

GOVERNMENT OF MALAYSIA

THE FEASIBILITY STUDY ON ROAD CONSTRUCTION AND
IMPROVEMENT PROJECT IN JOHOR BAHRU AND ITS
CONURBATION

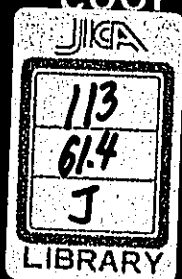


IMPLEMENTATION PROGRAMME
OF WIDENING AND REPAIRING
INTO SIX (6)

2-1

NOVEMBER 1982

JAPAN INTERNATIONAL
COOPERATION AGENCY



GOVERNMENT OF MALAYSIA

IMPLEMENTATION PROGRAMME
OF
WIDENING OF JALAN TEBRAU
INTO SIX (6) - LANE

JICA LIBRARY



1079542(5)

20465

NOVEMBER 1982

JAPAN INTERNATIONAL COOPERATION AGENCY

国際協力事業団

20465

CONTENTS

PAGE

1.	IMPLEMENTATION PROGRAMME OF WIDENING OF JALAN TEBRAU INTO SIX (6)-LANE	
1.1	General	1
1.2	Engineering Study	1
1.3	Construction Cost Estimates	14
1.4	Implementation Programme	19

LIST OF TABLES

PAGE

TABLES

1.	Design Standard	4
2.	Percentage of Indirect Cost	14
3 (1)	Land Acquisition and Compensation Cost	15
3 (2)	Construction Unit Cost	16
4.	Construction Cost of Roadway	17
5.	Construction Cost of Interchanges and Intersections	17
6.	Land Acquisition and Compensation Cost	18
7.	Cost for Service Duct	18
8.	Total Project Cost (in 1981 prices)	18
9.	Implementation Programme	19
10.	Annual Funding Requirements (at 1981 prices)	19

LIST OF FIGURES

FIGURES

1.	Typical Cross-Section	6
2.	Median Opening (for U-Turn)	7
3.	Alternative Schemes of six (6)-lane Proposal	8
4.	Jalan Tebrau Widening Project	9
5.	Intersection/Interchange Plans	11
6.	Cross-Section of Bus Stop	12

1. IMPLEMENTATION PROGRAMME OF WIDENING OF JALAN TEBRAU INTO SIX (6)-LANE

1.1 General

The widening of Jalan Tebrau into a four (4)-lane dual carriageway was first proposed by JKR and the detailed engineering design of the road was recently completed. However, taking into account the construction of the Toll Expressway which is expected to be completed in 1986 and development of Johor Bahru - Pasir Gudang Corridor, it will be impossible for even the proposed four (4)-lane Jalan Tebrau to cope with the predicted future traffic demands. Therefore, it is proposed in the Masterplan Study that this road be widened to six (6) lanes.

The Study is firstly to clarify as to whether it is technically possible to widen Jalan Tebrau into a six (6)-lane road or not, under the physical limitation of the reserved width and then is to formulate the implementation programme in case of widening into a six (6)-lane being possible.

The section of Jalan Tebrau to be widened extends from the interchange of this road with Jalan Tun Abdul Razak to the intersection of this road with the Toll Expressway Access Road. The total length of this section is approximately 6.53 kilometers.

1.2 Engineering Study

(1) Characteristics of Jalan Tebrau

Jalan Tebrau is planned as an Intra-Urban Primary Distributor in the Masterplan Study. Taking into consideration the existing land uses along Jalan Tebrau and the road network configuration, the function of this road is to serve both inter-urban and intra-urban traffic and traffic coming in and out of the planned Toll Expressway which is expected to be completed in 1986.

In order that Jalan Tebrau can function more effectively, it is necessary to partially control access traffic to/from minor roads and to limit stoppings and parkings. It is also necessary to have service roads along this road and to construct grade separations at major intersections. Moreover, U-turns should be allowed only at limited medium openings.

(2) Design Standard

1) Design Speed

The design speed of 80 km/h for Jalan Tebrau is recommended based on the road characteristics, vertical conditions and surrounding conditions.

2) Operating Speed

The operating speed on Jalan Tebrau is assumed to be 60 km per hour in order to ensure traffic safety.

3) Lane Width

A lane width of 3.5 meters for normal section, 3.25 meters for through lane at intersection and 3.0 meters for turning lane at intersection is recommended, taking into account the design speed.

4) Shoulder Width

According to JKR standard the shoulder width of flat terrain in the rural area is 3.0 meters. However, in the urban area, a width of 2.0 meters is enough to accommodate emergency parking without disrupting traffic flow. Therefore, the width of 2 meters is basically adopted for Jalan Tebrau.

5) Median Width

The median is a desirable feature of arterial roads and should be provided where space permits. At intersections where right turns are made and at median openings where U-turns are made, a right turn and a U-turn lane respectively is desirable to accommodate capacity and safety requirements. For this purpose, a median width of 5.0 meters including inner shoulder width of 0.5 meters for both sides is basically recommended. However, for U-turns, a width of 9 meters including inner shoulder width of 0.5 meters for both sides is to be adopted.

