

BUS-BUS INTERCHANGE, TOOMBUL SHOPPINGTOWN, BRISBANE

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ABSTRACT: *In November 1980 the Brisbane City Council Department of Transport introduced what was, for it, a major innovation in its operations, namely the Toombul Shoppingtown Bus-Bus Interchange.*

Many papers have concerned themselves with the theoretical aspects of interchange operation or have reported on attitudinal studies carried out on patrons following introduction of such facilities.

There is, however, a paucity of recorded information on the trials, tribulations and experiences of the practical running problems experienced by the operator.

This paper traces the early studies which ascertained that an interchange should be established at Toombul and then describes the investigations that were undertaken to determine routes and frequencies of feeder and trunk buses to best suit the users, namely the passengers.

The cornerstone of Interchange acceptance is the reliability with which a passenger can guarantee to make a planned connection from one bus to another and problems experienced in this area together with corrective measures taken are then described.

Passengers at Toombul showed a marked distaste for transferring, both by changing their travel patterns and by their answers to the attitudinal study, and the need for such matters to be considered when planning interchange operations is discussed.

Finally, the sheer volume of work involved in planning and implementing a major interchange is noted and a cautionary warning on over commitment of resources given.

The views expressed in this paper are those of the authors and do not necessarily reflect those of the Brisbane City Council.

INTRODUCTION

On Monday, 3rd November, 1980, the Brisbane City Council's Department of Transport commenced operation of a bus-bus interchange at Toombul Shoppingtown, which is located approximately 9 kilometres north-east of the city centre as shown in Figure 1.

The introduction of this interchange represented a major departure from the style of bus operations previously employed by the Council.

This paper initially describes investigations and considerations into location of the interchange; research into patronage and service levels; planning of the new services; layout and operation of the interchange and publicity involved in the introduction of the new system.

Since the opening of the interchange its performance and operation have been kept under constant surveillance. The latter part of the paper describes the experiences, both good and bad, encountered and measures taken to improve performance and assist user acceptance of the interchange.

EARLY INVESTIGATIONS

In 1974 a committee of officers from Brisbane City Council and relevant State Government Departments was established to investigate co-ordination of public transport in various areas of Brisbane.

In September 1974 this role was taken over by the newly constituted Metropolitan Transit Project Board (later to become the Metropolitan Transit Authority) who had the responsibility for formulating a suitable programme framework for Urban Public Transport.

One of the early projects approved for funding was a Bus-Bus Pilot Demonstration Programme.

Various sites for an interchange were considered around Brisbane, including some where private bus operators would be providing part of the "feeder" service to the interchange station and others that had the potential for rail to provide the line haul, or "trunk", service.

