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CONFIDENTIAL

MANAGEMENT COMMITTEE

CITY ENGINEER'S DEPARTMENT

Head 9

PROPOSED JOHANNESBURG RAIL RAPID TRANSIT SYSTEM

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At its meeting on the 5th August 1970, the Management Committee resolved inter alia, as follows:

That London Transport be retained to carry out the study of the proposed rail rapid transit system for Johannesburg at an estimated cost of up to R17 200.

A representative of London Transport and a representative of their consultants, Mott, Hay & Anderson, came to Johannesburg in October 1970 to study the proposed rail rapid transit system. In mid-November they returned to London to complete their report. This report has now been received and the * major data dealing with the initial implementation are reviewed in the attached Memorandum.

The actual cost of the study was R26 715.

The main conclusions of the report may be summarised as follows:

1. A rail rapid transit system in Johannesburg is fully justified and will be well patronised.
2. It is estimated that the proposed system will cover its working expenses but would only partially meet the interest and capital redemption charges.
3. Four stages of construction are recommended, the first being ready for operation in 1977 and the final stage completed by 1985.
4. A Metropolitan Transport Authority is suggested to run the system.
5. Preliminary design work on the system should start early in 1972.
6. If the steady, realistic and economical programme of planning and construction recommended in the report is to be followed, the City Council's decision in principle to back the rail transit project must not be delayed much beyond the end of 1971.

The racial usage of the proposed system raises certain social and political issues which are dealt with in a separate memorandum.

The main aspects of the consultants' report, i. e. the routes with the flexibility provided, the anticipated financial appraisal, the proposed initial programme up to 1980 and the form of the controlling authority are acceptable. As pointed out in the memorandum, if the consultants' programme is accepted, the first traffic relief (i. e. to the south), cannot be obtained before late 1977 and relief to the north-east, $2\frac{1}{2}$ years later, in early 1980, therefore if relief is not to be delayed any more, it is essential that the suggested programme of implementation be adhered to.

The first essentials are:

- (a) The Council must accept the scheme in principle as soon as possible.
- (b) Negotiations with the Province and higher authorities regarding finance and the form of the controlling authority, must be opened and proceeded with the utmost vigour, and
- (c) The City Engineer must be authorised to retain consultants and start preliminary designs, do topographical surveys and site investigations as soon as possible.

With regard to the approach to higher authorities for assistance, the attitude of the Government to the question of urban transport as outlined in the White Paper on the Borckenhagen Report is encouraging. The relevant section reads as follows:

"The Government is, however, aware of the new demands being made on local authorities regarding the planning and financing of modern urban and metropolitan road networks in order to provide, inter alia, efficient systems of mass passenger transport (Cf. par. 393 of the Marais Report, R. P. 32/1969). The Government will, therefore, consult the provincial authorities on the best procedure whereby this matter could be properly and speedily investigated with a view to formulating guiding principles regarding future development, and also the financing involved. The body which will be appointed to conduct the enquiry, will be requested to submit within six months, an interim report in which guiding lines regarding probable future developments in urban transport in South Africa, and the possible financing thereof, are indicated".

IT IS RECOMMENDED

- (a) That the Management Committee approves in principle that a rail rapid transit system for Johannesburg as detailed in the consultants' report should be introduced.
- (b) That no details of the report be released to the public or the Press at this stage.
- (c) That steps be taken for the Management Committee to hold discussions with the Provincial Administration in the first instance and later with the Cabinet Ministers concerned regarding:-
 - (i) the legislative and financial assistance required for constructing and running the proposed system
 - (ii) the controlling authority that should be established to run the system
- (d) That the City Engineer be authorised to retain consultants to do preliminary designs and site investigations.

(C. E. 227/71)

Mr Carlsson

Ext. 577

PROPOSED JOHANNESBURG RAIL RAPID TRANSIT SYSTEM

REVIEW OF CONSULTANTS' PROPOSALS

1. INTRODUCTION

The terms of reference for the study were designed to ascertain the feasibility of the scheme and to give the technical departments the necessary basic information for future preliminary work. The report gives this detail very well but in this memorandum only the major data dealing with the initial implementation are dealt with.

The main conclusions of the report may be summarised as follows:

1. A rail rapid transit system in Johannesburg is fully justified and will be well patronised.
2. It is estimated that the proposed system will cover its working expenses but would only partially meet the interest and capital redemption charges.
3. The system should, on the basis of experience elsewhere, substantially increase property values and release great property development potential along its route.
4. The initial system should consist of a north-south line splitting into two branches at its northern end, and an east-west line. The two lines would intersect in the heart of the Central Area.
5. The system would be mainly in tunnel and would be a conventional 1,435 metre gauge steel on steel duorail.
6. Four stages of construction are recommended, the first being ready for operation in 1977 and the final stage completed by 1985.
7. The initial system is designed to be capable of expansion after 1985 if necessary. Even with the extension of the system, no line would extend more than 6,5 kilometres from the city centre.
8. Servicing facilities would include depots at Trojan and Mayfair with overhaul shops at Trojan.
9. It is suggested that more land be bought for open air car parks as opposed to more costly multi-storey parking garages as proposed at outer stations.
10. A Metropolitan Transport Authority is suggested to run the system. The senior officers of the Authority should be selected at an early stage.
11. Preliminary design work on the system should start early in 1972.

