Different walking speeds were assumed for different types of walking situations;

2) Calculation of time savings inside the station building

An approach similar to that described above was adopted to calculate time savings within the station building. Several sample entry points were examined within the station buildings and decreases in transfer time within the building were estimated for the case of improved facilities.

(2) Overall Time Savings

Based on the calculations presented above, the study team calculated overall time savings, as shown in Table 4.4.5.1 below. The results were used in the demand forecasting and economic evaluation stages of the study.

Table 4.4.5.1 Estimated Time Savings from Station Improvements

Station	Time Saved (sec)/Pass		Total	
	Outside Building	Inside Building	(sec)	(min)
PASAR SENEN	127	138	265	4.4
JATINEGARA	148	92	240	4.0
KEMAYORAN (New)	95	40	135	2.3

4-4-6 Cost Estimation and Implementation Schedule

(1) Cost estimation

Tables 4.4.6.1 and 4.4.6.2 present estimates of the total construction for the Stage I and Stage II programs (respectively) for improving feeder and station facilities at Jatinegara, Pasar Senen, and Kemayoran. The total cost for Stage I was estimated at 38.162 billion rupiah and the cost for Stage II at 27.028 billion rupiah.

The costs were estimated based on the following assumptions:

- the major construction works would be undertaken by a general contractor chosen in an international tender;
- the unit price of each item was expressed in April 1989 prices;
- the cost was split into foreign and local currency portions, but both were expressed in rupiah;
- Indonesian taxes and duties on imported equipment and materials were not included;
- land acquisition and compensation were assumed to include compensation for the loss of property and the relocation of public utilities;
- the cost of detailed design and supervision services was assumed to be 10% of both the foreign and local components of construction cost;
- a physical contingency equal to 15% of the total cost of construction was assumed; and
- an exchange rate of 13.4 rupiah = 1 yen was employed.

Table 4.4.6.1 Construction Cost for Improvement of Feeder and Station Facilities (1st stage)

Units:10^6 Rp

No	Investment item	Unite	Quant	Foreign Cost	Local Cost		Total
					M/M	Labor	
1	Pasar Senen						
	Bus bays	m^2	567	56.0	57.0	3.0	116.0
	Pedestrian crossing	m^2	530	2.0	1.0	1.0	4.0
	Traffic signals	L.s	1	4.0	2.0	0.0	6.0
	Pedestrian bridge	m^2	1,033.0	3,528.0	2,282.0	1,107.0	6,917.0
	Passage	m^2	250	52.0	3.0	0.8	55.8
	Station front plaza		1	2,300.0	56.9	14.0	2,370.9
	Sub total			5,942.0	2,401.9	1,125.8	9,469.7
2	Kemayoran						
	Bus bays	m^2	519	53.0	40.0	3.0	96.0
	Pedestorian crossing	m^2	207	1.0	1.0	0.0	2.0
	Traffic signals	L.s	1	4.0	2.0	0.0	6.0
	Station building	m^2	300	189.0	88.0	38.0	315.0
	Station front plaza		1	1,532.0	94.0	26.0	1,652.0
	Sub total			1,779.0	225.0	67.0	2,071.0
3	Jatinegara						
	Bus bays	m^2	1,161	358.0	91.0	9.0	458.0
	Bus platforms	m^2	485	2.0	26.0	1.0	29.0
	Overtrack station	m^2	2,700	4,848.0	2,268.0	972.0	8,088.0
	Station bridge	m^2	1,980	1,777.0	832.0	356.0	2,965.0
	Sta.front plaza		1	1,350.0	1,583.0	23.0	2,956.0
	Sub total			8,335.0	4,800.0	1,361.0	14,496.0
4	D/D & E/S			1,606.0		998.0	2,604.0
5	Land purchase				5,616.0		5,616.0
6	Physical contingency			2,408.0	1,114.0	383.0	3,905.0
7	Sub total			4,014.0	6,730.0	1,381.0	12,125.0
8	Total			20,070.0	14,156.9	3,934.8	38,161.7

Table 4.4.6.2 Construction Cost for Improvement of Feeder and Station Facilities (2nd stage)

Units: 10^6 Rp

No	Investment item	Unite	Quant	Foreign Cost	Local Cost		Total
					M/M	Labor	
1	Pasar Senen						
	Pedestrian bridge	m^2	594	134.0	1,313.0	637.0	2,084.0
	Pedestrian mole	m^2	1,850	7.0	66.0	3.0	76.0
	Overtrack station	m^2	2,700	4,848.0	2,268.0	972.0	8,088.0
	Station bridge	m^2	730	655.0	307.0	131.0	1,093.0
	Platform	m^2	6,480	4,342.0	2,109.0	904.0	7,355.0
	Sub total			9,986.0	6,063.0	2,647.0	18,696.0
2	Jatinegara						
	Parking area	m^2	1,256	381.0	103.0	1.0	485.0
	Pedestrian bridge	m^2	635	570.0	267.0	114.0	951.0
	Sub total			951.0	370.0	115.0	1,436.0
3	D/D & E/S			1,094.0		920.0	2,014.0
4	Land purchase				1,862.0		1,862.0
5	Physical contingency			1,641.0	965.0	414.0	3,020.0
6	Sub total			2,735.0	2,827.0	1,334.0	6,896.0
7	Total			13,672.0	9,260.0	4,096.0	27,028.0

(2) Implementation Schedule

Fig. 4.4.6.1 presents a schedule for implementing the planned improvements to feeder and station facilities at Jatinegara, Pasar Senen, and Kemayoran. Detailed design for Stage 1 is scheduled to begin in October 1991, with construction completed by the end of fiscal 1994. Detailed design for Stage 2 is scheduled to begin in October 2000, with construction completed in March 2004.

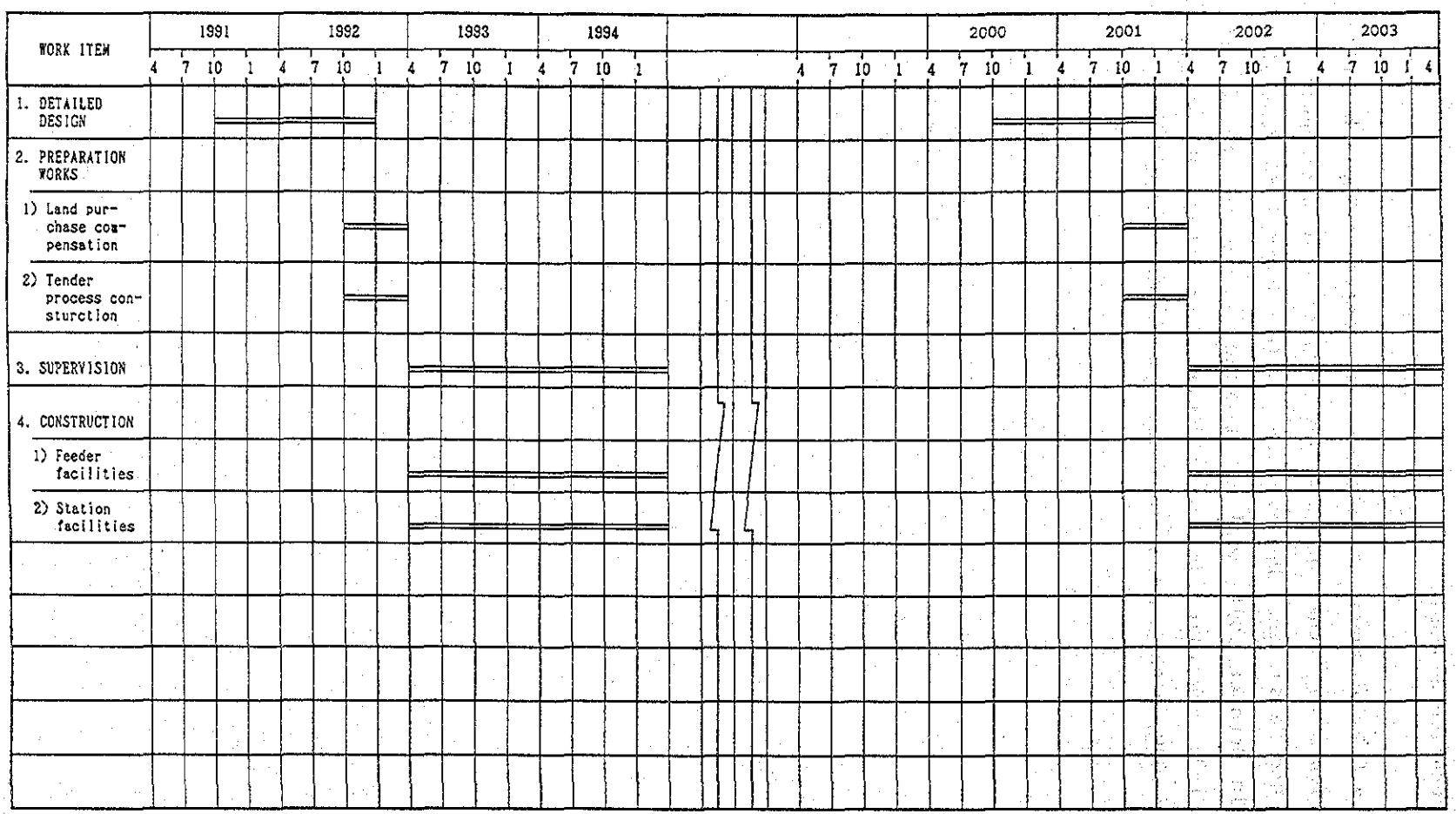


Fig. 4.4.6.1 Implementation Schedule for Improvements at Jatinegara, Pasar Senen, and Kemayoran Stations

4-5 Guidelines for Improving the 18 Other High-Priority Stations

4-5-1 Introduction

The previous section presented improvement plans for three of the 21 stations urgently requiring improvement, the so-called representative stations. This section provides guidelines, cost estimates and an implementation schedule for improving the 16 other high-priority stations. Because the two of the 18 other high-priority stations do not need any improvement of the examination. The 21 stations collectively will serve approximately 70% of all railway passengers in the JABOTABEK region.

4-5-2 Improvement Guidelines

The stations selected as urgently requiring intermodal transfer facilities are those with great potential for linkage between railway and bus operations. To achieve this potential, a variety of feeder service facilities (e.g., bus bays, pedestrian bridges) are required, as shown in Table 4.5.2.1 and Fig. 4.5.2.1 (1) to 4.5.2.1 (16).

(1) Jakarta Kota

- Pedestrian bridge is proposed on Jl. Jemb Batu for passenger safety

(2) Sawah Besar

- Bus bays and pedestrian bridge are proposed to connect the station building and the bus loading/unloading points.

(3) Gamibir

- Passenger safety facilities are proposed together with the construction of bus bay and pedestrian bridge along the Jl. Medan Merdeka Timur.

(4) Cikini

- The construction of bus bays and zebra cross is proposed along the Jl. Pegangsan Timur and Barat.

(5) Manggarai

- Street widening of the bottle-neck on Jl. Sultan Agung is proposed for integration of Manggarai Bus Terminal with planned station-front-plaza for establishment of traffic interchange.

(6) Duren Kalibata

- Passenger safety facilities are proposed together with the construction of bus bays along the Jl. Raya Kalibata.

- Construction of ticket box and station front plaza are proposed for the passenger accessing from the back side of the station building.

(7) Pasar Minggu

- Instead of ground station building proposed by Option "a" plan an over-track station and station bridge are proposed to directly connect the planned pedestrian bridge from the bus terminal to the station building.

- Provision of bus bays and station front plazas along Jl. Pasar Minggu and the planned new road at the back of the station are proposed.

(8) Depok Baru

- Reviewing of the development plan of station front plaza, the station front plaza is proposed to integrate with the new built bus terminal.

- Some of the route buses using the new bus terminal are introduced to the planned station plaza to load/unload railway passengers.

- Platform elevation and passenger bridges are proposed for safety transfer.

(9) Kebon Pedes

- Promoting coordination between the planned bus terminal and the station facilities is recommended both in design and operation.

(10) New Kampung Bandan

- Introduction of new bus services particularly between this station and Kota area is recommended for smooth transfer from circular.

(11) Kemayoran

- Development program is mentioned in Feasibility Study.

(12) Pasar Senen

- Development program is mentioned in Feasibility Study.

(13) Angke

- Bus bays along Jl. Tubagus Angke station building, improvement of platform, passenger bridge and front plaza are proposed, and removal of venders from the front plaza area and along Jl. Stasiun Angke is proposed.

(14) Tanah Abang

- Construction of bus bays and station front plaza on Jl. Jati Buru is proposed to alleviate traffic congestion and to secure pedestrian safety.

- Construction of an over-track station, passenger bridge and platform is proposed.

(15) Dukuh

- Provision of hanging pedestrian decks and passage way is proposed along Jl. Sudirman for providing direct access between bus and rail. Improvements on passenger information service and ticket sales counter inside of over-track station are required.

(16) Jatinegara

- Development program is mentioned in Feasibility Study.

(17) Klender

- Provision of bus bays along Jl. Bekasi Timur Raya and new road, and station front plaza is proposed.

- Construction of an over-track station building and bridges is proposed to connect the roads running front and back side of the stations.

- Extension of platform is proposed for long formation of train operation.

(18) Bekasi

- Coordination with bus operators to modify their routes is proposed into the station front plaza installing traffic signalling for right turn lane.

(19) Tanjung Priok

- Construction of pedestrian bridge is proposed to connect the bus terminal and the station front plaza.

(20) Palmerah

- Provision of bus bays along the new road and improvement of platform are proposed.

- Construction of ticket box is proposed for the passenger accessing from the back side of the station building.

(21) Kebayoran

- Provision of bus bays along the new road. Improvement of platform, and construction of passenger bridge and station front plaza.

- Provision of a ticket sales box at the new road side of the building is proposed for passenger convenience.

Table 4.5.2.1 Recommended Feeder Service Facilities at the 21 High-Priority Stations

	No	Station name / Investment item	Feeder facilities								Station facilities						
			Bus bay	Pedestrian bridge	Pedestrian cross	Traffic signal	Passage way	Right turn lane	Under pass	Parking area	Overtrack station	Station building	Platform	Station bridge	Passenger bridge	Station front plaza	
	1	Jakarta Kota		○								○					
	2	Sawah Besar	○	○	○												
	3	Gambir	○	○													
	4	Cikini	○		○												
	5	Manggarai							○								
	6	Duren Kalibata	○		○							○				○	
	7	Pasar Minggu	○							○	○			○			
	8	Depok Baru											○		○	○	
	9	Kebon Pedes															
	10	New Kampung Bandan															
*	11	Kemayoran	○		○	○		○				○	○		○	○	
*	12	Pasar Senen	○	○	○	○										○	
	13	Angke	○									○	○		○	○	
	14	Tanah Abang	○								○		○	○		○	
	15	Dukuh Ats		○			○				○						
*	16	Jatinegara	○								○		○	○		○	
	17	Kelender	○								○		○	○		○	
	18	Bekashi				○		○								○	
	19	Tanjung Priok		○								○					
	20	Palmerah	○									○					
	21	Kebayoran	○		○							○					