6) Sidewalk and Planting

In order to ensure convenience and traffic safety for pedestrians and to create a more attractive landscape, a width of 5 meters is adopted for sidewalk and planting.

7) Service Road

The service road should be provided for local traffic. A one-way two (2)-lane service road is recommended for both sides of Jalan Tebrau, both in the developed and to be developed areas.

A carriageway width of 6.0 meters (2-lane) is recommended to give adequate space for atalled or disabled vehicles and for public utilities such as electricity, telecommunications and water.

The design standard is summarized as shown in Table 1.

Table 1 : Design Standard

Items	JKR Standard	Design Standard
	Rural Area	
Lane Width		
a) Normal	3.50	3.50
b) Through Lane at Intersection	-	3.25
c) Turning Lane at Intersection	-	3.00
Median		
a) Normal	3.00	4.00
b) Special Cases	-	1.00
c) U-Turn Section	-	8.00
Shoulder		
a) Right	-	0.50
b) Left	3.00	2.00
Service Road	-	6.00
Sidewalk and Planting	-	5.00
Bus Stop	-	3.00
Minimum Radius	170	170
Maximum Gradient	Flat : 3% Rolling : 4.	4%
Stopping Sight Distance	90m	90m

(3) Cross-Section

1 Normal Section

A typical cross-section of the normal section, the intersection and the interchange is shown in Fig. 1.

2 Median Opening for U-Turn

The cross-section of median opening for U-turn is shown in Fig. 2. In this case, 44 meters is required for the Right-of-Way (R-O-W).

3 Embankment and Cutting Section

In the embankment and cutting section, the width of R-O-W was wider than that of the normal section. Even though the R-O-W reserved is wider, it would be necessary to treat technical measures, such as retaining wall to some segments in the developed area. In the under develop area, however, it is desirable to acquire additional land in order to reduce construction costs.

Fig. 3 shows the typical cross-section of the embankment and cutting section.

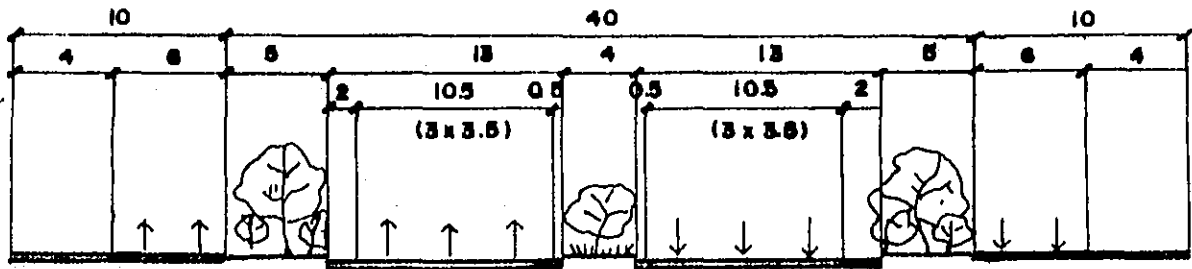
(4) Preliminary Engineering

1 Horizontal Alignment

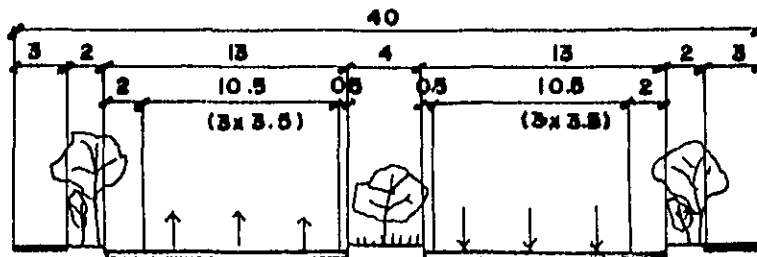
The horizontal alignment of the six (6)-lane is basically the same as that of the four (4)-lane road made by JKR. The general alignment of Jalan Tebrau is shown in Fig. 4.

Typical Cross-Section Fig. 1

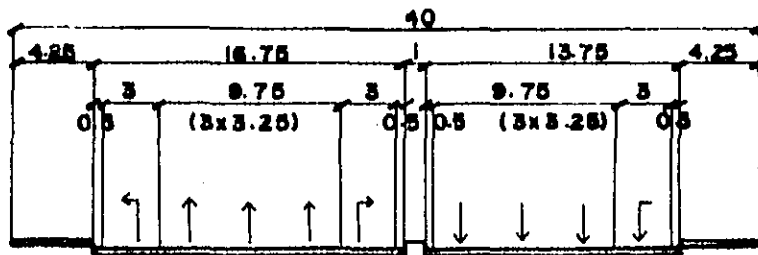
1. Normal Section (with Service Road)



