city in terms of residential, commercial, and industrial development involving enormous capital for water, sewerage and drainage investment plus unspecified amounts for the re-location of government offices, etc.

1980 has arrived, capital for public investment in the seventies fell far short of planners' dreams. Sydney has seen the Eastern Suburbs Railway constructed, a few kms of urban freeways and slower population growth than anticipated. The reality of limited public capital dictates a more selective application of transport and land use investments and policies if they are to attempt to reduce the inequities of Sydney's urban system.

This paper discusses how we can use the data base and processing power built by SATS to identify public transport improvements and land use strategies consistent with available capital resources.

SYDNEY'S PUBLIC TRANSPORT SYSTEM

It is sufficient to say that Sydney's public transport system is a radial one producing the highest accessibility to the Central Business District of all locations. There are of course exceptions to this radial rule, such as frequent cross suburban buses on the lower north shore. The city is served by a government bus system in the older areas and private bus operators providing mostly feeder services in areas which contain more than half the metropolitan population.

This system produces varying levels of public transport access to employment/retail/service centres. This is demonstrated by considering the distribution of

* The views expressed in this paper are those of the authors and do not necessarily represent the views of the Urban Transit Authority of New South Wales or the N.S.W. Department of Environment and Planning.

relative door to door travel times for transit and car. The actual ratio of weighted [1] transit time to car time is referred to as the skim ratio.

These ratios for the C.B.D., Parramatta (the second C.B.D.) and Bankstown, a mixed retail/commercial/ industrial area in the southern suburbs are illustrated in Figure 1. The accessibility disadvantage to Bankstown is obvious.

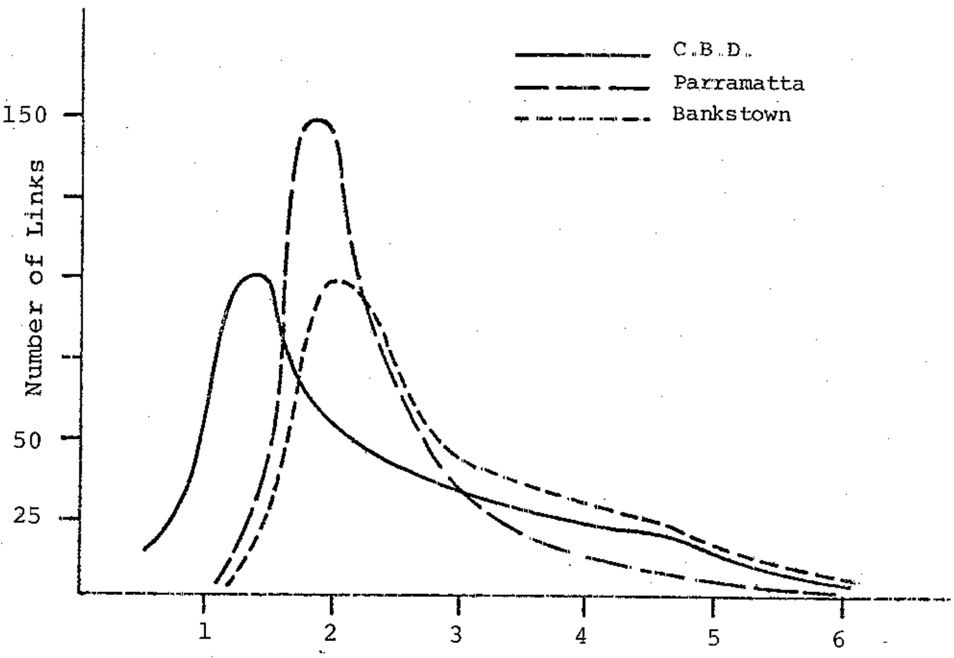

Figure 1 Current Skim Ratios to Three Regional Centres

METHODOLOGY

The trip performance of the motor car was used as the yardstick to determine a theoretical but magnificent, public transport system, a system whereby a trip between any 2 points could be made with the same service relative

1 The weights were derived from the SATS home interview survey. Non-invehicle time (access time, waiting, etc.) 2.5 times invehicle time.

to the car as trips to the C.B.D. That is, all trips were given a skim ratio of two or their existing skim value if less than two.

Having created this magnificent system, which true to form was restricted to morning peak trips, new modal splits were determined, new trip tables generated, transit flows distributed to a spider network, present transit flows subtracted. The remainder yielded a network of generated or latent demand for public transport.

