(3) Indonesia Port Corporations

85. The 110 commercial ports have been developed and managed by the Indonesia Port Corporations. There are four Corporations at the whole country, and they have the managing area and port. Port Corporations have some branches under the head office. There are total 71 branches under four port corporations, which manage one or more commercial ports.

86. The Port Corporations presently established are shown in **Table** 2.22. Port Corporations were conversed to stock corporation from the public corporation (PERUMPEL) in December 1992 according to the Governmental regulations No.56-59, October 1991.

2.4.2 Dry Ports and connecting Railways

(1) Dry ports

87. As for June 1994, Indonesia has five dry ports connecting with ports: three in Java Island and two in Sumatra Island. (**Table2.23**)

Table 2.23 Dry Port and Connecting Ports

	Dry Ports	Connecting Ports
Java	Gedebage Solojebres Rambipuji	Tanjung Priok Semarang Surabaya
Sumatra	Tebingtinggi Kertapati	Medan Panjan

88. Of these dry ports, Kertapati located in Palembang, Sumatra, has not been handling any containers since 1992. It is in substantially closed situation. (See **Table** 2.33) These dry ports belong to respective PERUMKA's stations. A Chief of Dry Port is appointed for each dry port. However, no station has an independent organization for a dry port. (**Fig. 2.49**)

89. The dry ports should have customs clearance, inspection, and foreign exchange banking organizations required for import and export formalities.
Shippers can complete all the import and export formalities at any dry port. (See Section 2.7.3)
However, only Gedebage has all these organizations at the dry port (station). The other dry ports do not have these organizations in them, but shippers can complete import and export formalities in the cities where the dry ports (stations) are located.

(2) Railway

a. Organization and operation

i) Organization

90. The railways in Indonesia are government-owned. They are administrated under the jurisdiction of the Directorate General of Land Transport and Inland Water ways (DGLT) of the Ministry of Communications and managed and operated by PERUMKA. The Government owns basic railway facilities (tracks, track beds, and signalling and communication facilities) and conducts their construction, improvement, maintenance and project investment. As principle, operating facilities (cars, stations, locomotives, substations, warehouses, etc.) are owned and operated by PERUMKA.

91. The Directorate General of Land Transport and Inland Water ways (DGLT) of the Ministry of Communications is functionally divided into three bureaus, Traffic & Transport Bureau, Safety Vehicle Technology Bureau, and Facilities Development Bureau. These three bureaus have respectively a railway related department, Railway Transport Department, Railway Vehicle Department, and Railway Facilities Department.

92. PERUMKA has 4-step organization structure consisting of the head office, branches, sub-branches, and field organizations.
PERUMKA's head office is located in Bandung. The head office has four divisions (General Affairs & Personnel, Transport & Marketing, Engineering, and Finance Divisions), two centers (Planning & Development and Education & Training Centers), and Business Administration Section. PERUMKA has four local branches, Semarang in Java, Palembang in southern Sumatra, Medan in northern Sumatra, and Padang in western Sumatra. Semarang Branch in Java has nine sub-branches, Jakarta (No.1),

Bandung (No.2), Cirebon (No.3), Purwokerto (No.4), Semarang (No.5), Yogyakarta (No.6), Madiun (No.7), Surabaya (No.8), and Jember (No.9). These sub-branches are in charge of field guidance and supervision.
Each of the sub-branches controls train operations under its responsibility. (Refer to Figure 2.25)

ii) Business records

93. In 1993, PERUMKA carried 95.36 million passengers for 12,224 million pass-kms and 15.68 million tons of cargo for 3,956 million ton-kms. The revenue of passenger business and that of the cargo business amounted to 243.0 billion Rp and 144.9 billion Rp, respectively. PERUMKA's total operating revenue, including other operating revenues, amounted to 433.4 billion Rp (122% compared with the preceding year).
In 1992, PERUMKA achieved the operating revenue of 355.3 billion Rp (118% compared with the preceding year), consisting of the passenger revenue of 184.6 billion Rp, the cargo revenue of 129.2 billion Rp, and the related business revenue of 41.5 billion Rp.

Table 2.24 PERUMKA's Transport Revenue (in million Rp.)

	1991	1992		1993	
Item	Revenue	Revenue	Comparison with Proceeding Year	Revenue	Comparison with Proceeding Year
1. Passenger	147,321	184,638	125	243,045	132
2. Cargo	110,011	129,155	117	144,850	112
3. Sub-Total	257,332	313,793	122	387,895	124
4. Others	44,328	41,473	94	45,552	110
5. Total	301,660	355,266	118	433,447	122

PERUMKA's Materials

94. In 1992, PERUMKA decreased the number of employees from 39,376 to 38,143 as a result of the efforts to improve business management to attain more efficient operation.

However, they received 31.5 billion Rp from the Government for deficit covering, owing that operating expenses, depreciation expenses, and insurance premiums had increased.

iii) Budget system

95. The Government's railway related budgets are classified into general budgets and development budgets. General budgets are examined by the Ministry of Communications and approved by the National Assembly after consultation with the Ministry of Finance. Development budgets are allotted to construction, improvement works, vehicle purchase, etc. as large projects utilizing loans from foreign countries. These budgets are examined by the Ministry of Communications and determined after consultation with the Agency of National Development (BAPPENAS). The Government has the authority to compile and execute development budgets and budgets for maintenance and the improvement of government-owned basic railway facilities (tracks, road-beds, bridges, signalling and communication facilities, etc.).

96. PERUMKA has no authority to compile the work related budgets for basic railway facilities (tracks, road-beds, bridges, signalling and communication facilities, etc.). The Government owns basic railway facilities (tracks, road-beds, bridges, signalling and communication facilities, etc.) operated by PERUMKA and is responsible for their construction, improvement, and maintenance. However, the Government commissions actual construction, improvement, maintenance work and their supervision to PERUMKA. The Government pays the expenses for them.

97. Works executed by PERUMKA in 1993 amounted to 95.7 billion Rp in total, of which 73.5 billion Rp was financed from governmental budgets and 22.1 billion Rp from PERUMKA's funds. The breakdown by items shows 71.8 billion Rp spent for tracks, 12.4 billion Rp for bridges, 8.8 billion Rp for signalling and communication facilities, and 2.7 billion Rp for buildings. (Refer to Table 2.25)

Table 2.25 PERUMKA's Work Related Budgets (1993)

(in million Rp.)

Item	Governmental Budget	PERUMKA'S Funds	Total	Percentage
1.Track	56,751	15,030	71,781	75
Rail	54,268	2,027	56,296	59
Ballast	-	7,629	7,629	8
Roadbed	-	412	412	
MTT Fuel	-	2,132	2,132	2
Others	2,482	2,829	5,311	6
2.Bridge	7,075	5,310	12,385	13
3.Signalling & Communications	8,779	-	8,779	9
Signalling	5,797	-	5,797	6
Communications	2,982	-	2,982	3
4.Building	941	1,782	2,723	3
5.Total	73,547	22,121	95,668	100
6.Percentage	77	23	100	

PERUMKA's Material

iv) Facilities

98. The Indonesian railway network covers 6,491 km in total length, including 1,440 km of non-operated sections. Currently, the service covers 3,663 km in Java Island and 1,388 km in Sumatra Island, which is 5,051 km in total. Double track sections are 206 km long, while electrified sections are 157 km long. All the lines have a gauge of 1,067 mm. (Refer to **Table 2.26**)

99. Java Island has three trunk lines. One of them is the northern trunk line (Jakarta - Cikampek (84 km) - Cirebon - Semarang -Surabaya: 726 km) that connects between Jakarta, the national capital, and Surabaya, the state capital of eastern Java. The other two are the southern trunk line (Cirebon - Yogyakarta -Surabaya: 610 km) and the

Bandung line (Cikampek - Bandung -Kroya: 337 km) that passes from Jakarta through Bandung (state capital of western Java) and gets to Yogyakarta and Surabaya. All of these three lines are concentrated between Jakarta and Cikampek, producing an overcrowded state. (Refer to **Figure 2.26**)

100. Sumatra Island has western, northern, and southern railway networks which are independent each other. These networks are not connected with any other railway line.

Table 2.26 Railway Track Length

Area	Track Length km	Operating sections km	Non-Operating Sections km	Gauge mm
Java/Madura	4,470	3,663	807	1,067
South Sumatra	673	673	-	1,067
West Sumatra	281	201	80	1,067
North Sumatra	561	514	47	1,067
ditto	506	-	506	750
Total	6,491	5,051	1,440	

a. Infrastructure

i) The northern trunk line (Jakarta - Cirebon - Semarang - Surabaya: about 726 km) and the southern trunk line (Jakarta -Cirebon - Yogyakarta - Surabaya: about 830 km)

101. These lines joining the Jabotabek line, are non-electrified lines. They run through most of the flat areas.
Transport facilities of these lines have been partly improved. Both the double track section (Jakarta - Cikampek: about 84 km) and the single track sections (Cikampek - Cirebon - Surabaya) have allowable axle load of 18 ton. The effective length of the main track at each station is kept more than 300 m.

ii) Bandung line (Cikampek - Bandung - Yogyakarta - Surabaya: about 880 km)

102. The Cikampek - Bandung - Banjal section of the Bandung line runs in a mountain area. The track grade is 15 - 16/1000 between Purwakarta and Padalarang and 25/1000 between Cicalengka and Banjal. The radius of curvature is between 200 and 300 m.
Improvement works for transport facilities of this line have been delayed. This is all single track line except on the section of Padalarang - Bandung - Kiracondong of the 18.3 km long. The allowable axle load is 15 ton. Like the northern trunk line, the effective length of the main track at each station is more than 250 m.

103. As for the signalling system, five stations (Cirebon, Semarang, Yogyakarta, Solobalapan, and Surabaya) and Bandung Station are equipped with relay interlocking devices, color light signals, and electric switch machines. However, all the stations except these six ones are operated on the mechanical interlocking apparatus and semaphore signals. The stations have token-less block devices and German SH type manual generators. (**Figure 2.27**)
Short wave radio (VHF) equipment is installed for communication. It is used for exchanging information between command offices and train crew, between command offices and stations, and between train crew and stations. (**Figure 2.28 and 2.29**)

104. The railways in northern Sumatra have obsolete facilities. Old 25 kg or 33 kg rails constructed by Holland about 100 years ago are being sequentially replaced by 42 kg or heavier rails. The allowable axle load is 11 tons because quite obsolete old rails are still used in some sections and bridges are old and obsolete. Therefore, only 20 ft containers per wagon can be carried.
As for the signalling system, Medan Station has electronic interlocking devices, but all the other stations are operated by the mechanical interlocking apparatus and semaphore signals. The token-less block system is used for all the line.
The railway tracks in southern Sumatra have been improved to meet the increasing demand for coal transport. The allowable axle load is 18 tons in almost of the sections though it holds still 15 tons in some sections. Coal trains (1,600 tons) are hauled by multiple diesel locomotives.

b. Rolling stock

105. PERUMKA has 569 diesel locomotives, 1,257 passenger cars, 126 electric railcars, 118 diesel railcars, 12,556 freight cars. The operating efficiency is 76% for locomotives, 83% for electric railcars, 45% for diesel railcars recording the lowest operating rate, and 78% for freight cars.

Table 2.27 Current State of PERUMKA's Rolling Stock

Vehicle Type	Total Number	Operative Vehicles	Vehicles in shop (inspection & repair)	Operating Vehicles	Operating Rate
	A	B	C	D	D/B%
Diesel loco	569	500	427	381	76
Electric railcar	126	126	116	104	83
Diesel railcar	118	110	91	50	45
Passenger car	1,257				
Freight car	12,556	11,074	10,007	8,618	78

PERUMKA's Material

Ministry of Transport and Communications and PERUMKA: Organization Chart

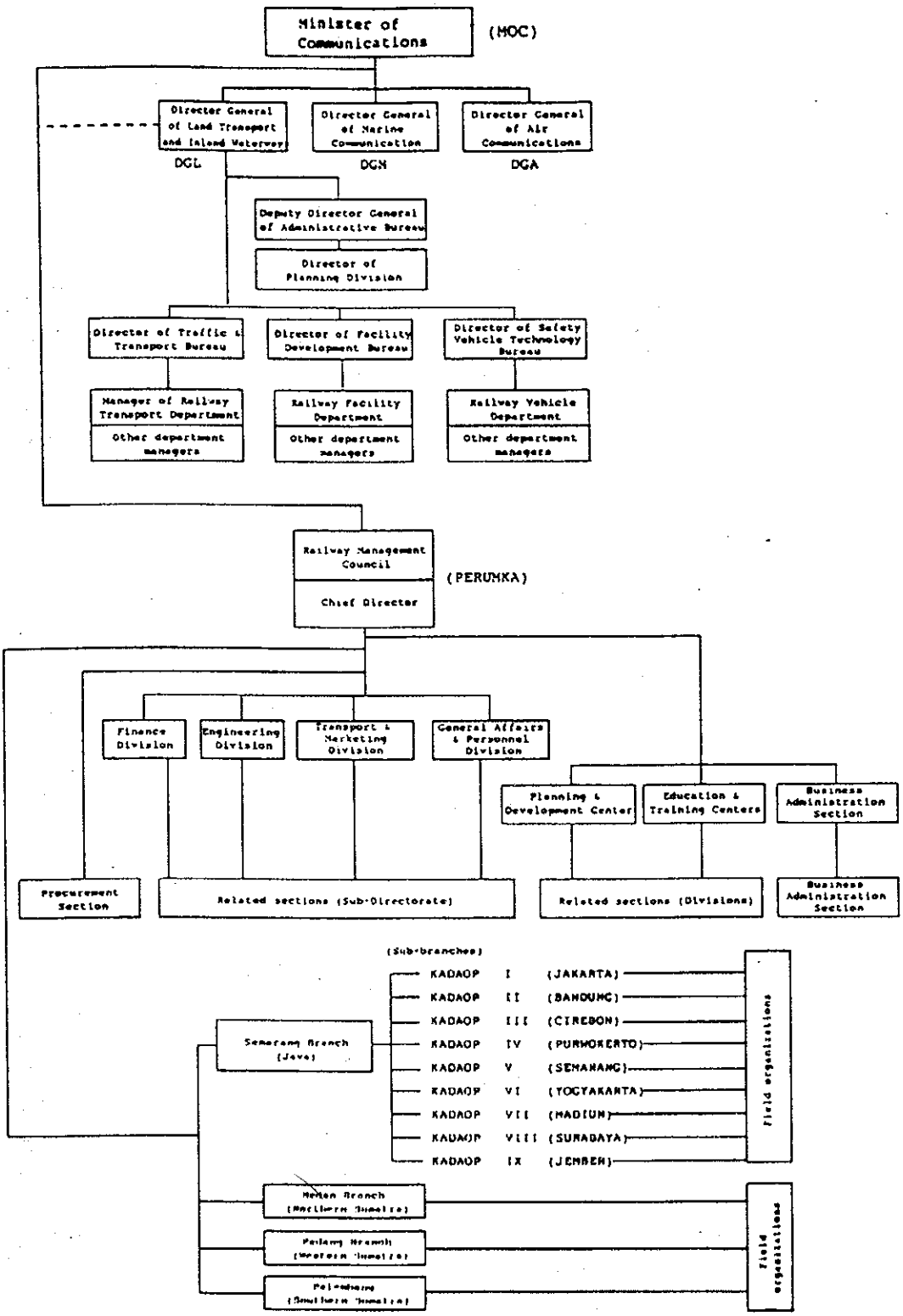


Fig. 2.25 Ministry of Communications and RERUMUKA: Organization Chart

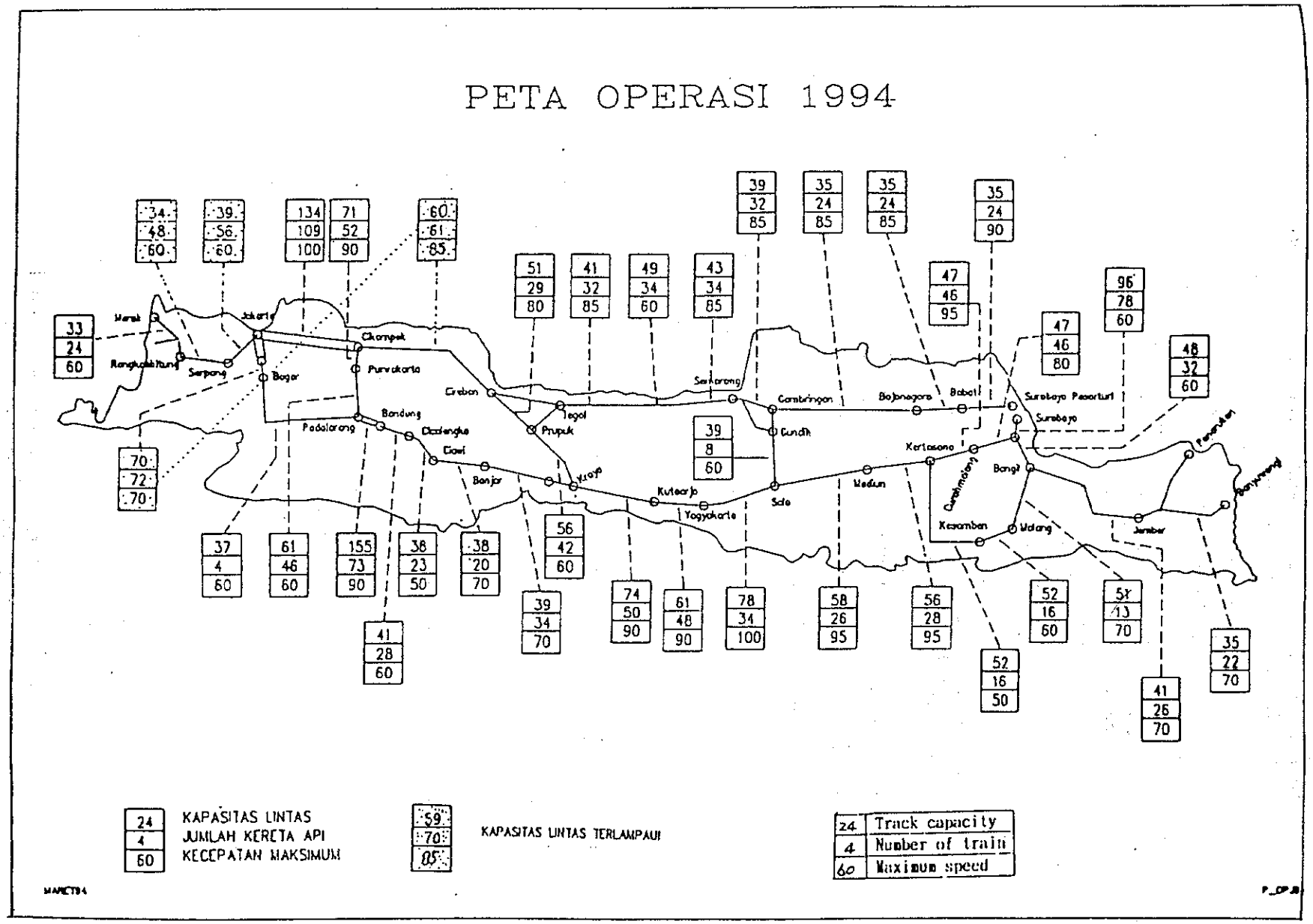
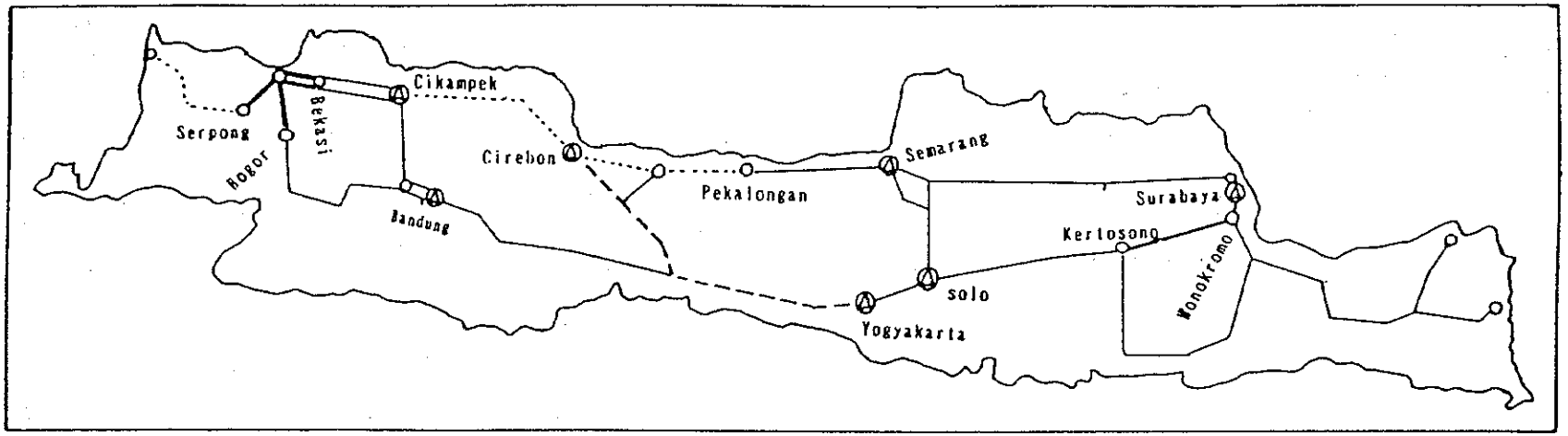