* Station for Feasibility Study

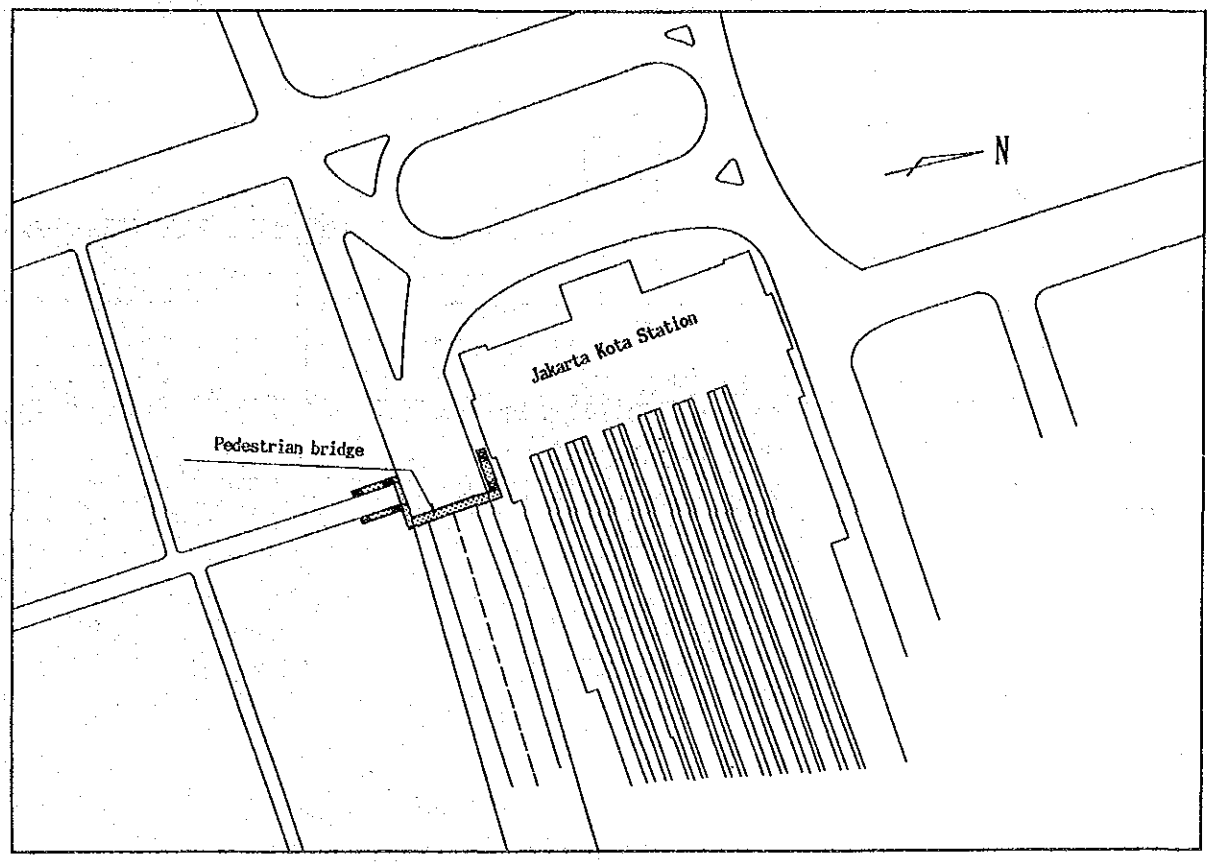


Fig. 4.5.2.1 (1) Jakarta Kota

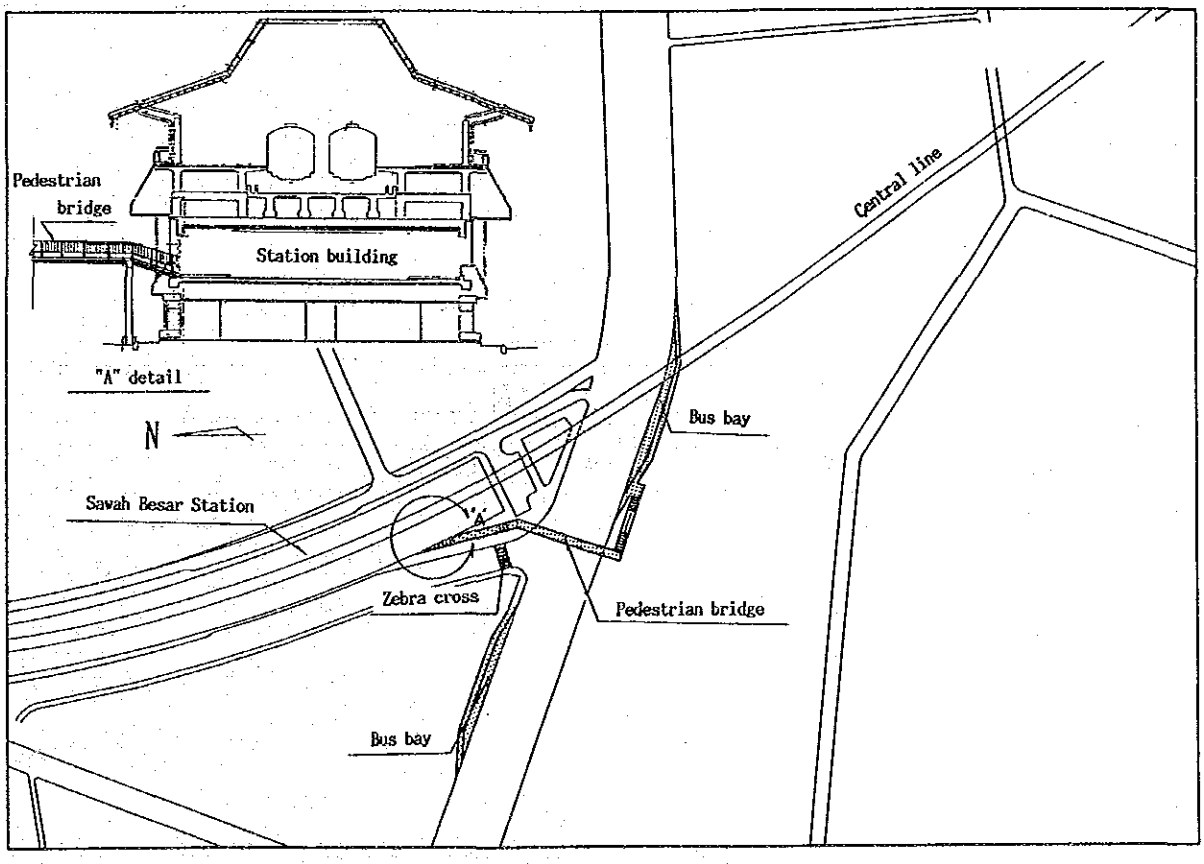


Fig. 4.5.2.1 (2) Sawah Besar

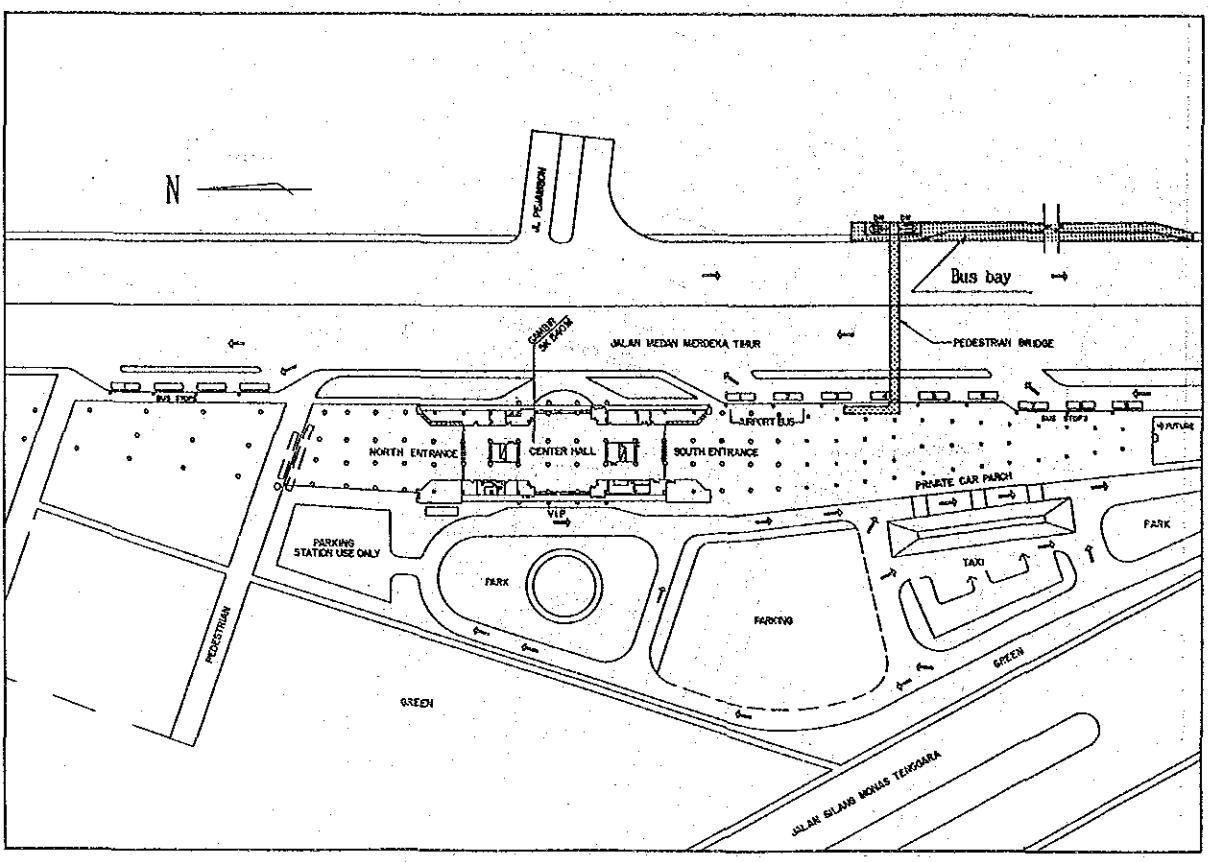


Fig. 4.5.2.1 (3) Gambir

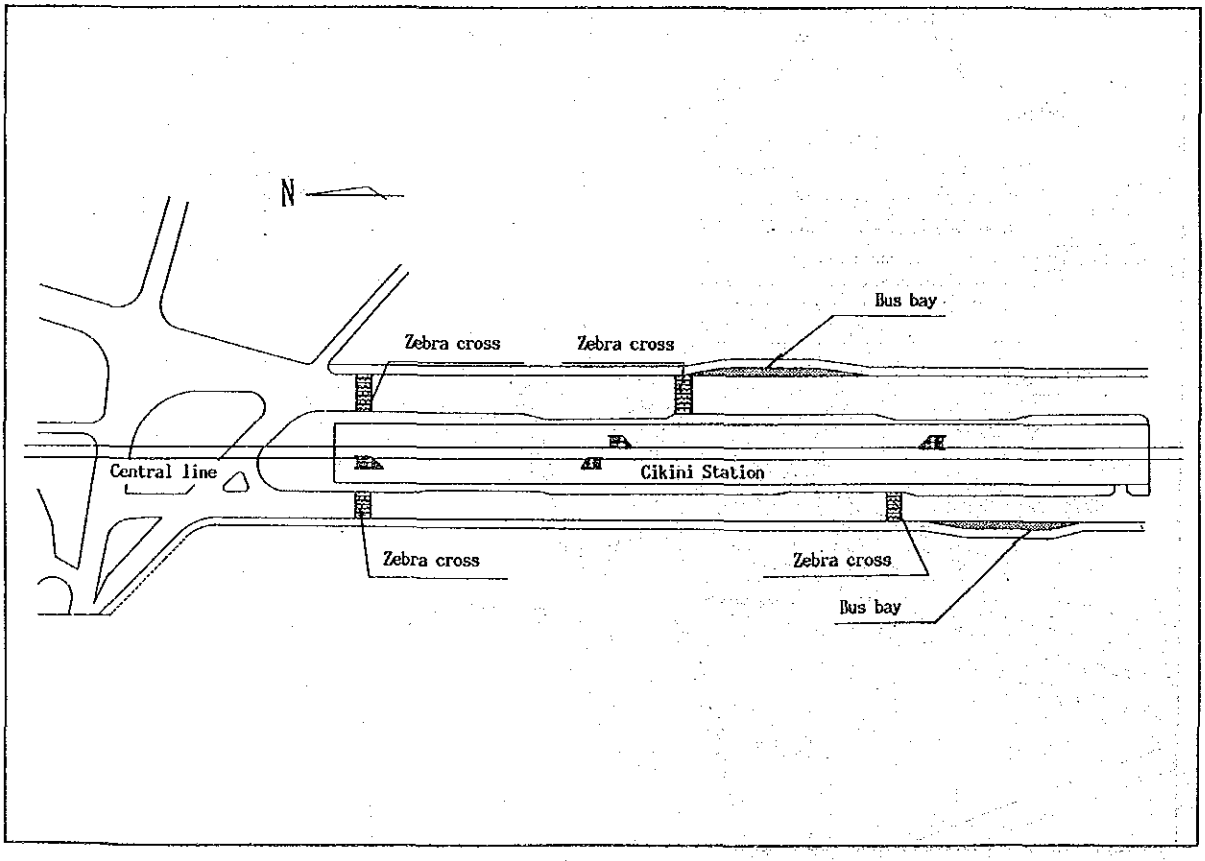


Fig. 4.5.2.1 (4) Cikini

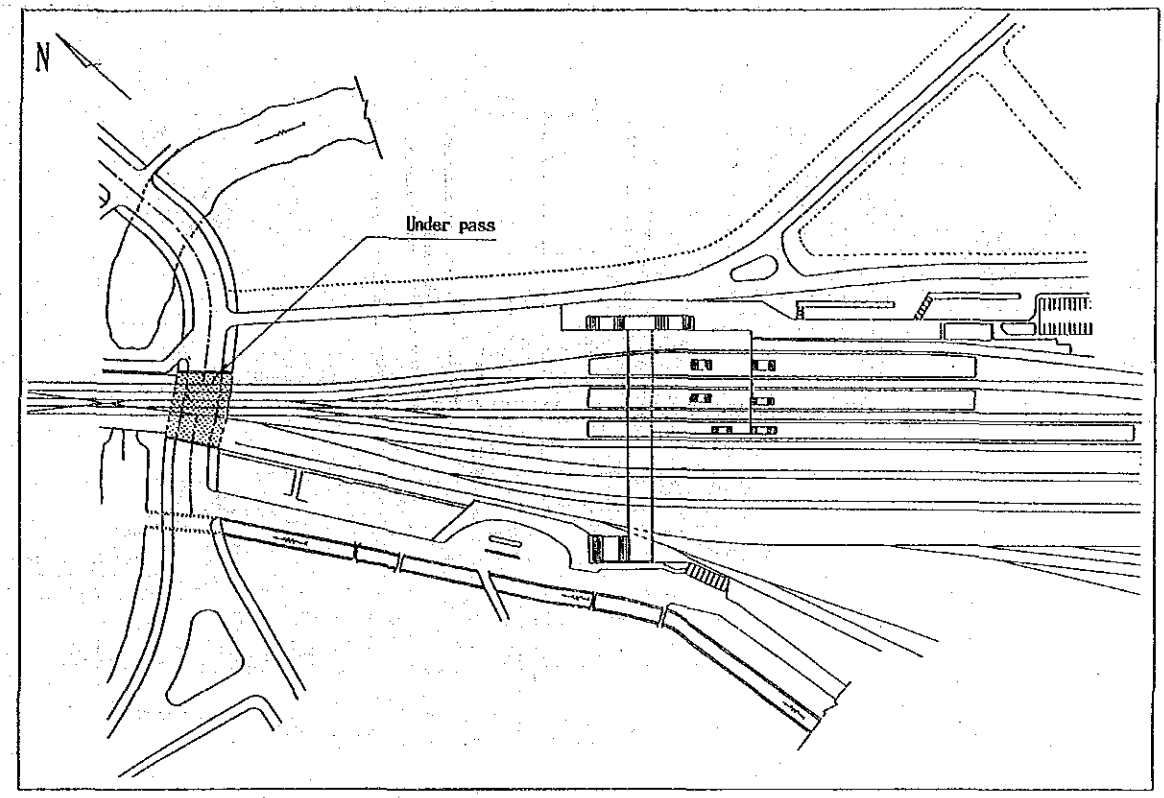


Fig. 4.5.2.1 (5) Manggarai

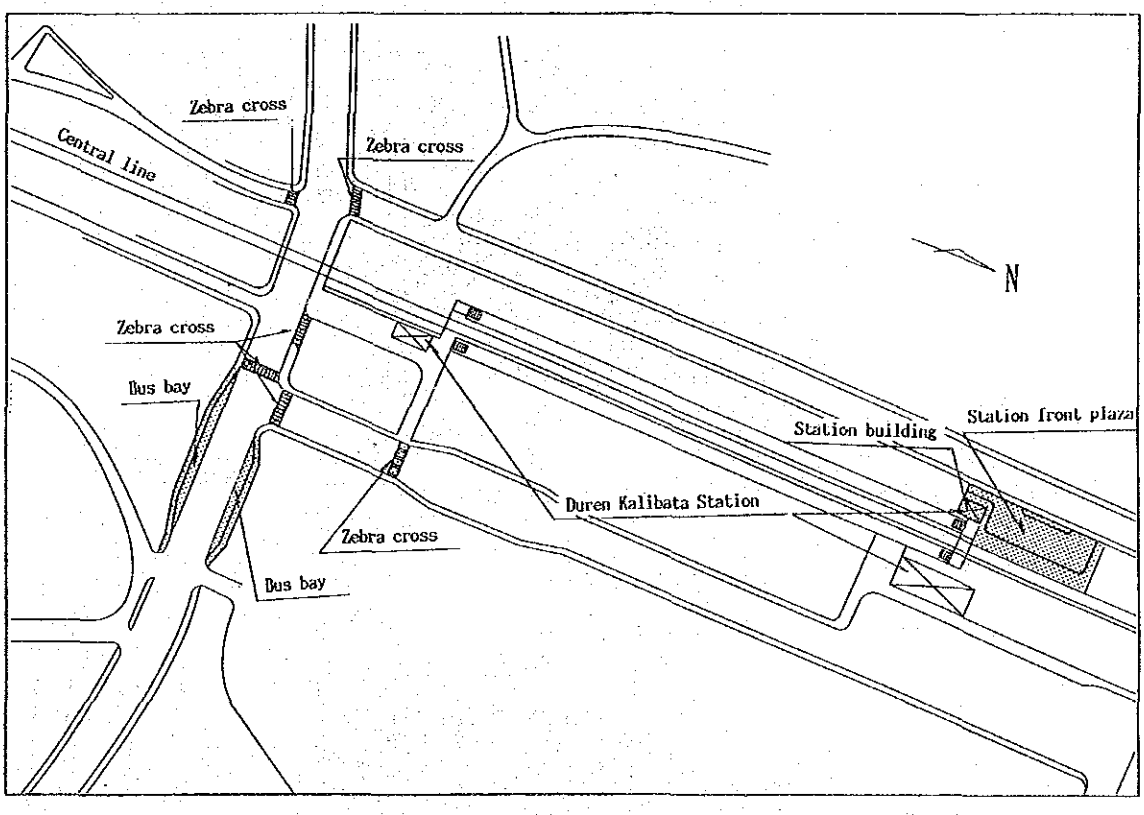


Fig. 4.5.2.1 (6) Duren Kalibata

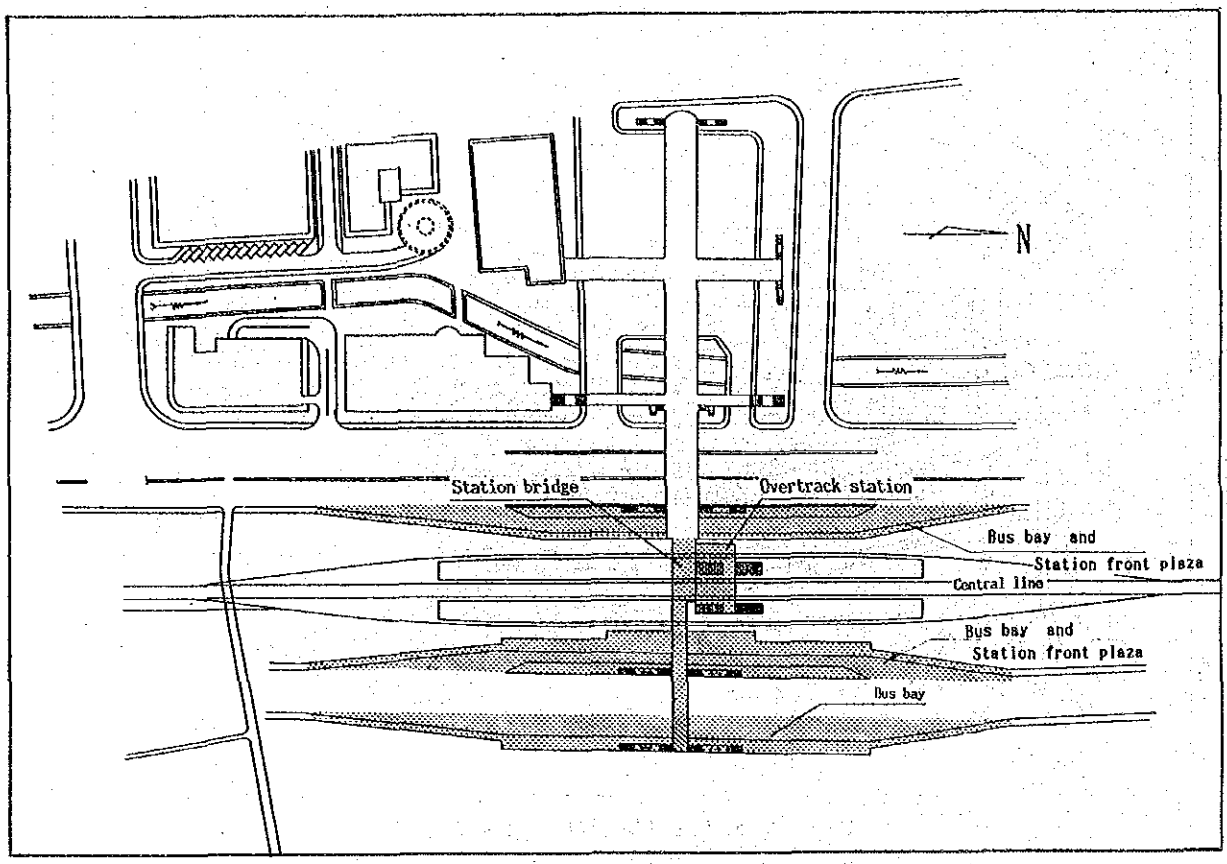


Fig. 4.5.2.1 (7) Pasar Minggu

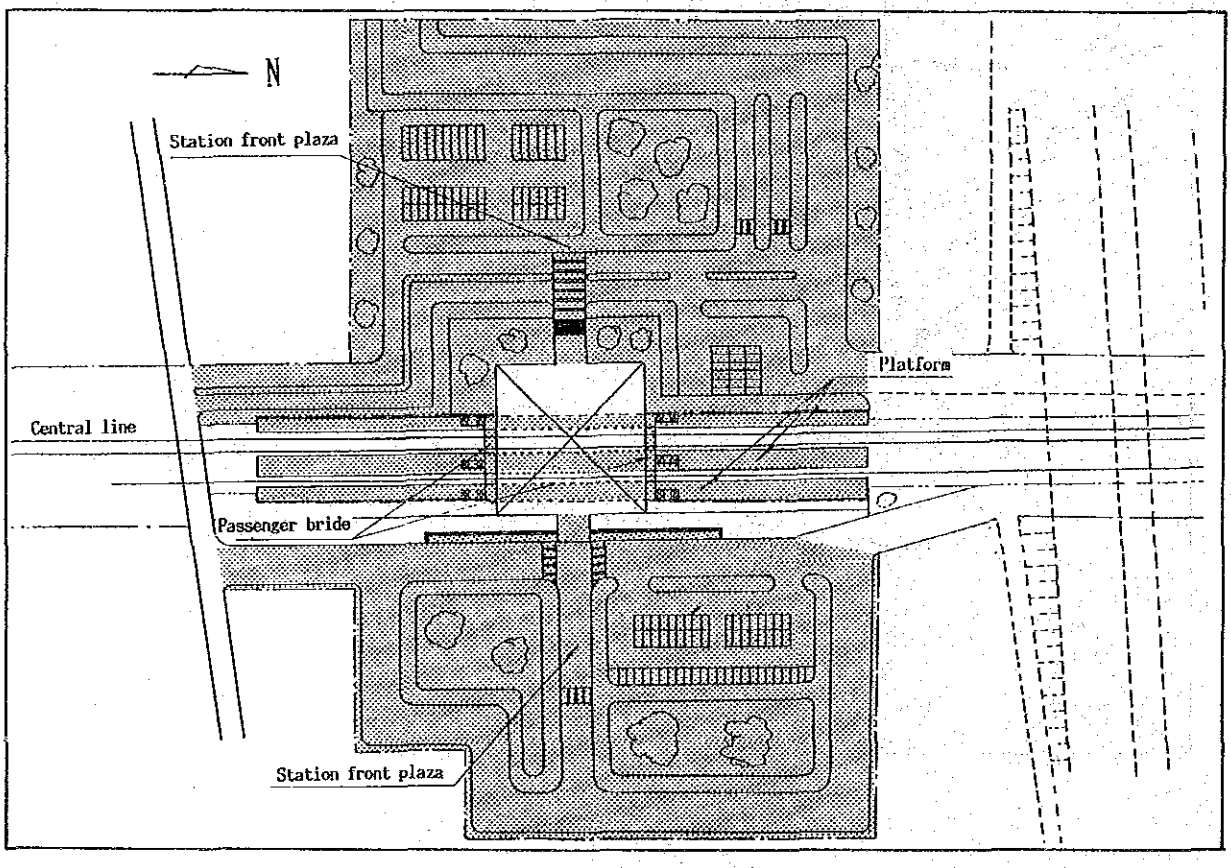


Fig. 4.5.2.1 (8) Depok Baru

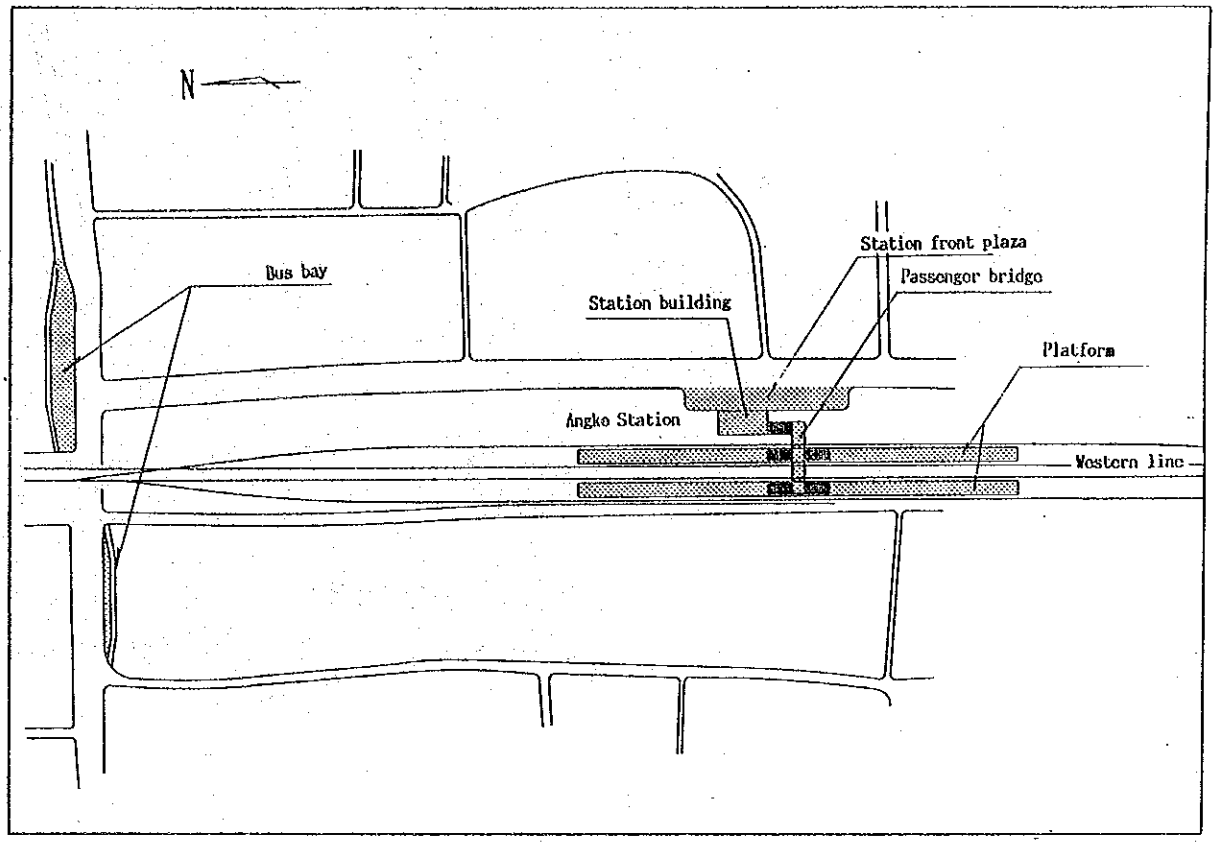


Fig. 4.5.2.1 (9) Angke

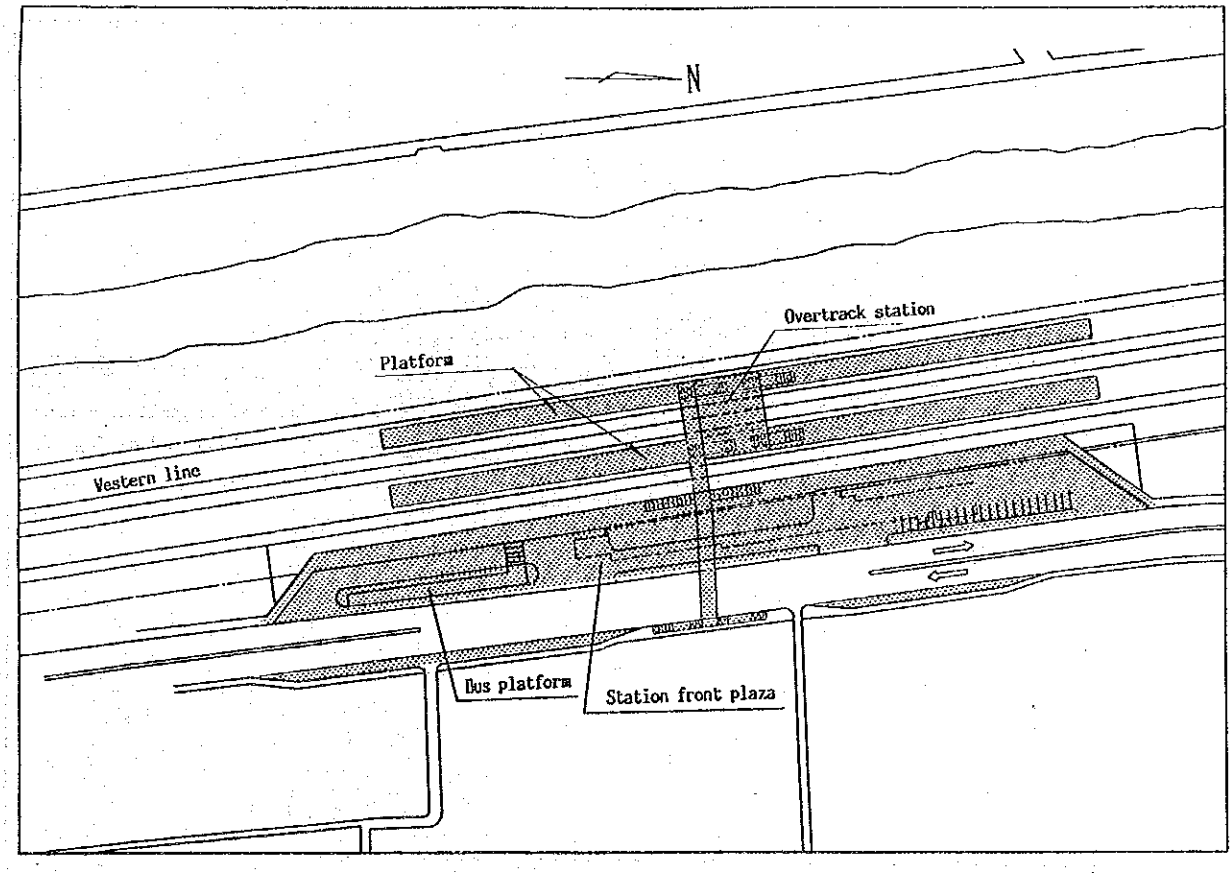


Fig. 4.5.2.1 (10) Tanah Abang

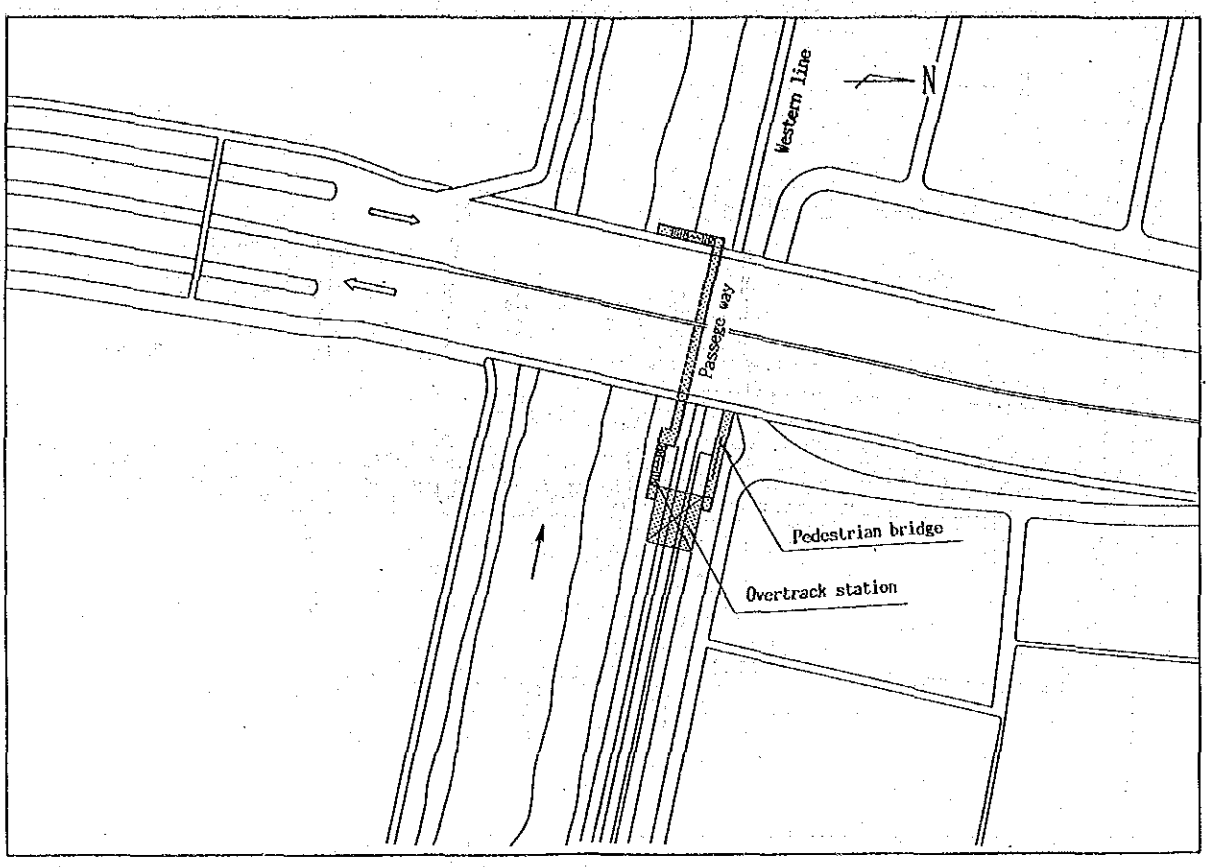


Fig. 4.5.2.1 (11) Dukuh

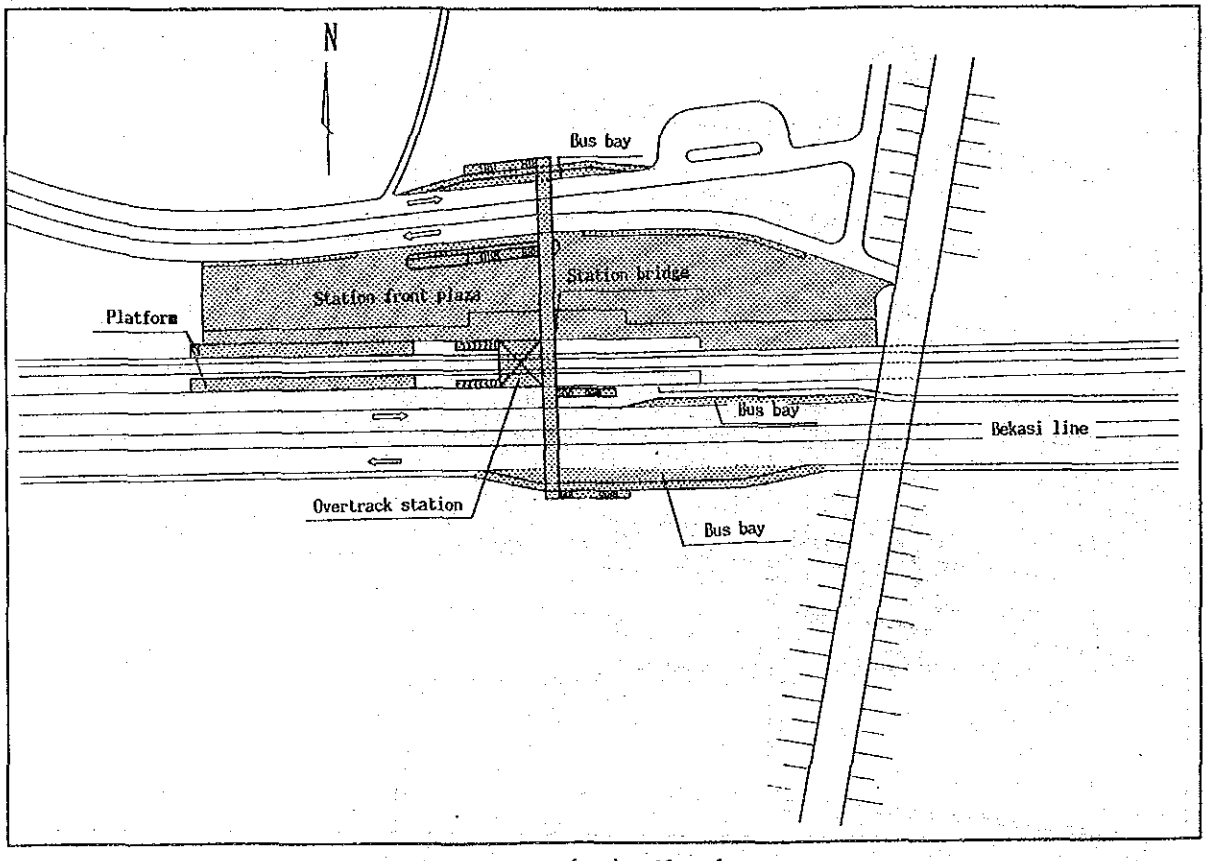


Fig. 4.5.2.1 (12) Klender

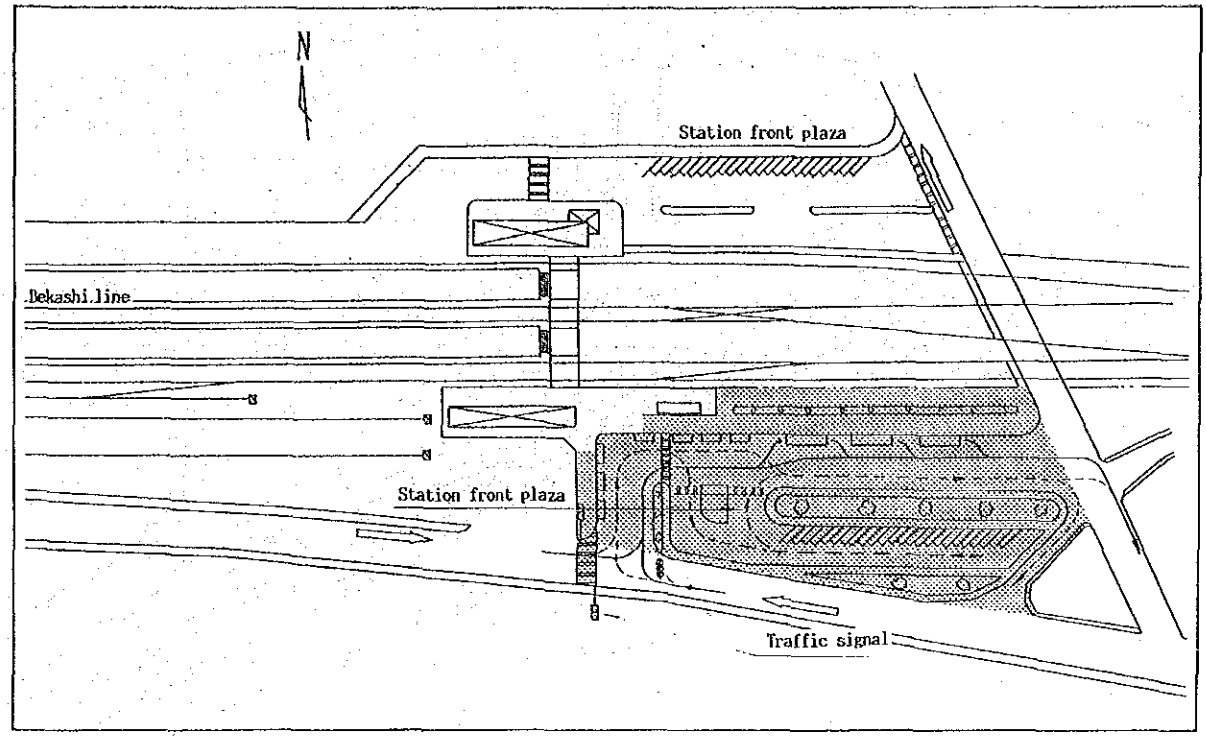


Fig. 4.5.2.1 (13) Bekasi

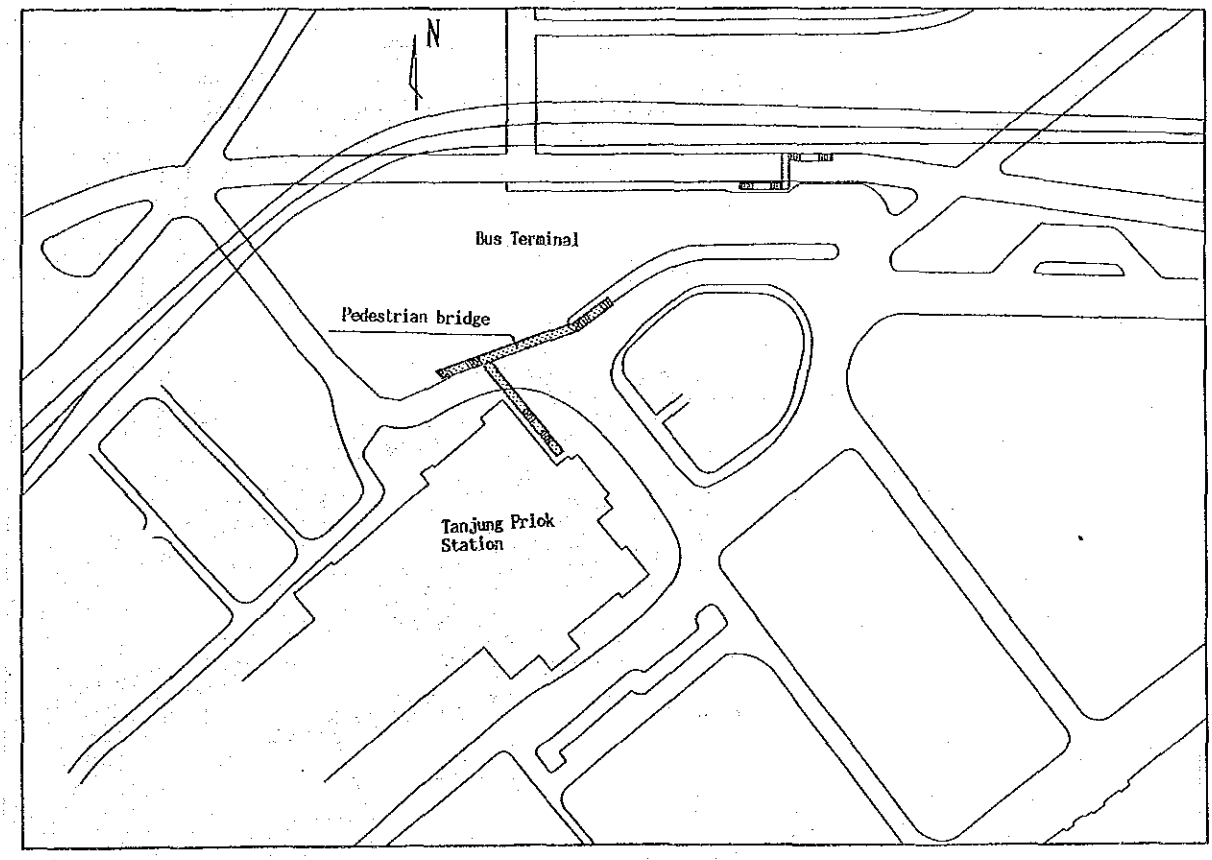


Fig. 4.5.2.1 (14) Tanjung Priok

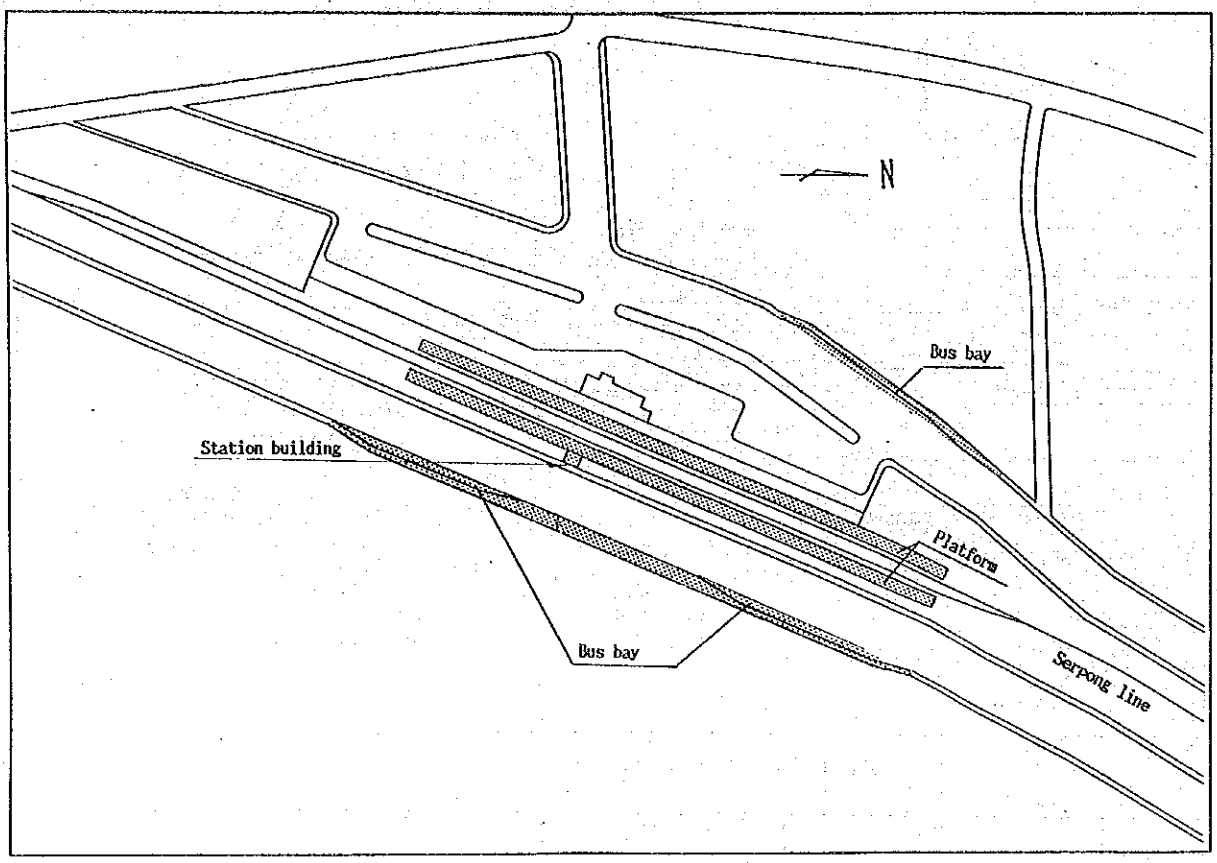