The assistance of the Transport Study Group of NSW who helped the ideas and cranked the models is warmly acknowledged.

RESULTS

As a preface to discussing the early results it is essential to understand that the models were constructed to fit the transport behaviour of the 1971 community in the 1971 city. For this work population and employment were adjusted to 1976 distributions, but 1980 behaviour is still assumed to be that of 1971. The massive change to the transit system however is exactly the type of exogenous shock that models cannot handle - consequently the indication that peak transit ridership of 260,000 (37%) would rise to 320,000 (46%) is an empty result, a hopeless underestimate of the likely impact on behaviour and land use structure that such a massive change would induce. But all is not lost - the latent demand estimate for particular corridors is an excellent indication of the response to a high quality service on that link.

The power of the technique is that without being tied to specific system development, all possible development is tested in one fell swoop, the corridors of significant responses identified - then the most effective system developments emerge. It is rather nice to start with evaluation and then finish up with a specific project.

Figure 2 shows the cumulative frequency distribution of transit demand on the 658 network links. This indicates the huge contribution to peak patronage made by a small proportion of all transit links. Similarly Figure 3, which shows the cumulative frequency distribution of latent demand, illustrates that less than 10% of links demonstrate latent demand of 1,000 or more during the morning peak with the idealised system.

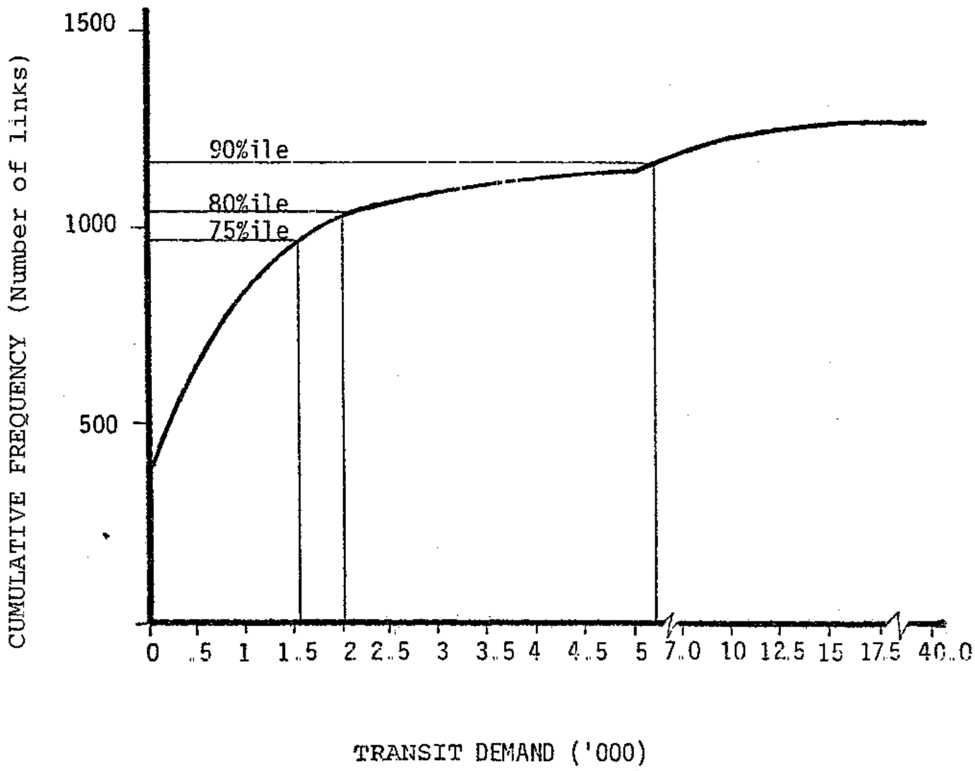

Figure 2 Cumulative Frequency Distribution of Transit Demand on Zone Spider Network