2. Normal Section (without Service Road)



3. Intersection



4. Interchange (3 Legs)

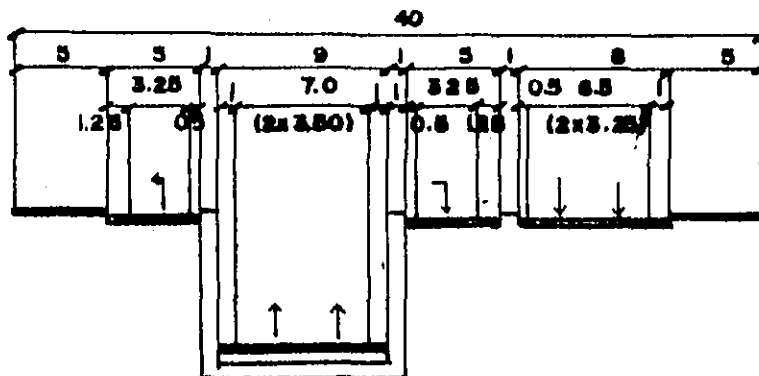
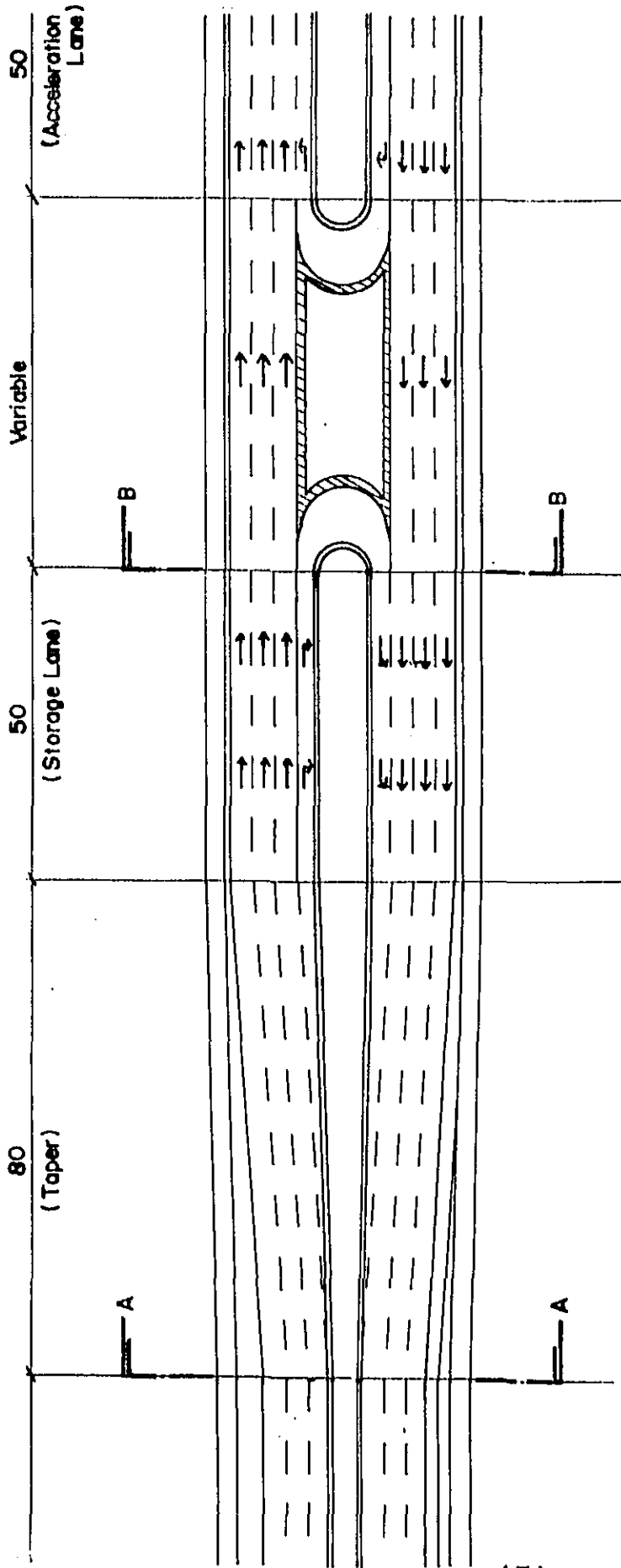
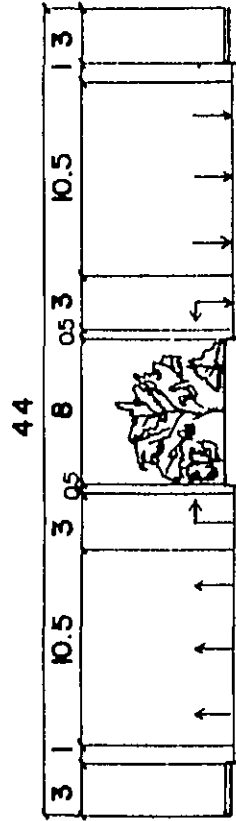


Fig. 2 MEDIAN OPENING (FOR U-TURN)