Fig. 4.5.2.1 (15) Palmerah

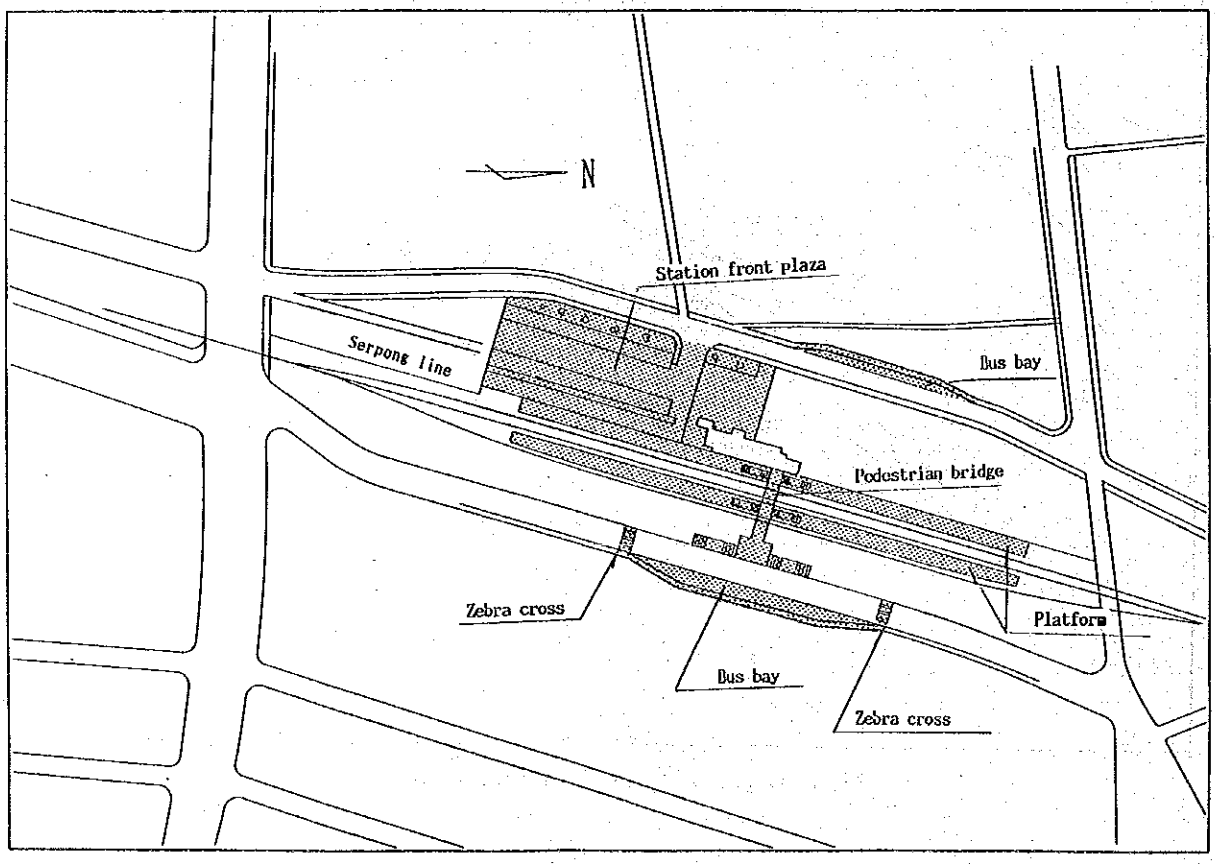


Fig. 4.5.2.1 (16) Kebayoran

The following improvement items are prefered for modernized commuter passenger service.

(1) Passenger service facilities

Improvement on passenger infromation service and ticket sales counter

- Jakarta Kota
- Tanjung Priok

(2) Introduction of bus bay

Introduction of bus bay by relocation of platform and expansion of bus deck.

- Dukuh (Fig. 4.5.2.1 (17))

(3) Expansion of bus pool and/or station front plaza

Expansion of traffic interchange space for safety transfer

- Tanah Abang
- Manggarai (Fig. 4.5.2.1 (18))

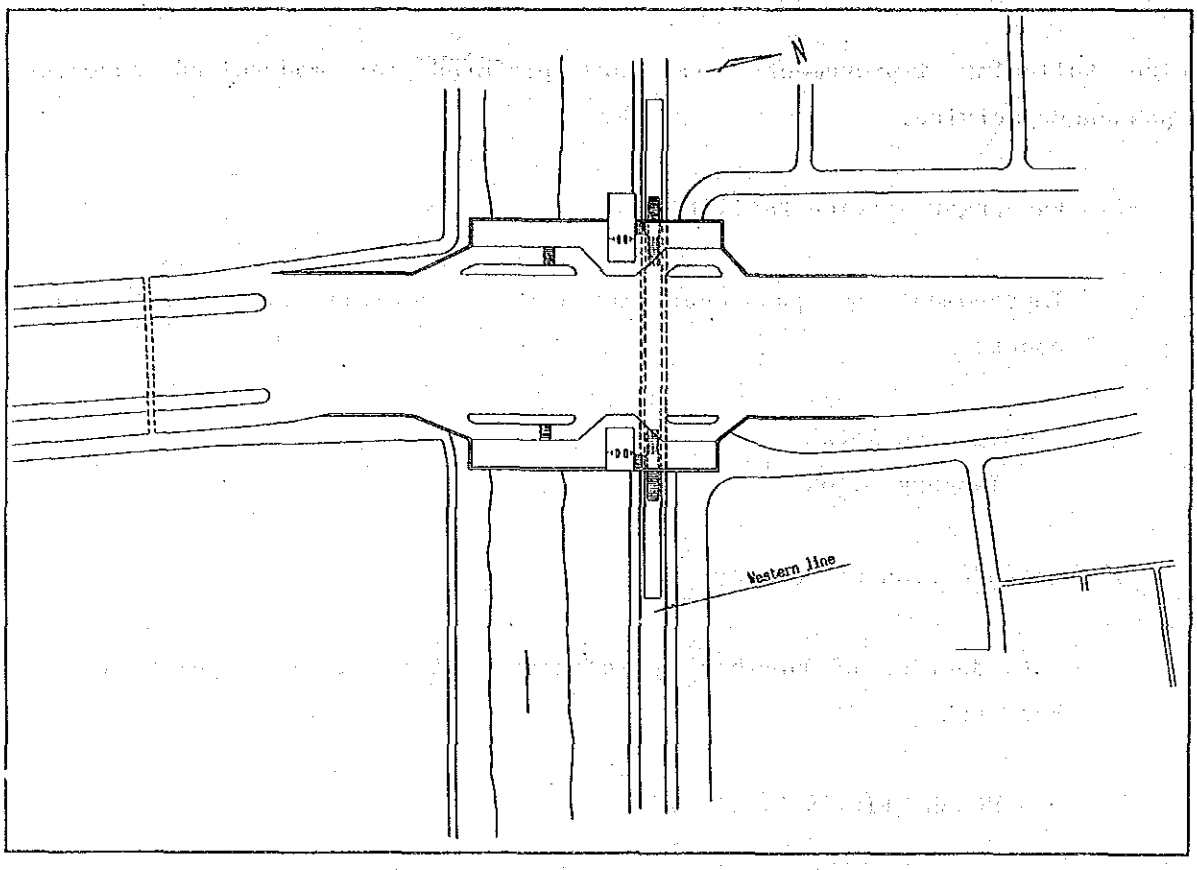


Fig. 4.5.2.1 (17) Dukuh (Second Stage)

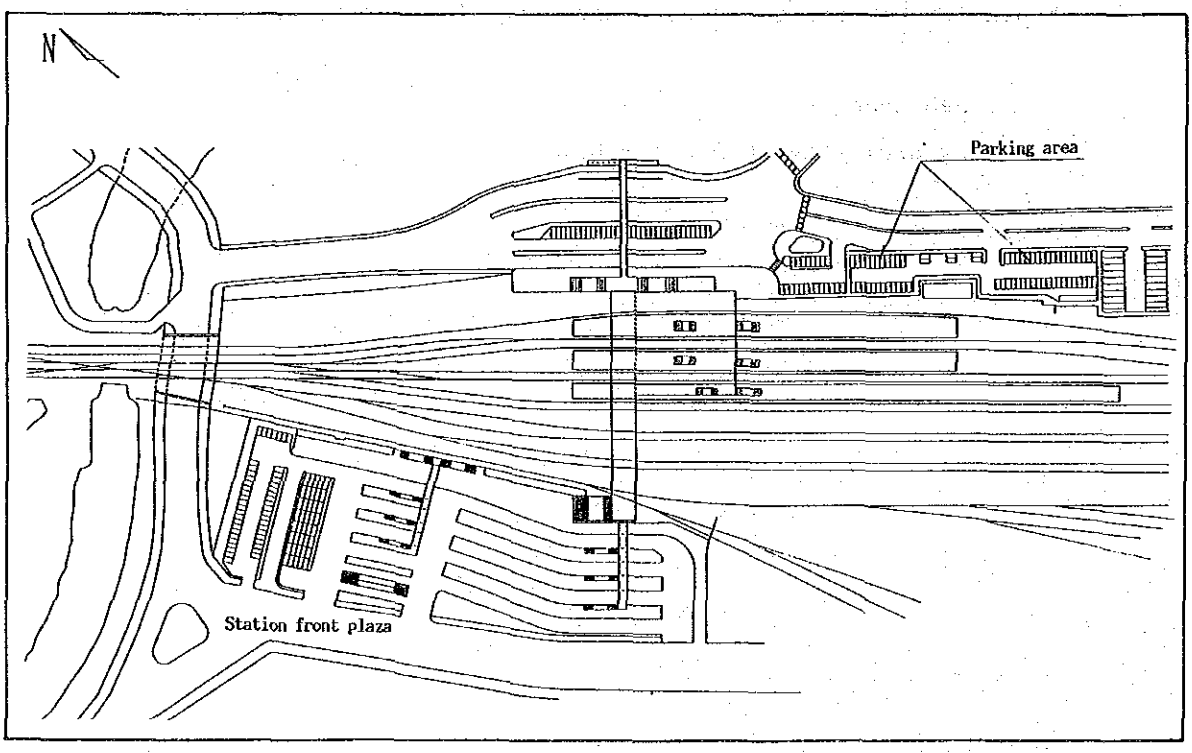


Fig. 4.5.2.1 (18) Manggarai (Second Stage)

4-5-3 Cost Estimation and Implementation Schedule

Investment cost were estimated refering to the case studies of F/S studies and shown in Table 4.5.3.1. A implementation schedule for the 16 high-priority stations is presented in Fig. 4.5.3.1.