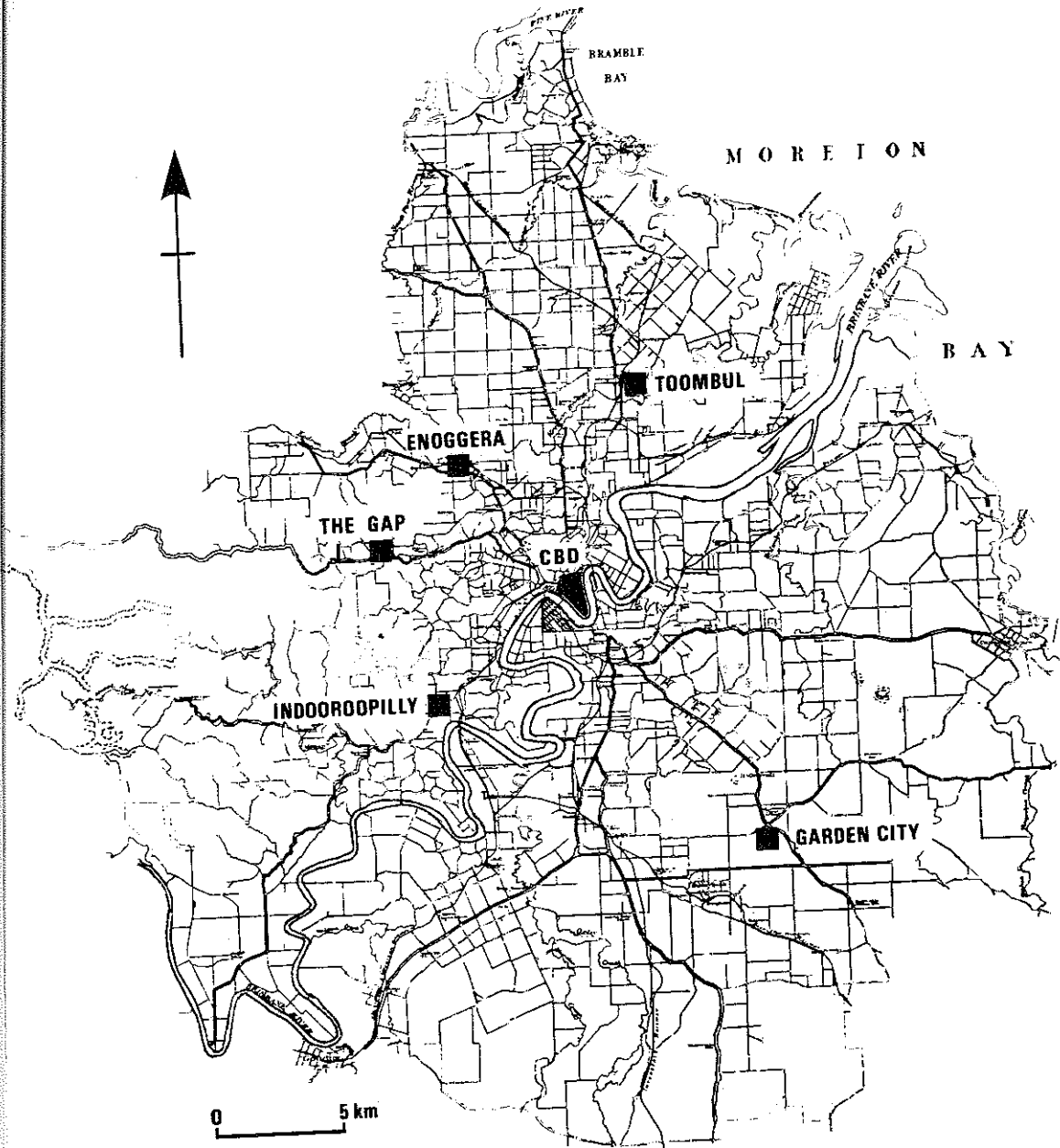


FIGURE 1 - Location of Toombul Interchange with respect to other Brisbane Localities

BUS-BUS INTERCHANGE, TOOMBUL SHOPPINGTOWN, BRISBANE

Some of the factors taken into account in the location decision process were:-

- (i) the site should be at least 6 kilometres from the C.B.D. A site at least this distance from the C.B.D. was considered necessary if any travel time savings were to accrue to bus riders and that these time savings would be both usable and noticeable.
- (ii) the interchange point should be a regional node where a number of passengers would choose to terminate their journey.
- (iii) the interchange point should be accessible to the C.B.D. via one or more high frequency trunk routes.

Eventually Toombul Shoppingtown was chosen as the site to be investigated as to the worth or otherwise of a Bus-Bus Demonstration Project and the consultancy firm, P.G. Pak-Poy & Associates Pty. Ltd. were retained to investigate and make recommendations on the Project.

In 1979 a final report (Pak Poy 1979) was submitted to the Metropolitan Transit Authority, the major recommendation being:-

"Introduce a bus-bus demonstration project for a trial period. The demonstration would include service and new feeder route experiments and would be aimed at attracting increased bus ridership in the area."

At this stage it should also be recorded that Toombul was also a strong contender for bus-rail interchanging but it was considered that there was:-

- (i) lack of an integrated ticketing system which would permit transfer between modes without penalty;
- (ii) lack of peak rail capacity;
- (iii) the need for faster trains to achieve significant time savings;
- (iv) the fact that bus-bus had better off-peak operation.

Therefore consideration of a bus-rail system was seen as an appropriate longer term solution which could be extended from the initial bus-bus interchange - should that prove successful.

Detailed data collection commenced in March 1979 on the routes shown in Figure 2.

On every bus all passengers were interviewed to establish:-

- (i) Point of origin, usually place of residence or employment;
- (ii) Bus Stop at which passenger boarded;
- (iii) Bus Stop at which passenger alighted;
- (iv) Destination of passenger, usually place of residence or employment.

Answers received to questions (ii) and (iii) were then manually compiled to form a matrix which showed:-

- (i) for inbound buses - passengers boarding BUS STOP and alighting ZONE;
- (ii) for outbound buses - passengers boarding ZONE and alighting BUS STOP.

This information was used to determine the appropriate level of service between the Interchange point and the C.B.D. Because inbound passengers destinations were allocated by zones it was a relatively easy matter to nominate, for each inbound bus on the proposed feeder routes, the break-up of passengers by destination zone. From this break-up passengers travelling to the C.B.D. could be allotted to express buses and those with destination between the Interchange point and the C.B.D. could be allotted to "all-stops" line-haul buses.

When all the travel information was collated broad decisions on routes to be included in the Interchange could be made.

Assessment of this information resulted in the Hendra Routes 62, 63 and Wavell Heights Route 40 services being passed over for consideration in planning for the Interchange because:-

- (i) The objective with the Hendra service was to seek to rationalise this service as it operated in an area served by other routes and it was considered that rationalisation be deferred to a later date; and
- (ii) The Wavell Heights Route 40 Service was on the western periphery of the area being reviewed and from the data collected it was apparent that a significant number of passengers had destinations in areas which could not be readily reached from a bus-bus interchange point at Toombul.