12. If a benefit-cost study was thought necessary, this should be started during 1971.
13. If the steady, realistic and economical programme of planning and construction recommended in this report is to be followed, the City Council's decision in principle to back the rail transit project, should not be delayed much beyond the end of 1971.

2. PHYSICAL LAYOUT

The most important item of a rail rapid transit system is its routes. The consultants have recommended two routes. The one is an east-west route very similar to one of those proposed in the City Engineer's report. The other route is essentially a north-south route serving Rosettenville in the south and bifurcating in Braamfontein to serve the north-eastern high density areas up to Orange Grove and the north-west up to Richmond. This route also gives direct access to the main S. A. Railways station, Johannesburg. This route varies very considerably from that proposed in the City Engineer's report but it serves the same extremities.

The location of the routes was based on

1. Ease of operation
2. The need to get the maximum passenger traffic to make the system as viable as possible
3. Provide for better service to most people as soon as possible
4. The need to retain as much flexibility as possible for future lines.

With the exception of the north-east where the proposed line has been extended to the heart of the Orange Grove shopping centre at 9th Street, and in the north-west where the line has been shortened to Richmond, the system's extremities remain as in the City Engineer's report.

The shortening of the line to Richmond lessens the attractiveness of the system for possible park & ride traffic from the Barry Hertzog Avenue corridor and the department considers that this may have to be reconsidered nearer the time of detailed planning.

The report indicates possible extensions "if studies towards the end of the century" indicate that extensions are genuinely essential. The report considers that the north-western section of the north-south line could possibly extend from Parktown to Rosebank and from Richmond to the Melville area. The east-west line could possibly extend southwards from Mayfair to Evans Park on the west and from Bertrams to Bruma in the east. Traffic build-up on the north-south line, south of Braamfontein may require the elimination of bifurcation in Braamfontein with the extension of the north-west line south-eastwards to near New Kazerne.

The possibility of further extensions, e. g. to Sandton, is not recommended.

The department initially had certain reservations about the north-west and north-east lines meeting in one line through the Inner Central Area but in view of the flexibility built into the system, and the extreme doubt raised by the consultants of the ability to convert large numbers of motorists to public transport, the departments find the proposed route acceptable particularly because of the improved service to the shopping core and the ease of operation from the depot near Trojan. If park & ride is very successful and passenger traffic builds up faster than anticipated by the consultants, it will be possible to eliminate the bifurcation at Braamfontein and extend the north-west line to the south-east at an earlier stage.

The east-west line will be built in tunnel for the whole of its length, but the north-south line will be in tunnel from Trojan in the south to the northern boundary of Yeoville in the north. The extremities to this line, i. e. to Orange Grove in the north and to Rosettenville in the south, will be either left in open cut or be built on the cut and cover principle.

3. TECHNICAL

The report deals with the various types of equipment that would be available for a rail rapid transit system and comes down very firmly in favour of the steel tyred wheel on steel rail type using the conventional 1,435 metre gauge. The S. A. Railways use the 1,067 metre gauge but this has not been recommended because with the larger gauge, more room is available in the car bogeys to house motors and other equipment. Since the recommended system would pick up its electrical current from a third rail, trains would not be able to run on the S. A. Railway system, thus there is no need to maintain the S. A. Railway system gauge.

Higher coaches have been recommended compared with those presently used in London because of the warmer climate in South Africa. Also, a ballasted track is recommended so these two points together require a larger tunnel than used in latest lines in London. A 4,5 metre diameter tunnel is therefore, recommended for each track.

Although 6-car trains are recommended initially for Johannesburg, these could ultimately be extended to 8-car trains. It is therefore, recommended that all platforms lengths should be 145 metres long to allow for longer trains. 8-car trains are considered to be the best size for the optimum control of passenger flows and to minimize station stop time.

The recommended coaches would be of light-weight aluminium alloy construction and would be equipped for automatic train operation. The coaches would be fitted with a public address system and there would also be communications equipment for the train operator to talk to the traffic control office.

Automatic driving of trains is recommended because of the more regular service it gives to the public, the savings in operating costs, because only one man is needed instead of a two-man crew, and the savings in current consumption with all trains being able to run at more economic speeds in off-peak periods.

A differential fare system is proposed with the use of electronically coded tickets whose validity is checked by passing over a reading head in the entrance gates.

For each line of a rail rapid transit system, a depot is essential. The main depot is recommended in the Robinson Deep area. This depot will also be the main maintenance depot for the whole system. For the east-west line, the depot is proposed in mining land immediately south of Mayfair and immediately north of the Council's licensing testing depot. Because of weather conditions in Johannesburg, it is recommended that all areas for the stabling of trains should be covered to prevent the trains becoming excessively hot and thus possibly requiring air conditioning equipment.