Fig. 2.26 Operation Railway Map 1994



Mark	System	Purchase party	Financial aid	Present Status
⊙	All Relay Interlocking	Germany	Germany	Open
- - -	WEST RACE	Australia	Australia	Preparation
——	Interloking system a. Thb-Srp b. Jak-Boo Mri-Bks	 France United Kingdom United Kingdom	 France Japan(OECF) Japan(OECF)	 Construction Partially Open Partially Open
——	Relay Interlocking	Italy	Italy	Preparation
-----	VPI : a. Srp-Mer b. Ckp-Cn c. Cn -Pk	United Kingdom Holland U.S.A	United Kingdom Holland U.S.A	Construction Ktm-CN Open Construction
——	MEKANIK (Mecanic)	···	···	Existing Facilities

Station name code
Thb:Tanahabang, Srp:Serpong, Jak:Jakarta, Boo:Bogor, Mri:Manggarai, Bks:Bekasi, Mer:Merak, Ckp:Cikampek, Cn:Cirebon, Pk:Pekalongan, Ktm:Kertasemaya.

Fig. 2.27 Signal Equipment Network

JARINGAN RADIO MAICROWAVK

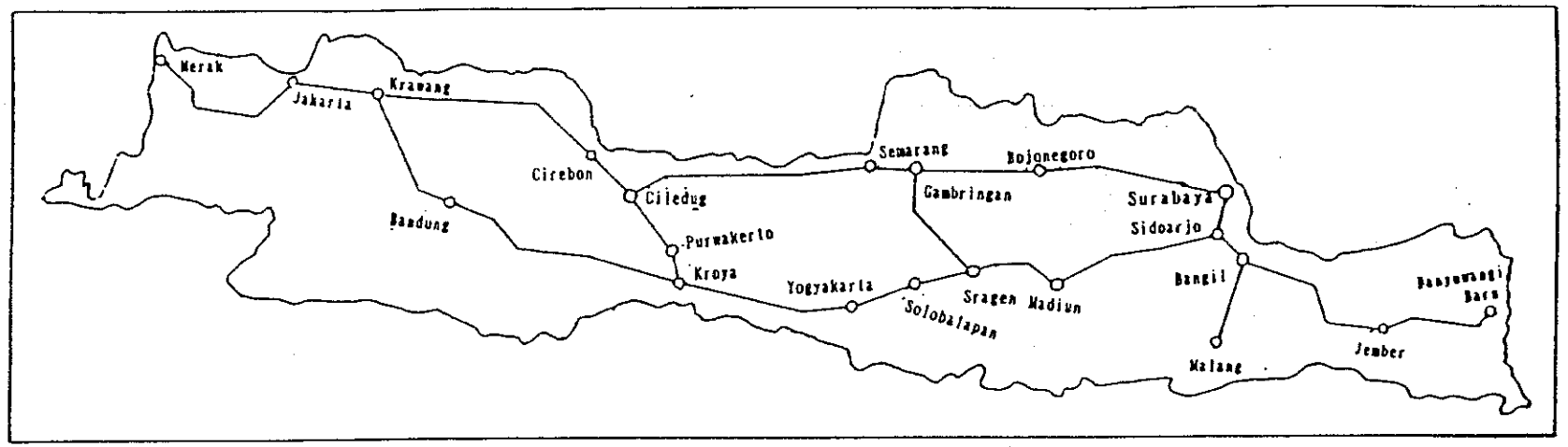


Fig. 2.28 Radio Microwave Network

JARINGAN RADIO VHF TRAIN DISPACHING

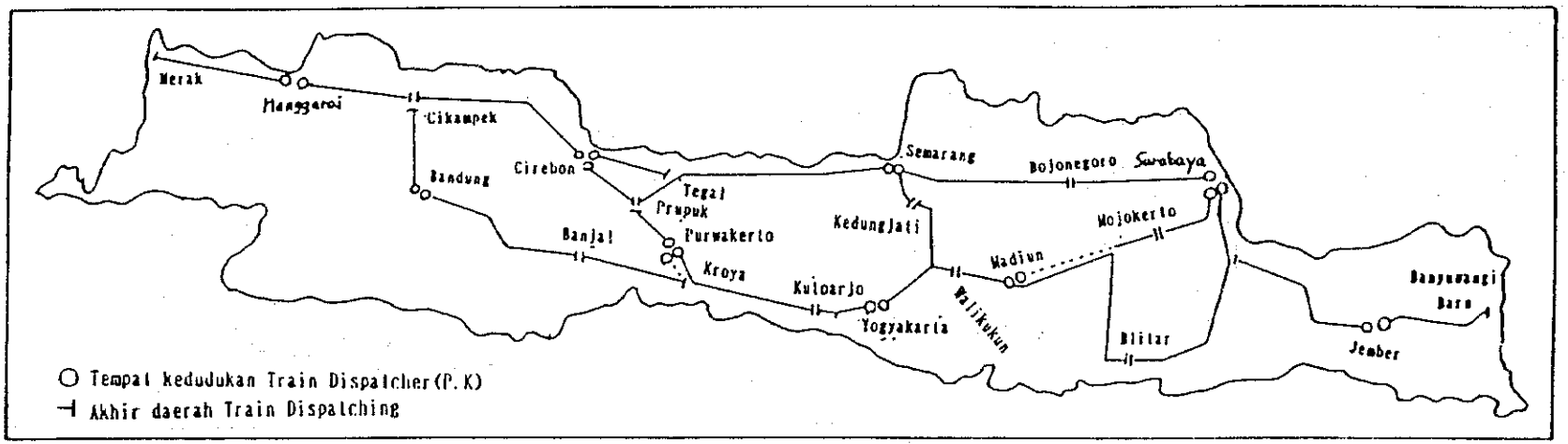


Fig. 2.29 Radio VHF Train Dispatching

2.5 CONTAINER CARGO TRAFFIC IN INDONESIA

2.5.1 International Container traffic in port sector

106. There is no comprehensive data on international container traffic Indonesia but based on the incomplete statistics available (**Table 2.28**), international containers are presently handled at approximately twenty ports including Belawan, Palembang, Panjang, Tanjung Priok, Tanjung Perak, Makassar, Teluk Bayer, Banten, Cirebong, Cilacap, P.Baai, Pontianak, Banjarmasin, Balikpapan, Samarindo, Bitung, Ambon, Kupang and Biak. Total international container cargo throughput is estimated at about 1.8 million TEUs in 1993.

2.5.2 Domestic container traffic in port sector

107. Domestic container traffic in Indonesia is generally underdeveloped. There are also no comprehensive statistics on domestic container cargo traffic throughput Indonesia, but it is clear that the ports of Tanjung Priok and Tanjung Perak are the major mother ports for domestic container traffic. Based on the statistics from the ports of Tanjung Priok, Tanjung Perak and Makassar, the total domestic container cargo traffic is estimated at about 100 thousand TEUs in 1993.

2.5.3 Container traffic by Railways

(1) State of general transport

108. In 1993, PERUMKA operated 23,994 thousand km by passenger trains and 13,590 thousand km by freight trains. In total, they carried 95.36 million passengers for 12,224 million pass-kms and 15.68 million tons of cargo for 3,956 million ton-kms. PERUMKA has achieved large growth in both passenger and freight transport for five years from 1988 until 1993. For example, the number of passengers increased 1.8 times, showing an average annual growth of 16.3%. The freight (in tons) increased 1.5 times, showing an average annual growth of 10.4%. Passengers increased sharply in particular between 1990 and 1993. The average travel distance (in km) has been decreasing, but no reason could be found.

Table 2.28 Container Cargo Traffic in Indonesia

(Unit : TEU)

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994* Ex. Plemb		Remarks
Belawan	10,793	21,116	25,393	37,205	59,414	78,828	102,557	133,401	152,514	174,000		
Palembang			12,466	13,759	19,396	25,795	30,176	32,063	42,895	54,000		Include domestic container
Panjang					14,611	19,391	20,457	25,639	39,876	54,000		
Tg. Priok	207,241	249,032	283,571	337,063	453,728	602,857	736,358	866,557	1,056,684	1,192,000		Include domestic container
Tg. Emas	2,445	9,055	13,390	23,672	30,811	43,658	57,511	68,963	78,861	94,000		
Tg. Perak	51,361	74,699	77,943	104,094	143,225	198,135	255,690	328,345	411,741	493,000		Include domestic container
Makassar	200	400	600	871	2,693	6,456	15,469	24,885	47,352	54,000		Include domestic container
Sub Total	272,040	354,302	413,363	516,664	723,878	975,120	1,218,218	1,479,853	1,829,923	2,115,000	2,061,000	
Share	99.5%	99.5%	99.4%	99.4%	99.3%	99.5%	99.4%	99.0%	98.5%	98.0%	95.5%	
Teluk Bayur	?	?	?	1,466	705	1,114	198	1,023	?	?		
Banten	?	?	?	-	40	99	385	154	?	?		
Cirebon	?	?	?	98	107	2		24	?	?		
P. Baai	?	?	?	-	-	60	-	-	?	?		
Cilacap	345	?	?	-	-	-	-	-	?	?		
Benoa	?	?	?	308	361	6	-	-	?	?		
Pontianak	?	?	?	-	34	847	796	2,838	?	?		
Banjarmasin	?	?	?	1,198	4,180	2,755	4,185	9,220	23,115	?		
Samarinda	?	?	?	-	-	-	668	183	?	?		
Bitun	?	?	?	-	-	-	99	-	?	?		
Ambon	?	?	?	-	-	-	476	658	?	?		
Biak	?	?	?	-	-	-	420	435	?	?		
Sub Total	1,367	1,780	2,495	3,070	5,427	4,883	7,227	14,535	27,867	43,163	97,163	
Total	273,407	356,082	415,858	519,734	729,305	980,003	1,225,445	1,494,388	1,857,790	2,158,163		
Increase Vol		82,675	59,776	103,876	209,571	250,698	245,442	268,943	363,402	300,373		
Increase Rate		30.2%	16.8%	25.0%	40.3%	34.4%	25.0%	21.9%	24.3%	16.2%		

Source : PTPI I, PTPI II, PTPI III, PTPI IV

* : Estimated by The Study Team

Table 2.29 Transitions in Railway Passenger Traffic

Fiscal Year	Passengers (Thousand Persons)		Pass-kms (million Pass-km)		Average Travel Distance (km)
1988	52,495	100	7,836	100	149.8
1989	52,510	100	8,075	103	153.8
1990	56,150	107	8,909	113	158.7
1993	95,362	182	12,224	155	128.2

(FACTS AND FIGURES 1990)
(PERUMKA's materials)

Table 2.30 Transitions in Railway Freight Traffic

Fiscal Year	Freight Weight (Thousand Persons)		Ton-kms (million ton-kms)		Average Transport Distance (km)
1988	10,317	100	2,359	100	228.7
1989	11,416	111	2,449	103	214.5
1990	12,474	121	3,181	135	255.0
1991	15,682	152	3,956	168	252.3

(FACTS AND FIGURE 1990)
(PERUMKA's Materials)

109. Although the railway traffic has increased remarkably, the share of railway transport has been decreasing year after year due to modernization delay compared with other transportation. Road transportation has an overwhelming share in total transportation in Indonesia. Railways have a share of only 11% in passenger transport and 3% in freight transport.

Table 2.31 Transport Share by Mode (pass-kms, Ton-kms) 1984

(Unit: %)

Transport Mode	Road	Railway	Marine	Air
Passenger	82	11	2	5
Freight	70	3	27	1

(Source) World Statistical Yearbook

(2) State of container transport

110. Container cargo does not occupy a large share in the railway freight traffic. However, a steady increase is found by comparing the data in 1990 with those in 1993. In 1993, the container transport recorded 796 thousand ton, having made a 4-fold increase since 1990. The share of container cargo based on the following items shows the increase from 1.6% in 1990 to 5.1% in 1993.

Table 2.32 Share of Container Cargo in Railway Freight Traffic by Item

	1990	1993	93/90
Total Freight (1,000 ton)	12,474	15,682	126
Container Cargo (1,000 ton)	200	796	399
Share (%)	1.6	5.1	

(FACTS AND FIGURES 1990)
(Materials supplied by related dry ports)

111. The handling volume at each of the five dry ports is shown in **Table 2.33.** In total volume, Gedebage Dry Port occupies 95%, and handling at the other ports is very small.
In this connection, there has been no handling at Kertapati since 1992.

112. The container transport between Tanjung Priok Port and Gedebage Dry Port,

where the container handling volume is the largest, shows the average annual growth rate of 38% for five years of 1988 - 1993. This is higher than 31% the average at Tanjung Priok Port. (Refer to **Table 2.33**)

Through container trains are operated only between Gedebage and Tanjung Priok. At the other dry ports, container cars are connected with conventional freight trains, consisted of ordinary freight cars and carried to the freight station that branches harbor lines. From this station, containers are either kept on container cars and directly carried by a harbor line or transferred to trucks and carried to a container yard.

Table 2.33 Container Transport Volume by Dry Port

(TEU, 1,000 ton)

Dry Port (Connecting Port)		1989	1990	1991	1992	1993	Share
Gedebage (Tg. Priok)	TEU	14,807	23,065	35,836	52,008	60,918	
	Ton	102,991	170,992	232,003	322,778	754,494	94.8
Solojebres (Semarang)	TEU	52	1,302	2,181	2,122	2,152	
	Ton	442	11,252	16,773	17,714	16,687	2.1
Rambipuji (Surabaya)	TEU	518	648	706	1,036	2,516	
	Ton	3,108	4,278	4,699	6,693	18,024	2.2
Kertapati (Panjang)	TEU	104	1,134	174	-	-	
	Ton	814	8,853	1,292	-	-	
Tebing Tinggi (Belawan)	TEU	80	380	1,304	1,360	592	
	Ton	880	4,180	14,344	14,960	6,512	0.8
Total	TEU	15,561	26,529	40,201	56,526	66,178	
	Ton	108,235	199,555	269,111	362,145	795,717	100

(Materials supplied by related dry ports)

Table 2.34 Transitions in Marine Container Handling Volume

(TEUS)

Fiscal Year	1988	1989	1990	1991	1992	1993
Volume Handled at Tg. Priok	275,278	337,236	477,480	621,568	815,651	978,305
Ratio to preceding Year of above	131	142	130	131	120	
Volume Handled at Gedebage	8,962	14,773	23,065	35,645	51,008	60,918
Ration to preceding Year		166	156	155	143	119
railway Share	3.5	4.4	4.8	5.7	6.3	6.2

(Materials supplied by related dry ports)

2.6 SITUATION OF THE EXISTING CONTAINER HANDLING PORT FACILITIES AND ON-GOING PROJECTS

113. Brief characteristics of each ports regarding berthing facilities, railway facilities and existing port development plans are introduces in this section.

2.6.1 Port of Belawan

(1) Port facilities

114. The berthing facilities are lined up on the right bank of the mouth of Belawan River: these port facilities are grouped into four bases, namely from up to down stream, "Belawan Rama", "Ujung Baru Base", "Cita Base" and "Gabion Base". Gabion Base is consists of 500 m full container wharf equipped with a pair of gantry cranes and 350 m multi-purpose wharf. International containers are presently handled at the full container wharf. In addition to the wharf, there several container terminal operated by private sector near the wharf.

115. The railroad, mainly utilized for the petroleum transportation at present, is terminated at Ujung Baru Base, and its extension to Gabion Base for container transportation is still in planning stage.

(2) Hinterland

116. The Port of Belawan is located 37 km away from Medan. A toll highway is in operation to serve as the access to the Port from the City of medan. Industrial estates are located suburbs of Medan and near Belawan Port. The distance between the Medan Industrial Estate (MIE) to the center of the Medan City is 10 km and 15 km to the Port of Belawan

117. The industries in North Sumatra are grouped in by the following four types: basic metal, basic chemical, miscellaneous and small/home industry. (Source: Map of investment in North Sumatra, North Sumatra Investment Coordinating Board, supposedly 1993)

(3) On-going and proposed development plans

118. For the development of Port of Belawan, studies have been conducted three times. The latest study is the Review Master Plan of the Port of Belawan, which proposed the development plan for the year 2000 and 2018.

a. Study by Sir William Malcrow & Pertners (1975)

119. The first study was done by Sir William Malcrow & Pertners, and completed in 1975. The study recommended the Phase I development plan which included the construction of Gabion wharf (Container berth 500 m and multi-purpose berth 350 m) on the basis of their traffic forecast for the period 1975 (2.85 mil. t) through 1998 (15 mil. t).