BUS-BUS INTERCHANGE, TOOMBUL SHOPPINGTOWN, BRISBANE

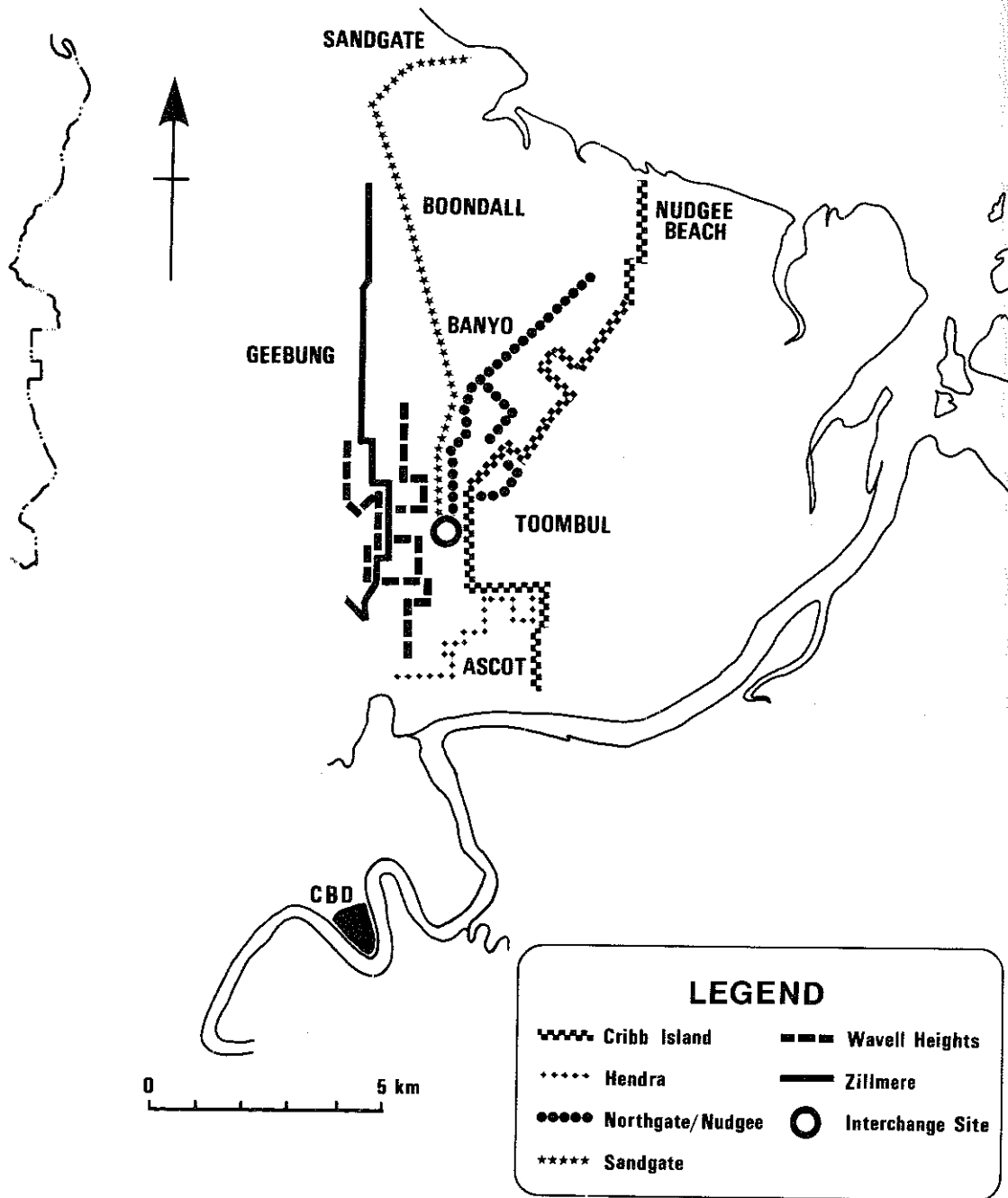


FIGURE 2 - Routes on which original survey data was collected.

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The resultant route pattern adopted for the Interchange operations is shown in Figures 3 (Feeder Routes) and 4 (Trunk Routes).

With the decision made on routes to be included in the Interchange, detailed scheduling within certain constraints could commence. These constraints included:-

- (i) a service level for the feeder routes of at least the same frequency as applied on the direct City service but where possible service levels to be improved;
- (ii) transfer times to be kept to a minimum but not less than five minutes;
- (iii) through-running buses to be allocated to routes which brought down the most passengers and to be shared over the feeder routes as evenly as possible;
- (iv) that peak hour services operate as near as is practicable to present times;
- (v) the trunk services via Sandgate Road and Ascot to retain the timetables which applied to those routes.

These policy constraints emanated from the desire to minimise the trauma for passengers by providing a basic service reasonably approximating that which existed before the interchange.

With the development of the schedule for the Interchange, all feeder routes (except the Chermside Cross-Country Service) obtained services of greater frequency. In some cases there was a dramatic increase in the number of bus trips per day (for instance parts of Banyo had an increase of trips per day from 14 to 24) whilst other areas only saw an increase of 2 trips per day.

Whether such increased levels of service could be justified will only be shown by the passage of time. It was, however, thought important to give the interchange every opportunity to succeed by erring on the generous side if there was any doubt.

On the Interchange to C.B.D. "trunk" route sixteen (16) inbound express trips were provided between 6.30 a.m. and 9.30 a.m. with the aim of decreasing travel time for passengers. This was considered necessary as it was expected that there would be some resistance to having to transfer between buses at the Interchange as has been reported by Philbrick (1977), MacDonald (1980) and Sullivan (1980) amongst others.