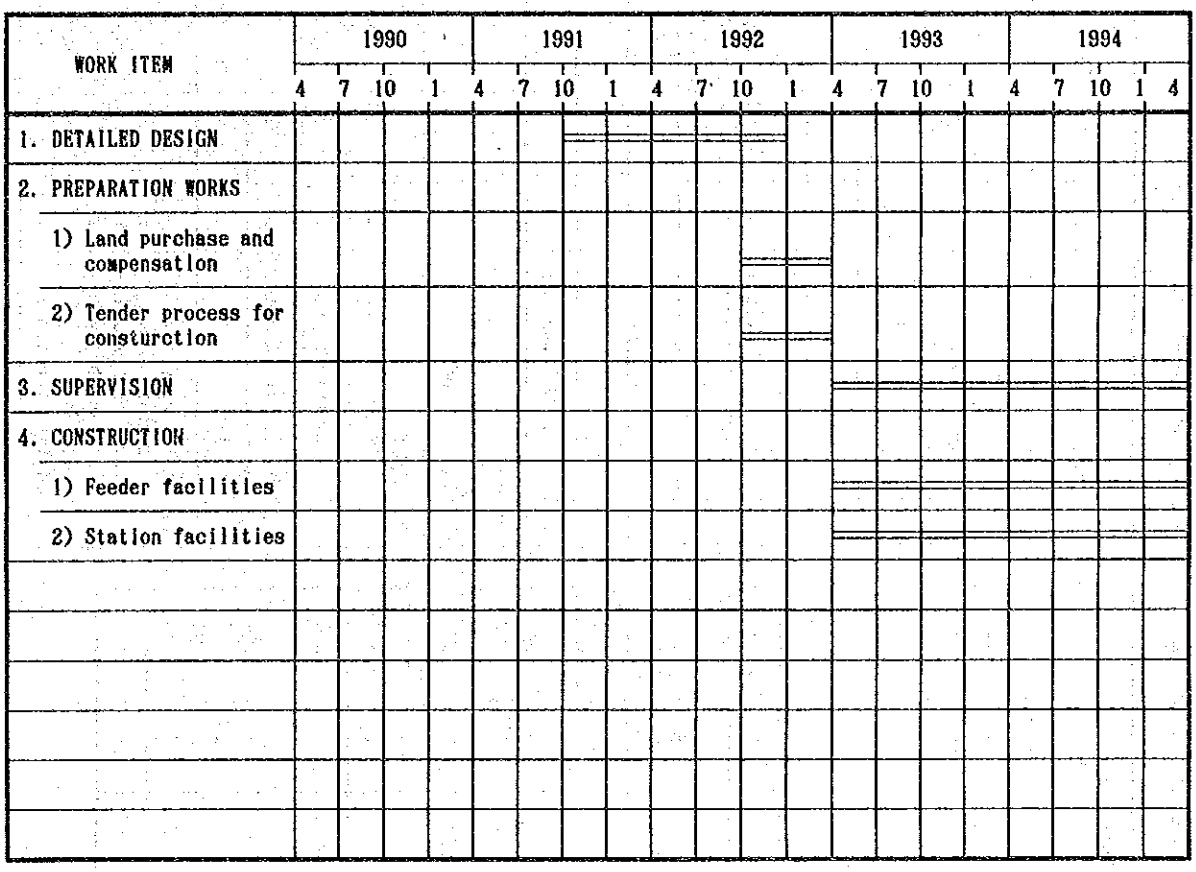


Fig. 4.5.3.1 Implementation Schedule for Improvement of the 16 High-Priority Stations

Table 4.5.3.1 Construction Cost for Other Improvement Station

Units: 10^6 Rp

No	Investment item	Unit	Quant	Foreign cost	Local cost		Total
					M/M	Labor	
1	JAKARTA KOTA						
	Pedestrian bridge	m²	239	817	528	256	1,601
	TOTAL			817	528	256	1,601
2	SAWAH BESAR						
	Bus bays	m²	294	67	309	280	656
	Pedestrian cross	m²	27	0.1	0.1	0.1	1
	Pedestrian bridge	m²	264	902	584	283	1,769
	TOTAL			969	893	563	2,426
3	GAMBIR						
	Bus bays	m²	402	88	73	5	166
	Pedestrian bridge	m²	332	1,001	734	356	2,091
	TOTAL			1,089	807	361	2,257
4	CIKINI						
	Bus bays	m²	784	145	535	6	686
	Pedestrian cross	m²	230	1	1	0	2
	TOTAL			146	536	6	688
5	MANGGARAI						
	Under pass	L.s	1	1,981	1,356	581	3,918
	TOTAL			1,981	1,356	581	3,918
6	DUREN KALIBATA						
	Bus bays	m²	996	136	99	1	236
	Pedestrian cross	m²	218	1	1	0.3	2
	Station building	m²	400	38	18	8	64
	Station front plaza	m²	690	143	10	2	155
	TOTAL			318	128	11	457
7	PASAR MINGGU						
	Bus bays	m²	2,631	958	309	18	1,285
	Parking area	m²	1,242	411	89	1	501
	Overtrack station	m²	400	718	336	144	1,198
	Station bridge	m²	1,020	911	411	197	1,519
	Station front plaza	m²	240	179	61	25	265
	TOTAL			3,177	1,206	385	4,768
8	DEPOK BARU						
	Station front plaza	m²	18,600	7,725	427	124	8,276
	Passenger bridge	m²	230	206	97	41	344
	Platform	m²	2,268	1,520	738	316	2,574
	TOTAL			9,451	1,262	481	11,194
9	KEBON PEDES						
10	NEW KANPUNG BANDAN						
11	KEMAYORAN						
12	PASAR SENEN						
13	ANGKE						
	Bus bays	m²	476	64	35	3	102
	Platform	m²	2,160	1,881	908	389	3,178
	Passenger bridge	m²	150	135	63	27	225
	Station building	m²	200	1,260	59	25	1,344
	Station front plaza	m²	320	9	52	1	62
	TOTAL			3,349	1,117	445	4,911
14	TANAH ABANG						
	Bus bays	m²	495	111	93	5	209
	Overtrack station	m²	500	898	420	180	1,498
	Station bridge	m²	375	374	179	5	558
	Platform	m²	1,344	450	212	91	753
	Station front plaza	m²	1,200	257	50	5	312
	TOTAL			2,090	954	286	3,330

Units: 10^6 Rp

No	Investment item	Unit	Quant	Foreign cost	Local cost		Total
					M/M	Labor	
15	DUKUH ATS						
	Pedestrian bridge	m^2	140	478	310	240	1,028
	Passage way	m^2	360	4	5	0.4	9
	Overtrack station	m^2	135	241	113	48	402
	TOTAL			723	428	288	1,439
16	JATINEGARA						
17	KLENDER						
	Bus bays	m^2	135	30	24	1	55
	Overtrack station	m^2	500	898	420	180	1,498
	Station bridge	m^2	945	831	366	211	1,408
	Platform	m^2	960	643	312	134	1,089
	Station front plaza	m^2	7,200	3,281	37	9	3,327
	TOTAL			5,683	1,159	535	7,377
18	BEKASI						
	Traffic signal	L.s	1	2	1	0	3
	Station front plaza	m^2	2,900	605	39	10	654
	TOTAL			607	40	10	657
19	TANJUNG PRIOK						
	Pedestrian bridge	m^2	321	1,097	710	345	2,152
	TOTAL			1,097	710	345	2,152
20	PALMERAH						
	Bus bays	m^2	1,250	164	115	7	286
	Station building	m^2	15	38	17	7	62
	Platform	m^2	1,440	965	469	201	1,635
	TOTAL			1,167	601	216	1,983

Units: 10^6 Rp

No	Investment item	Unit	Quant	Foreign cost	Local cost		Total
					M/M	Labor	
21	KEBAYORAN						
	Bus bays	m^2	510	119	115	7	241
	Pedestrian cross	m^2	105	1	0.3	0	1
	Station building	m^2	50	38	15	8	61
	Platform	m^2	1,800	1,206	586	251	2,043
	Passenger bridge	m^2	420	358	198	17	573
	Station front plaza	m^2	6,725	1,402	85	24	1,511
	TOTAL			3,124	999	307	4,430
	SUB TOTAL			35,788	12,724	5,076	53,588
	D/D & E/M			3,579	—	1,780	5,359
	Land purchase	Land		—	3,817	—	4,478
		Building		—	661	—	
	Physical contingency			5,368	1,908	761	8,037
	Sub Total			8,947	6,388	2,541	17,874
	TOTAL			44,735	19,110	7,617	71,462

4-6 Implementation Strategies

4-6-1 Improvement Schedule

The JABOTABEK region currently has 53 railway stations, with an additional 20 stations to be added by 2005. The introduction of intermodal facilities between bus and rail was divided into four phases, taking into considering the program to develop other railway facilities and estimated potential railway passenger demand.

The four investment phases are as follows:

- Phase 1: 1991 - 1994 (21 stations);

- Phase 2: 1995 - 1997 (17 stations);

- Phase 3: 1998 - 2000 (17 stations);
  and

- Phase 4: 2001 - 2004 (12 stations).

A proposed implementation schedule is presented in Table 4.6.1.1.

Table 4.6.1.1 Implementation Schedule for Provision of Feeder Service

Line / Station		Phase 1 ('91-'94)	Phase 2* ('95-'97)	Phase 3** ('98-'00)	Phase 4 ('01-'04)
Central Line					
Jakarta kota		◎			
Jayakaruta	(New)			◎	
Mangga Besar	(New)			◎	
Sawah Besar		◎			
Juanda	(New)			◎	
Gambir		◎			
Gondangdia***					
Cikini		◎			
Manggarai		◎			
Tebet			◎		
Cawang	(New)		◎		
Durenkalibata		◎			
North Pasar Minggu	(New)			◎	
Pasar Minggu		◎			
Tanjungbarat	(New)		◎		
Lentengagung			◎		
Univ.Pancasila				◎	
Univ.Indonesia***					
Pondokcina***					
Depok Baru		◎			
Depok***					
Pondokterong	(New)				◎
Citayam				◎	
New Station	(New)				◎
Bojonggedeh				◎	
New station	(New)				◎
Cilebut					◎
Kebon Pedes	(New)	◎			
Bogor			◎		
Bekasi Line					
Klender		◎			
Klender Baru***					
New Station***	(New)				
Cakung			◎		
Kranji				◎	
Bekasi		◎			
Loop Line					
Jatinegara		◎			
Mampang			◎		
Dukuh		◎			
Karet				◎	
Tanah Abang		◎			
New station	(New)			◎	
Duri			◎		
Angke		◎			
New station	(New)			◎	
New K.Bandan	(New)	◎			
Rajawali			◎		
Kemayoran		◎			
Pasar Senen		◎			
Gangsentiong				◎	
Kramat			◎		
Pondokjati				◎	

Table 4.6.1.1 Implementation Schedule for Provision of Feeder Service

Tangerang Line					
Grogol			◎		
Pesing			◎		
New Station	(New)				◎
Bojong Indah	(New)			◎	
Rawabuaya			◎		
Kalideres			◎		
Poris				◎	
Batuceper					◎
New station	(New)				◎
Tangerang			◎		
Serpong Line					
Palmerah		◎			
New Station	(New)				◎
Kebayoran		◎			
Pondok Bitung			◎		
New station	(New)				◎
Jurangmangu					◎
Sudimara				◎	
New Station	(New)				◎
Rawabuntu					◎
Serpong				◎	
T.Priok Line					
T.Priok		◎			
Ancol			◎		
Total		21	17	17	12

Notes: * The strategy for developing intermodal transfer facilities in the second phase principally focussed on the Serpong Line, the Tangerang Line, and the main stations on the Central and Bekasi Lines. Station selection was made based on the potential number of passengers and planned railway facility improvement programs. Passengers volumes of 15,000 or more per day were required for the improvement of stations on the Tangerang and Serpong Lines, and 20,000 or more per day on the Central and Bekasi Lines.

** Passenger volumes of 10,000 or more per day are required for improvement in the third phase.

*** Station of Option "a" or "b"

4-6-2 Implementing Agencies and Responsibilities

(1) Implementing agencies and a review of their responsibilities in relation to feeder improvements

1) PJKA

PJKA, the Indonesian State Railways or Perusahaan Jawatan Kereta APi, is operated as a government-owned enterprise in compliance with the Enterprise Act/Compatibility Act of 1927. PJKA's current legal status is PERJAN (Perusahaan Jawatan), which refers to a public utility enterprise that fully undertakes a Government-sponsored mission. At present, however discussions have begun to change PJKA's legal status to PERSERO (Perusahaan Terbatas), a (limited) holding company in which the Government is the only shareholder.

With respect to the intermodal facilities proposed in this study, PJKA would have principal responsibility for those facilities within the station itself. Since PJKA would also benefit from improvements to facilities outside the station, it would also have responsibility (at least financial) to support these improvements. This issue is addressed in more detail below.

2) DKI Jakarta agencies

BAPPEDA DKI

The Provincial Development Planning Agency, or BAPPEDA, is the organization within the DKI Jakarta Government that is responsible for formulating overall investment policies and for coordinating the preparation of the Development Master Plan for Jakarta. Thus, BAPPEDA is responsible for determining the allocation of the investment budget to particular sectors, including transportation. However, BAPPEDA's sphere of authority is in practice limited to programs included in the provincial development budget. Thus, BAPPEDA's role regarding the proposed intermodal facilities would principally be in the planning of bus terminals.

Dinas Tata Kota

BAPPEDA, described above, delegates land use planning including some transport planning tasks to Dinas Tata Kota, the City Planning Service. The agency includes a Traffic and Infrastructure Planning Division, which concerns itself mostly with external road network planning and with monitoring transport plans produced by national government agencies. Dinas Tata Kota would therefore be expected to play a key role in those planning.

Dinas LLAJR

Dinas Lalu Lintus dan Angkutan Jalan Raya (Dinas LLAJR), the Traffic and Highway Transportation Service, is the largest transport agency within the DKI governments. Dinas LLAJR's major responsibilities include:

- issuing licenses to city buses, intercity buses, taxis, and bajaj;
- advising on and approving new bus routes or modifications of existing ones;
- inspecting registered bus, trucks, and taxis;
- providing training for the drivers of public transportation vehicles;
- Constructing, operating, and maintaining bus terminals and shelters (with operations and maintenance through the activities of BPT-AJR); and
- planning bus lines and other bus priority measures.

Thus, it is apparent that Dinas LLAJR will have a major role in the planning, construction, operation, and maintenance of most kinds of intermodal facilities proposed in this study.

Dinas P.U.

Dinas Pekerjaan Umum (Dinas P.U.), or the Public Works Service, is responsible for the design, construction, and maintenance of capital infrastructure projects. With respect to the intermodal facilities recommended in this study, Dinas P.U. will be responsible for the construction of bus terminals, bus bays, bus lanes, and pedestrian bridges, as well as the maintenance of bus bays.

3) Bina Marga

Bina Marga, the Directorate General of Highways in the national government's Department of Public Works, is responsible for the planning, design, construction, and maintenance of all elements of the primary road network. In DKI Jakarta, Bina Marga is responsible for all major trunk roads and for roads connecting major traffic generators that are deemed national in scope. Therefore, with regard to intermodal facilities in the project area, Bina Marga's responsibilities would relate to certain major roads and pedestrian bridges over those roads.

4) Bus operators

Eight separate enterprises operate buses in Jakarta: one state agency, four private companies, one cooperative, and two associations. Perun PPD and PT Mayasari Batki operate large buses and provide express services called PATAS. PT. Metro Mini and Kopaja operate medium-sized buses, while the other enterprises operate small buses. Since these bus operators would benefit from improvement in intermodal facilities, for example by the provision of bus bays or bus lines, they would be expected to participate in some way in the planning, construction, operation, and maintenance of the facilities.

5) Summary

Table 4.6.2.1 presents the various implementing agencies with respect to most of the proposed feeder improvements. "DKI" includes BAPPEDA, Dinas Tata Kota, Dinas LLAJR, and Dinas P.U., all of which were described above. Jasa Marga is the expressway authority, with some responsibility for Jalan Bebas Hambatan and pedestrian bridges.

(2) Institutional framework: problem areas and suggestions

It is apparent from an examination of Table 4.6.2.1 and the above discussion that a wide variety of agencies will share in the responsibility for the planning, construction, operation, and management of intermodal facilities. A critical issue that remains to be resolved, however, is the question of who will pay for the construction of station plazas. The issue is unresolved to date in the Indonesian context precisely because of the new and innovative nature of the concept. However, current practice in Japan may provide some guidance. In Japan, the costs (including land) are split between the local government and the railway, with approximately 5/6 borne by the local government and 1/6 by the railway, although the exact proportions are subject to negotiation. The issue of who will pay for operation and maintenance costs is addressed in the following section.

Table 4.6.2.1 Various Implementing Agencies for Feeder Improvements

Facility	Planning	Construction		Operation		Maintenance	
	Agency in Charge	Agency in Charge	Fund Sources	Agency in Charge	Fund Sources	Agency in Charge	Fund Sources
Jalan Bebas Hambatan	Jasa Marga Bina Marga DTK	Jasa Marga Private Company	Loan from private sectors Int. off. financial Agency	Jasa Marga or Private Co.(under control of Jasa Marga) (1)	Private sectors Jasa Marga	Jasa Marga Private Co. (under control of Jasa Marga)	Private Sectors Jasa Marga
Jalan Arteri Besar	Bina Marga DTK	Bina Marga	Central Govn. fund or loan (any (eligible lender)	Bina Marga DKI	Bina Marga DKI	Bina Marga DKI	Bina Marga DKI
Jalan Arteri Kecil	DKI	DKI	DKI (own funds or loan)	DKI	DKI	DKI	DKI (own funds or loan)
Jalan Kolektor Besar	Bina Marga DKI	Bina Marga DKI	Central Government, DKI (own funds or loan)	DKI	DKI	DKI	DKI
Jalan Kolektor Kecil	DKI	DKI	DKI (own funds or loan)	DKI	DKI	DKI	DKI (own funds or loan)
Bus Terminal	DKI	DKI	DKI (own funds or loan)	DKI	DKI	DKI	DKI (own funds or loan)
Bus Shelters	DKI	DKI Private Co. (under control DKI)	DKI Private Co. (2)	DKI	DKI	Depends on who built it (DKI or private co.)	DKI or private Company
Bus Bays	DKI	DKI	DKI	DKI	DKI	DKI	DKI
Bus Lanes	DKI	DKI Private Co. (3)	DKI (own funds or loan) Private Company	DKI Private Co.	DKI Private Co.	DKI Private Co.	DKI (own funds or loan) Private Co.
Traffic Signs & Marking	DKI	DKI	DKI (own funds or loan)	DKI	DKI	DKI	DKI
Signals	DKI	DKI Bina Marga	DKI (own funds and loan): Bina Marga	DKI	DKI	DKI Bina Marga	DKI Bina Marga
Pedestrian Bridge	Jasa Marga (4) Bina Marga (5) DKI	Jasa Marga Bina Marga DKI	Jasa Marga Bina Marga DKI Private Co. (6)	DKI	DKI	Jasa Marga Bina Marga DKI Private Co.	Jasa Marga Bina Marga DKI Private Co.

DTK : City planning office in DKI Jakarta
(1) : Private company established for management of toll road
(2) : A private company builds a bus shelter can put in advertisements tax-free for a certain period (determined by negotiation)
(3) : A private company established for bus lane management is planned.
(4) : Pedestrian Bridge over Jalan Bebas Hambatan
(5) : Pedestrian Bridge over Jalan Arteri Besar
(6) : A private company that builds a pedestrian bridge can in advertisements tax-free for a certain period (determined by negotiation)

4-6-3 Strategy for the Operation and Maintenance of Station Plazas

A station plaza is a multipurpose space used by a variety of people. Its functions include serving as an "entrance" to the city or neighborhood, as a transport interchange, and as a meeting place for travelers. The principal beneficiaries of a station plaza are the traveling public but the railway authority, bus/taxi operators, and private car users who want to ride the train also are beneficiaries.

A station plaza consists of many component parts, including pedestrian footpaths, space for vehicles to maneuver, bus waiting areas and platforms, taxi stands, private car parks, and traffic safety facilities. All of these components must be properly maintained if the users of the plaza are to receive the maximum benefit. Efficient operation of the area is also important for assuring that a plaza fulfills its functions to the maximum possible extent. These two aspects--maintenance and operation--will be discussed in the following sections.

(1) Maintenance

As was mentioned previously, station plazas in Japan are usually constructed jointly by the railway authority (company) and the city government, with each responsible for construction on the land that it owns. The responsibility for maintenance is similarly apportioned. Plaza facilities include the following:

- pedestrian footpaths;
- space for vehicles to maneuver;
- bus waiting areas and platforms;
- taxi stands;
- private car parks;
- information panels;
- lighting; and
- traffic safety facilities.

Although the responsibility for maintaining these facilities is divided between two different authorities, it is essential that all maintenance work be carried out in an integrated fashion. This is achieved in Japan by an agreement between the two authorites.

(2) The operation of station plazas

Station plazas are used by persons employing a variety of transport modes. The principal modes include the following:

- walk;
- bus;
- taxi;
- private car; and
- other modes (becak, bemo, and bajaj).

Among these modes, buses require operational arrangements involving the use of field staff to supervise the operation of buses using the plaza (e.g., with regard to the entry of buses into bus bays and their waiting for passengers). Most of the rules already applied with respect to city bus terminals would also apply regarding the operation of buses in a station plaza. Example rules are listed below:

- buses may pick up and unload passengers in specified areas only;

- bus bays are allocated to buses serving specific routes, and no other buses may enter to pick up passengers; and

- in order to prevent congestion at the entrance to the plaza, buses may not stand longer than a specified time.

Taxi stands and private car parks also require a degree of routine supervision related to their scale and the need to collect fees.

4-7 Urban Impacts by Improving Railway-and-Feeder Service and the Planning Tasks

4-7-1 Wide-range Effects Exerted by Introducing Railway-and-Feeder Commuter Service

(1) Wide-range effects

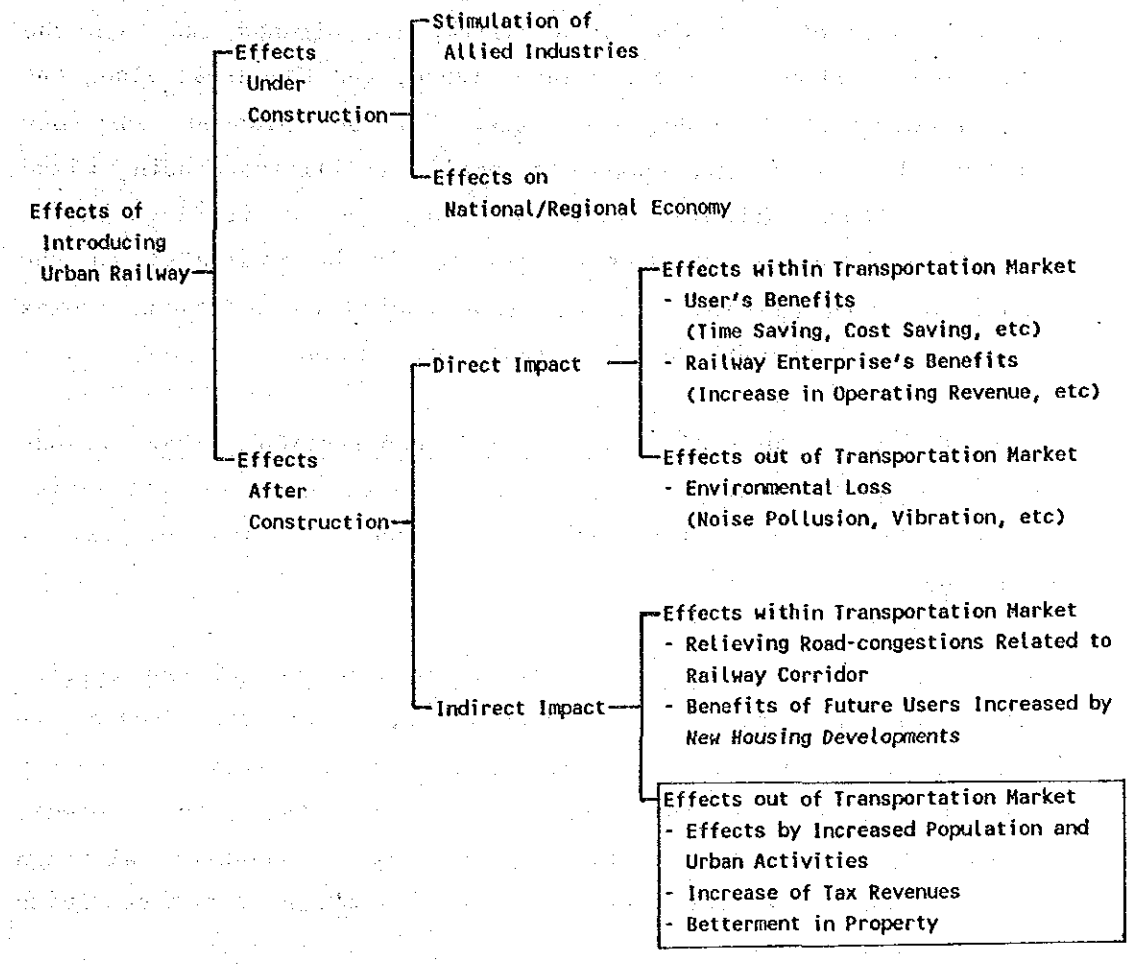
In big cities where the urban railway system is a major and popular transport, it has been known that introducing rail-based commuter services will exert wide-range effects on various fields. Improving the Jabotabek Railway system and the feeder system also is a type of introducing rail-based commuter services.

According to existing studies in Japan, the extensive effects by introducing urban railway are arranged as shown in Fig. 4.7.1.1. The outline is:

- At first, the effects brought by introducing urban railway are divided into: (a) effects under construction, and (b) effects after construction. The former is socio-economic effects brought by a large-scale construction; the later is various effects exerted by operating the commuter service.

  In addition, Jabotabek Railway Project also will bring the effects (a) but it does not include effects related to land acquisition because it intends to utilize the existing right-of-way and a part of facilities.

- The later includes: effects to be evaluated in the transportation market; and others outside the transportation market. Furthermore, these also are separated into: direct effects on the users or the enterprise; and indirect effects exerted.



Source: N. Hidano, H. Nakamura, Y. Aratsu, K. Nagasawa, "The Estimation of Capital Gains of Property Value for Equitable Cost Bearing of Urban Railway Improvement", Papers of Japan Society of Civil Engineers, Vol. 365/IV-4, 1986

Fig. 4.7.1.1 Extensive Effects of Introducing Urban Railway

Furthermore Environmental Impacts directly caused by introducing rail-based commuter service are noise pollution and vibration on the surroundings. From a viewpoint of urban planning, these environmental loss should be avoided by the land use planning along railway; namely areas along railway line should be considered as same as the areas along arterial roads. DKI Jakarta

District Plan has already considered it. For example, generally parallel roads of both side of a railway are planned and then the road-raiway-road corridor has been designed; and the areas along the road-railway-road corridor are used to be planned as non-residential areas (e.g., commercial/public facilities/housing mixed area) where three or more storied buildings are permitted to built. In addition, any environmental loss should be evaluated in the comparison with the environmental loss caused by additional roads traffics that will substitute the rail-based commuter services.