120. On the basis of this study, the Gabion Wharf was completed in 1985, and, in 1988, two gantry cranes started operation.

b. Study by Sir Bruce White, Wolf Barry and Partners (1983)

121. They perform the traffic forecast for the period from 1982 (5.6 mil. t) trough 2002 (19.5 mil. t), and proposed the extension of Gabion Wharf by 175 m for container cargos and Citra Wharf by 450 m for domestic conventional cargos as Phase II Project with a target year 2002. The feasibility study for Phase II Project was also completed in Nov. 1983.

c. Study by PT. Widya Pertiwi Eng. (1992)

122. The study reviewed the previous master plan on the basis of the revised traffic forecast up to the year 2018. According to their forecast, container traffic will reaches to 328,000 TEUs in 2000, 941,000 in 2005 and 1,260, 000 TEUs, respectively. The study recommended several items including upgrading the facilities for domestic wharf and relocation of the oil jetty and the fishing port near Gabion (container) wharf. It also recommended the expansion of container yard from existing 3.5 ha to 19.5 ha in 2000, 56.2 ha in 2005 and 75.3 ha in 2018 respectively, and the expansion of the container wharf, which was proposed by PT. Widya Pertiwi (the previous study), by 2018.

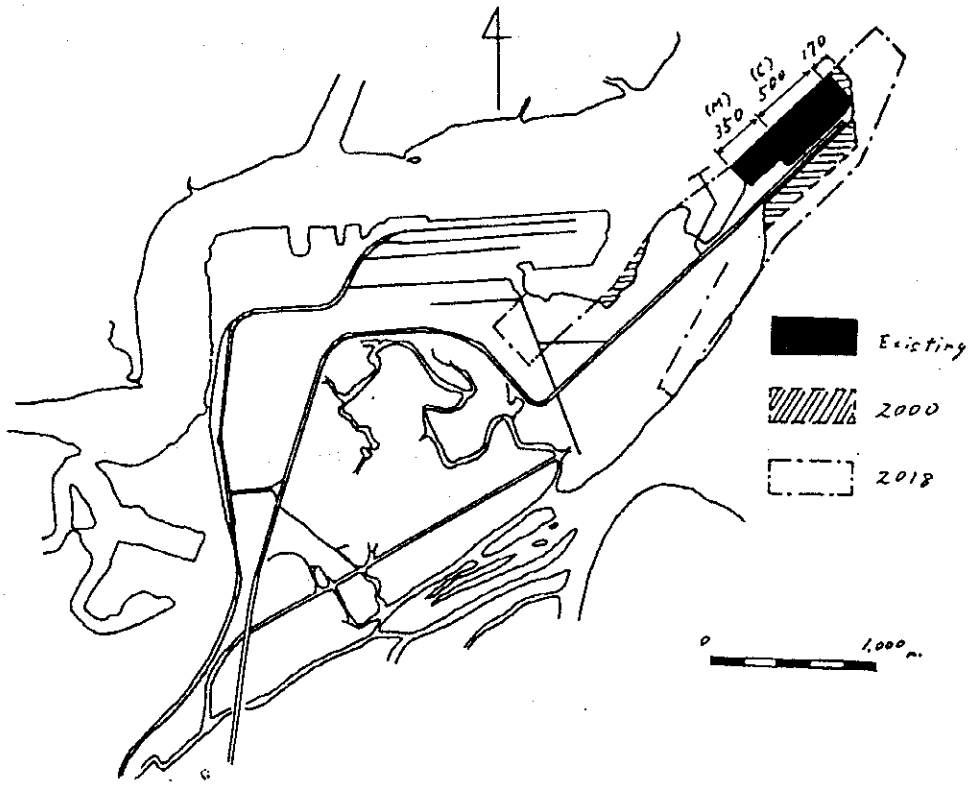


Fig. 2.30 Existing Container Terminal Development Plan (1): Belawan (North Sumatra)

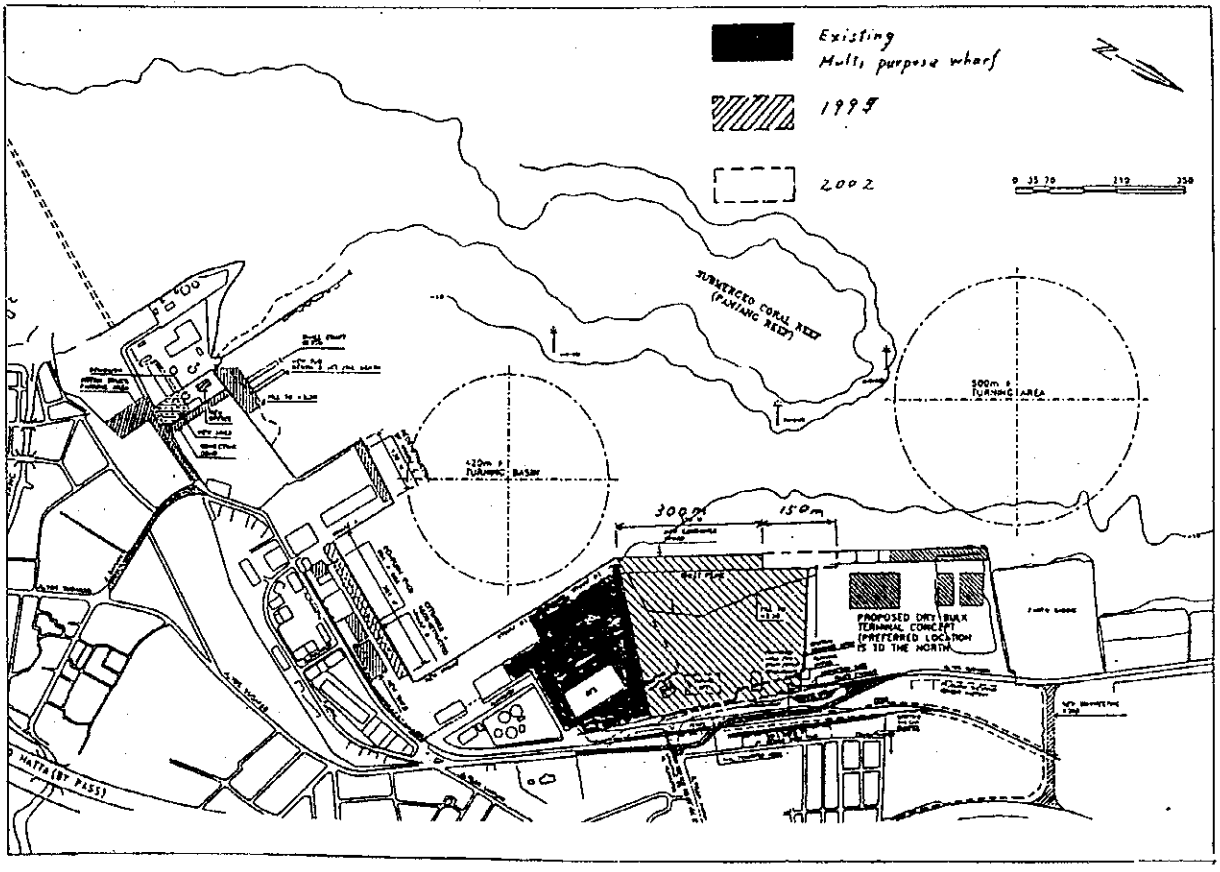


Fig. 2.31 Existing Container Terminal Development Plan (2): Panjang (South Sumatra)

123. **Figure 2.30** is a sketch of the plan proposed by the Study by PT. Widya Pertiwi Eng. (1992).

2.6.2 Port of Panjang

(1) Port facilities

124. Port of Panjang is located on the east coast of the cove of Lampung Bay. It is located south east part of Bandar Lampung City and serves as the gate way of the Lampung Province. It also used to serve as out let of the Southern Sumatra with the railways connecting to Palembang. However, the container transportation by railway terminated when Palembang Port was renovated.

125. The Panjang port area is well protected by coral reef from waves caused by West Monsoon (Musim Barat). The reef also protect the port basin from sedimentation and the port is said to be free from maintenance dredge, while many other ports of Indonesia are experiencing siltation problems. The port has conventional wharves, namely A through C and Multipurpose wharf D-I through D-III, where containers are handled. There is about 10 ha container yard as well as CFS.

(2) Hinterland

a. Highways and Rail

126. Panjang port is located along the Trans-Sumatra highway and 85 km away from Bakauhuni (Sumatra side ferry terminal from Merak in West Java). The road traffic to and from Bakauhuni is by-passed by Sukarno-Hatta, thus there is no through traffic in the city area. Between Palembang and Panjang, railways is also in operation. The railway supports the coal transportation from Palembang to Panjang, where coal is shipped to Banten (West Java) from which coal terminal it is transported to Jakarta by rail.

b. Bakauhuni-Merak ferry service

127. Ro-Ro ferry service between Bakauhuni (Lampung Province, in South Sumatra) and Merak (West Java) is operational since 1981. The ferries having track capacity from

30 to 50 is scheduled to leave the terminal every hour for 24 hours a day. The total cargo traffic by ferry has glowed up to 1990. The annual cargo volume by ferry stays at almost the same level of 3.8 million tons from 1990 to 1992: cargo traffic from Bakauhuni to Merak shows a slight increase, while that from Merak to Bakauhuni shows decrease. (KANWIL, Bandar Lampung)

c. Industrial structure and land use

128. Agro-industry is the major activity in the hinterland of Panjang port. Coffee and black pepper are the two main items of export. Non-agricultural occupies still smaller share (10 % of GDRP) and the industries are concentrated in the urban area near Port of Panjang

(3) On-going and proposed development plans

129. The original master plan of the Port of Panjang was prepared by Sir william Halcrow and Partners in 1975. However this plan recommendations were not implemented.

130. In 1984, under the direction of the Directorate General of Sea Communications, Lavaline International Inc. in association with Geodata Berlian Center completed a revised the revised master plan of the port.

131. This study first reviewed the previous master plan and prepared the revised plan which look at the year 2000.

132. The latest study was completed in Dec. 1992, by Sandwell Inc. in association with PT. Perentjana Djaja and PT. Sarana Antar Nusa Perekayasa. The study forecasted the cargo traffic by various methods up to the year 2012 and concluded that the container traffic would be expected to increase to 78,000 TEU's in 1996, 104,000 TEU' s in 2002 and to 157,000 in 2012. On the basis of their forecast, the study concluded that a new 300 m container wharf having a water depth 12 m would need to operate by 1996 and that the back up container yard should be completed by 2002. For long-term plan, it recommended to expand the container wharf by 150 m beyond 2012. The long-term plan also proposed new railway alignment as well as a depot next to the container terminal.

133. The construction of the container wharf is on-going and scheduled to complete in 1995. **Figure 2.31** is a schematic showing of the plan proposed by Sandwell Inc.(1992).

2.6.3 Port of Tanjung Priok

(1) Port facilities

134. Port of Tanjung Priok locates at northern coast of Java Island on the northeastern part of DKI Jakarta. The port extends approximately 6 km from east to west. It consists of six (6) major basins and six (6) finger piers, breakwaters and navigation channels.

135. The port has two entrance, i.e., West and East. The west approach channel, which is 3 km long, 200 m wide and 11 m deep below LWS, is used for oceangoing vessels. On the other hand the east approach channel is left undredged and there are some portions shallow than - 5 m, thus it cannot serve for large sizes ocean-going vessels. The maintenance dredge is performed annually in the west approach channel and basins as well, and the total volume of the dredge is in the range of 230,000 to 300,000 cubic meters for the past four years.

136. Port of Tanjung Priok started container handling in 1973, and in 1978, the Container Terminal I (CT-I) was inaugurated at Basin III to meet the tremendously increasing container traffic there. In 1991, the Container Terminal II (CT-II) started operation at the Basin II, and the Pasoso Container Terminal at the behind the CT-II also started operation for the container service to Bandung by railway.

(2) Hinterland

a. Highways and Rail

137. Tanjung Priok Port has the most populated hinterland: West Java province and the Metropolitan Jakarta, where the economic activities are at the largest scale of the country. Tanjung Priok Port serves as the outlet of such hinterland. For the container transportation, limited access routes are available. Among the tollway presently operational, those which connect the Port and the suburbs of Jakarta are North-south

Corridor which connect Jakarta-Bogor-Ciawo (47 km, started operating in 1978), Jakarta Cikanpek (73 km 1988), Jakarta- Tangerang-Ciujung (61 km in 1993) and a circular route in Jakarta. These routs serve as major access from the industrial estates out side of Jakarta. However, only North-south Corridor directly leads to port area, and most of the containers are carried through a heavily loaded ordinary road along the coast. It is expected that, by the completion of the planned Jakarta harbor Road, the access to the port will be improved considerably.

b. Industrial estates and land use

138. Industrial estates are located various areas. In addition to DKI Jakarta (Metropolitan Jakarta) itself, its suburbs Bogor, Tangerang and Bekashi are also being expanded as Industrial estates. Industrial area is still expanding in West Java Provinces: Cilegon, Cikpur, Badung and Cirebon.

Major products are:
in Ciregon ; steel, petro-chemicals and sheet glass,
in Jakarta ; pulp and paper, cement, vehicles, train, heavy equipment,
in Bekasi ; electric appliances.

(3) On-going and proposed development plans

a. Reports of the Studies of expansion plan of Tanjung Priok Port in recent years are:

i) Site selection study for Tanjung Priok Port Development, May 1990 by Public Port Corporation II (Perumpel II), Peter Frankel BMT LTD, Foundation for Research & Industry Affiliation and Boundary Institut of Technology(PFI).

This study examined eleven possibly sites and recommended that an area to the north of the existing Container Terminal (CT I) should be reclaimed. This proposed new container wharf forms a straight line with the Container Terminal I.

ii) Traffic forecast Study, August 1990, by Public Corporation II and PFI).

This study developed detailed traffic forecasts for the Tanjung Priok Port up to the year 2020. The forecast covered ont only containers but also all the non-oil cargo traffic passing through the port. The results were input to the following two studies, namely, "Master Plan Review and Feasibility Study.

The study forecast the container traffic to be 1,395 000 TEUs in 1995, 2,474,000 TEus, 4,168 TEUs, in 2005, and 5,737 TEUs in 2010.

iii) Port of Tanjung Priok 1991 Master Plan Review, Final Report, by PFI, 1991.

This study proposed layout plan of the container terminal as well as the relocation of the bulk terminal, on the basis of the results of the above mentioned Traffic Forecast Study. The number of berths required for the container handling given by the study are shown in **Table 2.24**. The report also made recommendation regarding access road and railways to the container terminal for the smooth operation.

Table 2.35 Required container berths

Container Terminal	Number of container berths required			
	1995	2000	2005	2010
CT I[1)]	4	4	4	4
CT II[1)]	2	2	2	-[2)]
CT III	1	3	3	3
CT IV		2[3)]	2	2
CT V			2	2
CT VI				3[2)]
Total	7	11	13	14

Note: 1) Existing facilities
2) CT II will be replaced by 1 berth of CT VI
3) Required in the year 2001

(Source: Port of Tanjung Priok 1991 Master Plan Review,Final Report)

iv) Feasibility Study for Proposed New Container Terminal (Container Terminal III), 1991 by PFI.
This study examined the feasibility of the Container Terminal III, which is the extension of the existing Container Terminal I toward the see across the breakwater. It also made proposals to the upgrading of Container II and Pasoso Railway Terminal.

v) Master Plan 1993, by Indonesia Public Port Corporation II, and

vi) Contingency Plan, March, 1993, Indonesia Public Port Corporation II.
Last two studies are intended to re-examine the development plan of Tanjung Priok Port up to 2000. As conclusion, the terminal which had been called the Container Terminal IV in the named in the Master Plan Review (Report v) was given priority to the Container Terminal III. Thereafter, the terminal is given a new name "Terminal III" which is presently a residential area next to the Container Terminal I to the East. At present, this plan is the latest and the authorized development plan of Tanjung Priok Port. **Figure** 2.32 is a schematic showing of the plan proposed the Indonesia Port Corporation II (v) and vi) above, 1992).

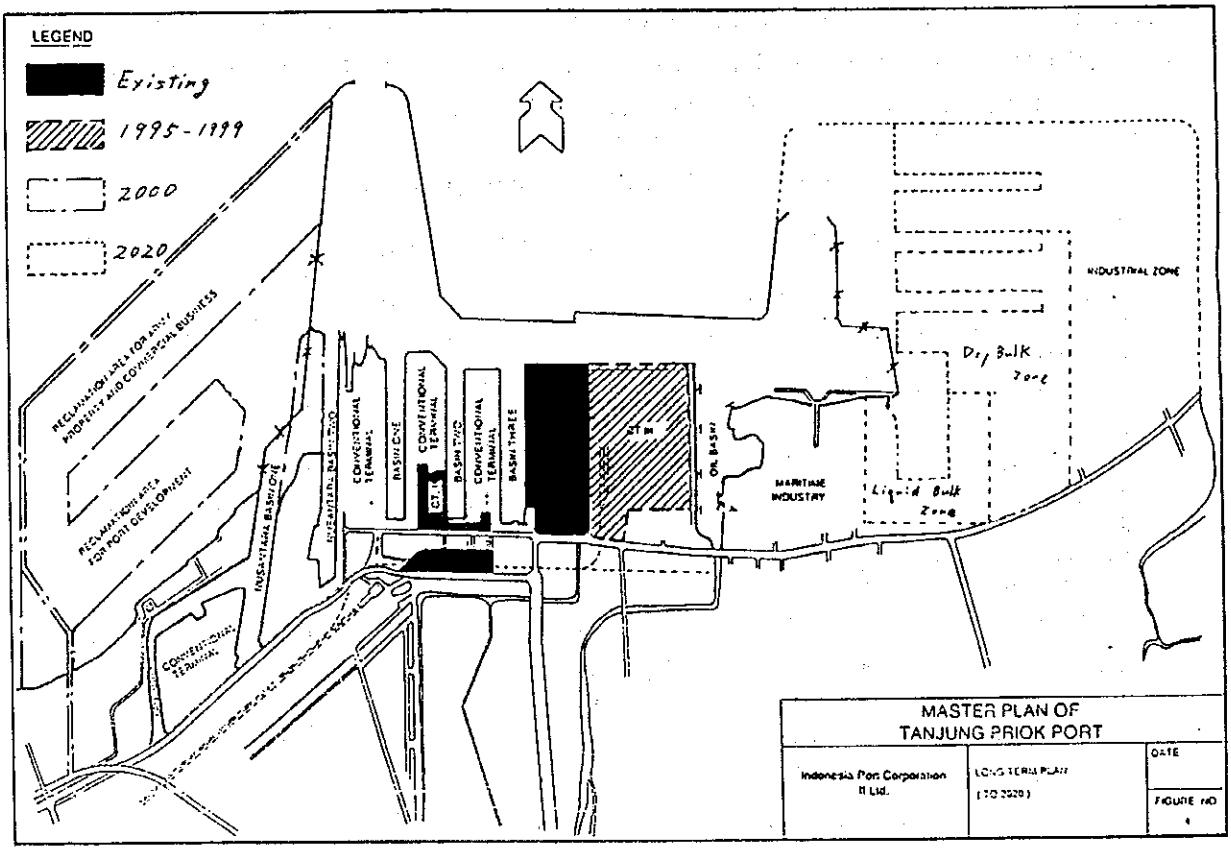


Fig. 2.32 Existing Container Terminal Development Plan (4): Tanjung Priok (Jakarta)

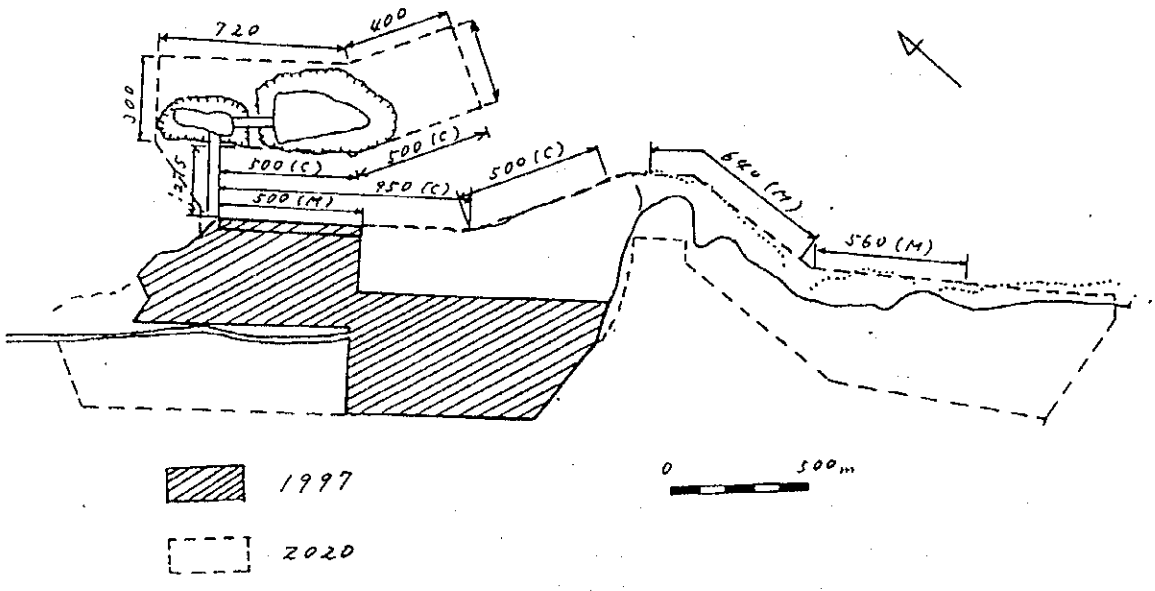


Fig. 2.33 Existing Container Terminal Development Plan (3): Bojonegara (West Jawa)

b. Bojonegara Port Development Plan
(Alternative port to Tanjung Priok Port)

139. In accordance with the study of the development plan of the Tanjung Priok Port, a plan to develop Bojonegara Port, an entirely new port in the west of the West Java, has been studied. The Master Plan and the feasibility study was completed in April, 1994.