Increases of the line-haul trunk service Route 171 along Sandgate Road were made to cater for passengers transferring from feeder buses to the "all stops" 171 buses to alight between the Interchange and the C.B.D. and also for passengers who boarded between the Interchange and the C.B.D.

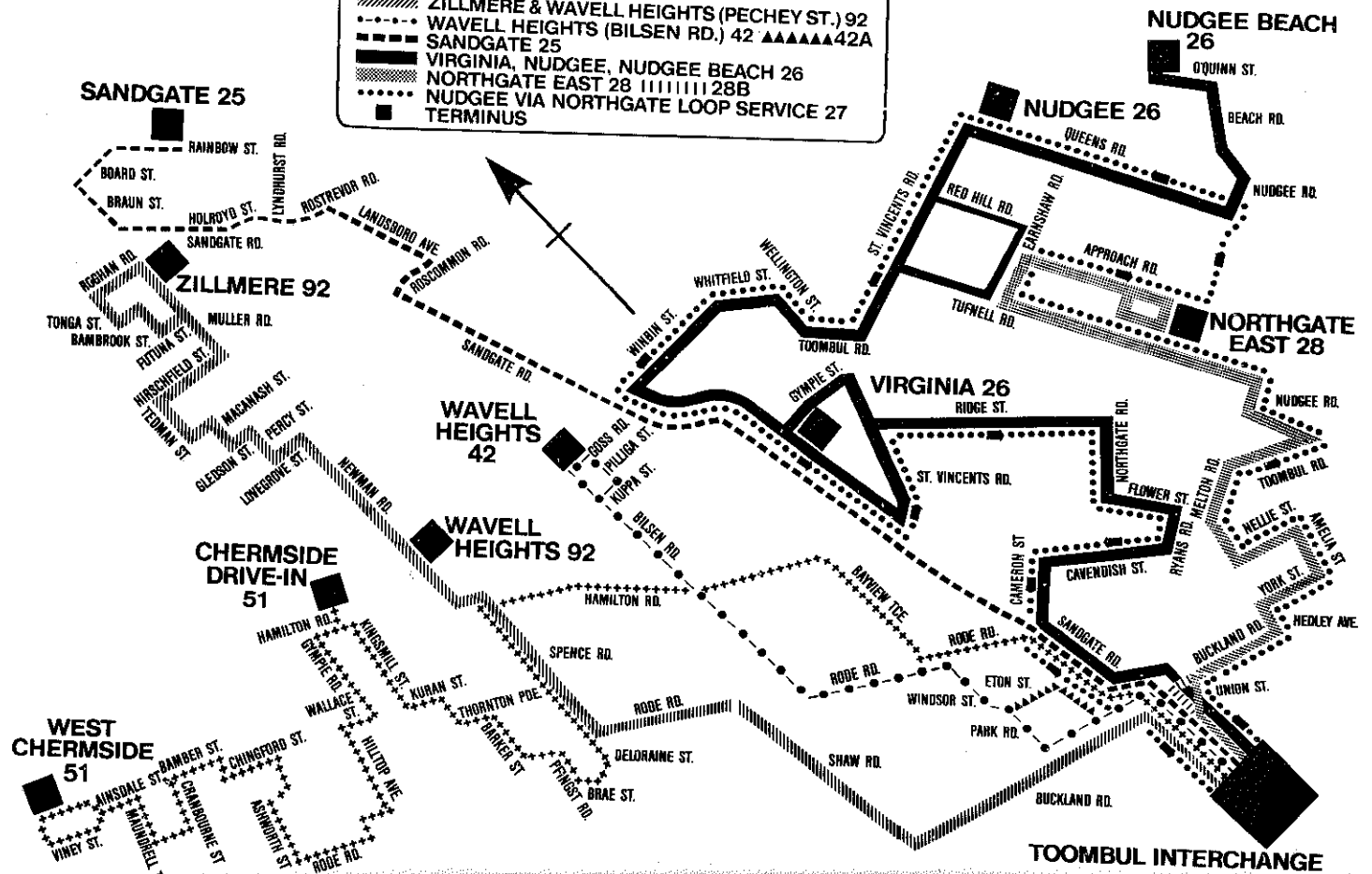


Wavell Heights
 Zillmere
 Interchange Site

TOOMBUL INTERCHANGE FEEDER SERVICES

LEGEND:-

- +++++ CHERMSIDE 51
- /////// ZILLMERE & WAVELL HEIGHTS (PECHEY ST.) 92
- .-.-.- WAVELL HEIGHTS (BILSEN RD.) 42 ▲▲▲▲▲▲▲42A
- SANDGATE 25
- VIRGINIA, NUDGE, NUDGE BEACH 26
- NORTHGATE EAST 28 ||||| 28B
- NUDGE VIA NORTHGATE LOOP SERVICE 27
- TERMINUS



100

FIGURE 3

BUS-BUS INTERCHANGE, TOOMBUL SHOPPINGTOWN, BRISBANE

TOOMBUL INTERCHANGE TRUNK ROUTES

INBOUND AND OUTBOUND

BUS-BUS INTERCHANGE, LOOMBUL SHOPPINGTOWN, BRISBANE

Boarding passengers experienced no change in travel time compared with operations before the Interchange but those transferring and alighting were subjected to the five (5) minutes transfer time additional to their earlier journey.