The grades of the main running lines will not exceed 3%. This is well within the range of steel tyres on steel rails and will not result in any excessive current consumption. The minimum radius of curves will be 400 metres, this radius will not necessitate any widening of the tunnels on curves and will easily permit a speed of 90 kilometres per hour.

The estimated cost of the proposed systems is :

Running Tunnels	R51,9m
Stations	<u>R62,5m</u>
Total Main Line	
Construction	R114,4m
General (Trains, depots)	<u>R 36,2m</u>
	R150,6m

It will be noted that the stations cost considerably more than the running tunnels, in fact nearly 55% of the total line construction cost.

4. PASSENGER ACCESS

Passengers reach a rail rapid transit system by three means, viz as pedestrians, as bus passengers (Bus & Ride) and as car drivers and passengers (Park & Ride). Each of these methods is most important to the success of the project.

4.1 Pedestrian Access

To get the most out of the system, particularly in the off-peak periods, stations must be located to encourage the maximum number of "walk in" passengers. The consultants have, therefore, located most of the stations, particularly the terminal ones, in areas of high density. For this reason the consultants do not favour the location of stations in the median of a wide motorway right of way.

4.2 Bus & Ride

The Greater Johannesburg Area Transportation Study's plan was dependent on a reorganised bus service to bring large volumes of passengers to the rail rapid system. This critical supporting role of the bus is endorsed by the consultants who state that the city transport departments' bus and trolley bus services must be planned and reshaped to fit in to the rail plan.

4.3 Park And Ride

The Greater Johannesburg Area Transportation Study's plan was heavily dependent on park and ride with the result that very large parking garage structures were recommended. It is noted from literature that while garages of this size had been proposed in other parts of the world, notably Chicago proposed massive park and ride garages in 1960, but none appear to have been built. The usual park and ride facilities are of the open lot type. In Cleveland a 3 000 car open lot is operational.

In recommending the large parking garages, the Greater Johannesburg Area Transportation Study team was well aware of this and also that it is very difficult to persuade the motorists to get out of his comfortable car, particularly in inclement weather. It was for this latter reason, that large garages were recommended to provide quick, weather protected access to the rail rapid transit system stations.

The consultants, in discussing the proposed routing, made the remark that the Greater Johannesburg Area Transportation Study's plan seemed to be distorted to fit in with the motorway plan and called for considerable faith in the conversion of car commuters to rapid transit. They also state that it has yet to be proved that high speed car traffic can be tempted off a motorway by a sign saying "rapid transit : park and ride" unless the motorway has at such a point itself, already become congested.

As a result of these observations, the consultants recommend that additional ground should be purchased at ten park and ride stations. They recommend an average size of about 700 cars, thus giving a total of 7 000 for the ten stations. This is approximately a third of that proposed in the Greater Johannesburg Area Transportation Study's plan. The consultants are also against parking garages because of the high cost of building and because they feel there will be certain operation difficulties.

As far as Johannesburg is concerned, the proposed motorways bypass the Central Area, which is the area served by the rail rapid system. Thus any motorist bound for the Central Area must leave the motorway a considerable distance from his destination. If there are convenient park and ride facilities available, he has the choice of completing his journey by car on congested roads or by the rail rapid. The department considers that the provision of attractive park & ride facilities can do a great deal to encourage the motorist to use the rail rapid.

As far as costs go, there is no doubt that parking garages are extremely expensive to build and unless the ground costs more than R400 000 per hectare, an open lot is cheaper. In the transportation plan, it was proposed that most of the park and ride garages would be built either over or under the motorway system, thus the cost of land would not be directly charged against the parking garage. Even so, it is estimated that the cost for parking a car at the park and ride garage would be about 40c per day.

The other point raised by the consultants, i. e. that traffic from the garages would not be capable of being handled on the roads, can be overcome if the road system is adequate. In the

transportation plan, the park and ride garages were based on the new motorway proposals and it is essential that these motorways are built if garages of this size are to operate efficiently.

Since there is the continual doubt of the effectiveness of park and ride, and the fact that parking garages have not been used in other places in the world for park and ride facilities, it is considered that the consultants' recommendation of providing open lots for an average of 700 car spaces (2 ha) at each park and ride station, could be accepted at this stage. A final decision does not have to be made until the preliminary design stage of the park and ride stations and more definite data will be available then. Also, if park and ride does catch on as it is hoped it will in the transportation plan, the parking garages can always be built at a later date.

5. FINANCIAL

The financial appreciation is divided into three sections, namely fares, traffic assessment and viability.

5.1 Fares

The consultants detail five possible sources of revenue for a rail rapid transit system. They are (a) passenger fares, (b) revenue from station car parks, (c) revenue from advertising, (d) revenue from the leasing of shops, kiosks, etc. at stations and (e) social benefit subscriptions which are "paid by the city and/or the Province or Central Government, in acknowledgement of unchargeable benefits to the community and the avoidance of alternative and non-remunerative works such as motorways" etc. This social benefit subscription is not termed a subsidy.