Section B-B



Section A-A

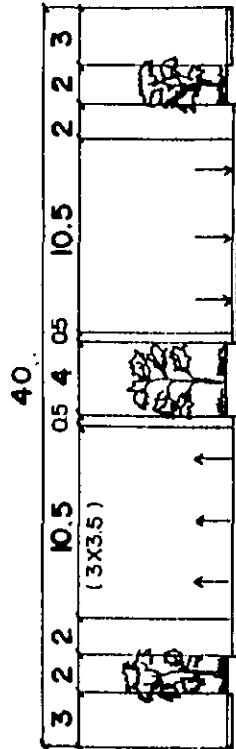
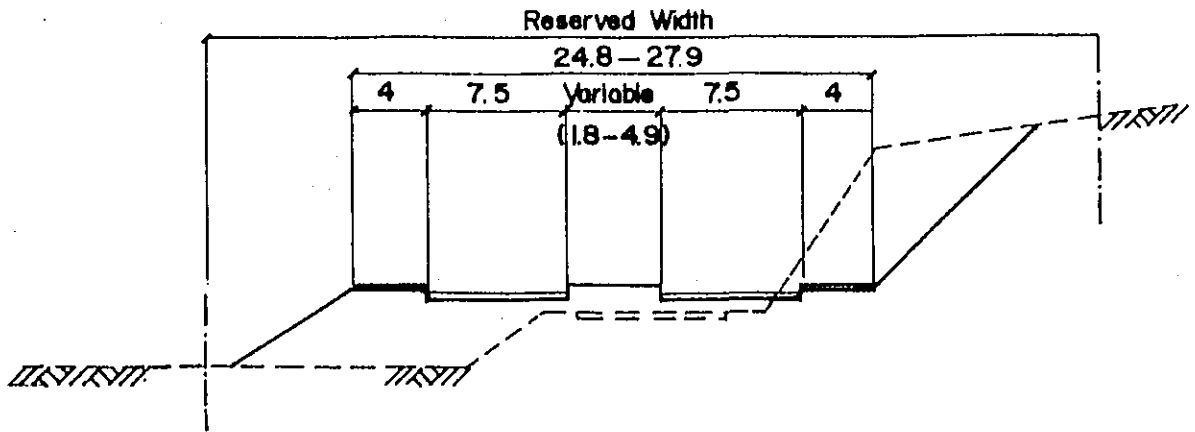


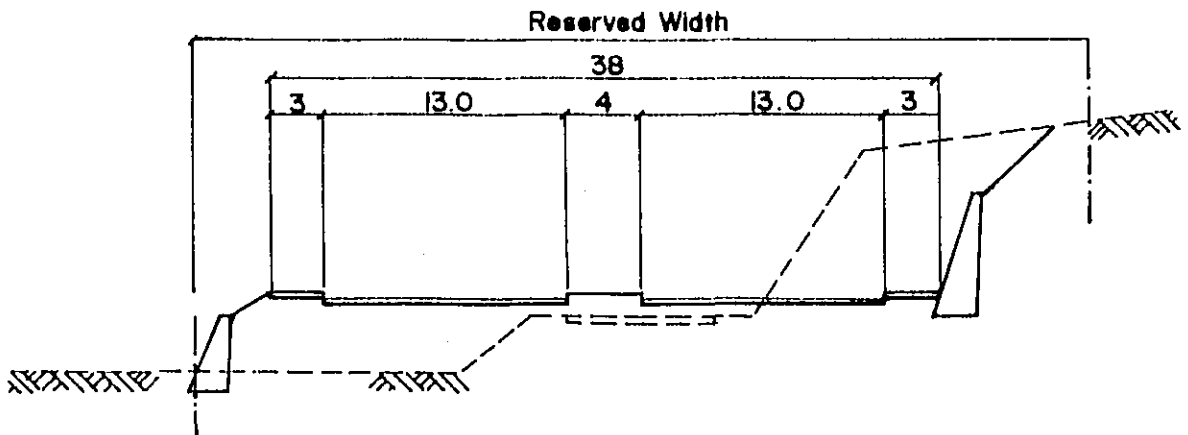
Fig. 3

ALTERNATIVE SCHEMES OF 6 LANE PROPOSAL.