It was calculated that the proposed schedule would result in a saving of ten (10) buses in the A.M. Peak and four (4) buses in the P.M. Peak even though the number of trips provided on services in the area has increased from 1493 trips per week to 1758 trips per week, an increase of nearly 18%. As the P.M. Peak is the Department of Transport's greater peak the effective saving of buses was four (4) buses. Furthermore six (6) Monday to Friday runs would be saved resulting in a reduction of seven (7) in the number of bus drivers required to operate at Light Street Depot.

THE INTERCHANGE

The actual Interchange facility is located in the Loombul Shoppingtown complex just off the major arterial road, Sandgate Road. The facility was built by the proprietors of the Shoppingtown at no cost to the Brisbane City Council and is maintained by the proprietors. The fact that the facility was built by the Centre reveals the mutual benefit which can be obtained when: -

- (i) an Interchange is located at a node where significant numbers of passengers may wish to terminate or commence their journey;
- (ii) private enterprise is aware of the potential increase in retail sales if residents in the catchment area of the retail centre have access to that centre on bus services which are both reliable and frequent;
- (iii) the public transport operator is freed of making capital investment on Interchange facilities, there is greater opportunity to improve feeder services to the node which further enhances the attractiveness to the Centre proprietor providing the Interchange facility.

The layout of the Interchange, which has space for ten (10) buses as shown in Figure 5, was designed to minimise walking for the greatest number of passengers; i.e., zones were allocated to the feeder routes according to the anticipated daily loadings, the route with the highest expected loading being located adjacent to the main line-haul zone. The feeder route with the lowest number of expected passengers was located furthest from the main line-haul zone. A further area capable of holding three (3) buses is also allocated for storing buses which are not in service.

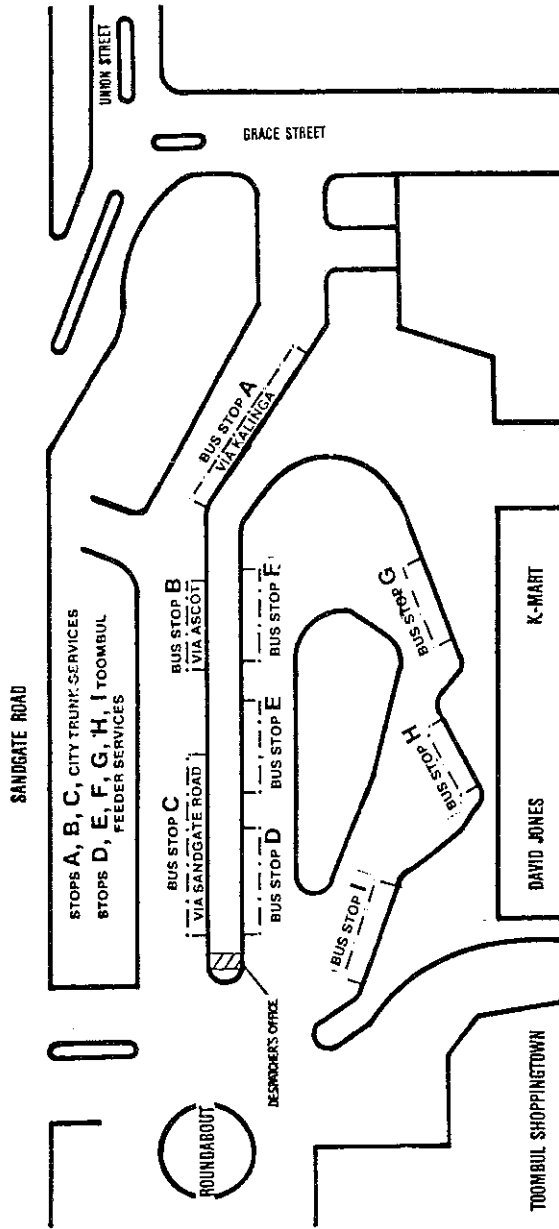


FIGURE 5

LAYOUT OF TOOMBUL BUS-BUS INTERCHANGE

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BUS-BUS INTERCHANGE, TOOMBUL SHOPPINGTOWN, BRISBANE

At the head of each zone a system of lights have been provided to enable the Despatcher on duty to control departures of buses. The lights are controlled from the Despatcher's office and are used to assist him in ensuring successful co-ordination of buses. The system is simply a red and green light activated as required. In addition each zone has a P.A. loudspeaker installed through which the Despatcher can direct instructions to the bus driver and communicate to passengers on-board buses and at stops.

Minor operational problems have been experienced because of the location and design of the despatcher's office, the principal ones being:-

- (i) because of the distance between the office and Zone A the despatcher is unable to read the destination blind and run number information;
- (ii) because of the geometry of the main platform the despatcher can have problems observing the arrival of buses at the Zone A stop;
- (iii) the despatcher's office was constructed with a solid "rear" wall which prevented him from seeing buses arriving from 'behind' him. Thus, he was unable to see bus run numbers or destination of those buses.

This problem is being rectified by insertion of a window in the rear wall.

These problems have highlighted operational requirements not previously fully appreciated and are to be kept well in mind in future interchange designs.