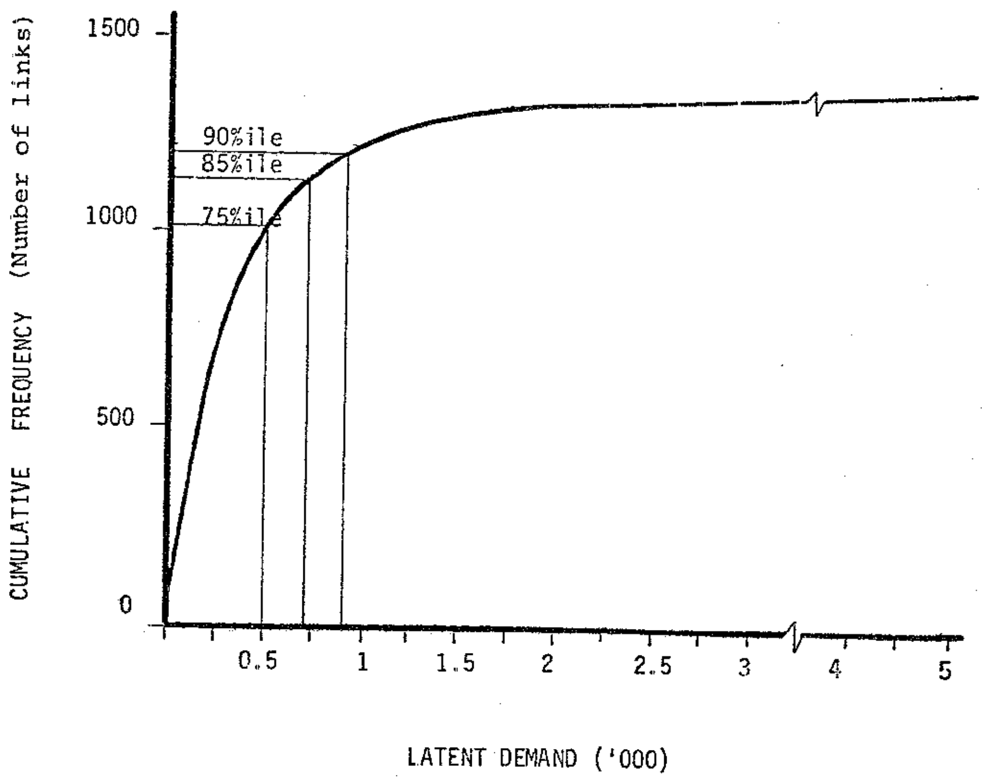

Figure 3 Cumulative Frequency Distribution of Latent Demand on Zone Spider Network

Figure 4 shows the cumulative frequency distribution of the ratio of latent demand to present demand on the 658 links. Again the very significant relative increases are made on proportionally few links - only 25% with increases of 50% or more. These results signal the greater cost effectiveness of selective public transport improvements compared to general system-wide improvements. This conclusion is reinforced when we consider which links in the system are showing the greatest latent demand - those links where latent demand was high in either absolute terms or relative to current demand. Plotting such links permitted visual recognition of the significant corridors.