Direct Effect to be evaluated within Transportation Market include users' benefits in time-saving, enterprise's benefits in cost-saving and so on; these have been evaluated in the economic analysis of this study.

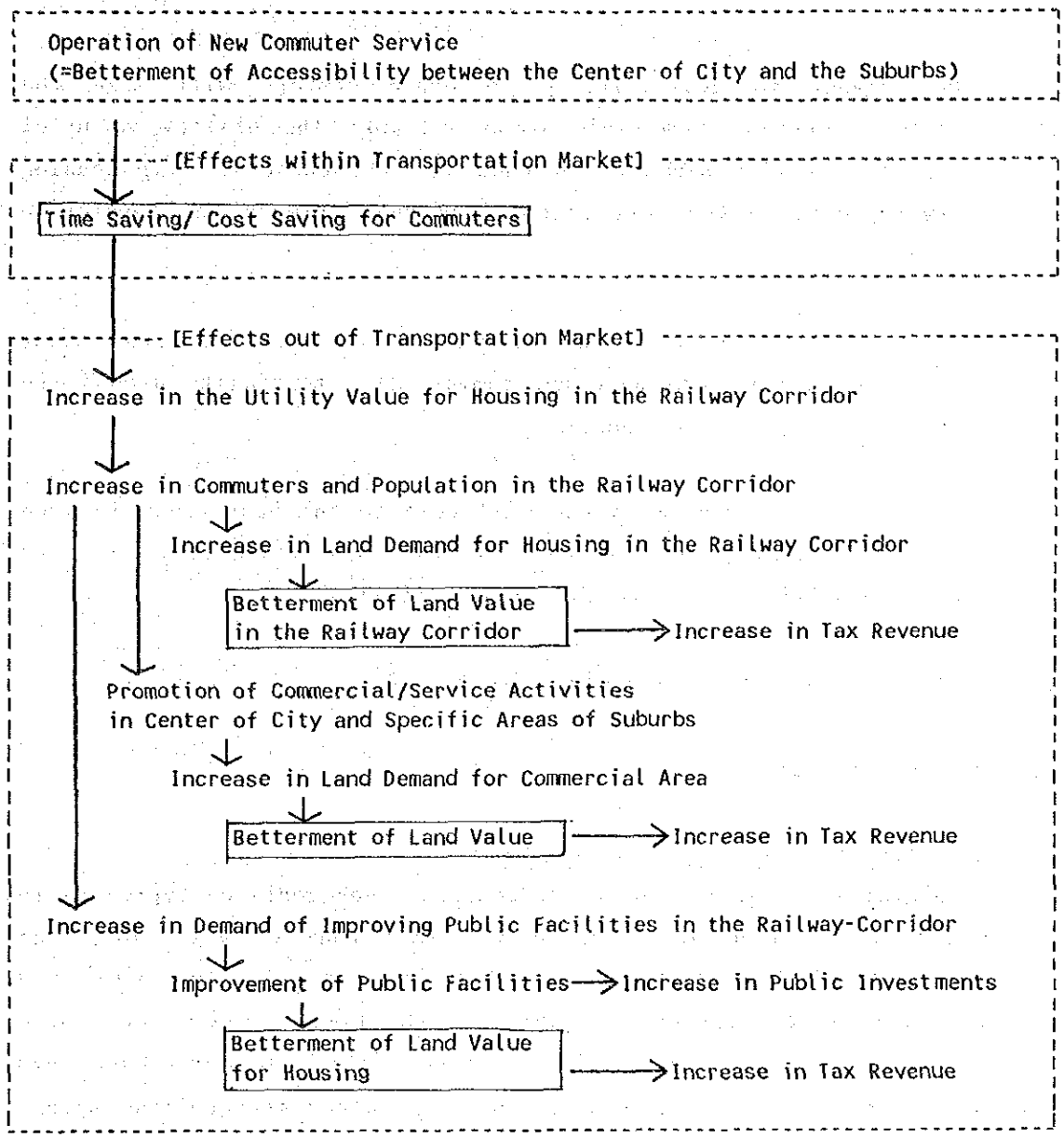
On the other hand, Indirect Effects outside the Transportation Market include increase in population, increase/decrease in municipalities' revenues and increase in capital gains of property value and so on; but they are used to be outside the economic analysis due to the difficulty in estimating in quantity, although it was often the actual reason of decision-making for introducing urban railway system.

Existing studies also have tried to estimate the total benefits and costs, or the capital gains in property value related to introducing the urban railway system; but it is very difficult to evaluate due to the complexity in the composition/existence of land value.

(2) Mechanism in spread

Mechanism in spreading various effects has generally been revealed. Fig. 4.7.1.2 shows the process related to indirect effects outside the transportation market. The characteristics are:

- The various effects are not independent but these originate in a direct effect within transportation market, namely time-saving effect for commuters.



Source: N. Hidano, H. Nakamura, Y. Aratsu, K. Nagasawa, "The Estimation of Capital Gains of Property Value for Equitable Cost Bearing of Urban Railway Improvement", Papers of Japan Society of Civil Engineers, Vol. 365/IV-4, 1986

Fig. 4.7.1.2 Mechanism of Extensive Impacts of Railway's Commuter Service on Urban Conditions along Railway

- Improvement in accessibility to urban centers will make the railway corridor commutable areas and make the utility value of railway corridor higher; and then it will encourage the housing developments in the railway corridor and increase the population there.

- As a result, the hinterland of urban centers around urban major stations will be expanded and commercial potentiality around the stations will be made higher.

- Urban impacts above-mentioned will come to the betterment in land value of railway corridor and the station's vicinities; and the betterment will belong to land owners finally.

(3) Realization of extensive social effects

1) Progress in Japan

Rail-linked Commuter Town Developments

Mechanism in spreading social effects has been realized typically in *major metropolitan areas in Japan. More than 60 years ago, the* first rail-linked commuter town that was named "garden city" was developed at the outskirt of Tokyo at the time. During last three decades, suburban commuter towns along railway corridors have been developed in large-scale within Tokyo and other metropolitan areas. As the background, it was pointed out that nation-wide rapid migrations from rural areas into the metropolitan areas had called for expansion of commutable areas.

Japan's Urban Land Consolidation Method

On other side, existing studies on the actual cases reveals that well-coordinated planning/ program for urban developments with the railway development have contributed the financial success of railway project. Existing studies pointed out two factors of well-coordinated housing development: (a) preceding land acquisitions of a part of railway corridor before the implementation of the railway project; and (b) a system of Urban Land Consolidation (or Guided Land Development, GLD) in Japan. The details are:

- The former factor makes the railway company or the related enterprise a land owner. After increasing the land value in the future, it will be able to take back the construction costs of the railway project.

- The later factor gives a chance to the railway company to organize a land association for Urban Land Consolidation of areas along the railway corridor. The urban land consolidation can develop a big well-ordered housing complex without large-scale land acquisition. Furthermore the costs for the construction will be financed by selling a part of the site of which land price would increase sharply.

Urban Terminal Area Developments

In the same process, urban terminal areas have been developed into urban core/sub-cores. Terminal Area Developments executed by the railway companies also have encouraged to feed the urban core and suburban rail-linked commuter towns.

City-planning Coordination

On the other hand, local authorities' city-plans have provided the development basis. Because almost all the major cities in Japan were burnt in the Second World War, new city-plans were prepared urgently for all the cities; these plans adopted a Urban Land Consolidation Method to develop well-ordered road network including a station- front-plaza.

Because introducing the rail-based commuter services can reduce a part of road traffic, areas around major stations were given advantage for commercial development and they were planned as the central business/commercial districts of the city and placed at the highest "floor area ratio" district among other areas in the city. The high-level "floor area ratio" above-mentioned is 400% to 800% generally. In addition, the maximum "floor area ratio" permitted in Jakarta is 300%.

Railway as Major Mode for Big Cities

Rail-based Better coordination between city-plans, land developments

and railway developments have brought rapid increase of: population in the railway corridors; working places around terminal stations; and railway ridership. Railway system has been the most popular transport for citizens in three metropolitan areas of Tokyo, Osaka and Nagoya in Japan; during last two decades, the railway systems of three metropolitans have kept about a 50 percent share in the total trips of the areas.

Compact Urban Centers

Popular utilization of railway have contributed to feed compact urban centers around terminal stations. The result of an existing study on 126 terminal stations out of about 1,300 stations within Tokyo Metropolitan Area (as shown Table 4.3.1.1), gives the image of rail-linked urban patterns and compact urban centers, as follows:

a) Major access mode

A terminal in the center of Tokyo has average passengers, getting on/off, of 200,000 a day; 94% of them are used to walk to/from their destinations. In a suburban station, that locates out side of 20 km radius, has 80,000 passengers a day; 23.5% of them use buses against the walking access of 58%.

b) Compact Development around station

A terminal in the center of Tokyo shows an average number of 1,169 workers per hector; a terminal in the suburbs within 20 km of the city center shows an average number of 203 population per hector (in gross density).

4-7-2 Tasks to Coordinate Rail-and-Feeder Improvement with Urban Development

(1) General concepts

Differences in the social, urban and cultural contexts of the both of Tokyo Metropolitan Area and Jabotabek have to be considered in

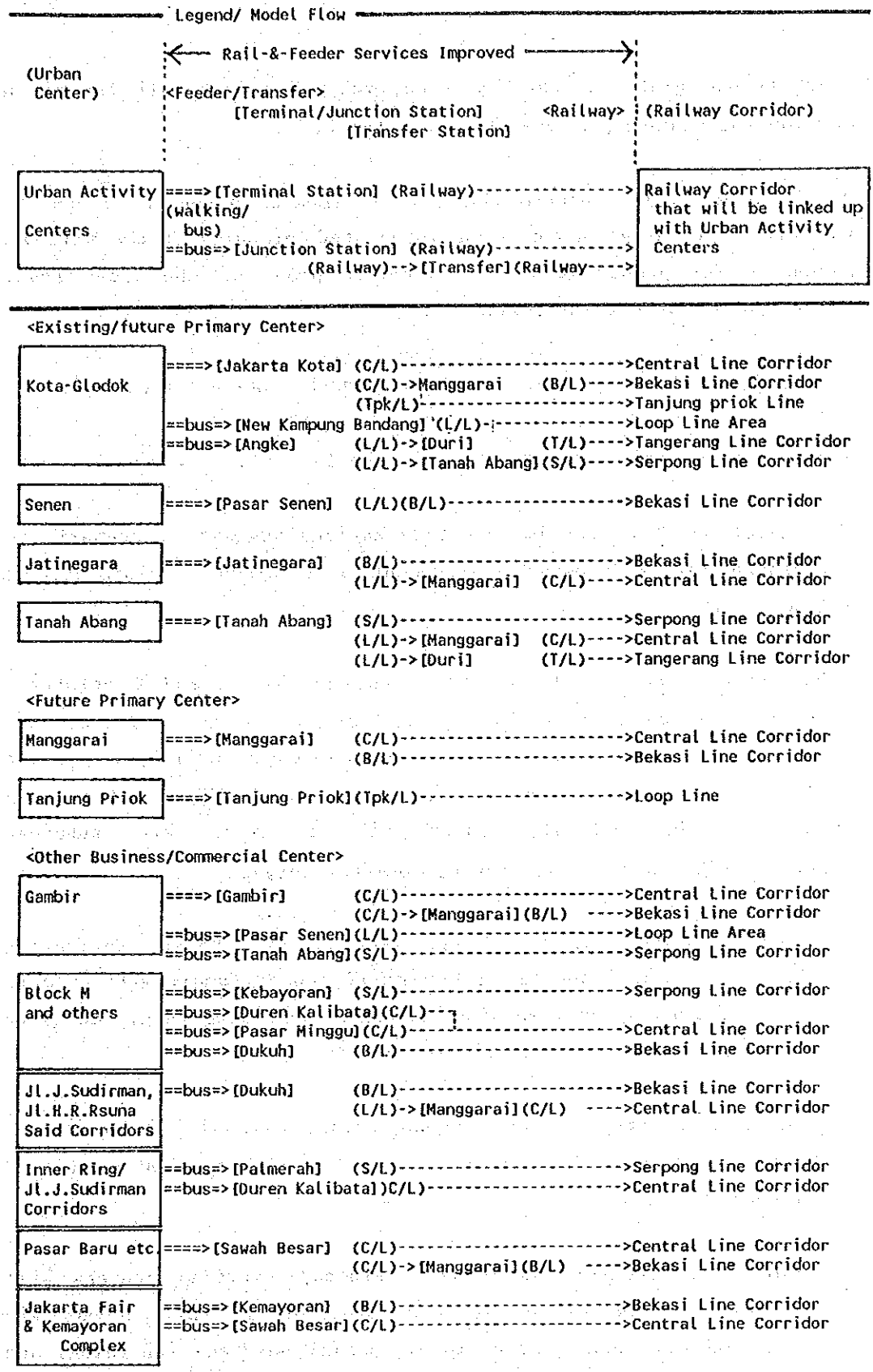


Fig. 4.7.2.1 (Urban Center-to-Railway Corridor) Accessibility Served by Rail-&-Feeder Improvement Project

order to integrate or coordinate the railway impact with the urban development planning of Jakarta and Botabek.

On the other side, because the railway impacts expected is one of the urban planning factors, an integrated planning study will be necessary for preparing a local/detailed plan for the area around major station or railway corridor.

(2) Scenario and planning tasks for areas around urban major stations

1) A scenario on impacts exerted by rail-and-feeder improvement project

The selection of urgent improvement stations suggests a scenario to coordinate rail-and-feeder improvement with urban development, as follows:

a) Out of 21 stations, 17 stations are the Type 1 and 2 Strategic Stations (namely, Urban Terminal and Urban Junction) as discussed in Section 4-2-1. As a result, the Jabotabek Railway may serve almost all the main urban centers of Jakarta. Fig. 4.7.2.1 shows how the urban activity centers will be linked with suburban corridors by the rail-and-feeder commuter service.

- Four existing primary centers (Kota-Glodok, Senen, Jatinegara and Tanah Abang) and the governmental center Gambir will be able to be served by only walking or short bus-riding (e.g., delivery bus service) from the terminal stations.

- In future, Manggarai and Tanjung Priok, that will be developed into the Primary Centers, also may be served by above-mentioned feeder modes.

- Blok M, Jl.Sudirman and other business/commercial centers will be able to be served by a combination of rail-and-bus via junction stations. For example, special bus-lane (on-going) and Patas (Express Bus) will offer better combination services via the Dukuh and Duren Kalibata Stations and so on.

b) Then, the Jabotabek Railway will have a chance of changing itself into an attractive alternative mode for commuters and it will offer a chance to change suburban railway corridors also into commutable areas.

c) It will stimulate to increase population within railway corridors and will develop commercial/service potentiality around terminal stations located at the center of Jakarta.

2) Urban development concepts of urgent improvement project on feeder service

To avoid large-scale involvements on the surrounding areas, the urgent improvement project are planned mainly on the right-of-way of railway and road. Table 4.7.2.1 shows how the urgent improvement actions will involve the station's vicinity. However, several stations (e.g., Jatinegara, Pasar Senen, Duren Kalibata, Dukuh, Klender) may be tight in the future due to the large potentiality as estimated for 2005.

Table 4.7.2.1 Grades on Areas Involved for Urgent Projects

Grade	Present Neighborings Involved	Commercial/ Business Area	Populated Housing/Mixed Area	Housing Area/ Developing Area
Grede 1:	- Urgent Work will be carried out mainly within R-O-W of Rail and Road.	Gambir Jakarta Kota(*) Pasar Minggu(*) Pasar Senen(*) Sawah Besar Tanjung Priok	Angke(*)	Bekasi Depok Baru
Grade 2:	- Urgent Work will involve areas along the roads partially.	Dukuh Jatinegara(*) Pasar Senen(*) Tanah Abang(*)	Cikini Klender(*) Manggarai(*)	Duren Kalibata(*)
Grade 3:	- Urgent Work will involve a block or more.		Kebayoran Kemayoran (New site) New Kmp.Bandang	Palmerah

Note. Stations identified by (*) seem to be a little too small to handle the potential demand forecasted; the areas to be involved will be graded up when necessary.
Furthermore Tanah Abang, Manggarai, Jakarta Kota have the second-stage plans/proposals to be expanded.

Because the above-mentioned major stations are located at commercial districts, the future large-scale expansion/development for providing full-scale station plaza or access roads should be designed and executed in coordination with commercial/service redevelopment actions.

3) Future planning tasks for station areas and access roads

To make better performance of rail-and-feeder service improvement, urban development/redevelopment around main stations will be important in the future, in particular for Jatingara, Tanah Abang, Manggarai and Tanjungpriok areas where the commercial developments have not yet reached at the level of the primary center as planned by DKI Jakarta Structure Plan.

Planning tasks for areas around urban major stations are:

- A basic task is, generally, how to coordinate the existing District Plan (RBWK) with railway impacts expected, considering the necessary urban factors in the area. Because the railway impact is one of the planning factor, an integrated planning study will be necessary for the station area.

- An important tasks will be on the planning/implementation method: how to coordinate commercial development projects with the station-front-area transportation planning including station plaza planning and pedestrian network planning; and how to feed the compact urban core/sub-cores around the major stations that will be able to reach at optimum "floor area ratio".

- The later task will be related to urban redevelopment method to control/encourage private sector's development activities in line with: feeding a walking-based compact urban core/sub-cores; and providing the pedestrian network and the space for a station plaza. For example, incentive method that will give higher "floor area ratio" in return of controlling car-parking spaces and providing the spaces for pedestrian and station plaza.

Urban Junction Stations that can serve for main urban centers/sub-centers of Jakarta will contribute to promote the railway ridership considerably because Jabotabek's railway network is not enough. The planning tasks for them are:

- Main tasks are on transportation planning, such as "Rail-and-Bus" combination services for Dukuh, Kebayoran, Duren Kalibata and so on.

- A city-planning task is how to provide necessary access roads, in particular, for stations located at populated areas (e.g., Angke, New Kampung Bandang, Kebayoran). It will solve a bottle-neck to increase the railway ridership at these stations considerably.

- A focus of discussion is on the land acquisition method for collector-level roads and the fund-making system.

(3) Scenario and planning tasks for area around main commuter stations

1) A scenario on accessibility improvement

Fig. 4.7.2.1 also shows the railway corridors to be linked to the major urban centers of Jakarta. A combination of railway-and-feeder improvement will offer better accessibility to areas along railway corridors. Namely, citizens living in the Jabotabek railway corridors will be able to commute one or more urban centers within one hour or one and a half hour travel-time. Compared with bus-based commuter services along the railway corridor in the future, the rail-and-feeder commuter service will be enough attractive in the travel-time and travel-comfortability also. A scenario on commuting in peak hour will be shown preliminarily, as follows:

a) Bekasi, Serpong, Tangerang, and Depok can be connected to the transfer stations on the Central Line by approximately 30 minutes rail trip and 15 minutes feeder trip. It will offer many alternatives for access to other urban centers of Jakarta.

b) Because the headway of train operation will be shortened at 6 minutes for the Central Line and at 10 minutes for the Bekasi Line, the transfer time of rail-to-rail at a transfer station will be shortened at about 8 minutes. Then a commuter may reach other terminal station by 20 to 30 minutes additional rail trip. As a result, a commuter from a suburban town may commute to an urban center around the Loop Line within approximately 65 to 75 minutes.

c) As a result, the Jabotabek Railway Corridors will be changed into one hour or one and half commutable areas of the Jakarta's urban centers. It also will change utility value of the railway corridors as attractive commuter towns and will increase population.

2) Planning tasks for major commuter stations

Problems to Introduce Feeder-Bus Service

Remained tasks on feeder service improvement are how to serve the optimum feeder-bus services in suburban commuter towns. For example, 15 minutes walking have approximately 150 ha (area of 700 meter radius of a station) and 15 minutes bus-riding will have 2,200 ha (area of 2.6 km radius). Namely, feeder bus services can expand the station catchment area considerably.

However, the suburban corridors have the urban/physical restrictions to introduce full-scale feeder-bus services, as follows:

- It is not easy to find large-scale undeveloped areas within the hinterland of suburban stations because the hinterlands consist of mixed land uses, such as scattered rural villages (Kampung), partially developed housings, farm lands, and river, forest and so on.

- Due to the land use characteristics, the station's hinterlands are covered by poor road network where roads available for bus-operation are lacking.

Short-Range Scenario of Depok Baru and Bekasi

Fig. 4.7.2.2 shows the improved rail-and-feeder commuter services for Depok and Bekasi areas. Citizens living in both areas may/will enjoy available commuter services to almost all the major urban centers of Jakarta, as follows:

a) At the present, the Central Line only is available for serving commuter services in peak hour headway. The Jabotabek Railway cannot serve the commuter services in the network.

b) The urgent project and Option "b" for 1992 will shorten the headway of other lines; then it can offer the commuter services in the network.

c) Because Depok Baru and Bekasi have been and will be developed as commuter towns and the road network are rather better, urgent projects in front of stations will make a chance for introducing feeder-bus services.

Hinterlands of both stations will have desirable potential demands, as follows:

- Housing complexes for low-income/middle-income households exists.
- The Structure Plans of Depok and Bekasi have planned the road network relating to the stations.
- The plans have projected the population at 500,000 for Depok (up to 2005) and at 700,000 for Bekasi (up to 2005).

However, the planning problems to be coordinated with the urgent project are:

- Depok Baru

  The access road from the east housing developments should be given priority; an arterial road from there to the station, but it has to cross over the artificial lake. And the development

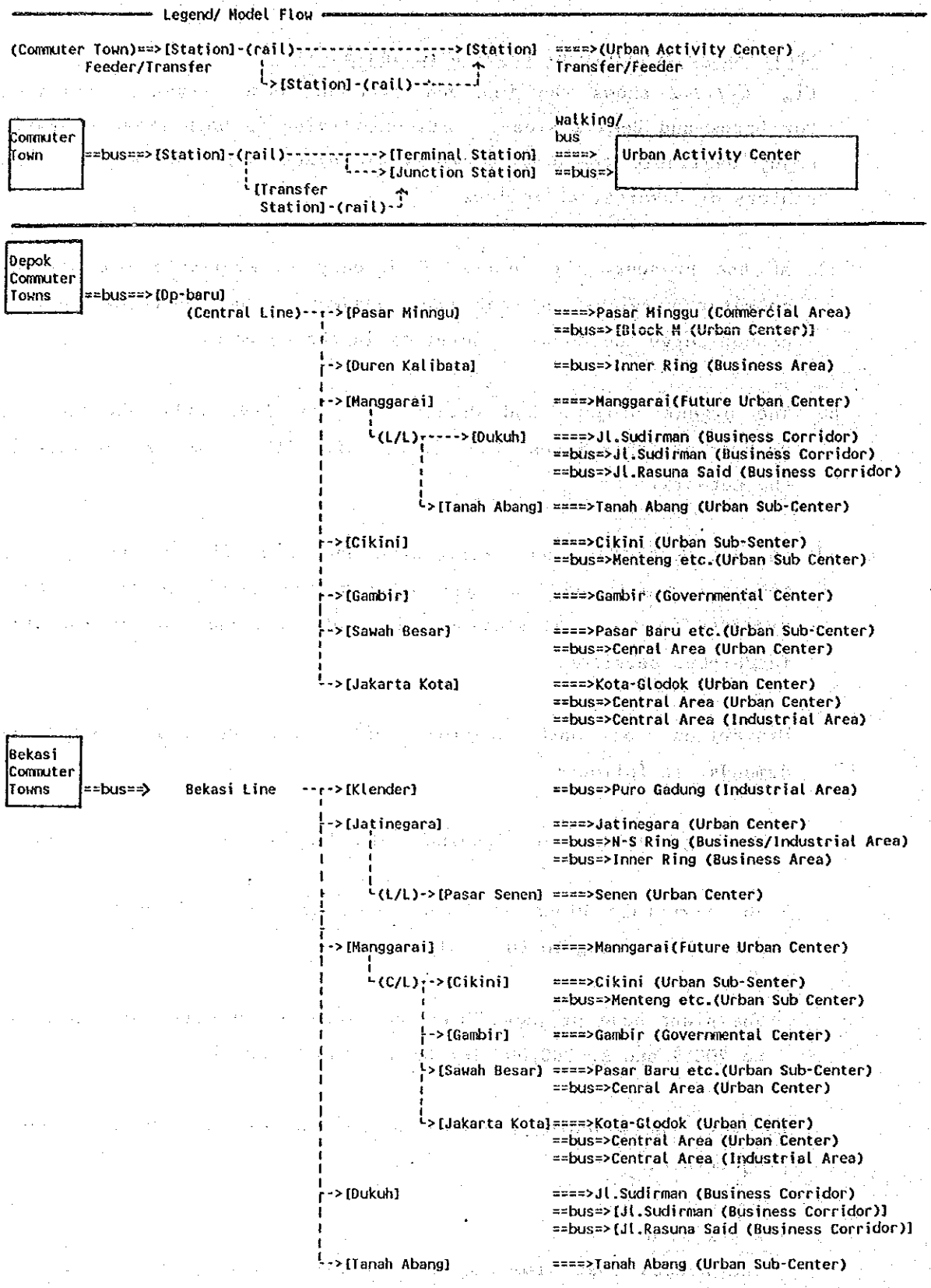


Fig. 4.7.2.2 Improved Accessibility from Major Commuter Stations to Urban Activity Centers

plans for the station's vicinity will be reviewed regarding the station's activities and rooms of the railway's right-of-way.

- Bekasi
  The road network related to the station and the development plan around the station should be reviewed to coordinate with the railway improvement.