With the concentration of the Department's bus services at the Toombul Interchange, it was obvious that economies could be gained if a meal room was provided at the Interchange. Again, this facility was included in the infrastructure which the proprietors of Toombul Shoppingtown had constructed. Consequently, the Brisbane City Council was able to achieve these further economies by eliminating the need for bus drivers to return all the way to their base depot at Light Street Depot near the C.B.D. to have a meal. It was calculated that a minimum of eight hours per day has been saved owing to this facility because paid travelling time does not have to be rostered into daily work shifts.

PUBLICITY

The introduction of a Bus-Bus Interchange at Toombul Shoppingtown represented a major change to both commuters and running staff. The Council's bus system was radially oriented toward the C.B.D. and had evolved from the days when the C.B.D. was the major focus for Brisbane's population which was reflected in the route structure of the tram routes which since have been replaced by buses. Consequently, riders who were using the system were accustomed to route structures, ticketing arrangements and schedules which had been established for many years. To make the transition easier for these users and to inform potential riders of the new system a major publicity programme was undertaken.

Radio advertisements were placed on a number of Brisbane radio stations particularly those which had strong listening audiences in the north-east suburbs. The emphasis of these advertisements was on increased service frequencies and access. Also listeners were advised to obtain publicity material explaining the new Toombul bus connection. An inducement to read this material was a lucky number on each brochure which offered prizes donated by Toombul Shoppingtown if the winning number was held. Publicity material for the proposed Interchange was distributed to residents and bus riders in the area. Forty-eight thousand brochures were distributed to householders in the region by Toombul Shoppingtown and all bus riders on buses operating in the region were given brochures on the proposed system. The material was also made readily available at Council libraries and Alderman's ward offices, the Department's Mobile Information Centre was stationed in the area during the period of transition and the new system was given publicity in Brisbane's major daily newspaper and the local suburban newspaper. The Council's weekly television programme 'City Report' also featured the Interchange system.

The second, and equally important 'training' aspect was that the running staff operating and supervising the system had to be educated as to how it worked and to be motivated toward ensuring the successful implementation of the bus-bus Interchange.

To simplify the operation, initially some transfer was permitted on selected buses which used the Interchange terminal when it had been completed but before the official "full scale" system was commenced. This had the advantage of allowing bus drivers and supervisory staff to become familiar with the layout and style of operation, prior to the second and final stage when all routes involved would be operating at the Interchange, and also get regular passengers used to using the transfer capabilities of the interchange.

BUS-BUS INTERCHANGE, LOOMBUL SHOPPINGTOWN, BRISBANE

The final stage of training involved issuing each staff member with a hand-book containing all details of the system, such as routes, destination signs, transfer arrangements etc.

The Union were also kept fully involved, from formulation of running times to actual Interchange operation, and this assisted considerably in the smooth running that occurred.

TICKETING

It is considered that a basic requirement of an Interchange is that transfer should not involve the user paying any more for the journey than "pre-interchange".

Unless expensive electronic machinery is to be required it is necessary for the system to suit a simple manual operation.

In July 1980 the Council introduced a zonal fare system which assisted in the handling of the intricate requirements of a transfer system with a reasonable degree of efficiency.

There are, however, still considerable limitations in the ticketing system which limit "transfer without penalty" opportunity and introduction of a new system has been the subject of negotiations between the Brisbane City Council, Metropolitan Transit Authority and Queensland Railways for some considerable time. It is to be hoped that a system satisfactory to all parties can soon be agreed on and introduced to enable maximum potential of such interchanges to be realised.

PERFORMANCE

Running Times And Reliability

Prior to the introduction of the Interchange surveys were carried out to determine estimated trip times for each route and were used to formulate proposed schedules which, to a large extent, would determine the efficiency with which the operation performed.

In practice this method proved generally satisfactory and for the Express routes, Wavell Heights Route 42 and Nudgee/Virginia Route 26 Services there has been no need to make subsequent adjustments to the allowed running time. Table 1 below shows the level of reliability achieved in the first two weeks of operation. For the purpose of this exercise a bus was classed as late if it arrived more than three (3) minutes late.

TABLE 1

Reliability of Arrival Times Compared with Scheduled Times

<u>Route</u>	<u>Reliability</u>
Express Services	95%
Wavell Heights	98.5%
Nudgee/Virginia	93%

Other routes generally operated satisfactorily but were found to be less reliable at various times of the day. In all but one instance, which is detailed later, these services have been able to be modified and very few buses now run late. One particularly interesting problem occurred on the Sandgate and Zillmere feeder routes which basically recorded on-time arrivals at the Interchange but had a particular period when late running occurred. On these routes the late-running was confined to the A.M. peak and in particular to those buses "through-running" to the City as Express buses. This seemed to show on the part of the passengers a resistance to physically change vehicles as passengers were showing an obvious preference to travel on buses which are through-running. (This is discussed in more detail later). Consequently these particular buses were attracting patronage higher than the average for these routes during the morning peak and were therefore taking longer to reach the Interchange than was anticipated due to increased loading times.

The affected services were generally adjusted to leave the outer terminus about five (5) minutes earlier which preserved the desired connections at the Interchange whilst not upsetting passengers by occasioning too great a variation from the original bus times. It was felt that passengers would not be adversely disturbed if timetable variations were restricted to five (5) minutes or less. Duhs and Gibbings (1973) claim travel patterns are not affected where trip time alterations are not greater than five (5) minutes.