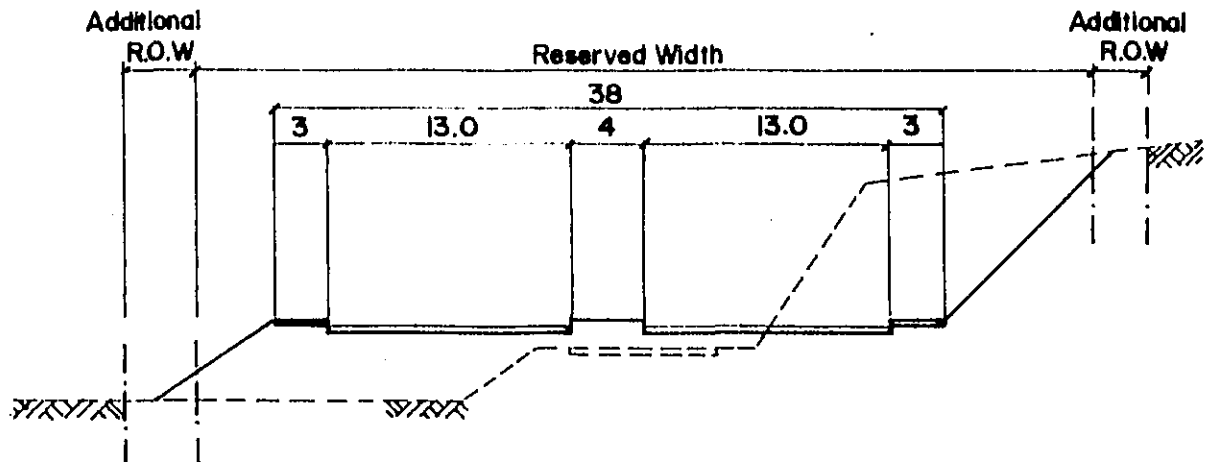
J.K.R Design

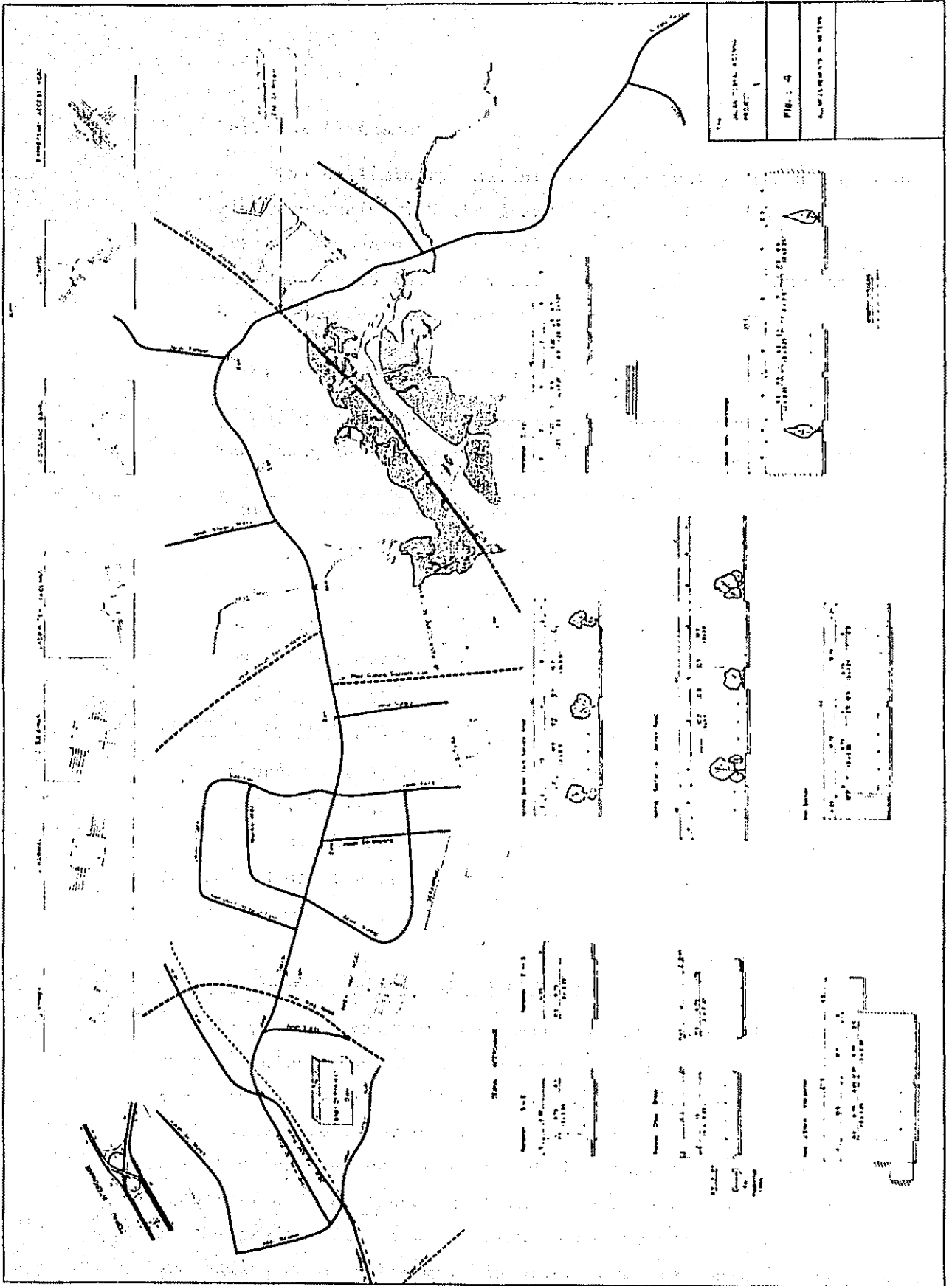


Scheme 1 (Retaining Wall)



Scheme 2 (Additional R.O.W)





2 Vertical Alignment

The preliminary analysis for vertical alignment is made simultaneously with the Study of horizontal alignment. Taking into account the rolling condition of Jalan Tebrau, it is proposed for a six (6)-lane road that some intersections be constructed as a grade separated interchange.

3 Intersection and Interchange Plans

Fig. 5 shows the intersection and interchange plans. The Study Team proposes five (5) grade separated interchanges.

4 Consideration on Bus Stop

In order to avoid disturbances to traffic flow by buses stopping at the bus stop, it is necessary to provide bus bay along Jalan Tebrau. The cross-section where the bus stop is needed is shown in Fig. 6.