140. The development of the Bojonegara Port aims to start operation in 1997 and to ease the heavily congested situation on Tanjung Priok Port by shouldering the hinterland of the latter. In addition, the port is planned to be expanded to a deep sea port in West Java for full container carriers of third or fourth generation in the year 2020. The development plan of Bojonegara Port proposed by the Indonesia Port Corporation II (1994) is shown in **Fig. 2.33.**

2.6.4 Tanjung Emas Port (Semarang)

(1) Port Facilities

141. Port of Tanjung Emas is located at north coast of Central Java, and it is within Semarang City. The slope of sea bed is mild, and it has 5.7 km approach channel having a width of 150 m and a depth of - 9 m. Because of the siltation, maintenance dredge is needed in the approach channel and inside port every year. The volume of the annual maintenance dredge is approximately 500 to 600 cubic meters. The port has three breakwaters, West and North Breakwaters and East Groin, for the protection of the port area from northwest monsoon. The berthing facilities are grouped into three sections:

Samudera Wharf ; - 9 m deep and 605 m long multi purpose wharf for oceangoing vessels including container carriers. The railway terminal has been completed nest to the container yard.

Coaster Wharf ; - 4.5 deep and 320 m long general cargo wharf for domestic vessels

Old Port ; Consists of Inner Harbour and Kali Baru, used for coastal boats

142. The port is presently suffering serious settlement of ground. Especially, the Inner

Harbour is submerged during high tide.

(2) Hinterland

143. Tanjung Emas Port at the cross road between the Jakarta- Surabaya Highway and Semarang -Megelang -Yogyakarta. Though Trans-Java Tollway Plan was proposed, only small portion is scheduled to be constructed in PELITA VI. In Semarang City area, a circular road which serves as the access to the port is being constructed.

144. The share of Agriculture, Mining and Manufacturing Industry sectors in the in 1990 were 20 %, 15 % and 20 %,respectively. However the letter two sectors growing in higher rate than that of the former. Major manufacturing products for export are, Textile and garment, furniture and plywood, and agricultural products are Tapioca and mushroom.

145. Just behind the Tanjung Emas Port, an Export Processing Area has been developed and it is ready to operate.

(3) On-going and proposed development plans

146. a. First Master Plan

The master plan and the feasibility study were started in 1977 and completed in 1978. The master plan aimed at the port development up to the year 2000 with the short-term plan up to 1980. The study proposed the existing multi-purpose berths in West Wharf as the Urgent Implementation Plan (Phase I Project). The wharf having 3 berths and - 9.0 m quay started operation in 1985.

147. b. Review Master Plan

The 1985 JICA Study Team reviewed the previous study
Indonesia Government request JICA Team to consider

i) Coal terminal,
ii) multi purpose berth (both container and conventional cargo),
iii) Passenger terminal for 6,000 DWT, which was to be operational 1986, and
iv) Rehabilitation of old port facilities(raising often flooded ground level)

The final report was submitted in June 1986, and it proposed:

i) Urgent development plan for 1990
ii) Short-term development plan for 1995
iii) Long-term development plan for 2005

148. The total container cargo volume forecasted for the year 1995 (390,000 tons) was reached in 1990. Thus, the Urgent development plan II (Stage I: Civil work and building in 1991, Stage II: Procurement of cargo handling equipment and computer hardware in 1992). The engineering services for the Urgent Development plan was started on July 16, 1992 (Stage I) Phase II-Stage II is under proceeding. With this Urgent Development Plan, a full container wharf having 345 m berth and -10m quay, which is an extension of the existing Multi-purpose wharf, will be completed in February 1997.

149. c. Study on optimum site for additional container wharf, by Japan Port Consultants in association with PT. Wiratman & Associates and PT. Dwidelta Corporation, Nov, 1993

150. This study forecast the container cargo traffic up to the year 2005 (408,000 TEUs for optimistic scenario, and 362,000 TEUs for conservative scenario). On the basis of updated container traffic forecast, the study concluded that an additional wharf having a berth 345 m and - 12 (initial depth -10 m) will be required. In addition, it also recommended the concept of the future development of the port and concluded that the central wharf is optimum site for the future development of container wharf.
This study thus covers demand forecast and layout plan and the feasibility study is desired for the future plan.

151. **Figure 2.34** shows the existing facilities and container terminal presently constructed.

2.6.5 Tanjung Perak

152. Tanjung Perak port is located in Madula Strait between Java Island and Madula Island. Oceangoing vessels utilize 46 km long West Channel in the strait. The 16 km entrance channel of the strait need to be dredged periodically, because of siltation there. At present the width and the depth of the navigation channel are 100 m and -9 m respectively.

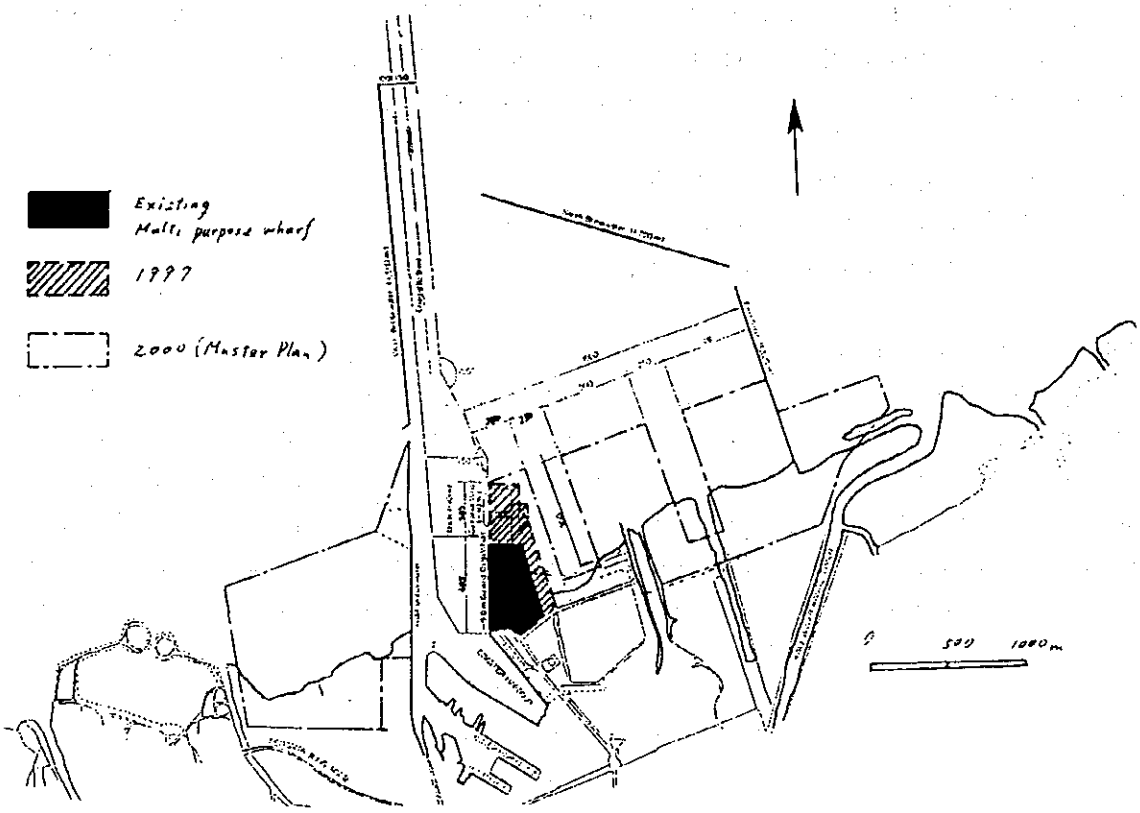


Fig. 2.34 Existing Container Terminal Development Plan (5-1): Tanjung Emas (Semarang)

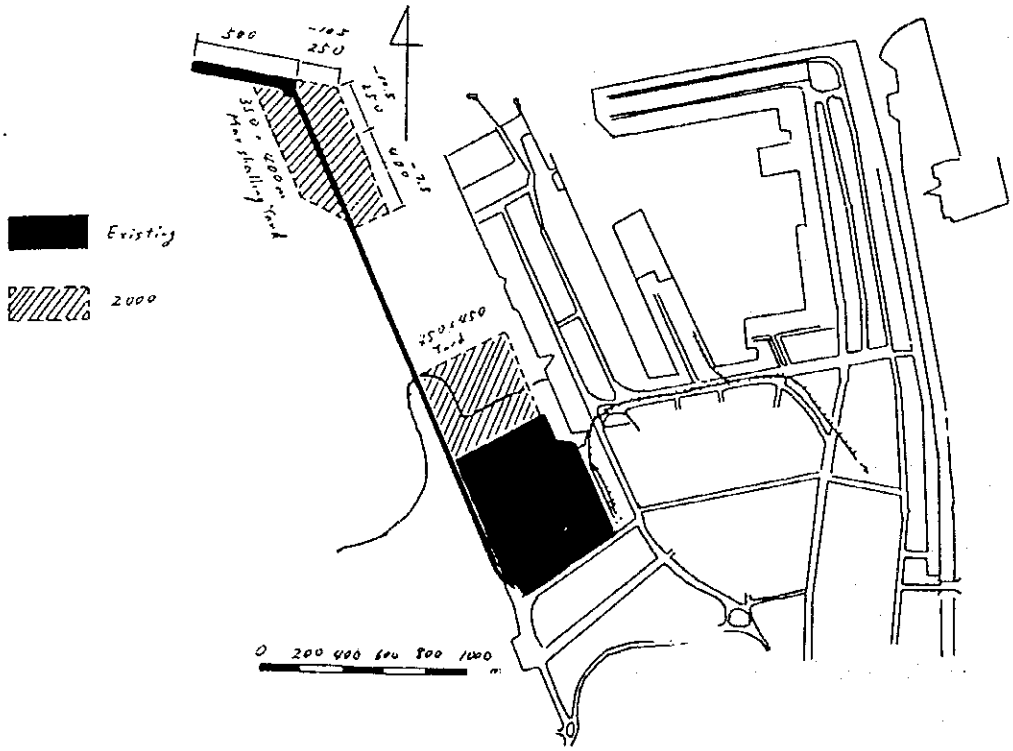


Fig. 2.35 Existing Container Terminal Development Plan (6): Tanjung Perak (Surabaya)

153. The port consists of two part: Old port and International Container Terminal. International containers are handled at both International Container Terminal and the Container Terminal I (CT-I) at Berlian Wharf which is one of the wharves in Old Port. The former has - 10.5 m deep and 500 m long pier equipped with three gantry cranes, while the latter used - 9.5 m deep and 700 m long berths without gantry crane.

154. Total yard areas are 150,000 and 32,000 square meters at the International Container Terminal and CT-I, respectively.

155. The railway terminal has been completed just out side of the container yard of the International Container Terminal.

(2) Hinterland

156. A toll highway between Surabaya and its suburbs (43 km) has been operation since 1986. This route serves as the access to the port from the industrial area to the south of Surabaya. In addition, a bridge between Surabaya and Madura Island is also planned and the study is expected to start shortly.

157. East Java Provincial government set the North coast and the souther suburbs of Surabaya as the industrial area. Both areas situated quite close to the Port of Tanjung Perak.

(3) On-going and proposed development plans

158. Regarding container handling facilities, both expansion of international container wharf and the construction of a new domestic container terminal are proposed. Presently a study on the long-term and short-term development plan is being conducted by the ADB loan. The study aims at the year 2010 for the long-term plan and the year 2000 for the short-term development plan, and scheduled to be completed in 1994.

159. **Figure** 2.35 shows the locations of existing container handling facilities and one of the possible sites for additional container berths provided in the interim report of the study.

2.6.6 Ujung Pandang

(1) Port facilities

160. Ujung Pandang Port is located at west coast of South Silawesi, and is in the City of Ujung Pandang. The port consists of several facilities, Ship repair Yard, Paetere Port (for traditional sailing boats), naval base, Pertamina oil base and Port of Makassr. Port of Makassar is the largest among these facilities where both oceangoing and inter-island vessels are berthed.

161. The Port of Makassar consists of three sections: Soekarno Quay which is only wharf presently operational for the cargo ships and passenger ships, Hasanuddin Basin for tug boats and patrol boats, and Hatta Quay which is presently the construction site of new container wharf.

162. Soekarno Quay was originally built in 1920, and has 1,360 long and -6 to -8m deep wharf. At present one berth is used for container service, however, no handling facilities except folk lift are equipped.

(2) Hinterland

163. A six km toll road between Ujung pandang Airport and the Makassar Port (REPELITA VI). The tollway directly leads to the port. In addition, relocation of the houses behind the Hatta Quay, for the widening the access road from two lanes to four

lanes. The national Highways, which serves the as an access to the port from the industrial estates, is being improved in South Sulawasi, and the.

164. Industrial estates are located not only in the City of Ujung Pandang and its suburbs, but also various areas in the province of South Slawesi.

165. Though there is no railway in the province of South Sulawesi, a Inland Cargo Terminal was completed in 1991 by the municipal government 6 km away from the Makassar Port. The Terminal has 6.5 ha and six CFS, each of which has 1,440 m^2, and 9,200 m^2 of open storage and 9,200 m^2 parking space. It also has fumigation facilities. The terminal located near the toll road, which is presently under construction, and can also serve as the container terminal for air cargo. However, the terminal is not functioning well, because the container trailers are restricted to run on the ordinary highways.

(3) On-going and proposed development plans

166. The Hatta Quay is presently renewed, the project covers the following:

a. Construction of 670 m long and -12 m deep new Hatta Quay;
   Maximum ship size is 300,000 DWT, with 216 m long (LOA) and Maximum draft 11.6 m.
b. Construction of 154 m small vessel quay,
c. Dredging and reclamation ; 1.4 million cubic meters,
d. Transit shed ; 4,000 square meters.
e. CFS ; 4,000 Square meters,
f. Administration building ; 455 square meters,
g. Maintenance shop ; 755 square meters.

167. **Figure 2.36** shows the renewal plan of Hatta Quay which is expected to complete in 1997.

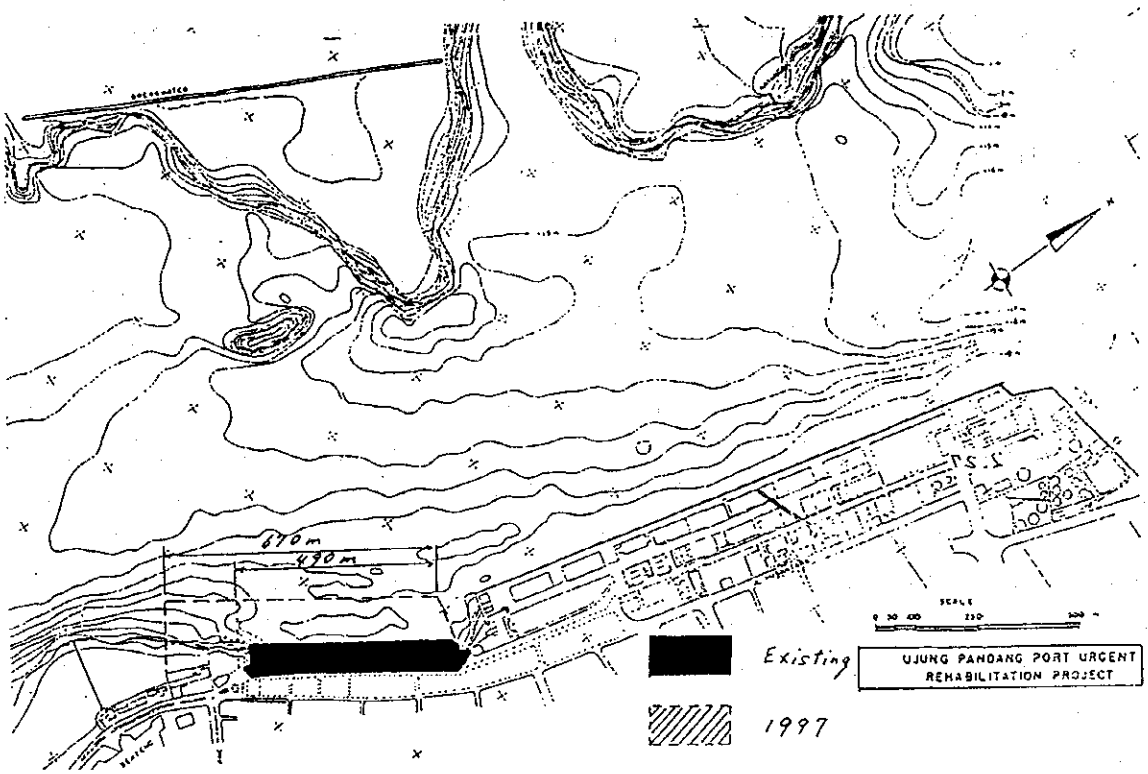


Fig. 2.36 Existing Container Terminal Development Plan (7): Ujung Pandang (South Sulawesi)

2.6.7 Development Works at Batam Island

1) The Growth Triangle Concept

168. Among the various regional economic zones conceived in different parts of Asia in recent years, the "Growth Triangle" concept has attracted wide attention as a means of regional economic cooperation within ASEAN. The Triangle is composed of the Province of Johol, Malaysia; the Republic of Singapore; and the Indonesian Rinau Islands (with Batam Island as the core), as shown in **Fig.2.37**.