- The both corridors of Central Line and Bekasi Line have the competitive road access to Jakarta. The hinterlands of the stations will be served by rail-based and road-based commuter services; but accompanied with the advancement of rail-and-feeder service improvement, the advantageous service areas together should be identified and the direct access buses to the center of Jakarta should be rearranged.

3) General planning tasks for suburban commuter stations

Urban Land Consolidation Introduction

As mentioned above, it is the key tasks how to improve the poor road networks around stations and how to develop the station's hinterlands effectively. Urban Land Consolidation is expected to be an available method. A model case is under way at Cibinong, guided by a land development institute under the Ministry of Home Affair, Bappeda Kab.Bogor and so on.

However, the optimum planning/implementation methods are necessary for Jabotabek, considering the Indonesia's social/cultural/urban contexts (e.g., land tenure system, land prices and tax, fund-making system for community-level facilities and so on). In particular, it will be important to supply mass-product low-cost housings because low-/middle-income householders will be majority of railway ridership.

In addition, the following concepts also will be important for the adoption into Jabotabek:

- To integrate the new housing areas with existing Kampung villages and farm lands, considering the environmental and farming systems.

- To utilize the rail-based commuter services for assisting the fund-making of constructions.

CHAPTER 5 GRADE SEPERATION ON E/L

CHAPTER 5 Grade Separation on E/L

5-1 Urban Circumstances on E/L Corridor

5-1-1 Present Urban Circumstances on E/L Corridor

(1) Area along E/L

Location. The Eastern Line runs through the periphery of the central area of Jakarta.

Land Use. Due to the nature of activity in the central area, the E/L corridor can be divided into three parts: north, central and south:

- North.
  The north of Jl. Garuda includes industrial, trading, commercial and housing areas, related to the Kota-Glodok or Ex-Airport. Jl. Industri, Jl. Angkasa and Jl. Garuda are the axes of activity.

- Central.
  Activity in the central parts focuses on Senen; general areas in the populated housing area. Jl. Let. Jend Suprapto is the main access to central Jakarta from the east.

- South
  The south of Jl. Let. Jend. Suprapto runs through the populated housing area; Jl. Pramuka, a main axis for central Jakarta, spreads commercial/business activities out to the E/L from the center.

(2) Station neighborhoods

Three stations out of seven are located in areas of urban activity:

- Rajawali beside Jl. Industri
  The vicinity includes the factories, warehouses and housing areas.

- Kemayoran (New Location)
  The details are in 4-3-1 and 4-4-3. In front of the station is the site of a former airport; the offices related to the airport, facing the station, are scheduled to move elsewhere. In back is a well-arranged housing complex.

- Pasar Senen
  The details are in 4-3-1 and 4-4-3. It faces the Senen commercial/business district. In back are mainly populated areas.

Four stations are surrounded by populated housing areas; New Station (proposed between the new Kemayoran and Pasar Senen) and Gang Sentiong are located just at populated housing areas; but Kramat includes the factory super-blocks and a governmental facility (Directorate General of Medicine and Food).

5-1-2 Future Development Directions

(1) Development projects and planned directions on E/L corridor

1) Development Projects
The on-going/committed projects related to the E/L Corridor are the Kemayoran Complex Development and Senen Triangle Redevelopment mentioned above.

The Kemayoran Complex Development will involve the vicinities of Rajawali and Kemayoran (new location) Stations; and it will promote urban activities over the Eastern Line from the central area; Jl. Angkasa will be a main axis, as mentioned in 4-3-1.

2) Long-Range development directions of E/L corridor
RBWK, the DKI's legalized District Plan, shows the long-range development directions of land, roads and other public facilities. The future E/L Corridor will be of two parts, the North and the South, by the planned land use, as follows:

- North

  The north of Jl. Let. Jend. Suprapto, namely the present North and Central parts, is planned generally to accept/introduce urban activities in future. The present housing areas along E/L are classified as at 'Housing/Public Building Mixed' area allowing three stories or more.

- South

  This is planned to be mainly a 'Housing' area to conserve/rehabilitate the residential environment.

RBWK also plans a Transportation Corridor consisting of the E/L and a road or two roads parallel to railway; the areas that will face the corridor are planned as 'Housing/Public Building Mixed' area mentioned above.

The 'Commercial/Business' area is located mainly around Pasar Senen and at the arterial road corridors, such as Jl. Angkasa, Jl. Garuda. Jl. Let. Jend. Suprapto, and Jl. Pramuka, and so on; 'Industry' is located at the north of Rajawali.

(2) Necessity of grade separation and impact of track elevation from urban aspects

1) Necessity of grade separation

From the viewpoint of future urban structure, the northern part of E/L, namely between the northern Jl. Mannga Dua and the southern Jl. Let. Jend. Suprapto, will need grade separation; due to a close relationship between the central and eastern areas, in particular, the Kota-Glodok, Pasar Baru or Senen and the Kemayoran Complex Development.

E/L track elevation will be more advantageous than a set of road-flyovers, because:

- A flyover of urban streets will separate and disturb the intimate urban circumstances, such as commercial atmosphere and urban

amenity; these factors will be evaluated at higher position in future, for Jl. Angkasa, Jl. Garuda, Jl. Let. Jend. Suprapto and so on.

- Several flyovers will have problems handling the local car flows around them, such as Jl. Industri, Jl. Let. Jend. Suprapto and so on.

- Fundamentally, the track elevation will free the ground level and all activities between the two sides.

- Furthermore, the utilization of space under the viaducts will add value to the Transportation Corridor.

2) Environmental impact of E/L

The main environmental impact of E/L track elevation will be noise pollution. DKI has environmental criteria for noise, as shown in Table 5.1.2.1.

Table 5.1.2.1 DKI's Environmental Criteria for Noise

Land Use	Maximum desired	Maximum allowed
Housing	45 dbA	60 dbA
Industrial/Office	70	70
Commercial/Business Center	75	85
Recreation	50	60
Housing/Industry Mixed	50	50

Source: Kuputusan Gubernur Kepala Daerah Khusus Ibukota Jakarta
Tanggal 7 Juni 1980;
No.: 587 Tahun 1980'

Noise pollution from the elevated track seems not to be a serious problem, because:

- RBWK plans general improvement/development of collector roads on both sides of the railway; areas along the roads are planned as 'Housing/Public Building Mixed' areas, not as pure 'Housing'.

- As a result, buffer-space will be provided for the surroundings. Furthermore a slightly lower environmental criteria for noise than in the 'Housing' area will be allowed in 'Housing/Public Building Mixed' areas.

And,

- There are technical methods for reducing the train's noise on the viaduct.

3) Future utilization of space under viaduct

a) Station areas

Space under the stations will have the advantage of utilization due to the large space (about 20 or 40 meters wide and about 300 meters long) and the daily concentration of people (railway users and others).

- Rajawali

Sited at Jl. Industri, it will cover the Jakarta Fair, scheduled to be open until 1992, within a 1-km radius. It can work as a effective junction for large-scale exhibitions at the grounds; the space under the elevated station, about 40-meters wide and 400-meters long, can provide space for handling a crowd of visitors.

- Kemayoran

As mentioned in 4-4-3, the station will be the main junction for the Kemayoran Business/Trading Complex and a Perumnas Urban Housing, and Pasar Baru district. The space under the station can be utilized for commercial/service purposes due to the advantageous location.

- Pasar Senen

The large space under the four-track station can be utilized for transportation and commercial/service purposes.

The vicinities of the remaining stations are planed generally to be small-scale 'Housing/Public Building Mixed' areas surrounding the housing area.

Other stations and their vicinities, surrounded by populated areas, will be stimulated into the local commercial/service centers due to future increases in railway users.

b) Areas between stations

The space under the general viaduct between stations will be restricted in shape; a 10 meters wide with continuous piers. But track elevation will provide continuous space about 3.5 meters in width at both sides under the viaduct. It will be an atractive alternative to utilize the above-mentioned space for pedestrian path along planned roads.

5-2 Present Situation of the Eastern Line

5-2-1 Railway Facilities

The Eastern Line is a double-tracked electrified route extending 12.5 km between Jakarta Kota and Jatinegara Stations. The route includes a quadrupled-track 1.9 km section between Rajawali and Kemayoran Stations, where a double-tracked line runs parallel in the direction of Tanjung Priok.

With completion of the improvement of the New Kampung Bandan Station which is now in progress, it is expected that the Eastern Line will be directly connected with the Western Line and will result in loop line operation.

(1) Track facilities

1) Plan and profile

As for the horizontal alignment of the line, there are many curved sections between Jakarta Kota and Rajawali and between Pondok Jati and Jatinegara. However, the section between Rajawali and Pondok Jati is for the most part straight except for the portions near Pasar Senen Station. On horizontal curves the radii vary from 300 m to 2000 m.

As for the vertical alignment, the line inclines upward from Jakarta Kota toward Jatinegara. The average gradient is less than 1‰ between Jakarta Kota and Gang Sentiong Stations and about 2.3‰ between Gang Sentiong and Jatinegara Stations. There are no sharp gradient. Fig. 5.2.1.1 shows the existing track layout.

2) Structure

As for the roadbed, the section between Pasar Senen and Jatinegara Stations is of stable low-embankment structure to accomodate the mild topographical inclination which runs downward from west to east.

As for bridges, there are pony trusses (two girders for the up track and the down track) across the Ciliwung Canal which is located at

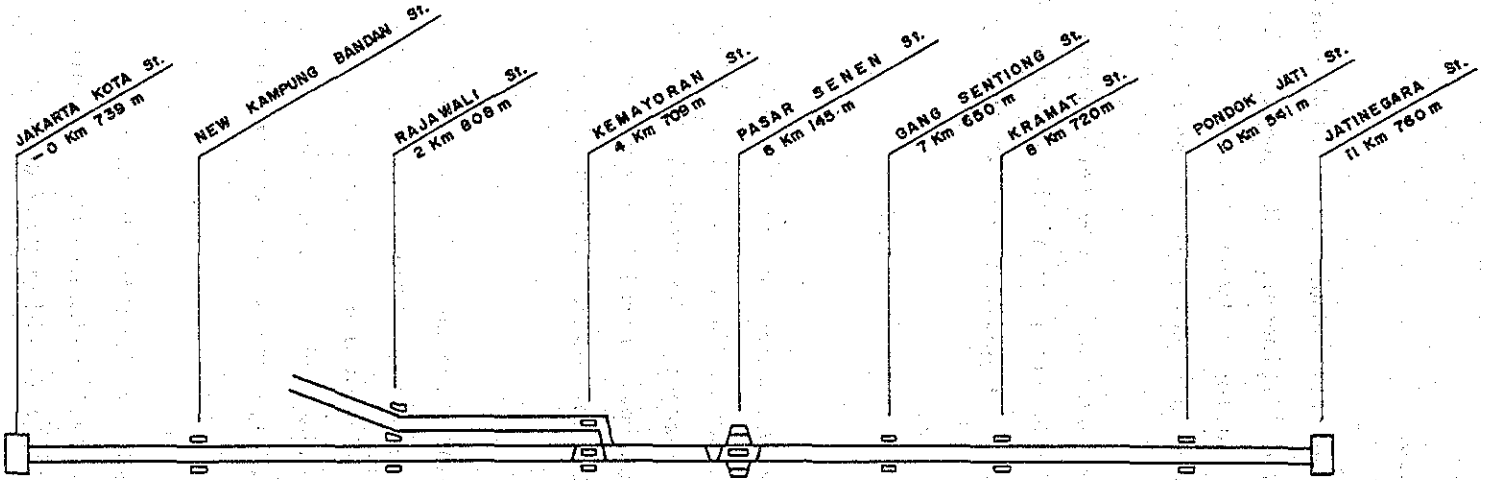


Fig. 5.2.1.1 Existing Track Layout of the Eastern Line

about 2.15 km from Kota Station. However, there are some problems with regard to their maintenance as the clearance between the river surface and the bridge is insufficient and the low-chord members are always in the water. There are no large-scale concrete bridges on the line.

3) Track

Management of the rails, the sleepers, turnouts, the ballast and the roadbed is of paramount importance to ensure the safe operation of rolling stock.

According to the field study, conditions of the track on the Eastern Line (Jakarta-Jatinegara) were largely as follows.

rails Types R.54 (H=159) and R.60 (H=172) are in use. Corrugation and engine burn from racing were observed on one section. Rails on curved and on straight sections are used appropriately, and have had their useful life plolonged.

sleepers PC sleepers and Pandrol clips are used on straight sections, and wooden sleepers and F-model fasteners on the curved sections, securing the railway gauge. As the fasteners near railway crossings easily come loose, they must be inspected with care.

turnouts Each station is equipped with DSS and SSS, but everywhere one finds turnouts which are impossible to use. Special turnouts should be kept to the minimum necessary and, in the interests of safety and manintenance, be replaced with normal turnouts.

ballast It would be highly desirable to standardize the quality and shape of the ballast, but the disorder of quality and shape of the ballast on one section (Kramat-Pondokjati) results in poor drainage and mud. The depth of the ballast must be never less than 250 mm below the bottom of the sleepers.

roadbeds The roadbeds are in good condition. As the strength of rail supporting is weak, the track irregularity is easy to develop. It is necessary, therefore, to maintain the shape of the roadbed and to improve drainage.

(2) Station facilities

Between Jakarta Kota and Jatinegara Stations, there are 6 stations. They are; Rajawali, Kemayoran, Pasar Senen, Gang Sentiong, Kramat, and Pondok Jati. The average distance between adjacent stations is 1.8 km.

1) Rajawali Station

This station is located 2.8 km away from Kota Station and has three platforms and four tracks. A double-tracked line runs from this station in the direction of Tanjung Priok. The platforms are of medium height, 0.4 m from the rail surface. The island-type platforms are between 2 and 6 m wide and the separate type are 2.5 m wide.

2) Kemayoran Station

This station is located 4.7 km away from Kota Station and has three island-type platforms and four tracks. The double-tracked line running in the direction of Tanjung Priok converges at this station with the Eastern Line. The platforms are low approximately 0.1 m from the rail surface. The platform width varies from 1.9 to 9.5 m.

3) Pasar Senen Station

This station is located 6.1 km away from Kota Station and has one platform and six tracks. As its name shows, this is a very important station as it is located in the large-scale commercial region, Pasar Senen. Although it has a station plaza, its function in connection with other means of transport is insufficient as is exemplified by the fact that buses do not enter the plaza. The platforms are of medium height, 0.4 m from the rail surface. The platform width is

17 m, and the main station office and platforms are connected by an underpass.

4) Gang Sentiong, Kramat, and Pondok Jati Stations

These stations are intermediate stations located in residential areas and they have two separate-type platforms and two tracks. Gang Sentiong Station is unmanned.

Platforms at these stations are of medium height, 0.2 to 0.3 m from the rail surface, and the platform width varies from 1.8 to 7.0 m.

(3) Electric facilities of section

The Eastern Line is electrified by a D.C. electrification system, and energy for electric traction is distributed by both the Jakarta Kota and Jatinegara substations. Electric railcars receive energy through an overhead contact wire system.

The electric facilities are as follows.

1) Substation

Name of Substation	Capacity
Jakarta Kota	3,000 kw (two 1,500 kw rectifiers)
Jatinegara	3,000 kw (two 1,500 kw rectifiers)

2) Overhead contact wire system

The overhead contact wire system is a simple catenary type with double contact wires, and is supported by rigid cantilevers mounted on steel masts.

At both end of Pasar Senen Station, there are airsections that enable power in the section to be independently cut off.

For this reason, there are feeder wires 1.5 km in length for both the up-and down-sides of this sections.

3) Disconnecting switch between stations

On the approximately 12 km long Eastern Line, there are station interval disconnecting switches near Rajawali, Kemayoran and Kramat Stations. The power substations and feeding system network are shown Fig. 5.2.1.2.

(4) Signalling and telecommunications

1) Signalling

The Eastern Line is provided with semaphore signals, mechanical interlocking devices, and mechanical points as signalling systems.

a) Block system

The Eastern Line between Jakarta and Jatinegara is equipped with the block systems using S & H tokenless block systems with semaphore signals.

b) Interlocking device

Jakarta, Pasar Senen and Jatinegara have S & H lever frames equipped with local blocks. There are also S & H lever frames in Rajawali, Kemayoran, Kramat and Pondoki Jati. Gang Sentiong has no interlocking device.

c) Level crossing protection device

The 12 automatically controlled barriers with alarms are provided for the Eastern Line. There are also 2 manually operated barriers with automatic alarms and 1 manually operated barriers without automatic alarm. The status of the existing level crossing protection devices is shown in Fig. 5.2.1.3.

2) Telecommunications

The fixed stations of the VHF radio utility system are located at Pasar Senen and Kemayoran. The overhead cable of 40 pairs is provided for some section of the line. The overhead bare wires of 18-20 wires are also used for the line.

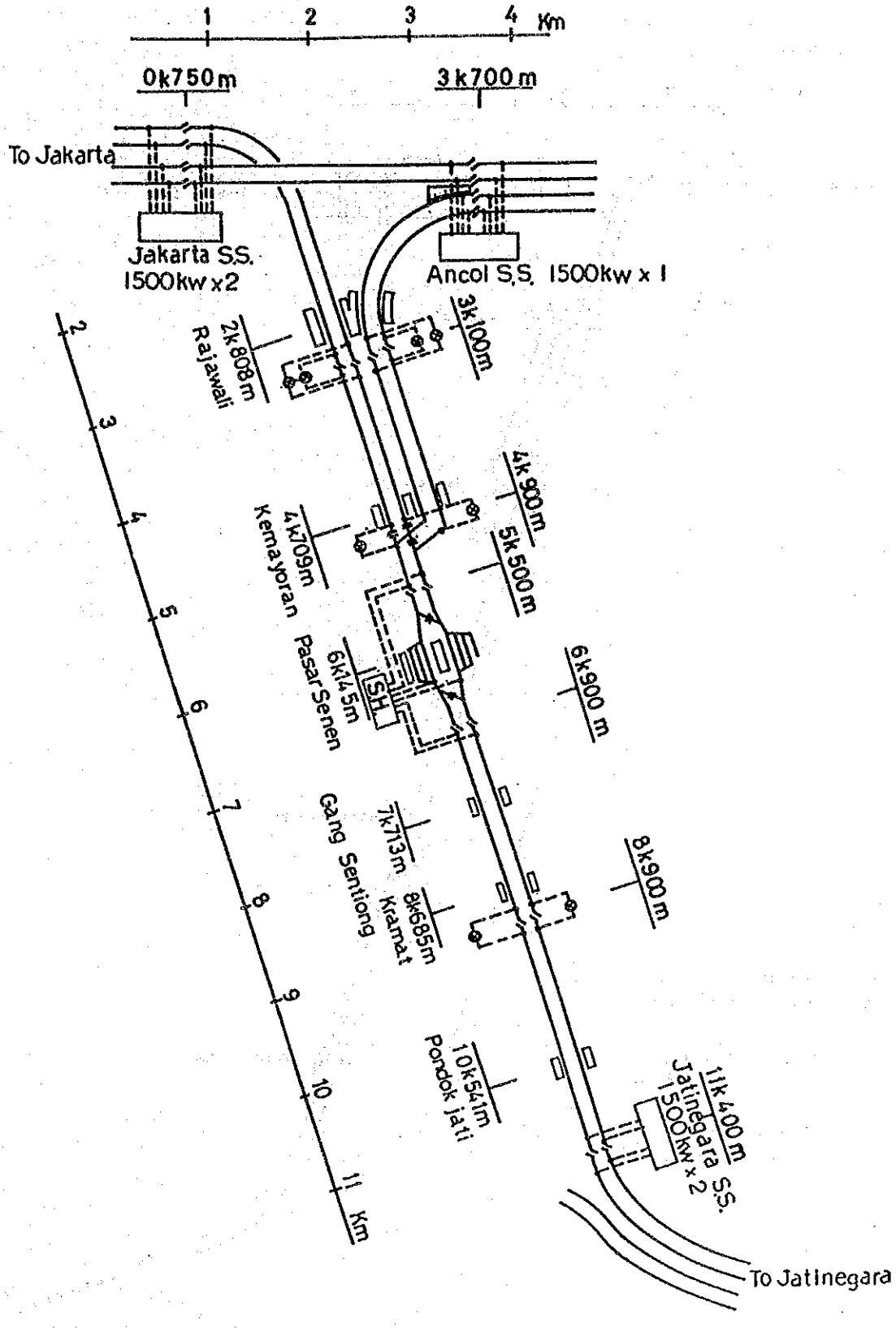


Fig. 5.2.1.2 Power Substation and Feeding System Network (1989)

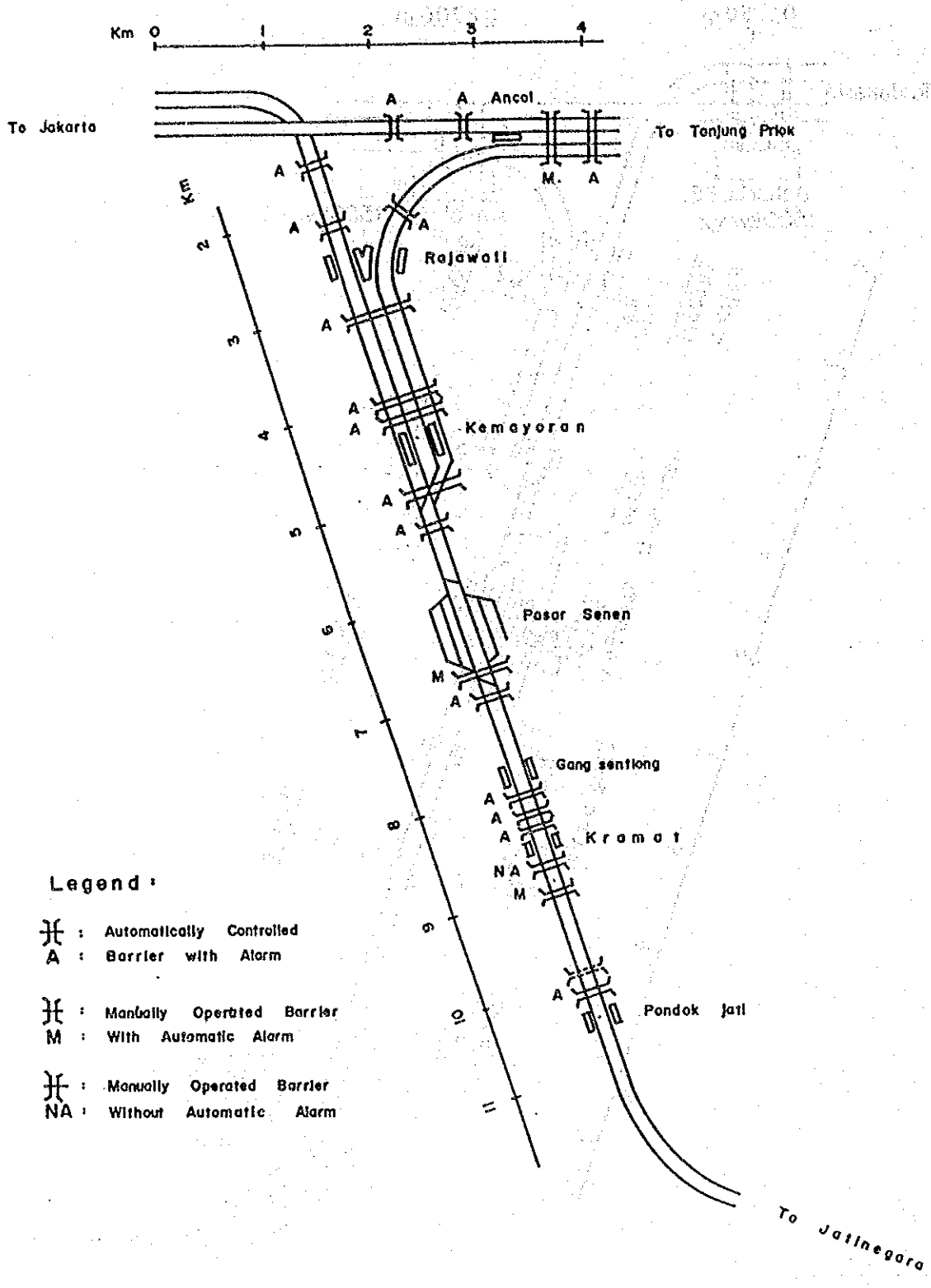


Fig. 5.2.1.3 The Existing Level Crossing Protection Devices

5-2-2 Level Crossings and Crossing Roads

Along the Eastern Line, there are 15 level crossings, and they are shown in Table 5.2.2.1, and a map of the surrounding area is shown in Fig. 5.2.2.1.