(5) Traffic Treatment of Service Road

In order for Jalan Tebrau to function more effectively, it is highly desirable to provide service roads on both sides of this road. In connection with this, it should also be determined how the service road should be utilized and provision should be made for access to it in the detail engineering.

(6) Proposed Common Duct to be Constructed

At present, most of the public utilities of Jalan Tebrau such as telecommunications and electric lines and water pipes are laid underground. In case of implementing the project, these would create problems; the first is to transfer these utilities during construction and the other is obstruction to traffic flow and weakening of the road structure on completion of the project due to excavation caused by maintenance, repair and adding more utilities. In order to avoid these inconveniences, it is proposed to construct a common duct underneath the service road along Jalan Tebrau.

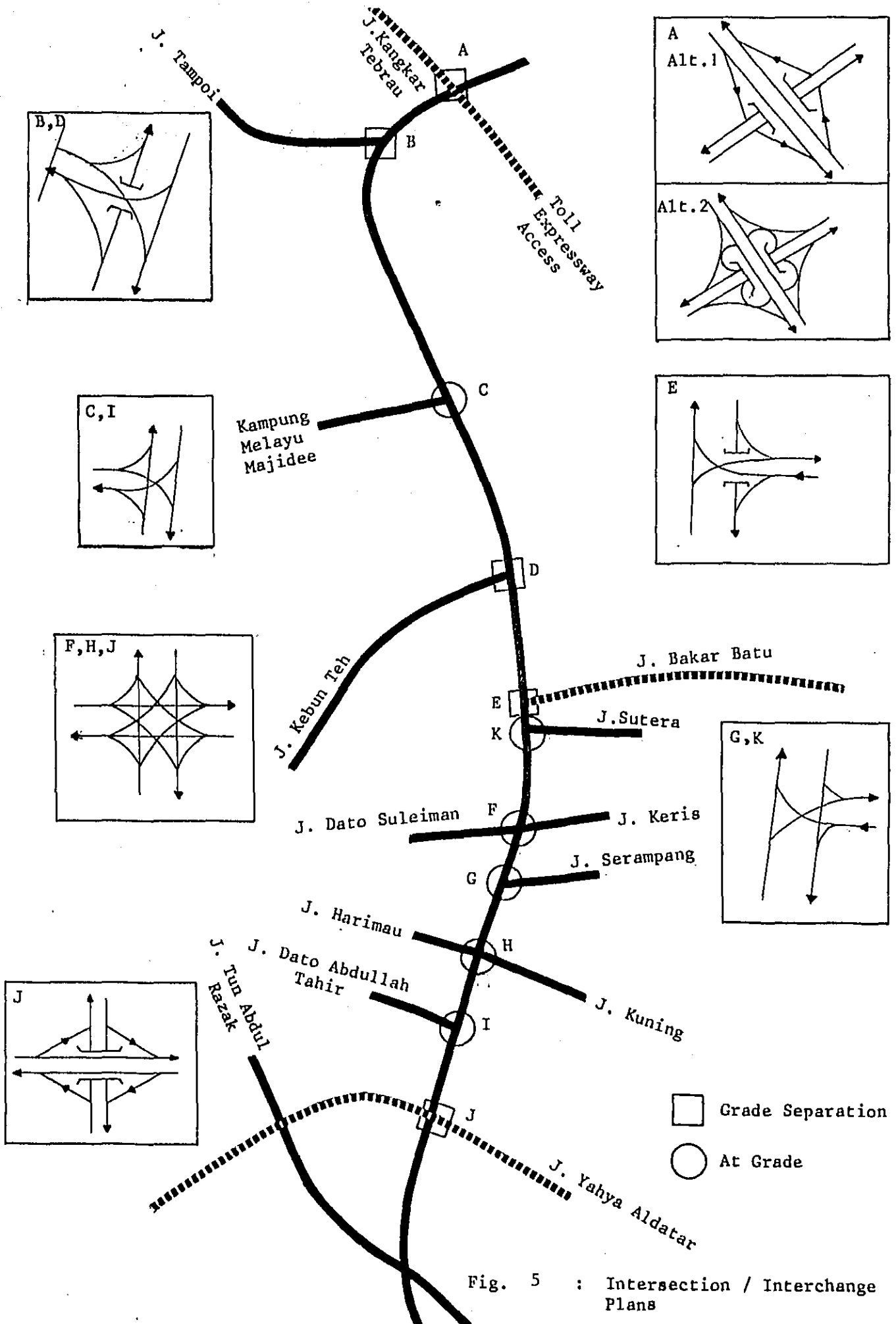
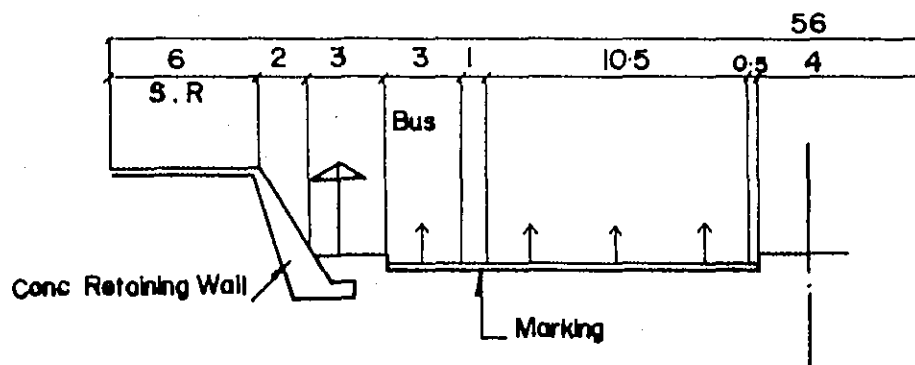
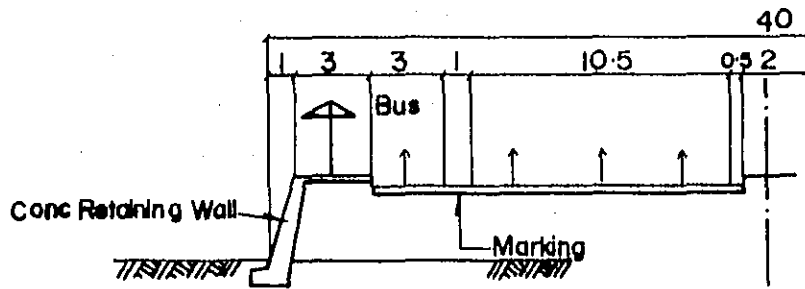