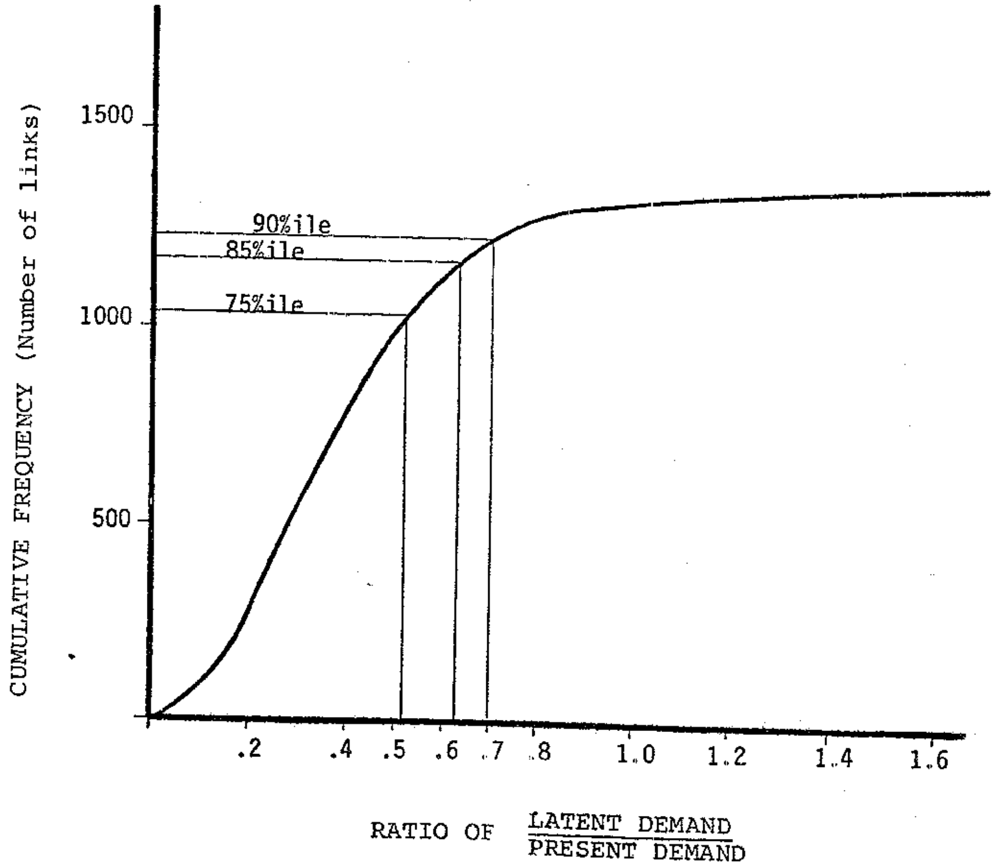

Figure 4 Cumulative Frequency Distribution of Proportional Increases in Demand on Zone Spider Network

Type (1) corridors where latent peak demand exceeds 500 passengers and where the proportional increase is greater than 50%. These corridors are shown on Figure 5 and are those with the most potential from new route development. Not surprisingly they tend to follow major circumferential roads and none are in the growth fringe areas, probably due to low population densities.

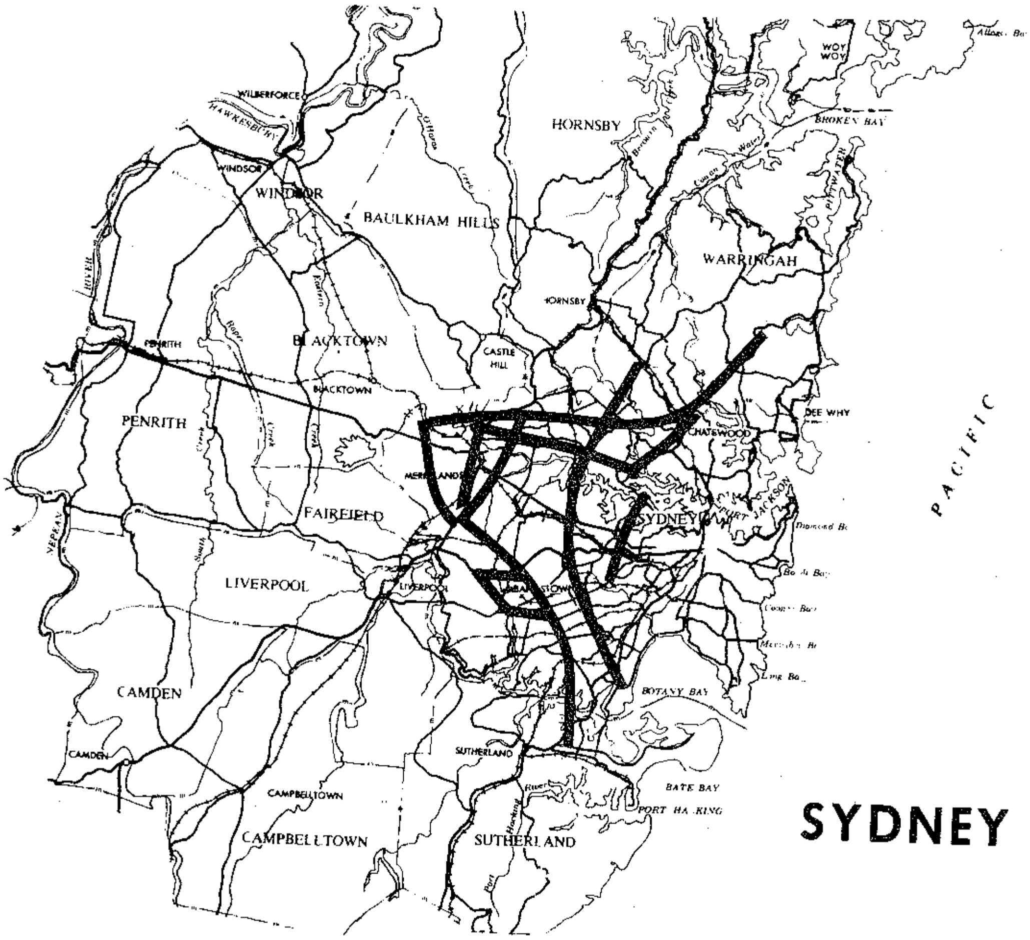

Figure 5 Links with Latent Demand Greater than 500 and Proportional Increase Greater than 50%

Type (2) corridors where the peak latent demand exceeds 500 passengers but the proportional increase was less than 50%. These are essentially radial corridors (Figure 6) and represent the potential for improved performance in terms of speed and interchange, that is, upgrading of existing services.