Table 5.2.2.1 Existing Level Crossings on E/L

No	Station to Station	Km	Name of Road	Situation of Road			
				Width (m)	Lane	Way	Existing Traffic Volume PCU. 1989
1	Kota ~ Rajawali	1K 300M	Jl. Manggadua	50	10	Both	55,994
2		2K 185M	Jl. Gunung Sahari	30	8	Both	96,464
3	Rajawali ~ Kemayoran	3K 110M	Jl. Industri	12	2	Both	31,160
4		4K 255M	Jl. Angkasa	12	4	Both	69,842
5		4K 570M	Gang Spoor	4	2	Both	1,262
6	Kemayoran ~ Pasar Senen	4K 780M	Jl. Garuda	20	4	Both	68,589
7		5K 445M	Jl. Kepu Selatan	10	2	One	49,578
8	Pasar Senen ~ Gang Sentiong	6K 250M	Jl. Let Jen. Suprapto	35	8	Both	131,192
9		6K 890M	Jl. Tanah Tinggi	4	1	One	19,960
10	Gang Sentiong ~ Kramat	7K 708M	Jl. Kramat Sentiong	8	2	Both	15,270
11		8K 484M	Jl. Percetakan Negara	14	2	Both	30,965
12	Kramat ~ Pondok Jati	8K 766M	Jl. Salemba Tengah	6	2	Both	11,571
13		9K 045M	Jl. Pramuka	35	10	Both	119,012
14		9K 865M	Jl. Tegalan	4		Pedestrian Only	2,922
15		10K 473M	Jl. Achmad Dahlan	6	2	Both	15,795

(1) Jl. Manggadua

This is a newly constructed road south of Jakarta Kota Station. It crosses the Central Line, Eastern Line and Ciliwung Canal and connects to Jl. Gunung Sahari. The distance to the Canal is less

than 100 m which makes access difficult. It will be extended toward the east and be linked to the Harbor Road at about Ancol. There is a Navy building which faces the Jl. Gunung Sahari. In the vicinity of New Kampung Bandan Station, the construction of commercial buildings is in progress.

(2) Jl. Gunung Sahari

Jl. Gunung Sahari running south to north crosses the Eastern Line at ground level, and the volume of traffic passing through the crossing is at present the third largest. On the opposite side of Ciliwung Canal, there is a Navy school. Along the road, new buildings are being constructed.

(3) Jl. Industri

There are a number of automobile related plants located along the road, and street stalls handling parts stand one after another. On the eastern side of the Line, the majority of motor vehicles crossing the line turn to the left. However, with development of the site of the former Kemayoran Airport, an increasing number of motor vehicles will go straight.

(4) Jl. Angkasa

The road runs east to west and connects the midtown to the site of Kemayoran, and many office buildings are located in the vicinity of the level crossing. On the western side of the level crossing, this road intersects in the form of a T with Jl. Bungur Beser (6 lanes, 24 m wide) and the traffic volume is great. The distance from the level crossing to Jl. Bungur Beser is relatively short, about 170 m.

(5) Jl. Gang Spoor

The crossing of this road is mainly for daily living and is generally used by pedestrians.

(6) Jl. Garuda

Similarly to Jl. Angkasa, this road runs east to west and connects the midtown with the Kemayoran site, and at present the traffic

volume and the type of passing motor vehicles are almost the same as those at Jl. Angkasa. On the western side of the crossing, it intersects with Jl. Bungur Besar, and the distance from the the crossing is short (about 130 m).

(7) Jl. Kepu Selatan

The road is presently a one-way passage from west to east but has a considerable traffic volume of small and medium vehicles (buses, sedans and bajaj.) The level crossing is closer, about 20 m from J. Bungur Besar. Jl. Bungur Besar and Jl. Gunung Sahari are connected to each other by a few one-way roads.

(8) Jl. Jend Suprapto

The level crossing with this road has the largest traffic volume among all the level crossings on the Eastern Line. It is located close to the shopping quarters including Pasar Senen Station, bus terminal and shopping center. Further, Senen Triangle development is in progress, and as a result there will be more people and vehicles present in the future. Jl. Kramat Bunder is planned to be flied over the Jl. Senen Raya and Jl. G. Sahari Triangle by 1993.

(9) Jl. Tanah Tinggi

This is a one-way road from east to west with a level crossing, and the vehicles are comprised mainly of small buses and bajaj. Pasar Gaplok is located along the track and mainly handles daily necessities.

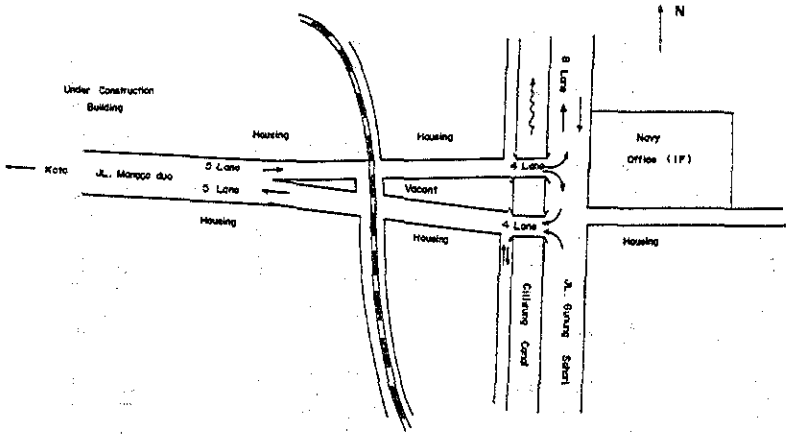
(10) Jl. Kramat Sentiong

This road crosses the Line on the southern side of Gang Sentiong, with considerable bajaj and motor cycle traffic volume. It is connected in one direction to the main road, Jl. Kramat Raya.

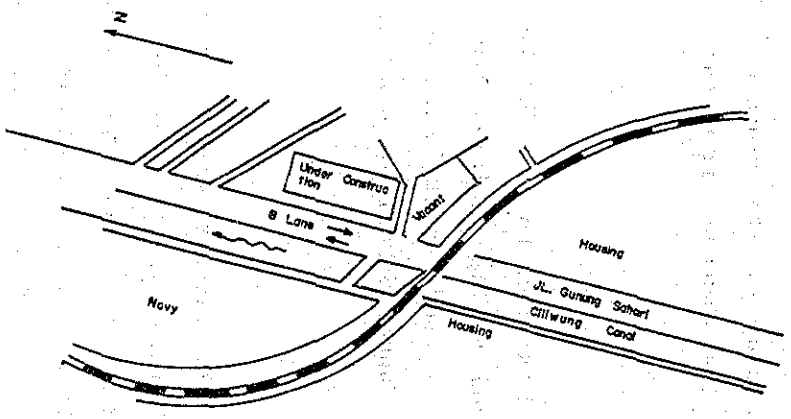
(11) Jl. Percetakan Negara

This is a collector road which connects Jl. Salemba Raya and Jl. Jen. A. Yani through a level crossing. The area around the crossing is a

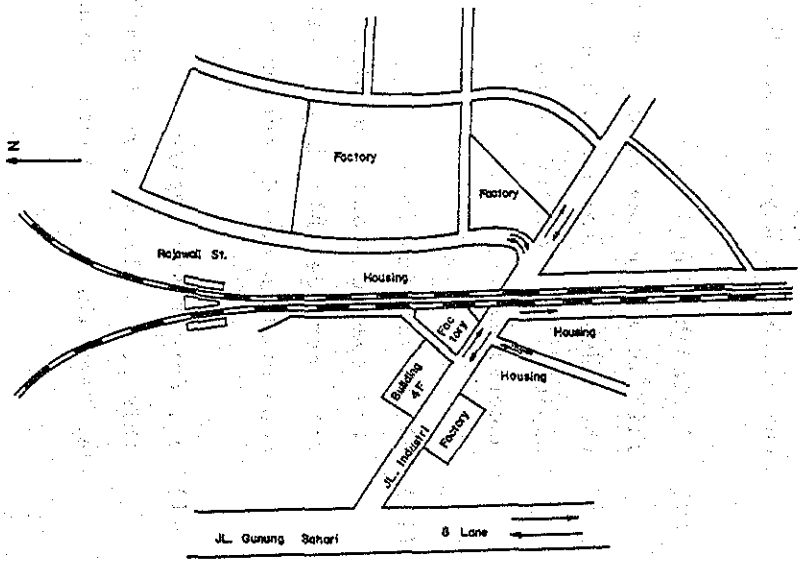
(1) JL. MANGGA DUA



(2) JL. GUNUNG SAHARI.



(3) JL. INDUSTRI



(4) JL. ANGKASA
(5) JL. GANG SPOOR
(6) JL. GARUDA

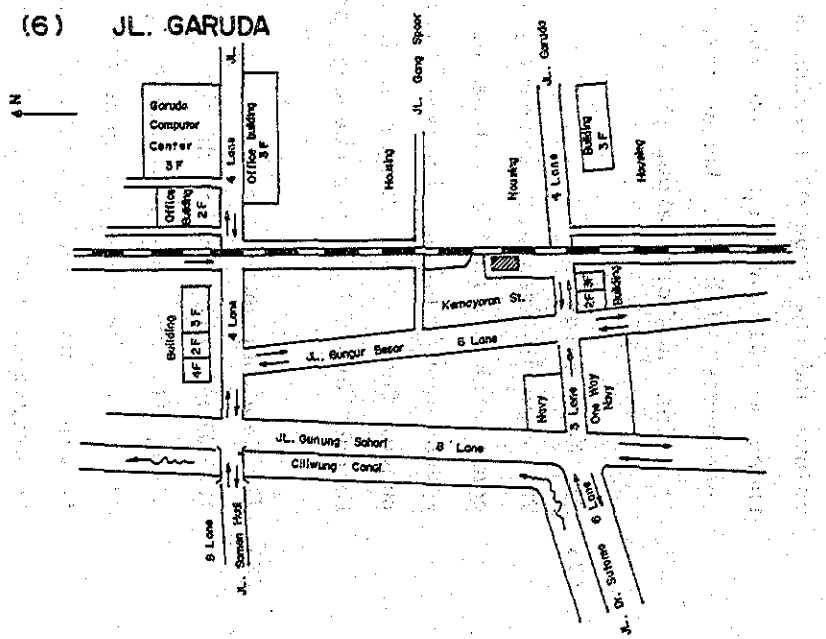


Fig. 5.2.2.1 (1) - (6) Status of Existing Level Crossings

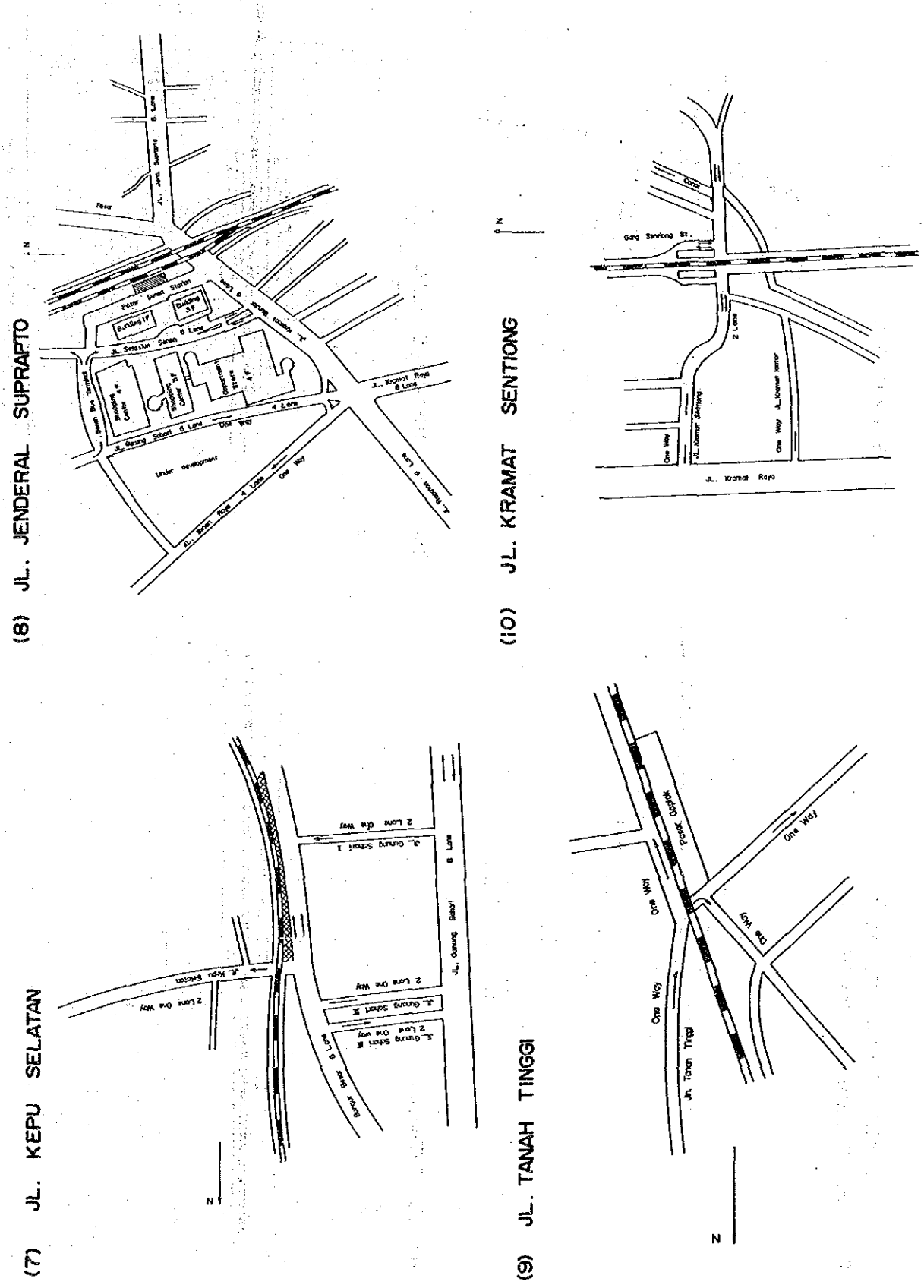


Fig. 5.2.2.1 (7) ~ (10) Status of Existing Level Crossings

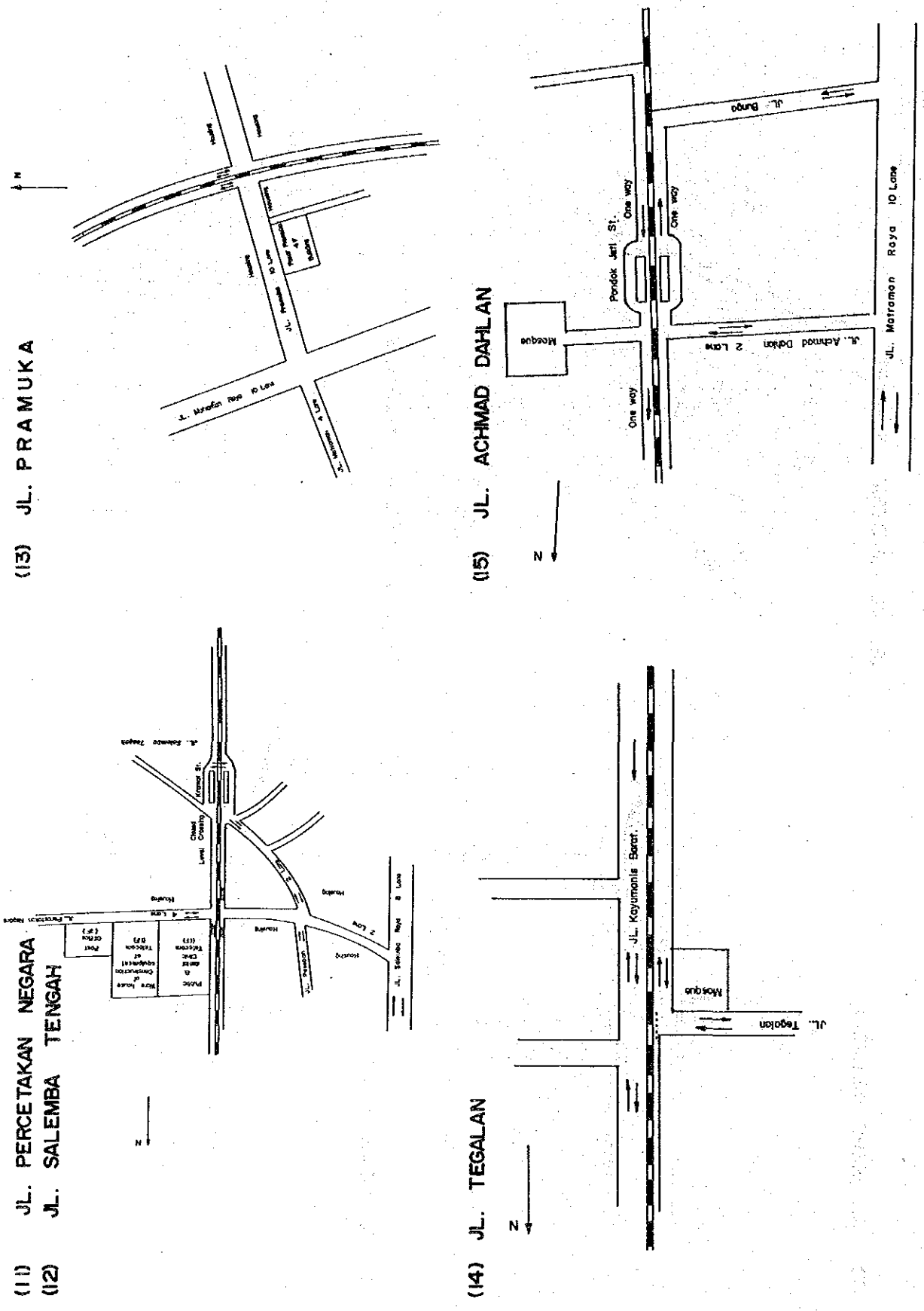


Fig. 5.2.2.1 (11) - (15) Status of Existing Level Crossings

residential quarter but includes a hospital, warehouse, etc. annexed to Telecom. Traffic going to and coming from Jl. Paseban across Jl. Percetakan Negara is considerable.

(12) Jl. Salemba Tenga

The level crossing is located on the southern side of Kramat Station and is small with mainly bajaj and motor cycle traffic.

(13) Jl. Pramuka

This is an arterial road running east to west and has a large traffic volume. A flyover is planned for the intersection with Jl. Matraman Raya.

(14) Jl. Tegalan

The level crossing is for daily living and has rail palisades provided to allow passage of only becak and pedestrians.

(15) Achmad Dahlan

The crossing is in the north of Pondok Jati Station. On the eastern side, it is connected only to a road running south to north. The traffic consists mainly of bajaj and motor cycles.

5-3 Principles of Grade Separation

5-3-1 Necessity of Grade Separation

(1) Traffic volumes on Eastern Line level crossings

Present and future (1998, 2005) vehicular traffic volumes on 15 level crossings along the Eastern Line are shown in Table 5.3.1.1. The total traffic volume across all of the level crossings on the Eastern Line is presently approximately 720,000 vehicles (PCU), and the average growth rate will be about 1.41 times greater in 1998 and 1.73 times greater in 2005. The volume of traffic at the level crossings in 1998 is roughly equal to the present traffic volume of the Central Line where work on track elevation has started. To cope with these future increases in traffic volume grade separation of Eastern Line will be required.

Table 5.3.1.1 Present and Future Vehicle Traffic Volumes on E/L Crossing (Both Directions) - PCU -

Name of Road	1989	1998	2005
1. Jl. Manggadua	55,994 (100)	89,173 (159)	114,978 (205)
2. Jl. Gunung Sahari	96,464 (100)	126,438 (131)	149,751 (155)
3. Jl. Industri	31,160 (100)	38,337 (123)	43,919 (141)
4. Jl. Angkasa	69,842 (100)	80,106 (115)	88,089 (126)
5. Gang Spoor	1,262 (100)	1,631 (129)	1,917 (152)
6. Jl. Garuda	68,589 (100)	101,016 (147)	126,237 (184)
7. Jl. Kepu Selatan	49,578 (100)	69,278 (140)	84,605 (171)
8. Jl. Jend. Suprapto	131,192 (100)	181,105 (138)	219,926 (168)
9. Jl. Tanah Tinggi	19,960 (100)	27,490 (138)	33,347 (167)
10. Jl. Kramat Sentiong	15,270 (100)	21,313 (140)	26,014 (170)
11. Jl. Percetakan Negara	30,965 (100)	47,076 (152)	59,607 (192)
12. Jl. Salemba Tengah	11,571 (100)	17,797 (154)	22,639 (196)
13. Jl. Pramuka	119,012 (100)	185,734 (156)	237,629 (200)
14. Jl. Tegalan	2,922 (100)	4,853 (166)	6,355 (217)
15. Jl. Achmad Dahlan	15,795 (100)	24,222 (153)	30,777 (195)
Total	719,576 (100)	1,015,569 (141)	1,245,790 (173)

Note: The PCU by vehicle type used in this table is derived from Bina Marga Standards.

(2) Number of Eastern Line trains

The number of trains along the Eastern Line is expected to increase as shown below.

Number of E/L Trains (per day for both directions)

1989	1998	2005
78	275	353 (277)

* The number in parenthesis shows the number of trains composed of 12-cars.

The number of trains will increase by 3.5 times in 1998 and by 4.5 times in 2005. This, along with increases in road traffic at level crossings, will result in greatly increased crossing delay time of motor vehicles. The track elevation of the Central Line will have been completed soon, therefore if grade separation of the Eastern Line has not been made by 1998, the city will not be fully integrated, and the merits of grade separation of the Central Line will not be fully realized. Therefore, grade separation of the Eastern Line will have to be completed by 1998.

5-3-2 Preconditions for Grade Separation

(1) Improvement level

1) The following will be improved by 1992 related with the Eastern Line, the Eastern Line, and loop operation on the Eastern and Western Lines will be realized.

a) Automatic signalling on the E/L;

b) Automatic signalling on the W/L;

c) Improvement of Kampung Bandun Station;

d) Electrification and automatic signalling on the Bekasi Line; and

e) Track elevation and automatic signalling on the C/L (Kota-Mri).

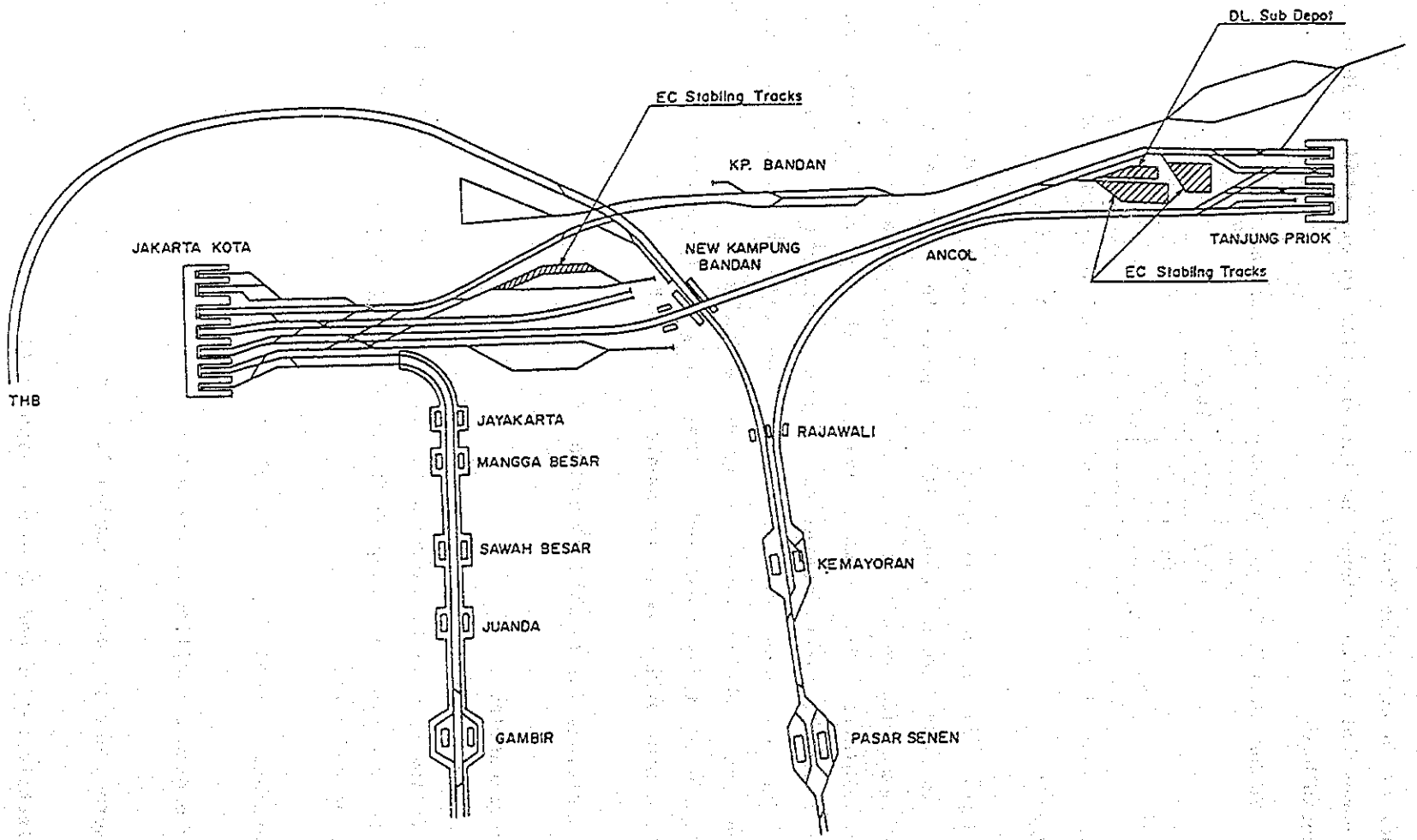


Fig. 5.3.2.1 Track Layout Plan in 1992

2) Relocation of Kota Station will not be completed by the time when grade separation is completed.

3) New Kampung Bandan Station will be constructed as scheduled, and the Eastern Line will cross the Tanjung Priok Line at ground level.

(2) Transportation

1) With 1) e) and 2) above, the middle- and long-distance trains from Bks will be operated via the Eastern Line to the present Kota Station.

2) Pasar Senen Station will be made the origin and destination station for some medium- and long-distance trains.

3) During grade separation work on the Eastern Line, the 1992 railway service level will be maintained.