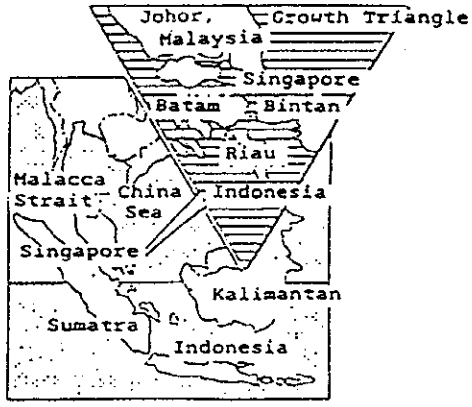


Fig. 2.37 Growth Triangle

169. This regional economic zone concept was advocated late in 1989 by Prime Minister Go Chok Tong of Singapore, who proposed combining the capital and technologies of Singapore, which is faced with an absolute shortage of labor and land space, with the bountiful land, labor force and natural resources of Malaysia and Indonesia for the joint development of the triangle area. The concept was accepted by both Malaysia and Indonesia.

170. Under the Triangle, concept Singapore is to provide infrastructure, including an airport, ports, telecommunications facilities, financial functions, high technology and managerial know-how, while electric power, water and abundant land and labor are to be supplied by Malaysia and Indonesia. The three nations are expected to supplement one another in term of Singapore's high-tech industries, the middle-level processing and assembly industries of Malaysia's Johor province and the labor-intensive industries of the Indonesia's province of Rinau.

2) Overview of the Batam Island Development

171. Batam Island, one of the Indonesian Rinau islands, is located about 20 km southeast of Singapore, and can be reached in about 30 minutes by ferry. The island is covered with jungle, and has six large reservoirs which are potential sources of water

supply for the island's development.

172. In 1971, the Indonesian Government began to develop Batam Island after accepting development proposals from Bechtel of the U.S. and Nissho-Iwai Corporation of Japan. Subsequently, the development of manufacturing industries has progressed rapidly under the Growth Triangle concept, and the tourist industry has also maintained steady development.

173. The development plan calls for 40% of the entire area of Batam Island, equivalent to nearly two-thirds national land area of Singapore, to be developed, and for the remaining 60% to be left in its natural state. The Batam Island development project has drawn wide attention as a yardstick for evaluating the progress of the Growth Triangle plan.

174. The Batam Industrial Development Authority (BIDA) of the Indonesian government is directly responsible for promoting the development of Batam Island. Construction of the Batam Industrial Park, the core of the development project, was initiated in February 1990 by BATAMINDO, a joint unit of the Singapore Technology and Industry Corporation (STIC) and Indonesia's Salim Group. The Phase I works, which cover an area of 70 ha (expanded from the 50 ha originally planned) were completed in April 1992.

175. The phase I works, which cost US$155 million, consist of an industrial zone, power and water supply facilities, workers housing, markets for perishable goods, food centers, hospitals, mosques and industrial an administration office.

176. As of 1993, 154 industries are operating or under construction at the industrial park. The Indonesian government has introduced various incentives for foreign investments in the Batam development, including authorization for foreign 100% investment for a period of 5 years. Indonesia provides an abundant supply of manpower and large factory sites on Batam Island. On the other hand, Singapore has assisted with the construction of infrastructure by providing technical know-how and financing. The industrial park has been developed in a well-balanced manner.

177. The Phase II works of the industrial park construction are currently being carried out to create an additional 100 ha industrial zone. Construction works are planned for

successive execution to create a total area of 500 ha for industrial operations on Batam Island. The development plan calls for expanding the industrial area to promote export industries.

178. Factory sites in the industrial park are leased to manufacturing companies on a 30-year leasehold. Batam Island as a whole is designated as a bonded area to promote export industries. Bonded warehouses and bonded factories are located within the industrial park. Land use, business and building permits are granted by BIDA by virtue of the powers delegated by Indonesia's Ministry of Interior Affairs. All manufacturers operating in the industrial park are required to export 85% of their products, but no restrictions are imposed on materials imported for production. Joint ventures exporting 100% of their products manufactured in the industrial park can initially be wholly owned by foreign interests. Once the foreign capital ownership ratio is lowered to 95% within 5 years from the start of commercial production, it does not need to be further reduced.

3) Overview of the Industrial Park

179. The primary goal of the Batam Island development is the growth of the tourist and manufacturing industries. The industrial park, an airport, ports, resort facilities, roads and other infrastructure are being constructed to foster the development of these industries.

180. Batam Island currently has a population of 146,214 which is expected to increase to 700,000 by the year 2000, as presented in **Fig.2.39.**

(1) Infrastructure

a. Roads

181. The development plan calls for a total of 69.6 km of international-class arterial roads. In addition, there presently 161.2 km of collector roads and 82.2 km local roads, which are to be extended to 332.0 km and 175.2 km, respectively. The existing road network provides good conditions for cargo traffic within the island.

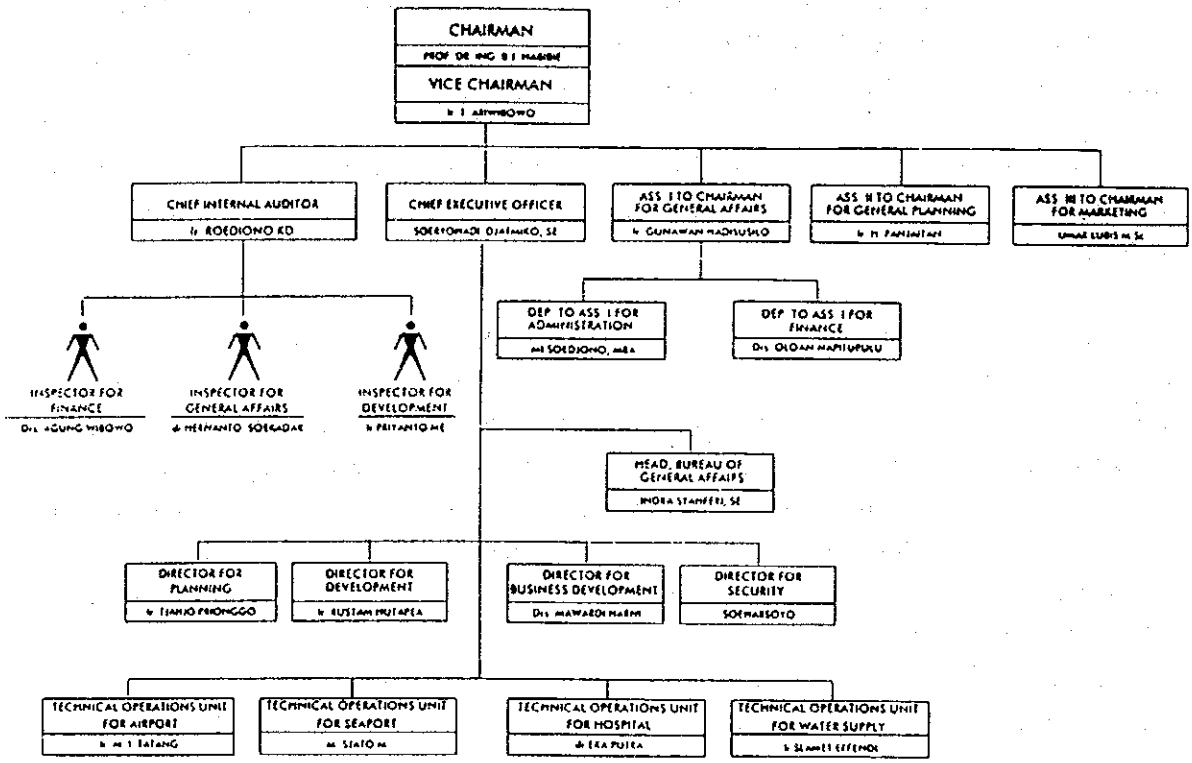


Fig. 2.38 BIDA Organization Chart

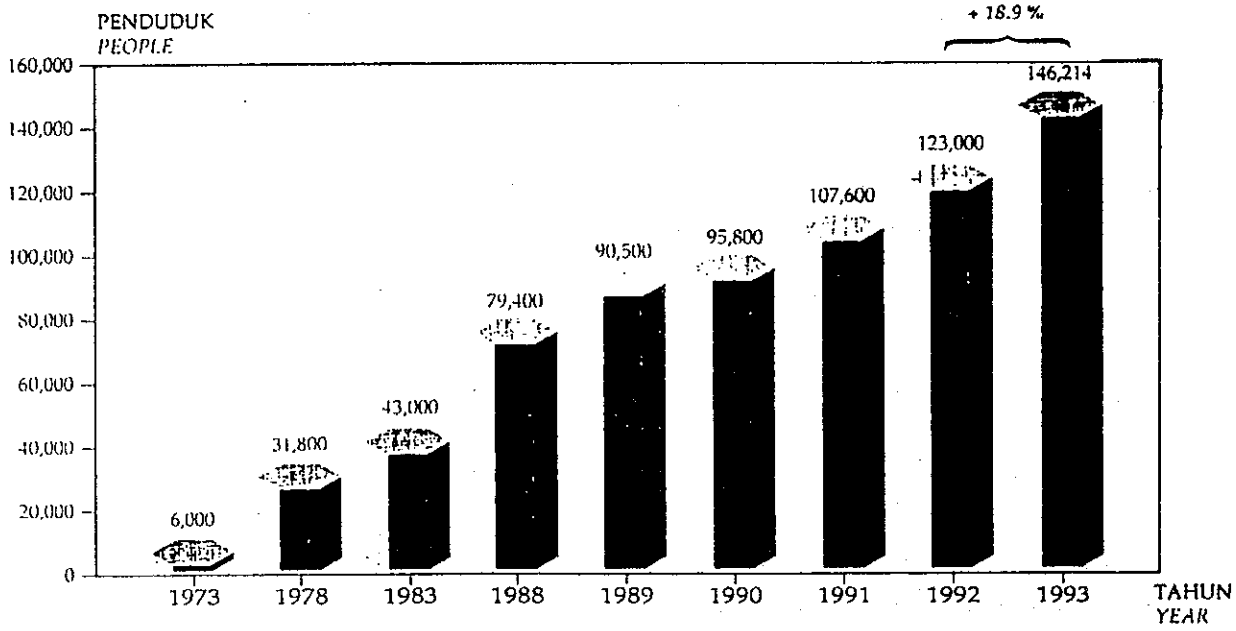


Fig. 2.39 Population Growth in Batam Island

b. Communications

182. Batam Island's communication circuits comprise the Palpa satellite station circuit and the circuits opened to traffic between Batam and Singapore in March 1991. The international communication circuits are linked to Singapore's network.

c. Electric power supply

183. Batam Island has four power stations with the following capacities.

Batu Ampar	36.5 MW
Sekupang	13.0 MW
Others	5.5 MW

184. In addition, 5 generating which each have a capacity of 22.5 MW are presently under construction, and an additional 550 MW of generating capacity is to be provided in the future. All factories at BIP have an independent power supply from diesel generators.

d. Water supply

185. There six reservoirs on Batam Island, but as its water resources are limited, industries consuming large quantities of water are not accepted. The companies located in BID are mostly engaged in the machining or assembly of electronic parts and precision components.

186. The existing water supply capacity is 850 LT/SEC, and the supply is to be expanded to 3,850 LT/SEC in the future.

e. Airport

187. Batam Island is served by Hong Nadim airport which is currently used only by domestic flights connecting with Jakarta. The airport has a 2,500-m runway which accommodates Air Bus A 300 jetliners, and will be expanded to have a 3,600-m runway to serve B-747 Jumbo jets.

188. The Indonesian government plans to upgrade the status of existing airport to

make it an international airport which may serve as a port of call on long-haul routes to Japan and other countries.

(2) Layout of the Industrial Parks

189. There are new eight industrial parks under development on Batam Island. The development work is being conducted by Batamindo Investment Corp. and other private companies.
The names and locations of each industrial park are shown in **Fig.2.40**.

5) Ports

190. Batam Island has three ports, as shown in **Table 2.36**. Batu Amper Port is mainly used for container transportation by small vessels carrying containers for transhipment at the Port of Singapore(Refer to **Fig.2.41**).

191. The Indonesia government has a plan to develop an international port by combining Kabil Port and the nearby Hang Nadim Airport. The new international port will be named " Asia Port ". A proposed development plan is shown in **Fig.2.42** and 2.43. The detailed planning is presently being undertaken by a consultant. According to BIDA officials, BIDA plans to develop this port as a container hub port covering South East Asia with the active participation of the private sector.

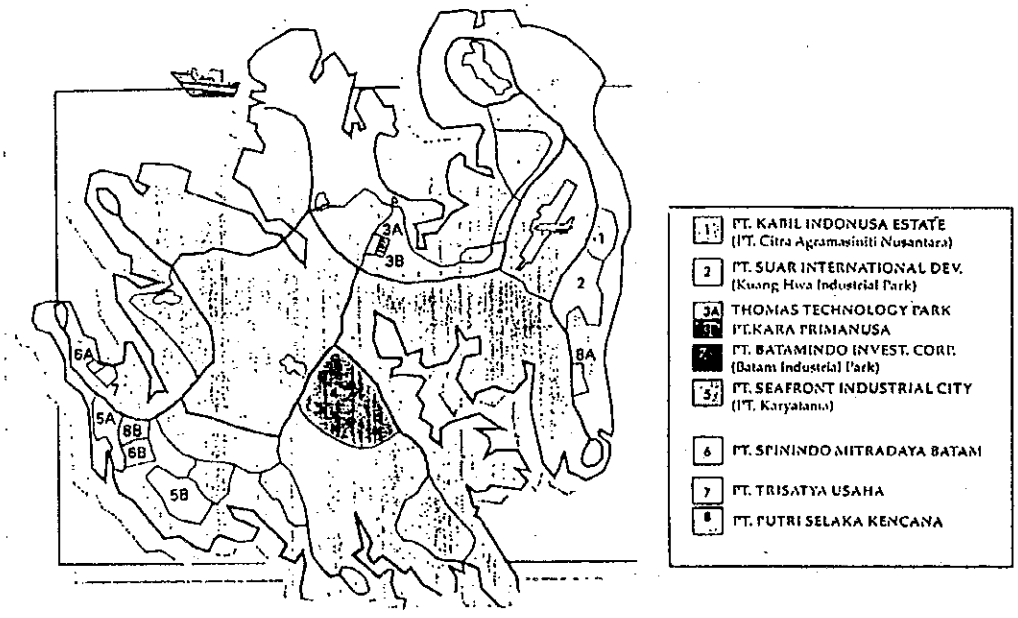


Fig. 2.40 Instrial Estate in Batam Island

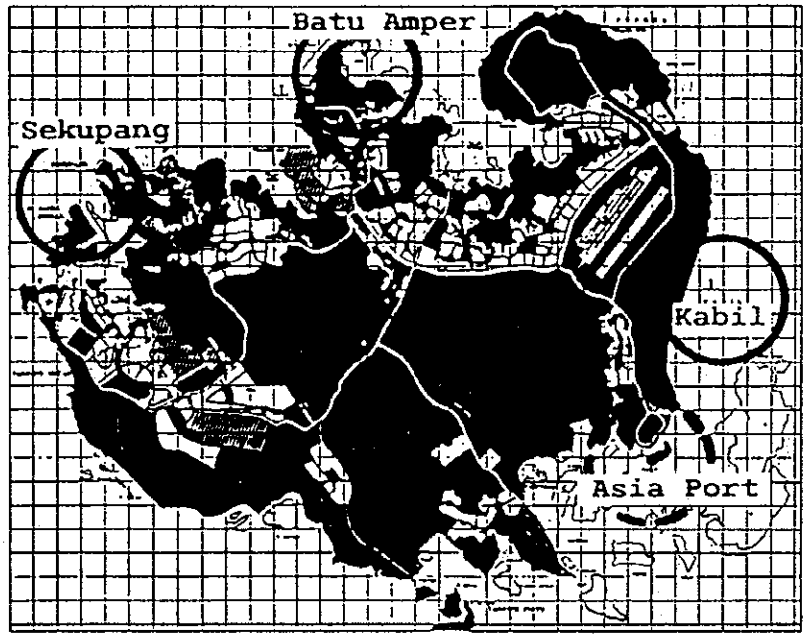


Fig. 2.41 Location of Ports

Table 2.36 Summary of Port Facilities on Batam Island

Item			Batu Ampar	Sekupang	Kabil
Max Vessel Size		Present	6.000 DWT	10.000 DWT	5.000 DWT
		Plan	35.000 DWT	15.000 DWT	150.000 DWT
Length of Berth		Present	1.000 m	177 m	100 m
		Plan	3.600 m	1.200 m	5.500 m
Depth of Berth		Present	6 m	11 m	13 m
		Plan	14 m	12 m	18 m
Storage Facility	Open Yard	Present	189.000 ㎡	116.120 ㎡	100.000 ㎡
		Plan	230.000 ㎡	143.600 ㎡	-
	Shed / Warehouse	Present	17.000 ㎡	42.240 ㎡	1.890 ㎡
		Plan	208.950 ㎡	92.000 ㎡	-

Source:BATAM:Step by step guide for investors

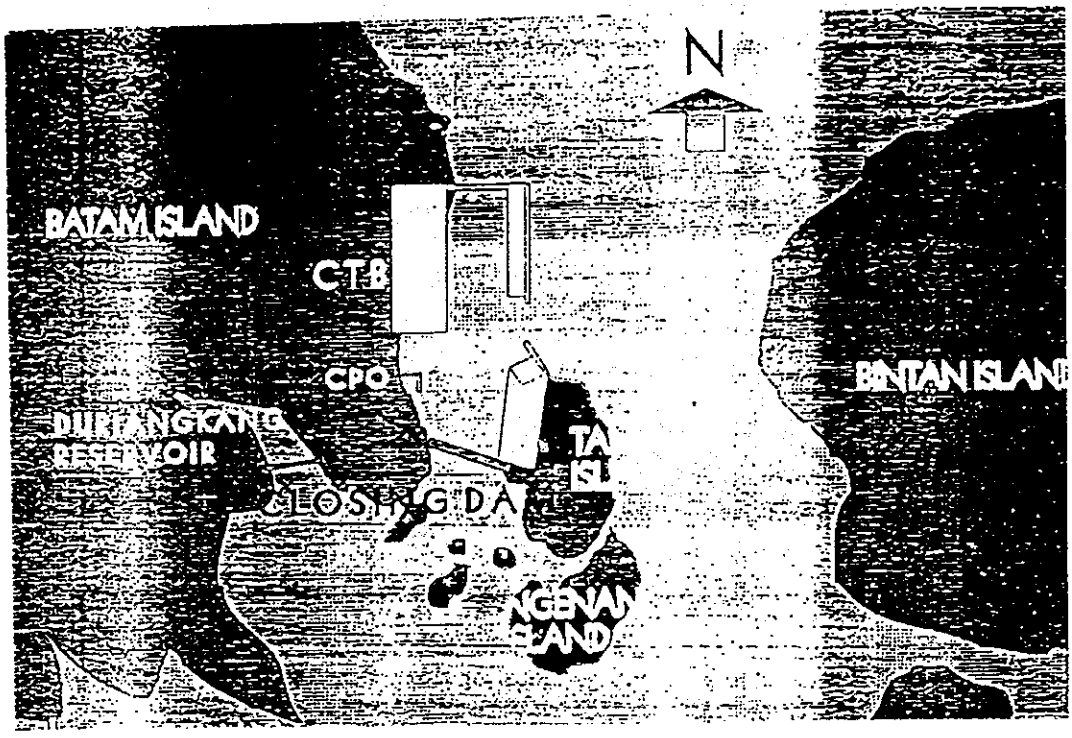


Fig. 2.42 Location of Asia Port Batam

Fig. 2.43 Master Plan Container Terminal Batam

2.7 SITUATION OF THE EXISTING CONTAINER DRY PORTS AND CONNECTING RAILWAYS AND ON-GOING PROJECTS

2.7.1 Tebing Tinggi Dry Port and connecting railways

(1) Activities

a. General condition along the railway line

192. The area of the North Sumatra State in northern Sumatra is about 71,680 km^2, the population is about 10,260 thousand and the population of the state capital Medan is about 1,730 thousand.
Main products (exported goods) of the State are processed rubber, palm oil, aluminum products, plywood, shrimp etc.