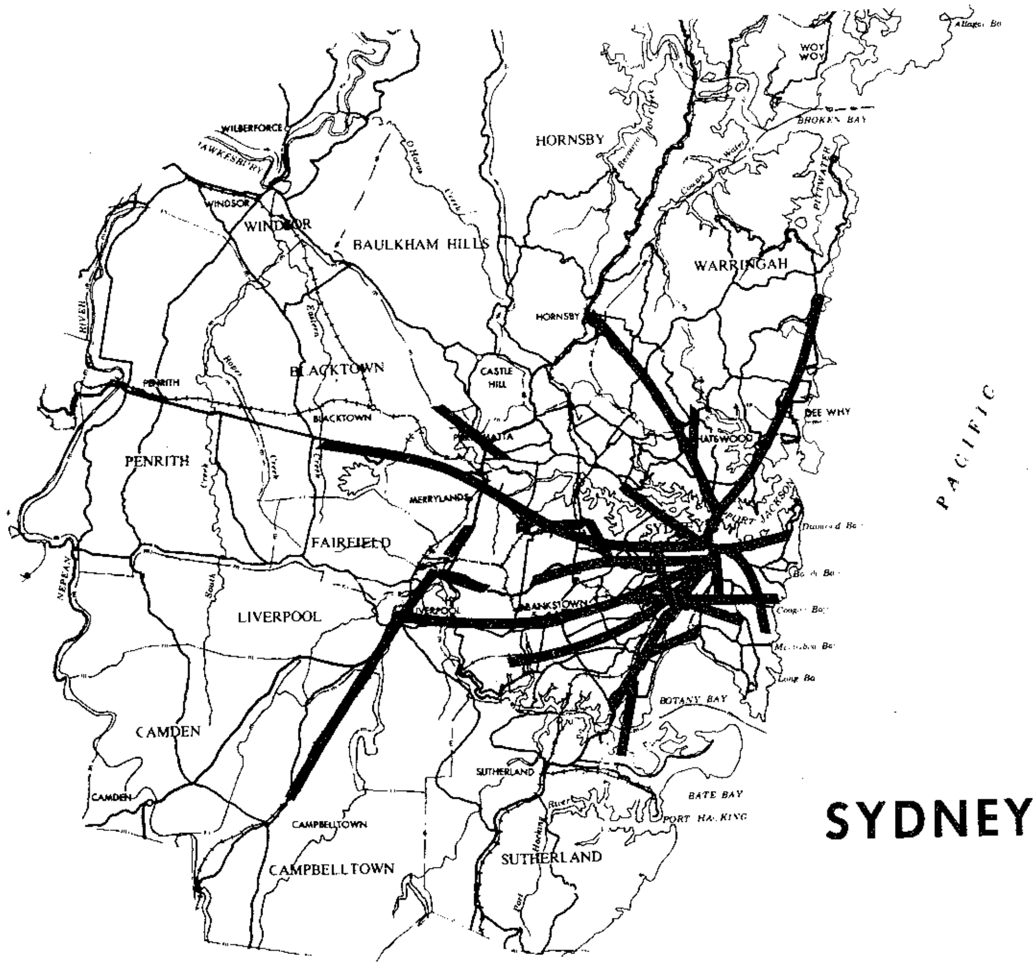

Figure 6 Corridors with Latent Demand Greater than 500

Type (3) corridors with high latent demand relative to current demand (greater than 50%) but where the magnitude of such demand is less than 500 peak passengers. (Figure 7). These corridors are distinctly circumferential and cover much of the newer growth areas in Sydney. As such they provide an indication of need in areas where few direct cross-suburban services exist, and the order of response likely to such service development. These corridors are more likely to highlight a transport isolated community or industrial area than the other two categories.