(3) Station arrangement

There are 9 stations along the 12 km 500 m section between Kota and Jatinegara on the Eastern Line, with an average station-to-station distance of about 1.5 km. When continuous grade separation, flyover or subway construction are to be excuted, the present Kemayoran Station will be relocated about 200 m to the north, and a new station will be constructed between Kemayoran and Pasar Senen, in conjunction with the redevelopment of the Kemayoran airport. At this time, the average station-to-station distance will be about 1.4 km.

(4) Road plan

With respect to the road plan, it is assumed that the project to widen the road as shown in Table 5.3.2.1 will be completed by the time when grade separation will be completed.

Table 5.3.2.1 Existing and Planned Width of Road on the E/L

Name of Road	Existing (Actual)		* Planned width (m)	
	Width (m)	Lane		
1. Jl. Manggadua	50	10	46	
2. Jl. Gunung Sahari	30	8	36	
3. Jl. Industri	12	2	24	
4. Jl. Angkasa	12	4	47	
5. Gang Spoor	4	2	9	
6. Jl. Garuda	20	4	46	
7. Jl. Kepu Selatan	10	2	30	
8. Jl. Jend. Suprapto	35	8	61	
9. Jl. Tanah Tinggi	4	2	22	
10. Jl. Kramat Sentiong	8	2	15	
11. Jl. Percetakan Negara	14	2	20	
12. Jl. Salemba Tengah	6	2	20	
13. Jl. Pramuka	35	10	50	
14. Jl. Tegalan	4	2	15	**
15. Jl. Achmad Dahlan	6	2	15	

Note: * source Tata Kota
** pedestrian only

(5) Geology

In this F/S, no boring test has been made in the area near the E/L grade separation. However, in D.P.U. "Sub Dinas Laboratorium & Pemplidkan Tansh," soil from at least at 10 places where public work was carried out near the Eastern Line was checked, and it was found that the depth having an N-value≧50 is about the same as that of the Central Line. Thus, in designing the continuous grade separation of the Eastern Line and flyover, the foundation depth should be the same as on the Central Line.

5-4 Grade Separation Plan

5-4-1 Subway

(1) Preconditions

1) The subway section is from near Kota to near Jatinegara.

2) The main line is of double-track, and at Rajawali St. branching toward Tanjung Priok is considered.

3) The track layout is:
For Rajawali St., in consideration of a branch from the direction of Tanjung Priok, one platform and two tracks;

For Pasar Senen St., in consideration of the departure and arrival of long distance trains, three platforms and five tracks; and

At the other stations, two platforms and two tracks, will be deployed.

A track layout is shown in Fig. 5.4.1.1.

4) Building and the station facilities will be undergrounded.

(2) Facility plan

1) Horizontal alignment
The horizontal alignment is planned along the eastern side of the Eastern Line so that double track operation of Eastern Line can be continued during subway and station facilities construction work.

Horizontal alignment is shown in Fig. 5.4.1.2.

2) Vertical profile
Between Kota St. and New Kampung Bandan St., a ground-level New

Kampung Bandan St. is planned; there is also a plan to relocate Kota St. in the future. These inevitably require change in the track layout, and so the existing ground level will be maintained for the time being.

Jl. Manggadua will pass over the Eastern Line with the latter kept at the ground level in view of the distance from New Kampung Bandan St.

The subway section is from the 1 km 450 m point at about the crossing with Jl. Manggadua to the 11 km 250 m point before Jatinegara St.

Pondok Jati St. will be relocated for about 500 m toward Kota as an access distance of about 1000 m is required to Jatinegara St.

A diagram of the vertical profile is shown in Fig. 5.4.1.3.

3) Structures

a) The underground tunnel is of parallel circular shields, each of single track, in view of the depth of the structure. The inner diameter of the tunnel will be 6.2 m in consideration of the construction gauge and allowance. A cross-sectional plan of the tunnel is shown in Fig. 5.4.1.4.

b) The station section will be an RC 2-layer structure of a rectangular cross-section in the cut and cover method with steel sheet piles, the first underground level designed for station office facilities and a concourse and the second underground level for platforms.

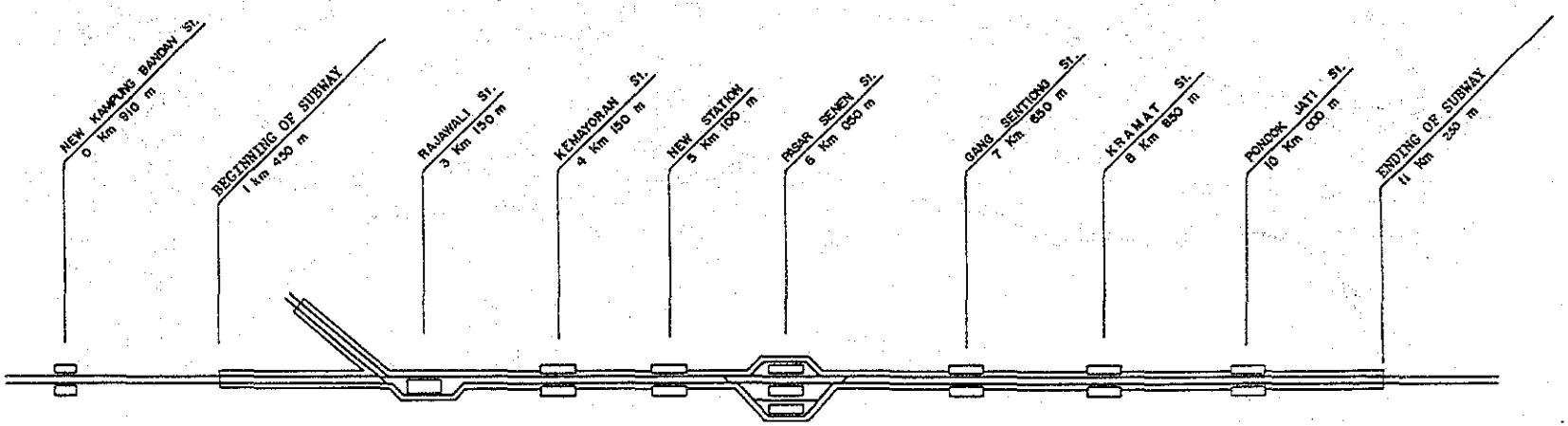


Fig. 5.4.1.1 Track Layout Plan for Subway of E/L

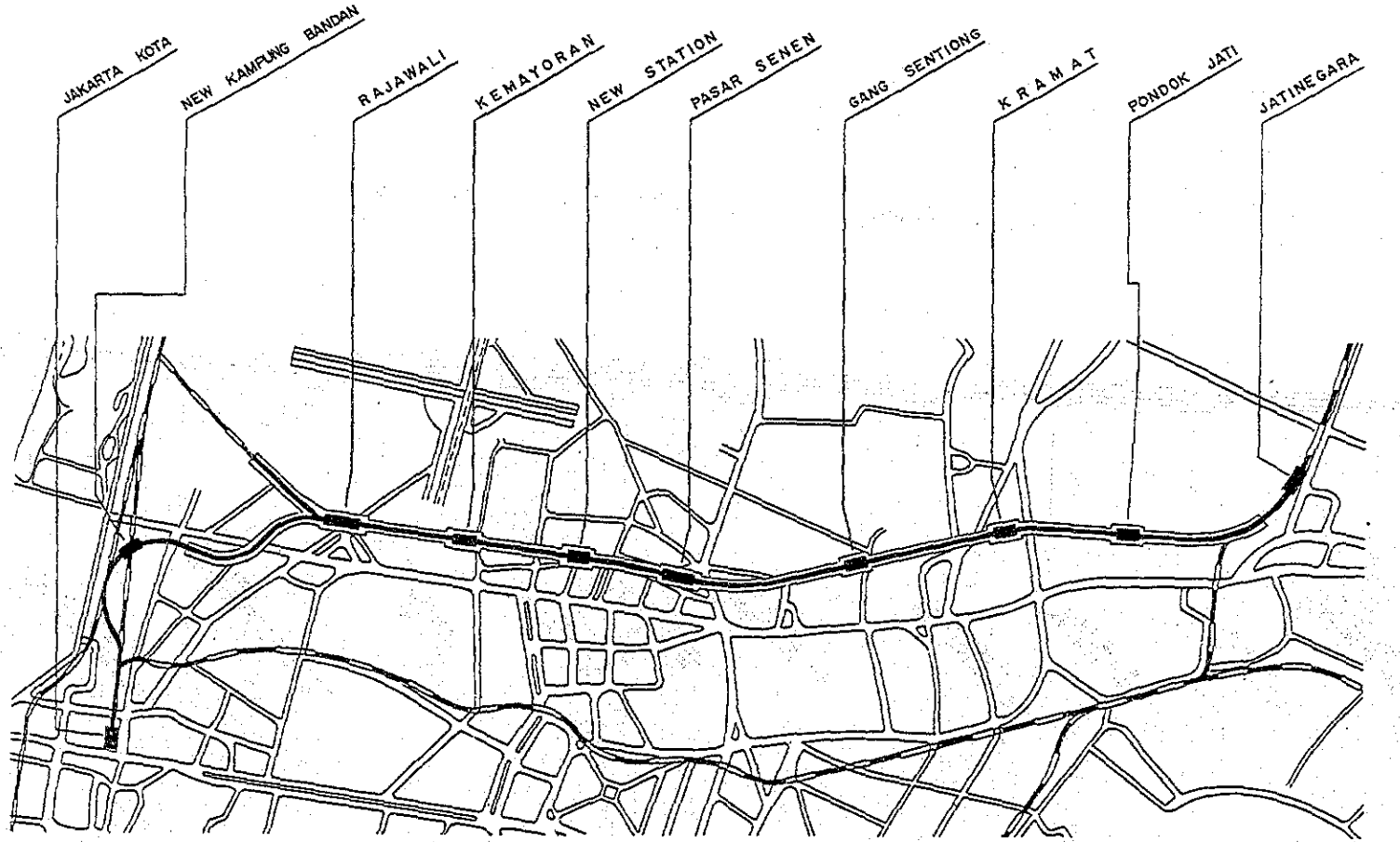


Fig. 5.4.1.2 Horizontal Alignment for Subway of E/L

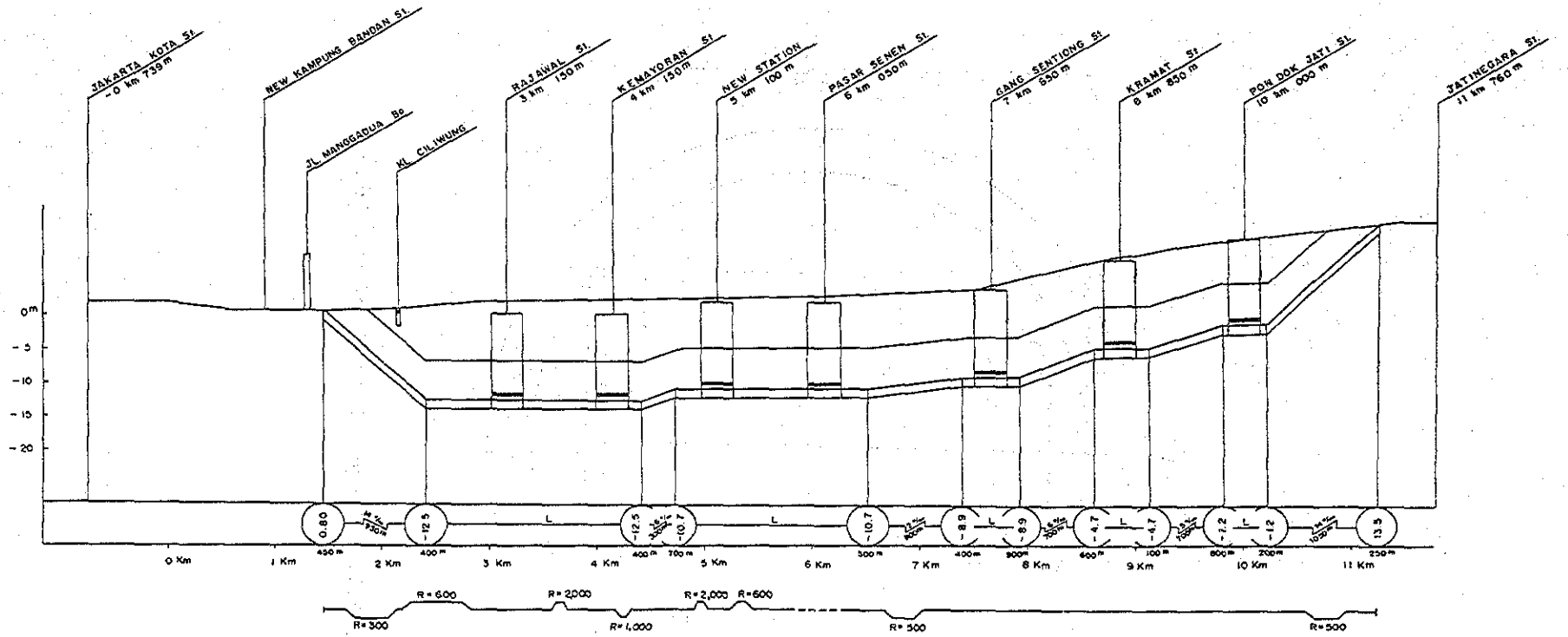


Fig. 5.4.1.3 Vertical Profile for Subway of E/L

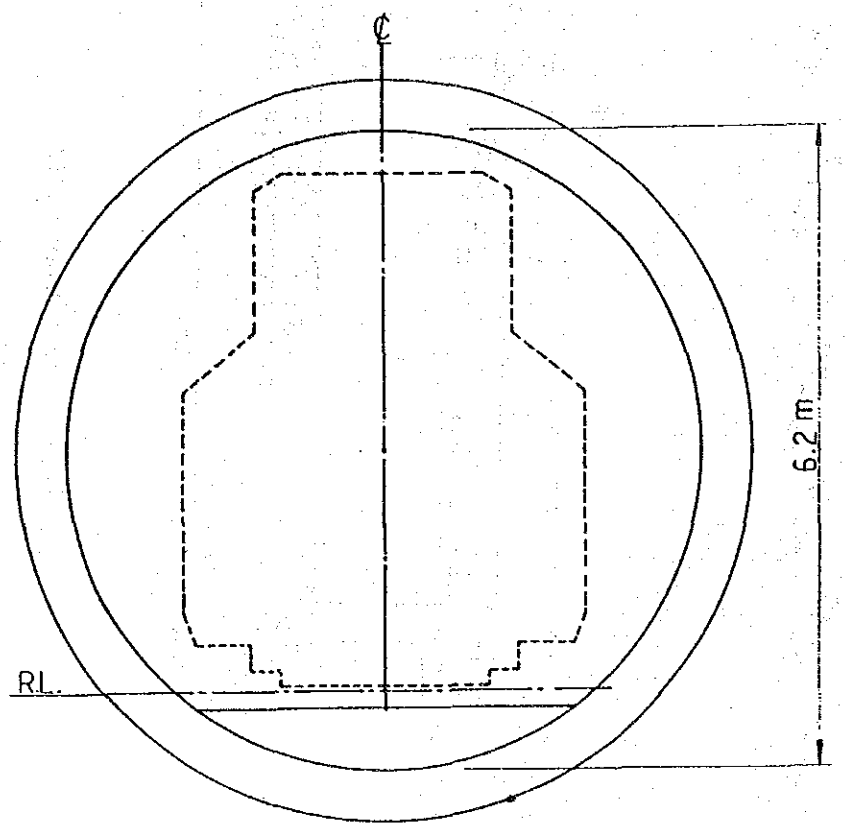


Fig. 5.4.1.4 Cross Section of the Subway

(3) Construction Cost

Based on the above-mentioned preconditions and plans, the investment cost for subway between the point of 1 km 450 m and the point of 11 km 250 (length = 9 k 800 m) both points measured starting from Kota Station, and that for Jl. Manggadua flyover were estimated. The result is as follows:

Subway :	1,474.38 billion RP
Flyover:	35.97 billion RP
Total :	1,510.35 billion RP

Construction cost per km of subway (excluding flyover) is 150.45 billion RP.

As described later, the total investment cost of continuous elevated railway between Kota Station and Jatinegara Station (length = 9 k 600 m) is 565.95 billion RP and cost per km is 58.95 billion RP. Accordingly, cost of subway per km is (150.45 billion RP)/(58.95 x billion RP) = 2.5 times as large as the cost of continuous elevated railway per km.

(4) Various problems relating to subway

1) Problems from the view point of train operation.

a) Problems relating to locomotive

Middle- and long-distance passenger trains and freight trains will continue to be operated on the Eastern Line from now on to the future. Unless all the railway lines in Jawa Island are electrified, these trains must be operated on the underground track of subway pulled by diesel locomotives, or they must be operated pulled by electric locomotives which will be connected to the trains at Jatinegara Station replacing with diesel locomotives.

In case trains are pulled by diesel locomotives on the underground track of subway and there are many number of trains, there will be air pollution problems due to discharge of smoke, which will necessitate the installation of forced ventilation equipment, resulting is increase of investment cost.

In case electric locomotives are connected to the trains at Jatinegara Station replacing with diesel locomotives, electric locomotives must be purchased, and storage tracks and repair depots for electric locomotives must be constructed, again resulting in the increase of investment cost. Besides, usage efficiency of electric locomotives in such case will be very low because of the very short operation section.

Further in order to prevent the railway track from becoming dirty by the muck discharged from the toilet of the trains either usage of toilet by passenger must be prohibited within the underground section, or the equipment for disposing the muck must be installed on the trains.

b) Problems relating to diesel car operation

In case the diesel car trains are destined for Kota Station from the east direction through Jatinegara Station and Eastern Line, two types of train operation can be considered:

a. The same diesel car trains will continue to run on the underground track, or

b. Electric car trains will be operated on the underground track with passenger to be transferred at Jatinegara Station from diesel car trains to electric car trains.

In the former type of operation explained in (a.) above, there will exist the problems similar to those for diesel locomotive operation. In the latter type of operation, there will be problems

that passengers must change trains at Jatinegara Station and that some additional electric cars must be purchased.

In conclusion, both types of train operation will not be advantageous.

2) Construction cost is very large

Compared with the continuous elevated railway, the subway has the same benefit that the road traffic is free from railway level crossings. However to construction cost is 2.5 times as large as that of continuous elevated railway.

(5) Propriety as alternative for grade separation

Examining the various problems associated with train operation and the very high construction cost mentioned above the subway alternative can be judged as being not appropriate for being studied as alternative for grade separation of Eastern Line from the practical point of view.

In this content, there will be a good reason that subway is eliminated from alternatives for grade separation of Eastern Line.

5-4-2 Flyover Plan

(1) Standard specifications

Standard specifications required for the flyover plan are according to "Standard Specifications for Geometric Design of Urban Roads," Jan. 1988, issued by Directorate General of Highways, Ministry of Public Works.

1) P.C.U. (Passenger car unit)

a.	Passenger car/three-wheels motorized vehicle/motorcycle:	1.0
b.	Light truck (gross weight < 5 ton)/micro bus :	2.0
c.	Medium truck (gross weight > 5 ton) :	2.5
d.	Bus :	3.0
e.	Heavy truck (gross weight > 10 ton) :	3.0

2) Number of lanes

Number of lanes for flyover is calculated using the standard design daily traffic, 13,000 (p.c.u)

3) Clearance dimensions

In spite of PJKA's construction gauge, clearance dimentions were decided as follows between counterparts and team.

For road H = 5.1 m
For railway H = 5.9 m
In addition, a work allowance of 0.2 m is considered.

(2) *Selection of flyover sites*

Flyover is planned according to the traffic volume, and the number of lanes is derived from the traffic volume of level crossings in 2005 using 13,000 PCU per lane. The flyovers of less than two lanes are eliminated due to unefficiency.

As the result, 9 sites were chosen, viz.
(1) Jl. Manggadua, (2) Jl. Gunung Sahari, (3) Jl. Industri, (4) Jl. Angkasa, (6) Jl. Garuda, (7) Jl. Kepu Selatan, (8) Jl. Jend Suprapto, (11) Jl. Percetakan Negara, (13) Jl. Pramuka

Six sites were not chosen, viz.

(5) Gang Spoor and (14) Jl. Tegalan where the traffic is mainly comprised of pedestrians; and (9) Jl. Tanah Tinggi, (10) Jl. Kramat Sentiong, (12) JI. Salemba Tengah, and (15) JI. Achmad Dahlan

(3) *Determination of the number of lanes*

However in the following casees, method above mentioned was not used. (2) Jl. Gunung Sahari: Extends from south to north and has 8 lanes. Therefore, it makes no sense to increase the number of lanes only at places where there is a flyover. (8) Jl. Jend Suprapto and (13) Jl. Pramuka require respectively 18 lanes according to calculations. However, such a wide road impedes the sound development of the city and thus the 10 lane maximum was chosen.

Table 5.4.2.1 Traffic Volume of Level Crossings and Number of Lane of Flyover (Both Directions) - PCU -

Name of Road	1989	1998	2005	13,000/lane	Number of lane
1. Jl. Manggadua	55,994	89,173	114,978	8.8	8
2. Jl. Gunung Sahari	96,464	126,438	149,751	11.5	8
3. Jl. Industri	31,160	38,337	43,919	3.4	4
4. Jl. Angkasa	69,842	80,106	88,089	6.8	6
5. Gang Spoor	1,262	1,631	1,917	-	-
6. Jl. Garuda	68,589	101,016	126,237	9.7	10
7. Jl. Kepu Selatan	49,578	69,278	84,605	6.5	6
8. Jl. Jend. Suprapto	131,192	181,105	219,926	16.9	10
9. Jl. Tanah Tinggi	19,960	27,490	33,347	2.6	-
10. Jl. Kramat Sentiong	15,270	21,313	26,014	2.0	-
11. Jl. Percetakan Negara	30,965	47,076	59,607	4.6	4
12. Jl. Salemba Tengah	11,571	17,797	22,639	1.7	-
13. Jl. Pramuka	119,012	185,734	237,629	18.2	10
14. Jl. Tegalan	2,922	4,853	6,355	-	-
15. Jl. Achmad Dahlan	15,795	24,222	30,777	2.4	-

Note: The PCU by vehicle type used in this table is derived from Bina Marga Standards.

(4) Flyover plan

For the railway, the flyover will have a clearance of H = 6.1 m including an allowance for the construction work. In cases where the flyover crosses over a road, the clearance will be H = 5.3 m. The standard grade will be 6%, and the number of lanes will be as was stated before.

1) Flyover passing over the railway only
Jl. Gunung Sahari, Jl. Industri and Jl. Pramuka

2) Flyover passing over the railway and road but not requiring an interchange
Jl. Garuda and Jl. Percetakan Negara

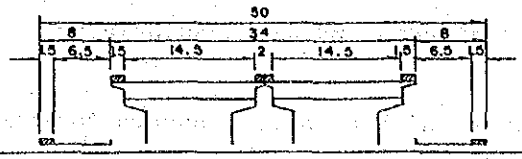
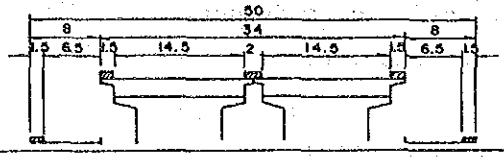
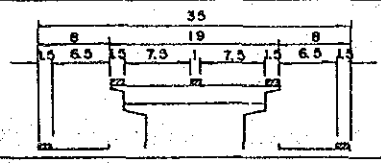
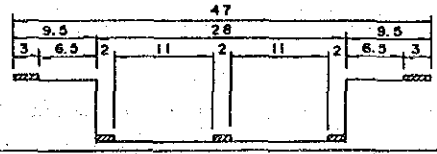
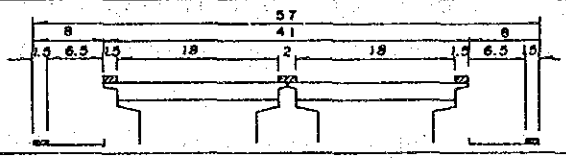
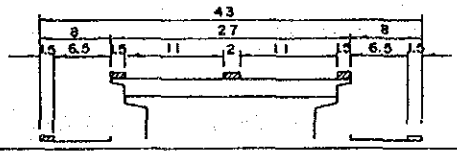
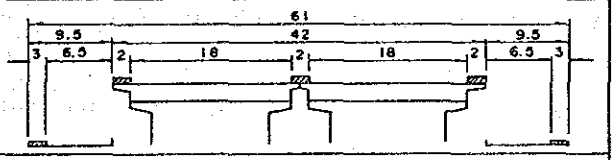
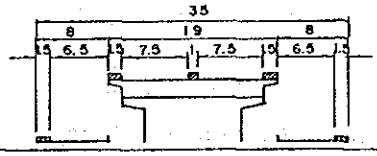
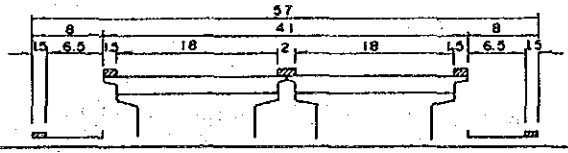
ROAD NAME	PLAN WIDTH (m)	PLAN LANE	SECTION (m)
① JL. Mangga dua	46	8	
② JL. Gunung Sahari	36	8	
③ JL. Industri	24	4	
④ JL. Argkasa	47	6	
⑥ JL. Garuda	46	10	
⑦ JL. Kepu Selatan	30	6	
⑧ JL. LETJEN Suprapto	61	10	
⑪ JL. Perce ta kan Negara	20	4	
⑬ JL. Pra muka	50	10	

Fig. 5.4.2.1 Conceptual Design of Cross Section for Flyover