193. Tebing Tinggi Dry Port is situated 81 Km apart in direction of south east from Medan, and connected with Belawan Port (Container Terminal Gabion Port) by railway route indirectly.
Tebing Tinggi district where the dry port exists is the primary industrial zone whose products are rubber, furniture, tapioca, etc. The district population is said about 120,000 people. Main item to be shipped by using marine container from the dry port is rubber.

194. Belawan Port is placed of 23 km north of the state capital Medan and is the important port in north Sumatra, and the container cargo is handled in Gabion Port area in the Belawan Port. Total railway transportation distance is 104 Km. (**Fig.2.44**) Container cargo handling volume in the Belawan Port in 1993 is 152,514 TEUs and is on the third as the domestic rank. Average growth rate per year for past 4 years shows the high growth rate of 24.6%.
At present, direct connection with the Gabion Port and railway is not formed yet and relayed by road transportation of about 2 km.

195. Export goods except palm oil in Tebing Tinggi and its surrounding areas are shown in the following **Table** 2.37.
The **Table** 2.37 shows that the volume of the goods is not so many and production places are far from Tebing Tinggi.

Table 2.37 Volume of Goods and Production Places in 1993

(Unit: Ton/Year)

	Tebing Tinggi	P. Siantar	Kisaran	R. Prapat	Total
Distance from T.T.	0 km	49km	74km	180km	
Rubber	54,000	9,639	34,409	48,992	147,040
Tapioca	2,500				2,500
Furniture	12,895				12,895
Ginger		487			487
Tea		650			650
Chocolate		250			250
Incense & Clove		48			48
Tobacco		463			463
Margarine		4,700			4,700
wood, etc.			8,002		8,002
Plywood				12,832	12,832
Total	69,395	16,237	42,411	61,832	189,875

b. Container transportation in Tebing Tinggi

196. Transportation result at Tebing Tinggi is shown in the following table.
At Tebing Tinggi, imported full containers don't arrive but only empty ones are delivered there.
Handling volume of container is small and at present (May 1994), container transportation has been completely stopped since this January because of about 10% more expensive tariff than road transportation. Caused by railway tariff hike.

Table 2.38 Handling Volume of Marine containers at Tebing Tinggi

	Departure (Full, TEU)	Arrival (Empty, TEU)	Total(TEU)	Income (1,000 Rp.)	Stopped Time
1988	36	36	72		
1989	40	40	80		
1990	211	211	422		JAN.-JUL.
1991	696	696	1,392	47,748.7	APR.-MAY
1992	680	680	1,360	47,567.0	OCT.-DEC.
1993	296	296	592	31,744.9	JAN.-MAR.
1994(-5)	0	0	0	0.0	JAN.-

197. The comparison of transportation expense by railway with that by road is as follows.

Railway transportation: railway Rp 100,100+both ends Rp 75,000 = Rp 175,100
Road transportation : = Rp 160,000
Railway - Road : = Rp 15,100
And the tariff doesn't form the available system as one package tariff.

c. Train operation

198. Operation of passenger train between Medan-R. Parpat:

Day time : 2 round trips
Night time : 1 round trip
Medan-Kisaran : 2 round trips
Total : 5 round trips

Operation of passenger train between Medan - Belawan : nil
Operation of freight train:

Belawan-Medan : 6 single way + locomotive only 7
Medan-Belawan : 8 single way + locomotive only 7
Medan-Tebing Tinggi : 7 single way
Tebing Tinggi-Medan : 8 single way
Kisaran-R. Parpat : 4 round trips

That shows, operation numbers of freight train is more than those of passenger train.

199. However, for the railway container transportation, there is not enough container cargo to operate the through container train, and the container transportation keeps on long range transportation stop.

(2) Operation facilities

a. Route

200. Between container terminal Gabion Port and the dead end of the port line is relayed by road transportation because the two points have the distance of about 2 km. In order to improve the connection with the Gabion Port, the extension plan of the railway line is studied by Port Authorities and PERUMKA. (Refer to **Fig. 2.46**)

201. The track between Medan and Tebing Tinggi that is a main line, uses 34 kg/m rail and wooden sleeper, and is superannuated, and allowable axle load is limited to 11 t for bridges. Therefore, container transportation uses only one 20' container loaded per wagon, and 40' container cannot be transported.

202. At present, the track between P. Parapat-Kisaran is improved by using concrete sleeper and the track improvement between Kisaran-Tebing Tinggi is being planned.
The gradient of the line is almost less than 10/1000 or level, but there is 20/1000 gradient on the line between D. Morangir-Siantar.
Blocking system on the line is almost Tokenless, but at Medan station, it is electronic interlocking system.
Effective length of the main track at the stations is more than 266 m.
At present, train operation is few and the line capacity is enough for increasing the operation.

b. Facilities at Tebing Tinggi St.

203. The layout is shown on **Fig. 2.45.**
Handling facilities are as follows.

Area of container yard	1000 m^2
Loading and unloading track	1*160 m

Staying track	1*160 m
Handling facilities	A movable step for light forklift is provided for stuffing into 20' container on the wagon. No heavy loading machine to handle containers is provided.
Planned capacity	21,000 TEUs/year
Access	Directly approach from public road
Transportation article	Rubber only
Dry Port function	Dry port function necessitated for handling is not provided.

c. Rolling stock

204. Each tractive locomotive has the hauling power of 600 t and is possible to carry twenty container wagons. But the one wagon can load only one 20' container because of allowable axle load of 11 t.
Many locomotives aged more than 20 years old, still more lack of working locomotive reaches about five ones at present stage. (Necessitated locomotives for operation : 26, ready for operation : 21)

(3) Dry Port management and operation

205. Dry Port function necessitated for handling operation is not provided.

(4) Container cargo handling system

a. At Tebing Tinggi

206. Container platform is built with elevated floor type that has enough space possible to operate heavy handling machine. Goods to be stuffed are carried by truck to the platform and stuffed to the container on the wagon by using light weight forklift.

b. At Belawan Port

207. Container handling place is situated about 2 Km apart from container terminal of Gabion Port. Therefore, the containers transported by railway are transferred on trailer-truck for Gabion Port. **(Fig. 2.46)**

(5) Ongoing project

208. Two plans shown on the **Fig. 2.46** are being studied by Port authorities and PERUMKA, for direct connection between the container terminal Gabion port and existing railway.

(6) Existing issues

209. a. Dry Port

i) The container transportation demand is little, and the resource area of transportation demand are scattered far from the Dry Port.
Major goods produced along the railway are rubber and palm oil, and they are processed by agro-industry. Tebing Tinggi area is one of these production areas, so major goods for container transportation by railway is rubber.

ii) Population and consumption demand is little, so that the full container transportation keeps one way.

iii) Tebing Tinggi is called Dry Port. However the operation function isn't set up as Dry Port, and consequently there isn't any privilege to be obtained by use of Dry Port at Tebing Tinggi for customers.

iv) Tariff doesn't form the available system such as one package tariff.

v) As the demand is little, the handling facilities for loading to wagon isn't installed for full container.

vi) As railway container transportation was defeated in competition with road transportation, owing to the boast of transportation charge, railway container transportation has stopped perfectly since January of 1994.

210. b. Connecting railways

i) It isn't directly connected with the container terminal by railway.
The distance between Gabion Port and railway container terminal is approx. 2 Km apart, and so the containers must be transferred to the road transportation. It makes a cause that makes transportation expense increase.

ii) As axle load is limited to 11 ton, only one 20' container can be loaded for one wagon. If axle load is increased to 15 ton, two 20' containers can be loaded for one wagon and a 40' container which can do more efficient transportation than two 20' containers on a wagon.

iii) As superannuation of railway track is advancing, the reform of track is being

promoted. However, the materials of rail and switch are forced to use those of the second hands.

iv) As superannuation of locomotive is advancing, a number of locomotives for operation are in shortage. (insufficient number of locomotives are five at present)

2.7.2 Kertapati Dry Port

(1) Activities

211. Kertapati St. is situated on the upper opposite side of Palembang container yard located along the Musi River.
Kertapati dry port belonging to that station has not been in activity since Nov. 1991, but in usage as a barge wharf for coal transport now.
The dry port has ever sent general cargo produced in Palembang City to Panjang 400 Km apart from there by using 30 flat cars and 50 container boxes.

212. The preceding container transport route was formed by detour as Kertapati - Panjang - Tanjung Priok - Singapore but now the direct container route to Singapore has been established, and former route had to be abolished.

213. The South Sumatra has been developing at the main core of primary and row material industries.
The South Sumatra railway has been operated based on the above industrial structure, but now mainly transports heavy and chemical goods. Basically, the structure is that huge volume of coal from TMB(Tanjung Enim Bare) in coal mining zone whose deposits are called about 8 billion ton is transported for electric power plants or cement factories near the sea side instead fertilizer, cement and ceramic products from the port area like Palembang are carried for inland zone. **(Fig.2.47, 2.48 Tab. 2.39)**
Accordingly, the occurrence of freight goods adaptable to container will not be found in the inland zone for a while.