Subsequent checks of these buses have not shown any loss of patronage and in fact have revealed on these trips an increase in patronage. Whilst it is possible there are a number of factors which have caused this result it is contested that the improved reliability of the amended services could be contributing to this increase. An attitudinal survey conducted amongst bus users in October 1981, revealed that only 10% of respondents thought buses were rarely or never on time. A remarkable response when reliability is so crucial to a successful Interchange system and any missed connection for whatever reason detracts from a reputation for reliability.

BUS-BUS INTERCHANGE, TOOMBUL SHOPPINGTOWN, BRISBANE

The one problem to which a solution has not yet been found involves the main trunk-haul all-stops service, Toombul Route 171, which has consistently run late outbound, particularly between 11.00 a.m. and 2.30 p.m. Close scrutiny of this problem did not disclose any inadequacy in the running time but what became apparent was that buses were arriving late at Salisbury, the southern terminus of the Toombul 171 route. Layover time was generally only about four (4) minutes and therefore buses were leaving Salisbury late to return to Toombul Interchange. This situation is compounded if a bus has to be held at Toombul Interchange should a feeder bus be running late because late departure from Toombul will mean a late arrival at Salisbury. Consequently, without adequate recovery time to cushion these effects late-running will reverberate through the system.

Unfortunately, when the Interchange schedules were developed the consequences of not taking full cognizance of such aspects affecting reliability, as detailed by Sullivan (1980), were not fully appreciated and the continuing problem does not help with the users confidence in the system. This is especially so because the time of day when the problem occurs is when riders are casual rather than regular users of the system and the risk of missed connections adds to the anxiety experienced by such users.

Patronage

Although efficient schedules and reliability of service are important facets of a public transport operation as far as the operator is concerned the most crucial indicator must be public acceptance and use of the service. Much literature on bus-bus transfer systems emphasises how patronage has been attracted to such systems because of increased availability of access and increased frequencies. With the Toombul experience patronage levels have not, at this stage, increased but an apparent slowing of the patronage decline compared to the whole system has been recorded as indicated in Table 2.

TABLE 2

Variations in Population and Average Daily Weekday Patronage
October 1980 to August 1981

	Population	Patronage
Brisbane City Area	-0.014%	
B.C.C. Transport Total System		-5.713%
Toombul Interchange Catchment	-3%	
Toombul Interchange Bus Routes		-5.14%

The comparative "increase" in Toombul patronage compared with total patronage figures could, to some extent, be because of the increased accessibility benefits which, from an attitudinal survey conducted in October 1981 amongst users of the Toombul Bus-Bus Interchange system, are well appreciated by patrons.

Respondents were asked to comment on various aspects associated with the Interchange and the great majority of responses indicated an awareness and positive reaction to the benefits available from the system.

Apart from specific questions respondents were also asked to list those features of the interchange that they most liked and disliked.

Improved access, convenience and increased bus frequency were listed by 66% of respondents as the features they liked best.

Transfer and Passenger Reaction

However politically popular or trendy Interchanges may be it must be realised that they are not all "good". For the passengers the basic requirement of an Interchange, namely the necessity to transfer from one bus to another, and the hassle and worry of co-ordination is a major cause of worry and dislike, particularly if they did not have to do so before the Interchange operated.

This 'resistance to transfer', mentioned earlier in the paper as having been a significant factor in Interchange operations according to some authors, has shown itself clearly at Toombul.

Not only did 48% of survey respondents (who listed a dislike) nominate 'the need to transfer' as their most disliked feature of the Interchange but passengers with the choice of 'through-running' or 'terminating feeder' buses have shown a marked preference for those 'through-running', as illustrated in Table 3 which shows, for comparable morning peak trips "before and after" Toombul, the percentage of the total inbound morning patronage carried on each bus.

TABLE 3

Passenger Resistance to Transfer
Wavell Heights Route 42

Trip Time	BEFORE TOOMBUL OPENED		AFTER TOOMBUL OPENED		Variation
	Passenger Load	% of A.M. Total	Passenger Load	% of A.M. Total	
7.10*	22	16.2	42	33.1	+ 16.9%
7.23	21	15.4	8	6.3	- 9.1%
7.38*	27	19.9	34	26.8	+ 6.9%
7.46	23	16.9	12	9.4	- 7.5%
8.00*	43	31.6	31	24.4	- 7.2%
	136	100.0	127	100.0	

* Indicates Buses which through-run "post-Toombul"

From this there would appear to be considerable resistance to changing buses especially when it is realised that similar travel time savings are achieved by all five new trips compared with the "pre-Interchange" C.B.D. oriented trips. (In fact the best time saving is 13 minutes on the 7.46 a.m. trip which is serviced by a "terminating feeder").

If it is assumed that passengers previously travelled on the bus which delivered them to their destination of the most suitable time, then, to avoid the need to transfer passengers must travel on an earlier bus because the time savings achieved do not guarantee on time arrival if a later bus is caught.

Therefore, effectively the passenger has increased his journey time by travelling on an earlier bus than is actually necessary.