Fig. 5 : Intersection / Interchange Plans

Fig. 6 - Cross - Section of Bus Stop



(7) Conclusion from Technical Standpoint

One of the intentions of the Study is to look into the possibility of accommodating the new six (6)-lane road within the original four (4)-lane reserved width. As the result of careful examination of the Preliminary Engineering Study made, it is concluded that it is possible to widen the existing two (2)-lane Jalan Tebrau to a six (6)-lane dual carriageway within the forty (40)-meter Right-of-Way reserved. However, the following difficulties would arise:

- a. In the case of the JKR four (4)-lane plan, it is necessary to acquire areas in the Army Camp including the three (3)-storey building, cafeteria and some other buildings. The same areas are also required for the six (6)-lane.
- b. The second area to be acquired is in the vicinity of Jalan Tebrau - Jalan Storey junction. In order to avoid affecting the two blocks of newly constructed three (3)-storey building, it is necessary to adjust the road alignment further to the right. The result is that four (4) shops and some vacant land would have to be acquired.

In connection with this, the main difficulty that arises in the vicinity of Jalan Tebrau - Jalan Storey is the proposal to prohibit right turns into Jalan Storey which at present is permitted. However, if the old three (3)-storey building could be acquired, this would solve the problem.

- c. The area where acquisition is necessary is along the Army Camp area and at Jalan Bakar Batu junction. The size of the area required will depend on the type of interchange designed for that particular intersection in the Feasibility Study of Southern Link.
- d. Another difficulty that would be in acquiring the many squatter houses along Jalan Tebrau between Jalan Stulang Baru and end of the project.

1.3 Construction Cost Estimates

(1) General

The construction cost consists of construction costs and land acquisition/compensation costs.

The construction cost is estimated on the basis of direct and indirect construction costs. The direct cost comprises cost of labour, equipment, materials and other related items while the indirect cost includes overhead cost, contractor's profits, contractor's taxes, contingency and engineering fee including supervising.

Table 2 shows the percentage of the indirect construction cost to that of the direct cost.

Table 2 : Percentage of Indirect Cost

	Percentage (%)
Overhead	10
Contractors' Profits	10
Contractors' Tax	3
Engineering Fee	10
Contingency	5
Total	38

(2) Conditions

The construction cost estimates are based on the following conditions:-

- 1) Section : Interchange of Jalan Tebrau with Jalan Tun Abdul Razak to that of Jalan Tebrau with Toll Expressway Access.
- 2) Total Length : 6,800 meters
Section 1 : Jalan Tun Abdul Razak
- Jalan Harimau (Length = 1,600 m)
Section 2 : Jalan Harimau - Jalan Bakar Batu
(Length = 1,750 m)

Section 3 : Jalan Bakar Batu - Toll Expressway Access
(Length = 3,450 m)

3) Conditions

- a. The construction cost is estimated from 2-lane to 6-lane.
- b. Three (3) partial grade-separated interchanges which are newly proposed are included:-
 - Interchange of Jalan Tebrau with Jalan Bakar Batu
 - Interchange of Jalan Tebrau with Jalan Kebun Teh
 - Interchange of Jalan Tebrau with Jalan Tampoi
- c. Interchanges of Jalan Tebrau with proposed Inner Ring Road and Toll Expressway Access are not included.
- d. The construction cost is estimated on the basis of 1981 prices.

4) Unit Construction Cost

The following unit construction and land acquisition and compensation cost is basically used for its estimation.