In proposing fares for the proposed rail system, the consultants have assumed that the interest and redemption of the capital cost will not have to be serviced wholly out of the fares revenue. In "most rapid transit systems around the world, the first cost of infrastructure and equipment is now met by the local provincial and national governments as part of their 'social benefit' contribution to the undertaking for easing and speeding travel, reducing road congestion and avoiding costly highway works".

In arriving at suitable fares for the transit system, the analysis has been done in Imperial measure of miles because all existing data on competing services was in this form. A differential fare system based on distance is recommended because, among other reasons, of the need to maximise the short distance central area user of the railway on which much of the social benefit as well as the financial return will depend.

To ease electronic and mechanical equipment, it is recommended that the fare steps should be in 5c rises. The minimum fare recommended is 5c for 1 mile and 10c for 1 - 3 miles, 15c for 3 - 5 miles and for over 5 miles a 20c fare. The maximum journey on the complete system in 1985 would be a little more than 8 miles. A full fare table is given in the report and the following are examples: -

1. From Orange Grove to the Vanderbijl Station would cost 20c
2. Rosettenville to Vanderbijl - 10c.
3. Mayfair to Vanderbijl - 10c.
4. Bertrams to Vanderbijl - 10 c.

The inter-availability of ordinary tickets between road and rail is not recommended. Thus people using the bus to reach the rail station would have to pay a separate fare for the bus as well as for the railway. Similarly, inter-availability of S. A. R. tickets and rail rapid tickets is not recommended.

On the basis of these fares it is estimated that the annual receipts on fares would be fractionally over R8 million per year. The consultants consider that there may be an advantage in offering season tickets at a discount for particular journeys and also possibly selling single tickets in advance in bulk at a discount.

To ensure that all fares due to the undertaking are, in fact, collected, the consultants recommend one of the automatic systems using oxide backed tickets which pass over reading heads as is described earlier in this memorandum.

5.2 Traffic Assessments

In arriving at the possible number of passengers that will use the proposed railway system in 1985, the consultants have compared the proposed system with existing systems in Stockholm, Oslo, Rotterdam and Lisbon. Using these figures and the figures given in the Transportation Report, fairly consistent results were obtained and it was considered that 75 million annual passengers should be used in the financial analysis. It is pointed out that this figure may be somewhat optimistic and that no increase beyond it is likely until either (a) the 1985 population statistics are exceeded, or (b) the post 1985 extensions are constructed or (c) the system is no longer restricted to the use by Whites only.

5.3 Viability

The capital cost of constructing and equipping the proposed Johannesburg rail rapid transit system of 22,7 kilometres is estimated at R150,6 million at late 1970 prices. In the planning programme presented, there would be relatively limited expenditure on surveys, detailed planning and design and legal requirements until 1974. Thereafter, with the start of physical work on the first stage, the expenditure would build up, probably rising to R15 - R20 million per year in the period 1976 - 1982 and thereafter falling off slightly to the opening of the last stage in 1985.

By the end of 1985 the whole system would be reaching its estimated level of traffic given previously, but depending on the actual make up of the fares with regard to concessionary tickets, season tickets etc., the R8 million mentioned above may not be reached and the consultants have assumed that this would probably drop to around R7½ million per annum. Commercial advertising and estate management income may bring in a further 0,2 million,

giving approximately R7,7 million per year. Working expenses have been calculated by comparison with other rail transit systems taking account of the specific salaries that would have to be paid in South Africa. On this basis, the annual working expenses are estimated at R4,9 million, giving a net surplus of R2,8 million. This analysis, of course, does not include the servicing of the capital costs.

The consultants point out that if the interest on construction costs is capitalised during construction, the estimated capital cost would increase by about R17,8 m to give a total capital outlay of R168,4 m. Interest alone at 6% would amount to R10,1 m per year and redemption over a thirty year period would add a further R2,1 m per year. The City Treasurer points out that 6% is unrealistic at the present time and interest is likely to be in the region of 9% or more. Loan charges over a thirty year period at 9% interest will amount to R16,4 m per year. If the operating surplus of R2,8 m on revenue account is realised, R13,6 m per year will still remain to be found.

With regard to servicing the capital expenditure, the consultants point out that the solution at present favoured in a number of cities, including London, is to meet all or part of the public transport authority's capital costs from local, regional or central government sources in recognition not only of the social benefits accruing to the community from an adequate provision of public transport facilities, but also of increases in property tax values and development potential resulting from new rapid transit facilities. In London, for example, a new rapid transit system similar to that proposed in Johannesburg, would receive 75% of the capital outlay by infrastructure grant from the central government and 25% by capital grant from the Greater London Council.

6. ADMINISTRATION

The report contains valuable comment on various aspects of operating, staff regulations and public image and these will be most useful in establishing the organisation. The most important items commented on are the form of the controlling authority and the staff structure.

6.1 The Form Of The Controlling Authority

The consultants discuss the various forms of controlling authority used by many of the existing transit authorities. Their conclusion is that the choice narrows down to the formation of a Johannesburg Transit Authority or the inclusion of a new rapid transit system as part of the Johannesburg Transport Department. The consultants recommend a public authority.