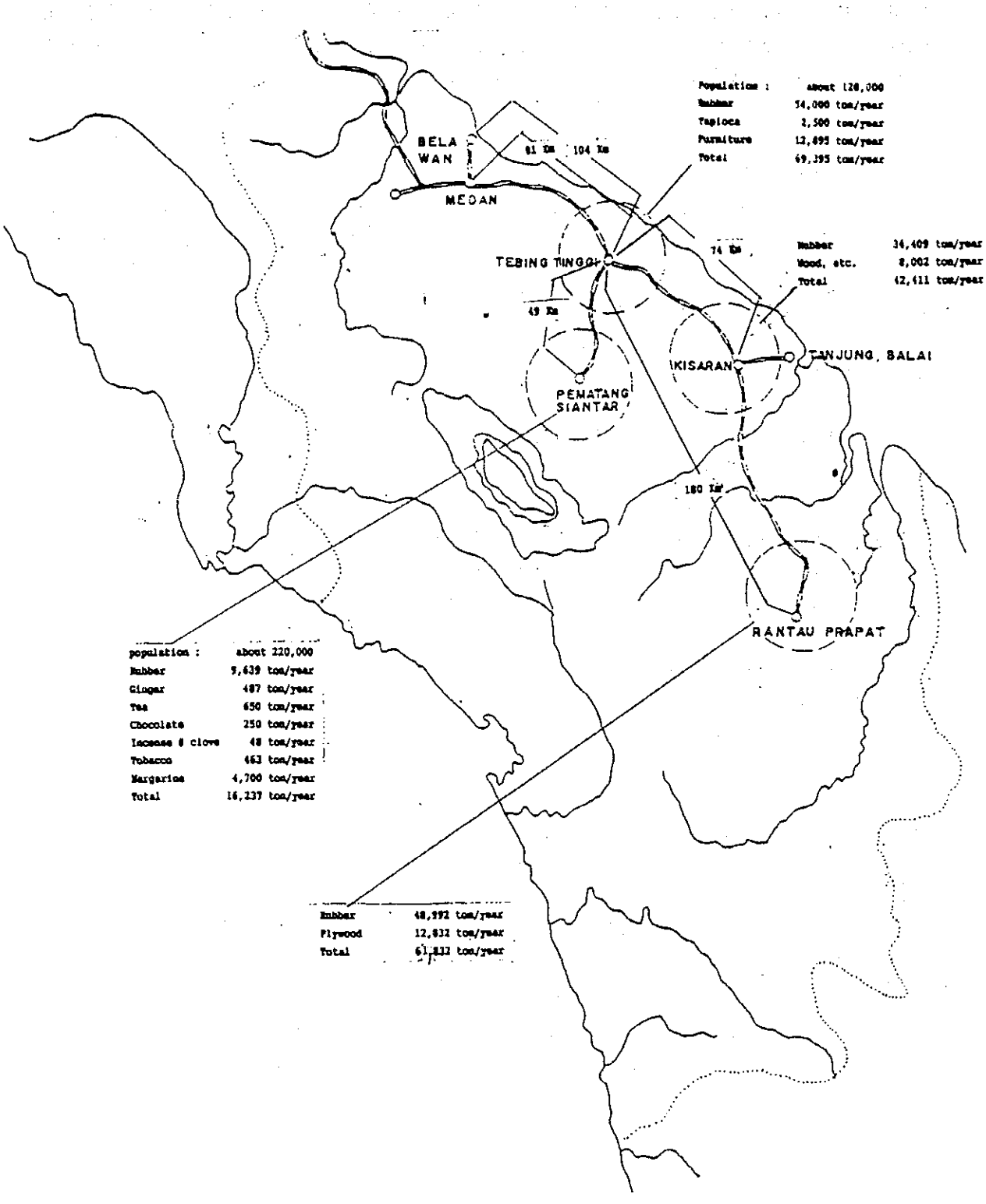


Fig. 2.44 Tebing Tinggi and its surrounding area

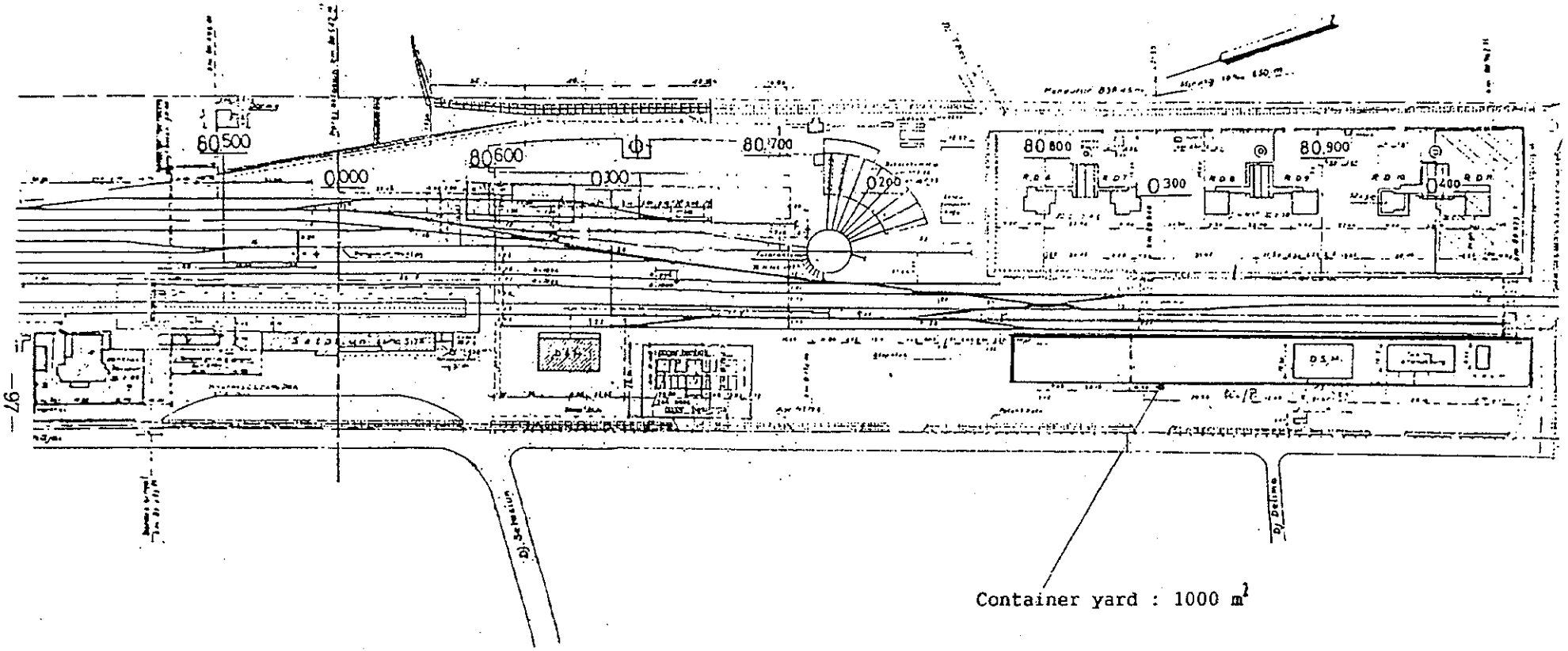


Fig. 2.45 Layout of Tebing Tinggi Dry Port

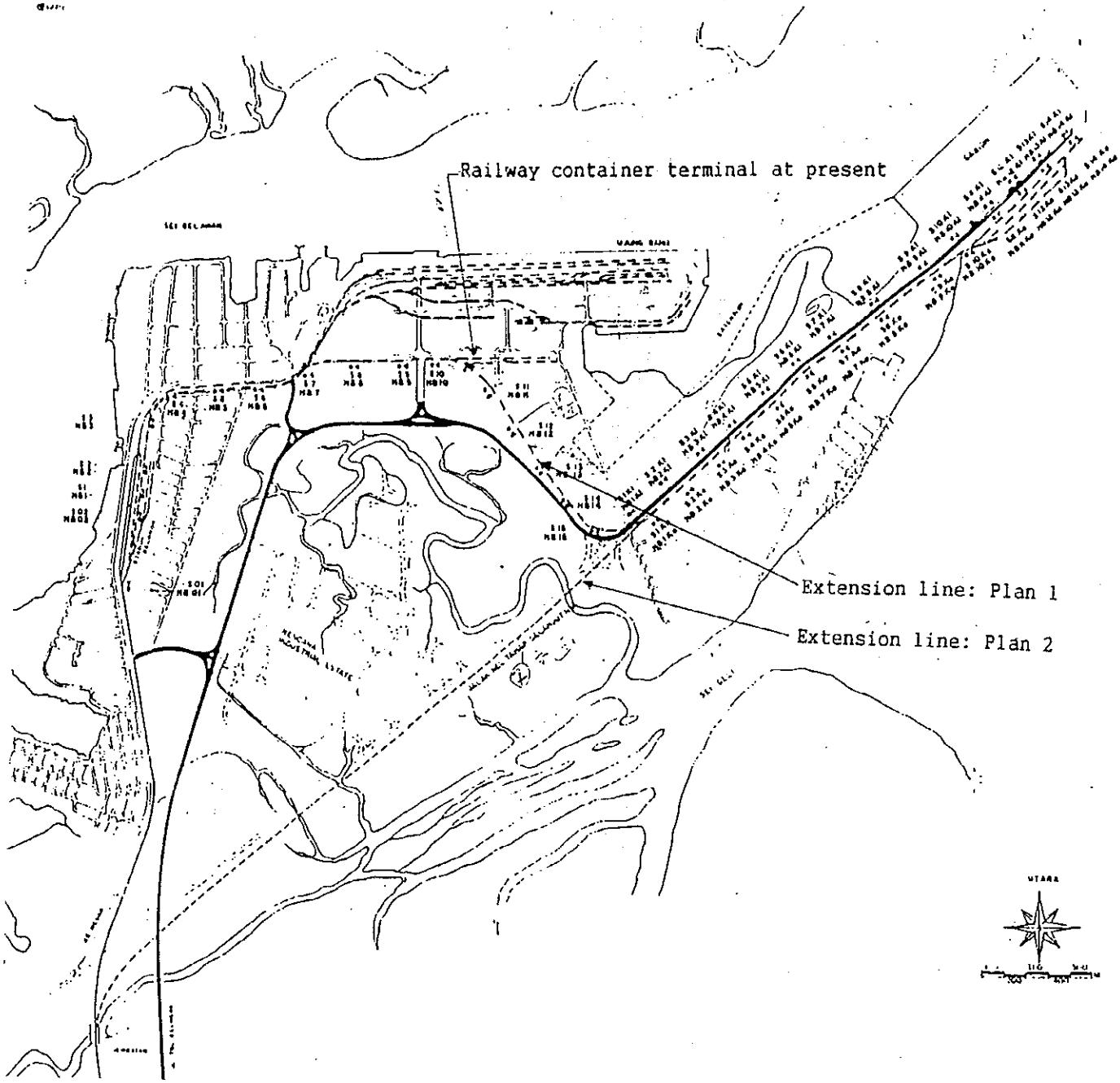


Fig. 2.46 Layout of Belawan Port

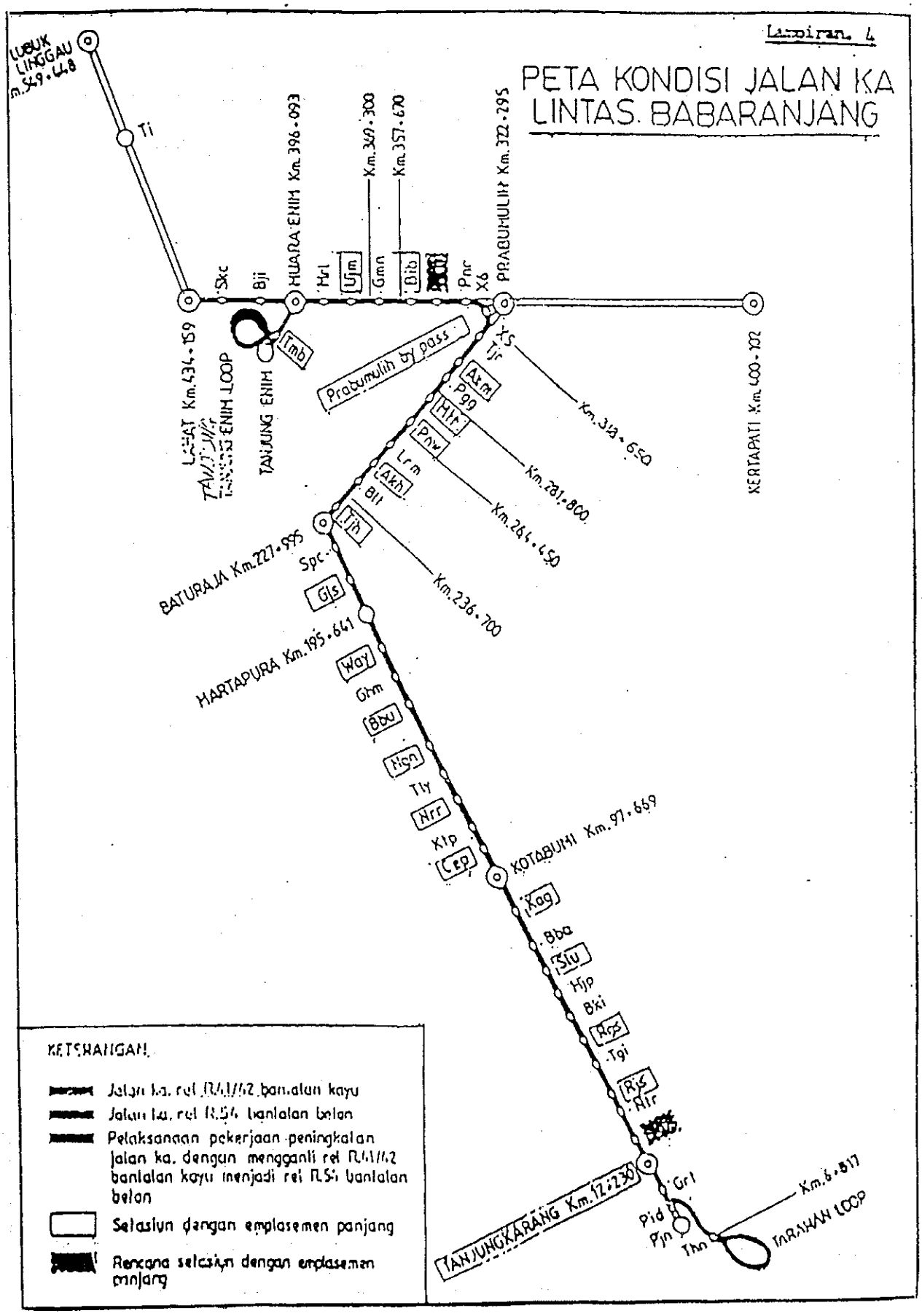


Fig. 2.47 Location map for coal transportation

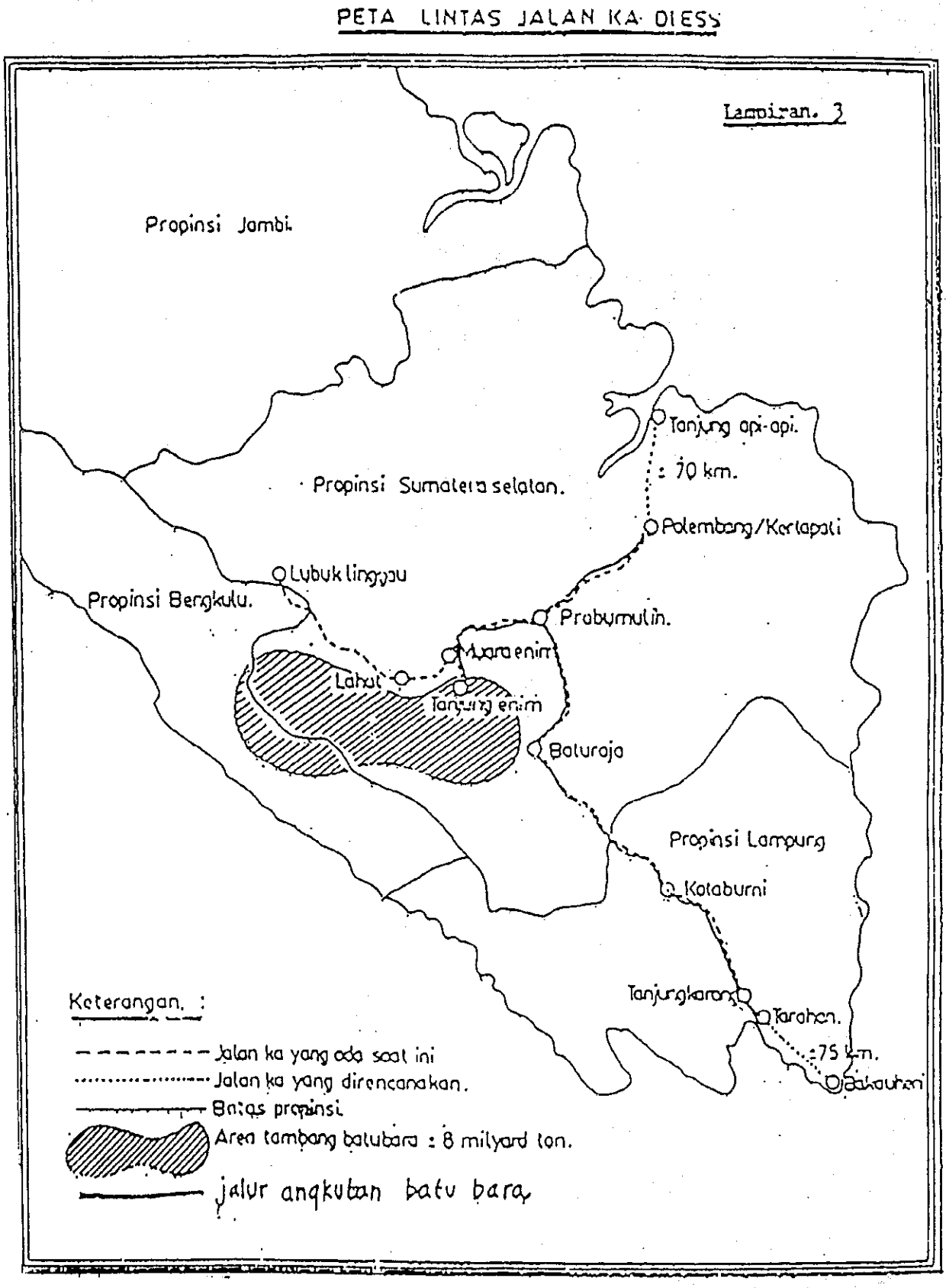


Fig. 2.48 Mining zone and transpotation route

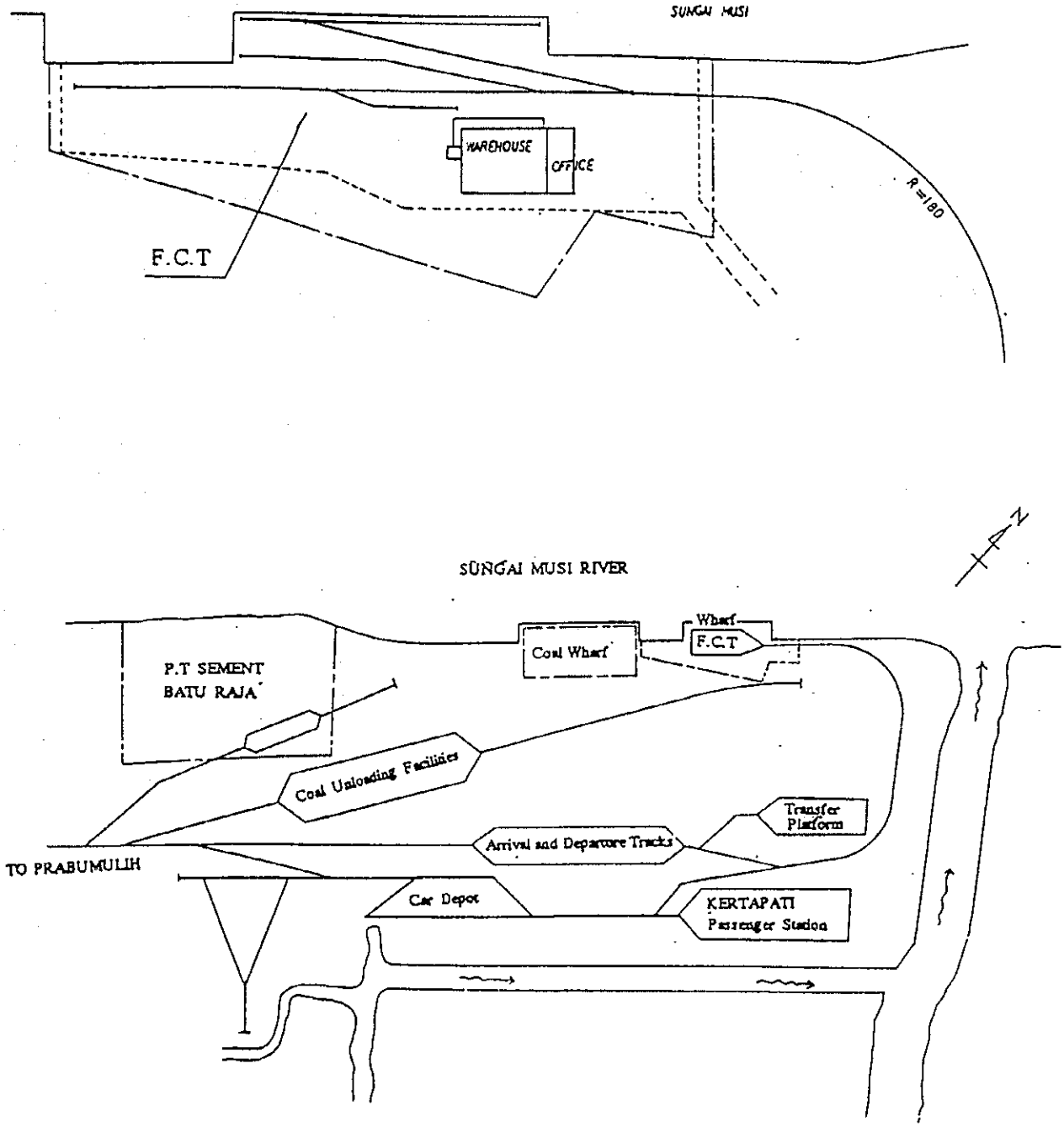


Fig. 2.49 Track Layout of Kertapati

Table 2.39 Achievement table in 1992

PROGRAM DAN REALISASI TAHUN 1992.

TAHUN 1992.

DALAM RIBUAN
- Vol.Km
- Pendapatan

URAIAN	PROGRAM 1992		REALISASI 1992		PERSENTASE		
	VOL	PENDAPATAN	VOL	PENDAPATAN	VOL	PENDAPATAN	
1.PENUMPANG.							
a.EKSEKUTIF.	52,500	20,370	36,863	14,430	70	71	68
b.BISNIS.	527,790	170,845	340,192	124,805	64	73	71
c.EKONOMI.	476,700	122,000	459,517	132,571	96	109	83
JUMLAH (1) :	1,056,990	313,215	836,572	271,806	79	87	75
2.BRG.NEGOSIASI							
a.S B M	195,166	43,620	202,204	53,081	104	122	159
b.PUPUK PUSRI	2,699	830	1,400	366	52	44	22
c.SEMEN/KLINKER	515,174	101,493	468,565	94,781	91	93	91
d.BATUBARA KPT	1,200,515	194,482	1,170,988	209,607	98	108	98
e.BATUBARA SRLY	4,559,999	1,878,719	4,710,157	1,940,585	103	103	103
JUMLAH (2A) :	6,473,553	2,219,144	6,553,314	2,298,420	101	104	103
BRG LAIN :							
a.ACI	8,913	3,918	6,337	2,329	71	59	76
b.PASIR BESI	11,120	2,513	11,780	2,682	106	107	142
c.KARET	67,188	20,736	75,093	22,890	112	110	145
d.BERAS	5,150	4,729	14,727	5,535	286	117	143
e.GULA	20,192	11,804	27,031	10,367	134	88	109
f.LAIN-LAIN	151,651	44,767	217,417	56,894	143	127	93
JUMLAH (2B) :	264,214	88,457	352,385	100,697	133	114	108
JUMLAH(2A+2B) :	6,737,767	2,307,611	6,905,699	2,399,117	102	104	104
3.PENDAPATAN OPERASI :							101
4.P.L.L :							60
5.TOTAL PENDAPATAN ESS :							100

Kep.Direksi Perumka No.KA/KU/05249/sk/92. Tgl.31-1-1992.

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(2) Facilities

214. Kertapati St. is the terminal for passengers and freight where a car depot for locos, coaches and wagons is attached. The track layout is shown as **Fig. 2.49.**
Main goods for freight transportation are coal.
Exporting coal is loaded on the barges from coal wharf next to the station where the handling volume of coal by industrial railway was 1.253 million ton in 1993 and now increasing. The others are cement, clinker of 36,000 t per month as arrival and fertilizer as departure.
It can say that there were no container facilities, because they had been utilizing only the existing siding for loading containers.

(3) Ongoing and proposed developing plan

215. There exist doubling track plan and extension plan by new line. Both are for coal transportation. **(Fig. 2.48).**

(4) Existing issues

216. The new establishment of direct container transportation route to Singapore has invited structural damage on the railway containers. The container resource exists only around the Palembang port, neither goods to fill container boxes are produced nor remarkable consumer cities exist in inland cities.
They are out of basic conditions of dry port.

2.7.3 Gedebage Dry Port and connecting railway

(1) Gedebage Dry Port

a. Activity

217. Gedebage dry port is located in the suburbs of Bandung city with the population of 1.8 million people. It is 187 km in the south east apart from Tg. Priok port.
PERUMKA prepares 190 marine container wagons including spare ones as follows for this route operation.
Two axle bogies with four wheels :PPCW 150 wagons

l = 13 m (1 * 40 ft or 2 * 20 ft use)
Three axle bogies with six wheels :PKPKW 40 wagons
l = 17.6 m (more than 30 t use)
Total 190 wagons

218. On the train operation table, four trains with each 17 wagon formation are possible to run between Gdb and Tpk without stopping on holidays, but to run five trains by supplementing spare wagons on busy days and three trains on Mondays and Sundays because of no work of customers on Sundays.

219. This transportation has started in 1987 for the sake of alleviation of highway transport and annual increase has been remarkable as follows.

Year	Annual transportation volume	Daily actual no. of running trains
1987	2,595 TEUS	one train / single way
1988	8,887 TEUS	ditto
1990	23,065 TEUS	two train / single way
1993	60,918 TEUS	three train / single way

220. The contents are as follows, where empty containers are imported and exported goods are stuffed to them.

	Full	Empty	
import	30 %	70 %	: industrial materials, machines
export	92 %	8 %	: Shoes, textile goods, tea

221. The main destination for export is japan.
This transportation has good reputation not only by customers but by PERUMKA, because the export procedure can be finished at Gedebage dry port, and the anxiety about stealing needs not for the customers on the way to Tpk St.

222. Generally speaking, the freight transportation should pay attention to customers' convenience, the dispatch of imported containers from Tpk St. concentrates at midnight and the trains arrive at Gdb St. after five or seven hours travel.

Export container trains starts successively from afternoon under dispersed interval from Gdb St. **(Fig 2.50)**

223. The train is hauled by CC201 type locomotive that is possible to pull 759 t and to connect 17 wagons.
The train length is about l = 14.2 + 13 * 17 = 235 m owing to the regulation of effective track length at each station between Pwk St. and Pdl St., where Chicadondung St. is caught in the steep grade of 16/1000 and difficult to extend the track length. (The effective length is 238 m)

224. Container size and the using ratio are as follows on Box substitute.
20 ft (8 * 8 * 20) 61%
40 ft (8 * 8 * 40) 39%
Jumbo size and high cube containers can't be handled under regulation of the construction gauge at steel bridges and tunnels.