In the case of a move from the 7.46 a.m. to the 7.38 a.m. bus an increase in journey time of eight (8) minutes has occurred and a shift from the 7.23 a.m. to the 7.10 a.m. bus results in a thirteen (13) minutes increase.

It seems passengers are revealing a preference to incur a travel penalty of eight (8) and thirteen (13) minutes rather than the inconvenience of changing buses in a five (5) minutes transfer period. The assumption is that passengers are valuing transfer time at something greater than 1.6 times the equivalent journey time for the eight (8) minutes trip shift and 2.6 times for the thirteen (13) minutes trip shift.

Travel Time Savings

The above observation adds weight to the claims in the literature on the different values placed by users on the different components of travel time. A brief description of the conclusion of some writers is outlined below together with a Table showing the total savings in travel time accruing to bus passengers in the morning peak.

For example Lee and Dalvi (1969) do not impose any weighting for walking or waiting time compared with in-vehicle time whereas Pak Poy (1979) imposed a weighting of "times two" (x 2) for transfer time.

Furthermore, Duhs and Gibbings (1973) assert that a change of up to five (5) minutes in trip time does not affect a passengers decision to use public transport whereas changes greater than that do. This then raises the parallel question of "what is a worthwhile time saving?" (George and Shorey 1978).

It is contended that, if variations in trip times of less than five (5) minutes are not considered significant then, similarly, travel savings of less than five (5) minutes could also be considered not significant.

As an exercise therefore calculations have been carried out using all three methods, namely: -

- Column 1 - Lee and Dalvi method - all travel components carry the same weighting.
- Column 2 - Pak Poy method - transfer time component counts "double" in-vehicle time.
- Column 3 - Adjusted Time method - travel differences of less than five (5) minutes are not considered and using Pak Poy weighting for transfer time.

The results of these calculations are shown in Table 4.

TABLE 4

Travel Time Savings (passenger minutes)

Route	(1)	(2)	(3)
	Lee & Dalvi Method	Pak Poy Method	Adjusted Time Savings
Northgate East	565	285	285
Nudgee/Virginia	354	84	174
Sandgate	1193	713	703
Wavell Heights	248	85	158
Zillmere	1222	872	808
Total	3582	2039	2128

From this it can be seen that, even when weighting of transfer time is imposed, there have been considerable overall time savings by introduction of the Interchange.

CONCLUSIONS

As is unfortunately often the case in the Planning and Research field, there are few practical papers available describing actual 'in field' results following introduction of well documented theoretical ideas, particularly papers dealing with operational findings.

This has made comparisons with other such projects very difficult.

BUS-BUS INTERCHANGE, TOOMBUL SHOPPINGTOWN, BRISBANE

It is apparent, however, that the results of the introduction of the Toombul Bus-Bus Interchange, particularly as far as resource savings and patronage have not been as dramatic as has been claimed in other centres such as New Delhi (Sharma) and Edmonton (Sullivan 1980) respectively.

This is put down to the fact that, because Toombul was the first such major innovation in a system that had been operating for many years, a policy decision was made to adhere as closely as possible to existing times and routes and hence minimise passenger disruption.

As a result a less than optimal system was no doubt introduced but one which had minimum adverse affect on the travelling public and the results have been encouraging enough to encourage detailed investigation of further bus-bus interchanges.

Since the opening of the Toombul Bus-Bus Interchange, in November 1980, we have seen the commencement of operation in April 1981 of a major joint venture, between Brisbane City Council, Queensland Railways and the Metropolitan Transit Authority, namely the bus-bus, bus-train Interchange at Enoggera.

Planning is also well advanced towards a bus-bus interchange at The Gap, about 10 km west of the C.B.D. and investigations are proceeding on further interchanges at Indooroopilly and Garden City.

The experience gained with the introduction of the Toombul Interchange proved invaluable in successful implementation of the Enoggera Interchange and it is to be hoped that lessons learned from these two operations will be put to good use in those to come.

Whilst the patronage level at Toombul has not increased, the rate of loss is less than that of the total B.C.C. operations and it is anticipated that, with time, the higher frequency of services and greater availability of destinations, through interchanging, will eventually result in increased ridership. This will particularly be so if an improved ticketing and fares system can be introduced.

This potential is particularly apparent from the Sandgate service which has shown an increase in ridership of 21% with a service increase of 20% during the period of comparison. It might be that for the other routes which have been established for about thirty years the old maxim "you can't teach an old dog new tricks" might explain the reluctance to adapt to a new system in spite of the obvious benefits.

Sullivan (1980) "advises" that an introduction rate of one interchange point a year can be considered a 'typical rate of progress'. This has been borne out by our experiences in the last twelve months, where:-

- (i) introduction of both Toombul and Enoggera Interchanges within 6 months has imposed an almost unworkable burden on staff resources;
- (ii) it is only after nearly twelve months that the 'fine tuning' of the Toombul system that the desired service reliability is being achieved and standard five minutes transfer times are fairly consistently being provided.

If I had to select one major finding from our experience of Toombul Bus-Bus Interchange (since reinforced by our Enoggera Interchange experience) it must be that:-

With a given level of resources a far superior service, in terms of frequency and accessibility, can be provided with the Interchange concept than that provided with the traditional C.B.D. oriented radial service.

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