The consultants recommend that the first step after the City Council has decided that a rail rapid line is to be proceeded with, should be to seek provincial support and legislation for the formation of a Johannesburg Transport Authority. On obtaining the necessary provincial support, a board of two or three full time members and a Chief Executive designate should be appointed. After these have decided on the shape of the

authority's general organisation, they will have to search for and select the General Manager designate for the rail transit system. The latter will then build up and start training his own organisation; the Chief Engineer will, as soon as he is appointed, be preparing probably in conjunction with consulting engineers, the detailed drawings on which, among other things, acquisition will be based. Once the railway side of the organisation has progressed as far as this, the new authority would be ready to take the city transport department's buses and trolley buses over with a view to planning and reshaping the road services to fit in with the railway plan.

The consultants discuss the scope of the transport authority and state that it may be desirable that this authority eventually takes over the coordination of all transport facilities in the Metro-com area.

6.2 Staff Structure

While the consultants recommended that the proposed controlling authority will take over the existing bus operation of the city, they have assumed that the form and structure of this organisation will remain broadly as at present, and the following section, therefore, only deals with the staff required for the railway side.

The consultants also assumed that the city's own Electricity Department and other departments such as Legal, Medical, Public Relations, Buying Branch, will, certainly at the outset, be available to serve the proposed controlling authority.

The railway section of the new authority would then require its own staff for (1) operation, (2) civil engineering, (3) mechanical engineering and (4) signals and telecommunications.

The hierarchy of the railway side of the administration would consist of the following: A General Manager (Railways), controlling, an Assistant General Manager (Engineering), Superintendent of Operations, a Railway Administrative Officer and Police Superintendent. The recommended organisation is shown diagrammatically in Appendix 1. This gives a total organisation on the railway side of about 900 persons.

7. IMPLEMENTATION

The programme of implementation recommended by the consultants is designed to give an efficient use of manpower, equipment and other resources by allowing the build-up of traffic demand to be matched by the progressive completion and opening to traffic at suitable intervals, of sections about 6,5 kilometres long. Such sectional opening means that revenue is being earned on at least part of the capital invested, without waiting for the final completion date for the whole project.

The following table gives the estimated cost of the various sections:

Section 1 : Rosettenville to Braamfontein	R49, 1m
Section 2 : Braamfontein to Orange Grove	R35, 1m
Section 3 : Mayfair to Bertrams	R50, 6m
Section 4 : Braamfontein to Richmond	R15, 8m
Total	R150, 6m

The consultants' proposal for opening the various sections is as follows: -

- September 1977 - open Rosettenville/Braamfontein section, 6, 5 km
- March 1980 - open the Braamfontein/Orange Grove section, 6, 9 km
- September 1982 - open the Mayfair/Bertrams section, 6, 15 km
- March 1985 - open the Braamfontein/Richmond section, 3, 1 km.

In order to meet the opening date of September 1977 for the Rosettenville/Braamfontein line, the fairly strict timetable given in Appendix 2 will have to be maintained. The highlights of this timetable are:

- (1) That the City Council should decide to embark on the project and authorise the City Engineer to embark on preliminary design work by the end of 1971, say October.
- (2) Negotiations should be opened immediately with the Department of Local Government to arrange for financial assistance and to settle the form of the controlling authority. Financial assistance and the form of the controlling authority should be settled by the end of 1972, say November.
- (3) A small engineering team should commence work on preliminary designs and topographical survey and site investigation in March 1972 at the very latest.
- (4) With the form of authority settled at the end of 1972, the project manager and general manager designate, should be appointed early in 1973.
- (5) Work to start on contract documents for the first section in September 1973. This means that the civil, electrical and mechanical engineering consultants must be retained early in 1973.

The City Engineer is in full agreement with the staging and timetable for the first two sections of the project, i. e. Rosettenville to Braamfontein, Section 1, and Section 2 from Braamfontein to Orange Grove. Making the Braamfontein to Richmond the fourth section to be opened, means that no relief to the very heavy car traffic from the north and north-west can be obtained until the middle of 1985. It is considered that possibly the Braamfontein/Richmond section could be built ahead of the Mayfair/Bertrams section, but this is something which can be finalised at a later date.

It will be noted from the above programme that considerable relief can be expected in the south by the end of 1977, but even with this programme, no relief will be forthcoming to the extremely heavy volumes of people that come in from the north until 1980 when the Braamfontein/Orange Grove section is opened. It is therefore essential that if the rail rapid transit system is to give any relief to the citizens of Johannesburg in the near future, the first part of the programme outlined in Appendix 2 must be rigidly adhered to. It is, therefore, essential that an early

decision be made by the City Council to go ahead with the project and that negotiations with the Province and higher authorities be proceeded with the utmost vigour as soon as possible.

8. CONCLUSION

The main decision to be taken at this stage is whether the city is to accept a rail rapid transit system in principle.