Table 3 (1) : Land Acquisition and Compensation Cost

	Site	Type	Unit	Cost
LAND	Urbanized	Class A	M ²	500
		Class B	M ²	300
		Class C	M ²	100
	Private Estate	(i) with housing potential	M ²	12
		(ii) without housing potential	M ²	3
Swampy Area	-	M ²	0	
Sea	-	M ²	0	
Compensation	Concrete House	-	M ²	540

Table 3: (2) : Construction Unit Cost

Item	Class	Unit	Unit Cost (M\$)	Remarks
Site Clearing		M ²	0.6	
Excavation	Soil	M ³	6.0	
	Rock	M ³	20.0	
Embankment	Soil	M ³	8.0	Hauling Distance = 10 km
	Soft Ground	M ²	4.0	H = 3 m embankment Including pre-loading
Reclamation	Seaside	M ²	120.0	Dredging and Reclamation
Slope Protection	Conc. Block	M ²	20.0	
	Grass	M ²	2.0	
Plantation	Roadside, Median	M ²	8.0	
	Open Space	M ²	6.0	
Pavement	Carriageway	M ²	30.0	
	Shoulder	M ²	22.0	
	Sidewalk	M ²	18.0	
	Overlay	M ²	14.0	T = 5 cm
Drainage	V-Shaped	M	15.0	Including conc. ditch
	U-Shaped	M	40.0	Including cover
	600 RC Pipe	M	160.0	
Box Culvert	1000 x 1000 RC	M	500.0	
	2000 x 2000 RC	M	1000.0	
	3000 x 3000 RC	M	2000.0	
Bridge	Grade Separation	M ²	1200.0	
	River=L=30m L=50m	M ²	1500.0 2000.0	
Curb and Gutter	Conc.	M	20.0	
Guard Rail	Steel	M	50.0	
Wall	Conc.	M	1200.0	H = 5.0 m
	Masonry	M	250.0	H = 5.0 m
Lighting	Steel	each	1500.0	Single Lumination
Road Sign	Normal Size	M	100.0	Regulatory, Danger Sign
	Special Size	M	1000.0	Informative Sign
Pavement Marking		M ²	3.0	
Under Pass		M ²	950.0	Including retaining wall

5) Construction Cost Estimates

The construction cost is estimated on the basis of the abovementioned conditions and the result is shown below:-

Table 4 : Construction Cost of Roadway

Section	Length (m)	Construction Cost (M\$'000)	Unit Cost (M\$ '000/m)
1 Federal Route 1 - Jalan Harimau	1,600	2,400	1,500
2 Jalan Harimau - Jalan Bakar Batu	1,750	2,000	1,140
3 Jalan Bakar Batu - Toll Expressway Access	3,450	10,300	3,000
Total	6,800	14,700	-

Note : including Drainage Structure

Table 5 Construction Cost of Interchanges and Intersections

Section	Number of Interchange	Number of Intersection	Construction Cost (M\$'000/m)
1 Federal Route 1 - Jalan Harimau	0	4	500
2 Jalan Harimau - Jalan Bakar Batu	1	3	2,500
3 Jalan Bakar Batu - Toll Expressway Access	2	3	4,600
Total	3	10	7,600

Note : excluding Inner Ring Road, Toll Expressway Interchange

Table 6 : Land Acquisition and Compensation Cost

Section	Length (m)	Land Acquisition and Compensation Cost (M\$'000)	Unit Cost (M\$'000/m)
1 Federal Route 1 - Jalan Harimau	1,600	2,700	1,690
2 Jalan Harimau - Jalan Bakar Batu	1,750	0	0
3 Jalan Bakar Batu - Toll Expressway Access	3,450	2,300	670
Total	6,800	5,000	-

Table 7 : Cost for Service Duct

Section	Length (m)	Cost (M\$'000)	Unit Cost (M\$'000/m)
1 Federal Route 1 - Jalan Harimau	1,600	1,800	1,140
2 Jalan Harimau - Jalan Bakar Batu	1,750	2,000	1,140
3 Jalan Bakar Batu - Toll Expressway Access	3,450	2,200	640
Total	6,800	6,000	-

Table 8 : Total Project Cost (in 1981 prices)

Section	Length (m)	Land Acquisition and Compensation (M\$'000)	Construction Cost (M\$'000)	Project Cost (M\$'000)
1 Federal Route - Jalan Harimau	1,600	2,700	4,700	7,400
2 Jalan Harimau - Jalan Bakar Batu	1,750	0	6,500	6,500
3 Jalan Bakar Batu - Toll Expressway Access	3,450	2,300	17,100	19,400
Total	6,800	5,000	28,300	33,300

The detailed engineering and supervision cost is broken down as follows:-

- Detailed Engineering Cost	: M\$ 1,275,000
- Construction Supervision Cost	: M\$ 1,275,000
- Total	: M\$ 2,550,000

1.4 Implementation Programme

The implementation programme is established as follows:-

Table 9 : Implementation Programme

	1983	1984	1985
Detailed Engineering			
Land and Acquisition and Compensation			
Road Construction			
Transfer of Service Duct			
Road Construction			

Based on the abovementioned Implementation Programme, the annual funding requirements are estimated as follows:-

Table 10 : Annual Funding Requirements (at 1981 prices)

	Detailed Engineering and Supervision (M\$'000)	Land Acquisition (M\$'000)	Construction Cost (M\$'000)	Project
1983	1,275	5,000	3,000	9,275
1984	638	-	14,150	14,788
1985	637	-	11,150	11,787
Total	2,550	5,000	28,300	35,850

JICA