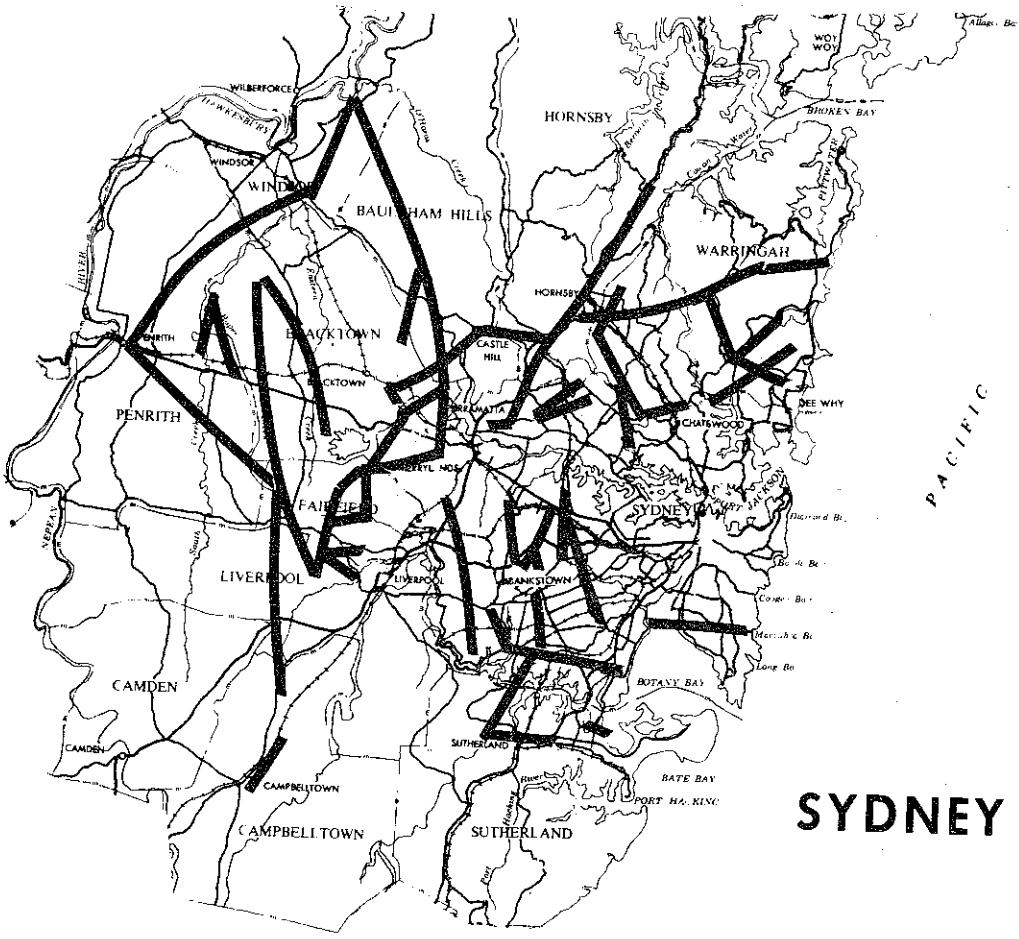

Figure 7 Corridors Showing High Proportional Latent Demand

The existing system or type 2 corridor has been a rapacious user of available capital, both in terms of maintenance and of development. On equity and cost effective grounds, transport capital should be diverted to corridors for major new route development (type 1) and significant disadvantage correction (type 3) and away from the traditional type 2 corridor projects for upgrading, resignalling, electrification, duplication and the usual type of new rail link which normally represent a level of service change, not a new service.

WHERE TO NEXT?

This manipulation of data has established corridors of demand which will respond to transit improvement. The question is which ones and when?

There is plenty of hard debate and analysis left:-

- which corridors are consistent with and promote desirable land use strategies
- which corridors demonstrate the greatest need
- similar analysis of off peak needs
- specific service development to cater for those trips at an appropriate standard
- evaluation of the cost versus patronage and land use impact of such improvement

Only the naive marketeers actually believe that a new bus route or interchange will have instant spectacular success. The inevitable truth is that the land use patterns, particularly the employment/residential distribution, and the existing transport network have mutually established the behaviour of present commuters and change in their behaviour will be gradual. The need exists for selective improvements and this latent demand work suggests that such improvements are, in terms of ridership and equity, best oriented towards fringe residential areas and the decentralised employment centres. There needs to be a shift in transit planners dreams from the rail, light rail, trunk-bus route type projects serving the already served concentrated commercial zones and white collar workers to a comprehensive bus system which also serves the dispersed employment areas. After all, the peak modal split is about 80% to the C.B.D., 30% to Parramatta but less than 15% to most other employment.