The Greater Johannesburg Area Transportation Study showed that the city's transportation needs could not be satisfied by roads alone, and that a rail rapid transit system was necessary. The consultants have now confirmed that a rail rapid transit system is fully justified and will be well patronised. It is therefore considered that the rail rapid transit system should be accepted in principle.

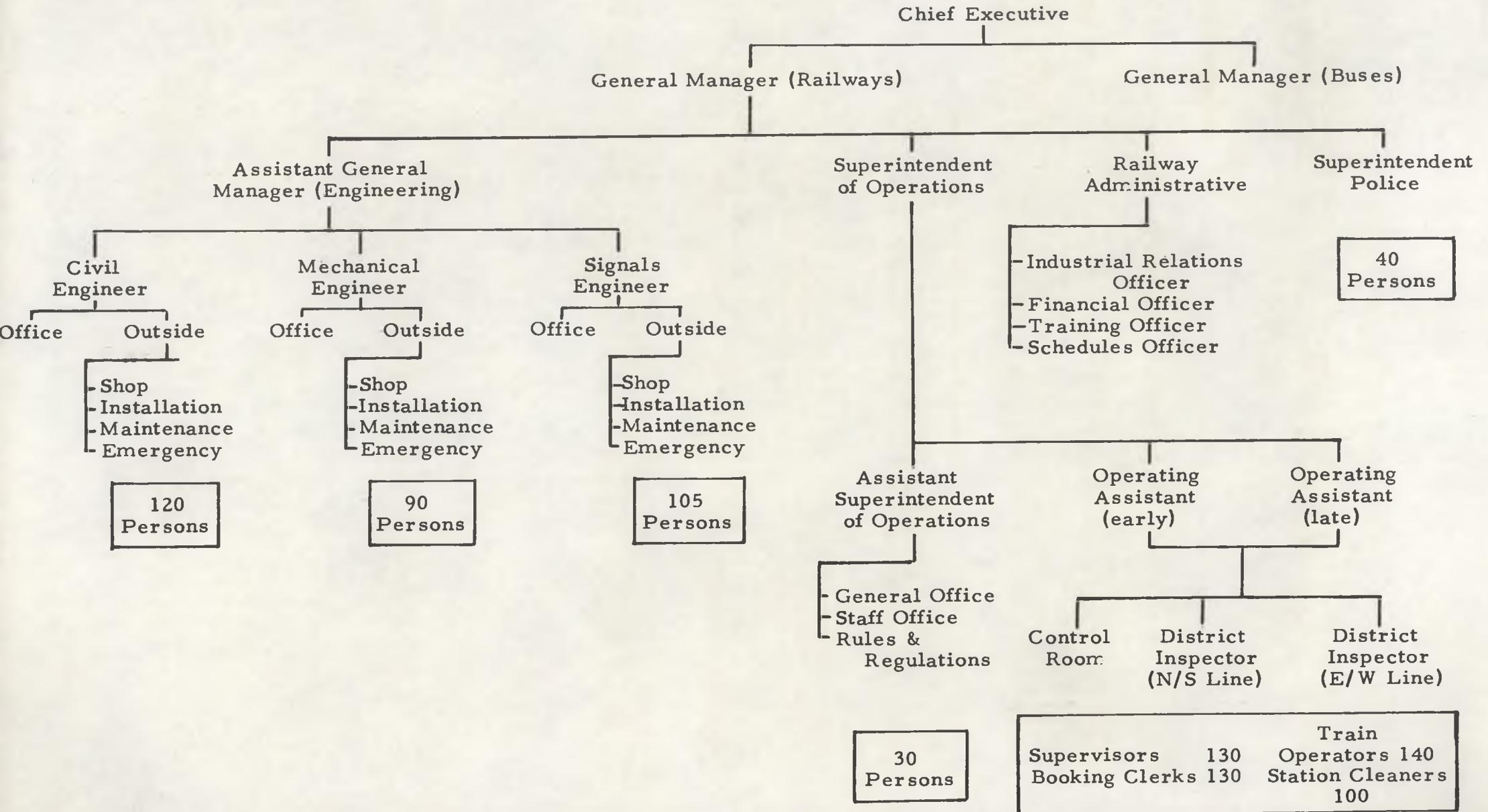
The next decisions to be taken are:

- (1) Are the proposed routes acceptable?
- (2) Is the proposed implementation programme acceptable?

As pointed out in this memorandum, the consultants' proposals serve the area very well and have sufficient flexibility for future expansion. It is, therefore, considered that their proposed routes should be accepted. The implementation programme has been well considered particularly in regard to the country's resources. From the point of view of relief of congestion, it might be advisable to alter the latter part of the programme, but there can be no alteration to the programme up to 1980. The first part of the programme is therefore acceptable.

Having accepted the first part of the implementation programme, this must be rigidly adhered to and thus it becomes essential that the basic decision, i. e. of accepting the rail rapid transit system in principle, must be taken as soon as possible.

PROPOSED ORGANISATION



RECOMMENDED TIME TABLE FOR IMPLEMENTATION OF
RAIL RAPID TRANSIT SYSTEM IN JOHANNESBURG

Preliminary

Date

1971

Administration

October City Council should decide to embark on project and authorise City Engineer to embark on preliminary design.

November Negotiations start with Department of Local Government for financial assistance and about form of controlling authority.

1972

November Form of authority settled and sources of finance settled.

Date

Engineering

Operational

1972

March Start of preliminary design.

1973

March Project Manager appointed
Retain Civil, Electrical and
Mechanical Engineering Consultants

General Manager
(Designate) appointed,

September Start on contract documents
Rosettenville-Braamfontein
Section

1974

January Start on drafting Rules &
Regulations

June Advertise contracts

September Construction starts

1975 Training school building starts

1976

June Training School complete

Training of instructors
starts

September Training of supervisors
starts

1977

February Two trains handed over for
training purposes

Training of train operators
starts

July All staff fully trained

August Stations and tracks handed
over to operating

Two weeks operation
without passengers

September Opening to full service
Rosettenville to Braam-
fontein.

(cont.).....

Appendix 2 (cont.)EngineeringOperational

1978) (Braamfontein - Orange Grove
1979) { section under construction
1980) (

March

Opening to full service of
 Braamfontein-Orange Grove
 section

1981) (Mayfair-Bertrams
1982) (under construction

September

Opening to full service
 Mayfair-Bertrams section

1983) (Braamfontein-
1984) { Richmond section
1985) (under construction

March

Opening to full service
 Braamfontein-Richmond section

1

CONFIDENTIAL
MEMORANDUM

THE RACIAL USE OF THE PROPOSED
RAIL RAPID TRANSIT SYSTEM.

In their report the consultants pass this following comment on the racial use of the proposed rail rapid transit system :

"At the first conference with the city representatives, the difficulty of catering for all race groups in terms of the Government policy became apparent. The requirements for separate facilities (e. g. duplicate entrances, exits and trains, etc.) on the close station spacing necessary in the congested city centre, would make the design of a rail rapid transit system impracticable. Accordingly, while it should be practicable to design a system for the carriage of non-Whites as well as Whites, neglecting separate facilities (and this could greatly affect the financial out turn), all figures and references in this report relate to Whites only."

The Town Clerk and the General Manager of Transport have shown considerable concern at the fact that the system as proposed by the consultants, is designed to carry White passengers only. There is, however, no doubt that there are very considerable practical difficulties in trying to design a multi-racial system to conform with Government policy. This memorandum attempts to indicate some of the difficulties.

The General Manager of Transport comments as follows:

"In contrast to the European, the Bantu is a natural traveller on public transport services and his demand for such services in the city is increasing at an appreciable rate.

"Especially in the morning the Bantu peak demand is at a different time from that of the European and by splitting the two peak periods over an appreciably longer period, the viability of what is essentially a capital intensive rather than a labour intensive project, would be greatly improved. Bantu patronage is in both directions, making it more attractive economically than that of the European's".

The General Manager of Transport makes particular mention of using the rail rapid transit system for the transport of Bantu passengers from the Orange Grove area to the city centre. A bus/rail interchange point in Orange Grove accommodating Putco buses as well as municipal buses, would appreciably reduce congestion on Louis Botha Avenue and possibly forestall the use of motorcars by residents of Alexandra Township and the operation of taxis, legal or otherwise.

The high priority in the Johannesburg transportation problem, is to provide an acceptable, efficient public transport system for the Whites. The major requirement in this regard is to transport large volumes of workers from the residential suburbs to the city centre. The rail rapid transit system proposed by the consultants is designed to do just this.

The non-White transportation problem is essentially the transportation of very large volumes of workers from Soweto to the city centre; smaller volumes then have to be transported to the suburbs. The South African Railways carries the majority of the Soweto Johannesburg traffic with the municipal and Futco buses distributing to the suburbs. The transport of Bantu from Alexandra to the city is a very minor volume.

The South African Railways propose an R80 million scheme for the improvement of the Soweto Johannesburg routes. This will include an improved distribution system around the city centre as shown on the drawing laid on the table. This new system will provide a very good distribution within the city centre.

Outside the Central Area the volume of Bantu that has to be distributed is comparatively small and can be handled by buses, but if the presently proposed rail rapid transit system was available to them, it could take the place of buses.

The rail rapid transit system proposed is designed to serve Braamfontein and the office and shopping core of the city centre and is closely connected to the White side of Johannesburg station, so is not suited to serve the non-White concourse.

There is no difficulty in the use of the rail rapid transit system as proposed by all races on an equal basis. The difficulty arises with White South African mores and the separate development policy. It is essential that the rail rapid transit system is attractive to the White South African, and, there is no doubt, that even if the separate development policy permitted multi-racial use of the trains, such multi-racial use would immediately make the rail rapid transit system unattractive to Whites. It is therefore, essential that if the rail rapid transit system is to be used by all race groups, that it be designed to operate with completely separate facilities for Whites and non-Whites.

In order to transport non-Whites on a rail rapid transit system under the separate development policy, the following options are available :

1. Setting aside part of a train for non-White use.
2. Using separate trains for White and non-White use, and
3. Building a separate system.

1. Setting Aside Part Of A Train For Non-White Use

This is a method used by the South African Railways and would require extended platforms and separate stairs, escalators, booking concourses and street entrances and exits.

The difficulties associated with this option on a system that has been designed to give good city distribution are:

- (a) 2-Coach trains have been found to be the optimum for rail rapid transit operation. Johannesburg will require 6-coach trains immediately to handle the White journeys with the increase to 3 coaches allowing for future growth. Thus, unless trains are made longer, no coaches can be set aside for non-White use.
- (b) In the city centre the stations range from 380 metres to 500 metres apart from centre to centre. With the stations being 145 metres long for 8-coach trains, there is only

3.

235 metres - 355 metres between the end of one platform and the start of the next, thus there is really no distance available to increase platform lengths.

- (c) Even with the setting aside of part of the train for non-White use, the mixture of races on the extended platform in the close confines of a comparatively small station tunnel will certainly be less attractive to the Whites.
- (d) The extension of the platforms will be somewhat expensive but virtually duplicate booking concourses and street entrances will have to be constructed, and these will be very expensive. It is estimated that increasing the size of stations to handle multi-racial travel, will add about R40 million to the cost of the system.

2. Different Trains For White And Non-White Use

This is also a method used by the South African Railways.

This method can be used on the basis of :

- (a) Extended platforms
- (b) Additional Platforms, and
- (c) Separate stations.

All the above would require separate stairs, escalators, booking concourses and street entrances and exits.

The use of separate trains would mean scheduling non-White trains in between White trains thus cutting down the potential capacity of the line for Whites quite considerably. This may be possible on the east-west line but could be serious on the north-south in the peak period.

Extra trains would certainly not be possible on that section of the north-south line between Braamfontein and Vanderbijl Square.

The difficulties associated with these methods are:

(a) Extended Platforms

Here the non-White trains would stop at a different section of the platform to the White trains. The platform thus now being nearly twice the length that is normally required. With the close station spacing in the city centre, the difficulties are now greater than those mentioned in 1 (a) above, while the objection mentioned in 1 (c) above will remain to a large extent.

Stopping a train in different sections of the platform would complicate the automatic train control but it is considered that this would still be possible.

The capital cost would be increased by about R60m excluding the cost of extra trains.

(b) Additional Platforms

Here the non-White platform would be built opposite the White platform with the railway track in between. The White trains would open their doors on one side, while the non-White trains would open their doors on the other. This would not complicate automatic train control unless the train is fully automatic down to the opening of the doors.

Additional platforms would require a far wider station tunnel which could not be fitted within the right of way of a street, thus abutting buildings would be affected.

Having the stations immediately opposite each other could give rise to various forms of unpleasantness with large numbers of Whites and non-Whites facing each other across a 3 metre gap.

The capital cost would be increased by possibly over R60m excluding the cost of additional trains.

(c) Separate Stations

The construction of separate stations is a possibility on the same line where the White stations are far apart but in the city centre a separate line would be necessary.

It should be pointed out that of the R114, 4 million for the main line construction work of the proposed system, R62, 5 million i. e. nearly 55% would be spent on stations. It can be seen that stations are very expensive; the average for the consultants' proposals works out at R2 $\frac{1}{4}$ m per station.

Allowing for complete duplication of stations and a 5 km bypass route with its own stations in the Central Area, it is estimated that this system could cost an extra R75 m, excluding the cost of extra trains.

In order to reduce the cost of extra stations, the possibility of express or limited stop trains has been suggested. The trains on the proposed system will run at short headways stopping at all stations; it is thus not possible to run express trains or limited stop trains on the same line. On London Transport, express trains are used in the suburbs and in New York, on Manhattan Island, but they all run on a completely separate line from the stopping trains.

3. Building A Separate System

Studying the capacity problems of the proposed system particularly in the Yeoville/Berea/Hillbrow/Central Area section of the north-south line, it would appear that the only way to cater for multi-racial use of the system, would be to build a new line to cater for non-Whites. On the plan laid on the table, some indication as to possible solutions to this problem have been shown. The advantage of the extension to the system in this manner is that, unlike the extended platforms and duplicate stations, this system could be used to provide far better service to the city as a whole particularly if the position was ever reached where all races were treated on an equal basis.

On the basis that the existing depot can serve these amended lines, the estimated cost of providing the line shown on the plan laid on the table, is about R55 million extra.

Conclusion

The Bantu volumes that would have to be shifted are such that, if they could be accommodated on the rail rapid transit system as proposed by the consultants without any additional capital cost, it would be very economical from a city's point of view, but to spend sums varying from R40 million to R75 million to cater for the comparatively small volume of Bantu passengers, seems to be out of proportion to the value to the city.

It would appear that the system should be accepted as proposed, for use by Whites only, on the understanding that it can be expanded to cater for non-Whites when their volumes prove to be sufficient and then it should be on the basis of extra lines as shown on the plan laid on the table. These extra lines can also be used for White traffic and therefore the estimated cost of R55 million would provide far better value.

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