Average transportation weight of a full container is as follows.

	20 ft	40 ft
export	8 - 14 t	18 - 24 t
import	10 t	22 - 30 t

225. The container trains are used by unspecified customers, but two companies named PT. Samudera Indonesia and Ameriko Piranti use a chartered train once a week.
The stuffing of export goods is conducted at the factories whose ratio occupies 85% of all ones but tea is done at CFS of Gdb St. The export examination by inspector (Scofindo) is conducted at the factories.
The train transportation efficiency(realized transportation volume / planned transportation volume in TEU) is 60,918/96,288 = 63%, bearable to the increasing traffic demand for a while.

b. Facilities at Gedebage dry port (refer 8.1.1)

226. i) general remarks
The track layout of Gedebage St. is shown as **Fig. 2.51.**
The freight handling facilities were added in 1987.
The outline of the facilities is as follows.

227. ii) Infrastructure

*	Land area	3.5 ha (after spreading) 2.6 ha (at present)
	loading and unloading space for transtainer 3000 m^2 container yard 1.5 ha and 6000 m2 under construction	
*	Loading and unloading side track	1 * 240 m
*	Passing tracks	2 * 240 m
*	CFS for export and import	2 buildings
*	Warehouse	20 m * 15 m * 5 m
*	Wagon checking tracks	2
*	Private siding track to oil terminal (stopped the use at present)	1

228. iii) Equipment

*	Transtainer	for	42 t	1
*	Toploader	for	35 t	1
*	Forklift	for	10 t	1
*	ditto	for	2.5 t	4
*	ditto	for	3.5 t	1
*	Hand pallet	for	2.5 t	2
*	Head truck			2
*	Chassis			4

Besides, one shunting locomotive is dispatched.

c. Dry Port management

i) management

229. This dry port is not one the regular stations but independent organization under PERUMKA Semarang branch and the following bloc units are established in it for the export procedure.
The shipping procedure by customers can finish here.

230. Chief of dry port is the representative of all organization in this terminal as follows.

PERUMKA	25	Others	148	
		* Port authority	48	
		Customs	32	
		* Quarantine	3	
		* BNI bank	2	
		Praghan Indonesia	60	(handling company)
		Export inspector	3	
		* sign is in the PERUMKA office		

231. Valid time for the reception for business document.
7 : 30 - 14 : 00
Valid time for the carrying in containers.
8 : 00 - 22 : 00
Fig. 2.52 shows organization of Gedebage St.

232. The export procedure is as follows.
* Submit shipping letter (fill out the format for freight transport)
* Pay tariff (From requirement of empty container to arrival from Tpk Port)
* Receive empty container (Agent (EMKL) delivery)
* The stuffing is conducted at the factory or warehouse by client under attendance of export inspector.
* Loading order on the wagon gives the priority to urgent shipment schedule, the others are based on the principle of fast come fast serve by receiving card.

Containers are accepted at Tpk St. between three days and six hours before shipping.

233. Import procedure is trusted to Gdb Dry port.
* Full containers unloaded from a ship are carried into Pasoso St. with the import letter and handed over PERUMKA.
  Shippers inform to customers of the arrivals.
* Customers conduct the followings for receiving containers with the letter transported from Pasoso St. to Gedebage St.
  Submit of a request letter for receiving customs inspection and its payment.
  Payment of tariff and storage service charge to accountant.
* The arrived containers are transferred from C.Y. side to customers' chassis based on the handed over directive. Payment cost composed of tariff and service fee between

Gdb St. and Tpk St. is as follows.

20 ft	full	container	120 * 10^3 RP
	empty	container	73 * 10^3 RP
40 ft	full	container	210 * 10^3 RP
	empty	container	132 * 10^3 RP

* Service fee means the sum of loading, unloading and storage charge.

d. Operation at Gedebage

234. The location of marshalling yard below the gantry crane over the loading track is shown as **Fig. 2.53**, where export containers in waiting occupy the center part with the handling volume of two trains.
Bandung side on both ends is used by import containers that don't finish customs procedure.
It is said that the longest storage period of them reaches 20 days.
The opposite side is used by them finished customs procedure that makes customers possible to carry away.
They are kept deposited for three or five days instead of warehouse.

235. The loading containers outside the crane are kept deposited under the classification either prepared or preparing for export letter.
There is a deposit space for empty containers next to them.
The clearance head under the crane makes four strata stacking of containers impossible.
However three strata are appearing enough below the crane.
The impossible time to handle the crane is accessing.

236. There are two CFSs for import and export at both ends of the crane rail whose handling volume is little.
Loading and unloading time per one train composed of 17 wagons needs two hours according to the explanation by station master.
The handling ability of crane is enough, but handling space is so small that a trailer can turn about with difficulty; therefore, spreading the handling space is ongoing.
Train formation order is as follows; therefore, that the heaviest containers are connected next to locomotive a little shunting is needed.

Locomotive * 40 - 20 t * Less 20 t * Empty

237. The Agent (EMKL) carries empty containers into Gdb St. from Tpk by railway in accordance with the request by customers from Tpk Port and delivers them to factories.
The maintenance is conducted at Jakarta.
The storage tracks are in shortage, so each wagon formation stays not only at the lead track but at the wagon repair track and at the passing track for waiting for departure at peak staying time.

e. Kiaracondong St.

238. Kac St. is next to Gdb St. on Bandung direction, the track layout is shown as **Fig. 2.54.**
All the container trains for Gdb St. can stop here on the way where a dead end siding possible to unloading is located in the land space with about 2.6 ha parallel to the station.
If all the empty imported containers are unloaded here before arriving at Gdb and delivered to customers, We can give allowance to the congestion at Gdb C.T.
However, the entrance faces directly main street in the city and a grade crossing.
They say that the local government doesn't permit carrying them out in the day time.

(2) Tanjung Priok St. and belonging station.

239. Tpk St. and belonging station have to be checked as well as Gdb St.
The network around Tpk St. is shown as **Fig. 2.55.**
The Pasoso St. is located next to C.T Berth, the industrial railway track branched from Tpk St. reaches PERTAMINA oil base. Pasoso St. is located intermediary one km apart from Tpk St. It was reformed from unnecessary marshalling yard to container freight station owing to the improvement of general cargo berths.

a. Pasoso St.

240. The industrial railway track branched from Tpk St. where track is owned by PERUMKA and the other facilities are owned by the Port Authorities.
Seven of PERUMKA staff are working here for contact business with the port.

The track layout is shown as **Fig. 2.56.**

241. We can find three side tracks including locomotive run around siding, PERTAMINA route that is in no use, is utilized as lead track, signals and safety facilities are not installed.
1 # track reaches general cargo berth where is in no use except transporting heavy machine or locomotive. 2 # track goes to empty container depot where is in no use.

242. The length of present elevated platform was 300 m where two toplifters were operated by Port side operators. It has finished extension works for securing 600 m long after completion.
After that, two container wagon formations become possible to be handled at the same time, though the shunting is complicated a little.
The width is 49 m enough to handle containers with toplifters.
There is a warehouse (100 m * 40 m) seemed to be CFS on the platform but it seems to be little use.

b. Tanjung Priok

i) facilities

243. Tpk St. is a terminal, and the track layout is shown as **Fig. 2.57.**
There are two double track routes, one is for Jakarta kota, another is for Kemayoran. The former is not used now.
The no. of departure and arrival trains at the station is shown as **Table 2.40.**
It is not enough used in spite of being a big station.
On **Fig. 2.57.** the way to use each platform track is as follows.
1.2.3# : Daily inspection, storage for spare wagons.
4.5.6# : Departure and arrival of passenger train.
4.5 # : Departure and arrival of container train.
The other tracks are used as storage siding.

Table 2.40 Number of Trains at Tpk St.(Double Way)

Year	90	92	93
Long & Middle Distance Train	2	2	4
Local Train(include Commuter)	-	-	-
Freight train	8	6	9
Dinas	4	6	4
Total	14	14	17

244. Sepur Labuhan route connects Pasoso St. with Tpk St.
Accordingly, a train arrived at 4.5 # track is pushed with tractive loco to Kota direction on the way of wagon shunting for accepting daily inspection at 1-3 # track and switches again back to Pasoso St. as it is.

245. There is Tpk. Gudang St. next to Tpk St. where had been a marshalling yard for industrial railway sidings to get to each wharf. It changed to the container freight station, still more has changed to an empty container depot after completion of Pasoso St. available to use, but it is no use at present.
PERUMKA has the will to utilize this area for a joint company established with some private company but MOC doesn't give the approval to it yet.

ii) operation

* The wagon formation started Pasoso St. takes 30 min. until starting again Tpk, in which 10-15 min for approaching, 15 min for daily inspection time and waiting time for departure is included.
* Loading and unloading work by one toplifter takes 2-3 min. per container, accordingly necessary loading and unloading time for one train needs about 45 min. by two toplifters. (2.5 * 17 * 2/2 = 42.3 min)
* Imported containers are carried to Pasoso by a yard truck one hour later after unloading from a ship. Exported ones are carried into marshalling yard in C.T. one or two hours before shipping at latest.

* Shunting is conducted by a tractive locomotive, the wagon formations waiting for departure are stored at Tpk St. or Pasoso St.
* Arrival trains are admitted even on the locomotive run-around track used for shunting, owing to excess empty wagons.
* The tractive locomotives successively arriving at Tpk St. from Gdb St. at midnight start from Tpk St, soon after exchanging wagon formation, at the same midnight. Therefore, the staying time of the locomotives is not so long.

(3) Connecting Railway

a. Activities

246. Jakarta-Cikampek-Bandung section is located in the western part of Java whose area has a large population represented with 38% of the total population of Java, it corresponds to 23.4% of whole population in Indonesia.
DKI Jakarta is the center of economic and cultural activities and its population and density record 7.3 million and 12,370 person/km^2.
Bandung City is the provincial capital of West Java (population of all the province is 4 million), has population of 1.8 million, and is the city of plateau with 743m height.

247. The route of railway transportation between Tg. Priok and Gedebage is connected with Tg.Priok port (north east of Jakarta) which is the biggest one in Indonesia. Gedebage freight terminal station is approximately 10km apart from the center of Bandung City, where the head office of Indonesia Railway Public Corporation (PERUSAHAAN UMUM KERETA API 'PERUMKA') is located. **(Fig.2.58)**.
The train frequency of each section on the transportation route is shown in **Fig.2.63.**

248. The list classified by passenger and freight transportation is as follows, it is almost occupied with passenger transportation.

	Jak--Bks	Bks--Ckp	Ckp--Pwk	Pwk--Pdl	Pdl--Bd	Kac--Gdb
Passenger Transport	60	56	28	22	34	26
Freight Transport	22	15	10	11	11	12
Dinas	--	--	--	--	--	6
Total	82	71	38	33	45	44

(Number of single way a day)

249. The direct trains between Gambir and Bandung are both limited express (PARAHYANGAN) and ordinary express, they are 21 trains per day single way, and also PARAHYANGAN are running within 160 minutes between Gambir and Bandung (150km), but it takes long time of 90 minutes between Cikampek and Bandung (71km) on the Southern Trunk Line. Based on the above reason, railway occupies 17% share in total passenger traffic between Jakarta and Bandung.

250. The commodity transported by freight train between Jakarta and Bandung is cement, sand (one train) and general merchandises etc.
The figure of track capacity on the Southern Trunk Line is shown in **Fig.2.60.**
The track capacity of a single track section can be calculated by the following formula.

$$N = \frac{1440}{t + C} * f$$

N: Track capacity (frequency)
t: mean operating time for all trains between adjacent two stations (minutes)
C: signal handling and blocking time (minutes)
f: track utilization factor

251. The track utilization factor 'f' adopts in general 0.6-0.7 because of track maintenance time and loss on diagram formation.
The coefficient of 0.7 is used on the effective time zone, which has a little fluctuation of train density in effective time zone on the Trunk Line.

252. The team calculates the track capacity at every section between Cikampek and Gedebage based on the above formula, and finds the track capacity already exceeds on the six sections in spite of adopting 0.7 of the track utilization factor, for instance, already operating 76 trains per day including non-regular trains between Cikampek and Cibungur on the train diagram, already exceed by 3 trains on the capacity. It causes the delay of trains.

253. The track maintenance is carried out both in the daytime (by manpower of one group) and at midnight (by MTT of one group).
Three MTTs are furnished with Cirebon track maintenance base, one of them is used between Jatinegara and Cikampek, the others are between Cikampek and Bandung.

254. There are the attended level crossing of 78 (73 Electrical system, 5 Mechanical

system) and the unattended level crossings of 286 on the route, train operators must use frequent alarm horn every time passing through the level crossing.
Every train can not help making the speed slowing down, because the inhabitants of wayside of Jatinegara and Bandung are walking on the track.
Recently, the commuter transportation in Bandung area is making gradual increase, the countermeasure for commuter service is necessary to make plan as soon as possible.

b. Facilities

255. This route consists of both double track section and single track section; the former is Jabotabek Eastern Line (Tpk-Jng) that is one of the urban railway in Java island and the Northern Trunk Line (Jng-Ckp); the latter is Southern Trunk Line (Ckp-Gdb) which has partial double track section (Pdl-Kac). (**Fig.2.61**)

256. The track layout of the every station on this route is shown in **Fig.2.62**, the track class for improvement and maintenance is ranked on track class 2nd between Tg. Priok and Padalarang, and on track class 3rd between Padalarang and Gedebage. (**Fig.2.59**)
In the Southern Trunk Line, the section between Cikampek and Padalarang (approximately 75km) is the single track line, with sharp curved alignment (minimum R=150m) and steep gradient (i=7.6 - 16.6/1000) on the mountainous terrain, the effective length of main track is 300m in the Northern Trunk Line, but in the Southern Trunk Line, it is limited to 239m owing to the difficulty of extension.

257. The blocking system on this route is one block between every two adjacent stations, and every station is equipped with mechanical signal and interlocking.
The locomotive and coach depot is located in Bandung and Jatinegara, and the locomotives for container trains belong to Bandung depot.

c. Ongoing proposed development plans

258. i) Modernization of signalling between Cikampek and Bandung

The submit of investment loan was proposed on this project by Australian government in 1994 and agreed.
The execution is expected to do during two years of 1995-1996.

259. ii) Double tracking between Cikampek and Bandung

It is said World Bank is going to propose investment loan on this project.

(4) Existing issues

a. Existing issues on the present route will be stated in detail including the traffic demand in the section 8.1.2, so omitted here.
b. However we have to consider the following problems about transportation demand after the completion of TCT-III by 2000 year.

260. The resource of increasing transportation demand depends on both the export industries around Gedebage Dry Port, TCT-I, II of Tg. Priok port, and the surrounding container depots support it.

261. The present TCT-I, II is approaching the limit of the capacity.
TCT-III where are many houses to be removed, is not under construction yet, but the access roads around TCT-III are congesting even now, and it might be doubtful whether TCT-III will be acceptable in charge of 150% increase of the present volume or not, so the construction of TCT-III would request more transportation demand for railway caused by the access route.

262. The railway facilities concerning TCT-III plan have not been studied concretely except the idea of new installation of the same handling terminal as Pasoso, still more it is necessary for railway to study whether the present transportation route will be kept in future as it is or not.

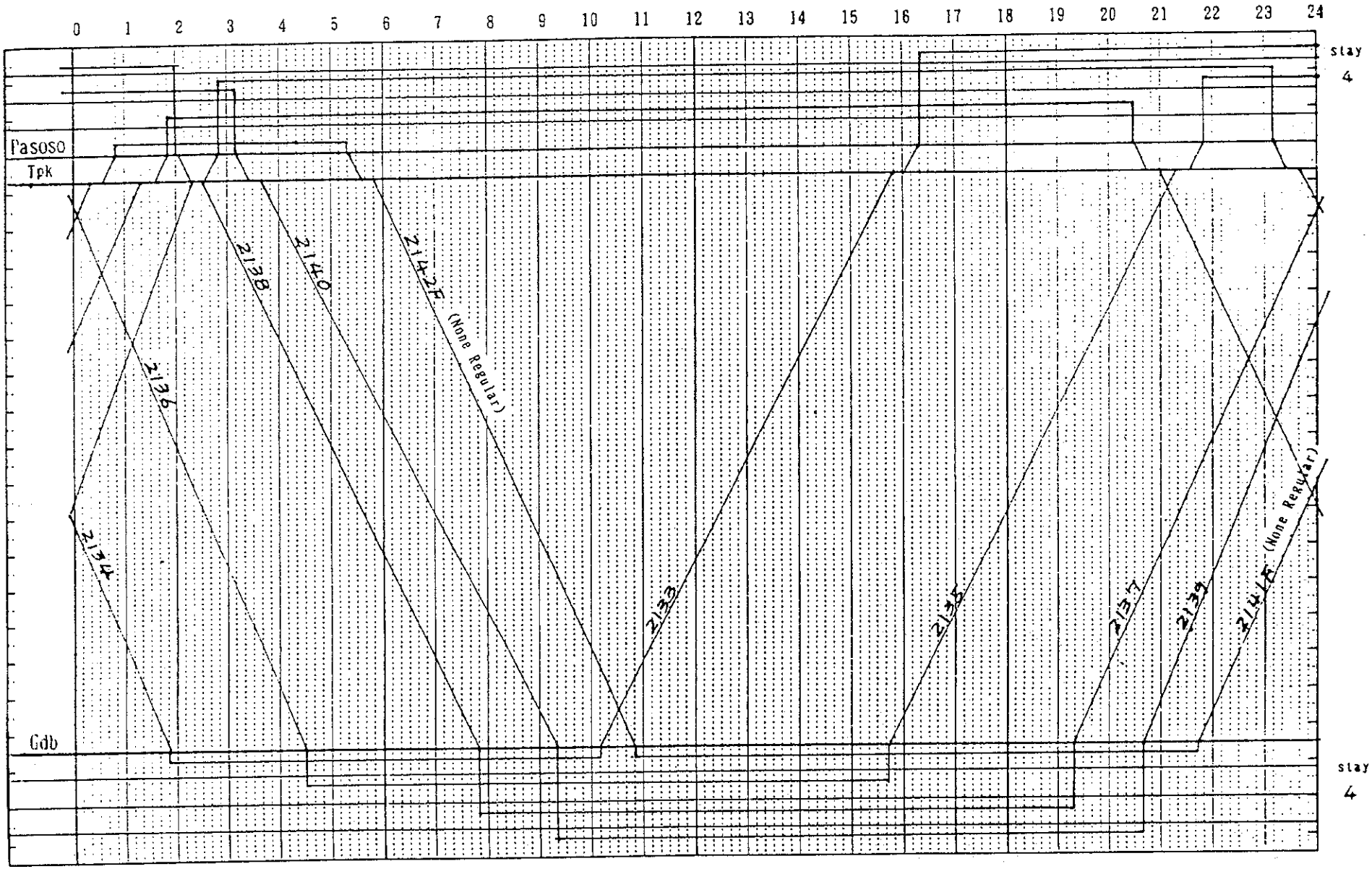


Fig. 2.50 Container Train Diagram five trains operation single way

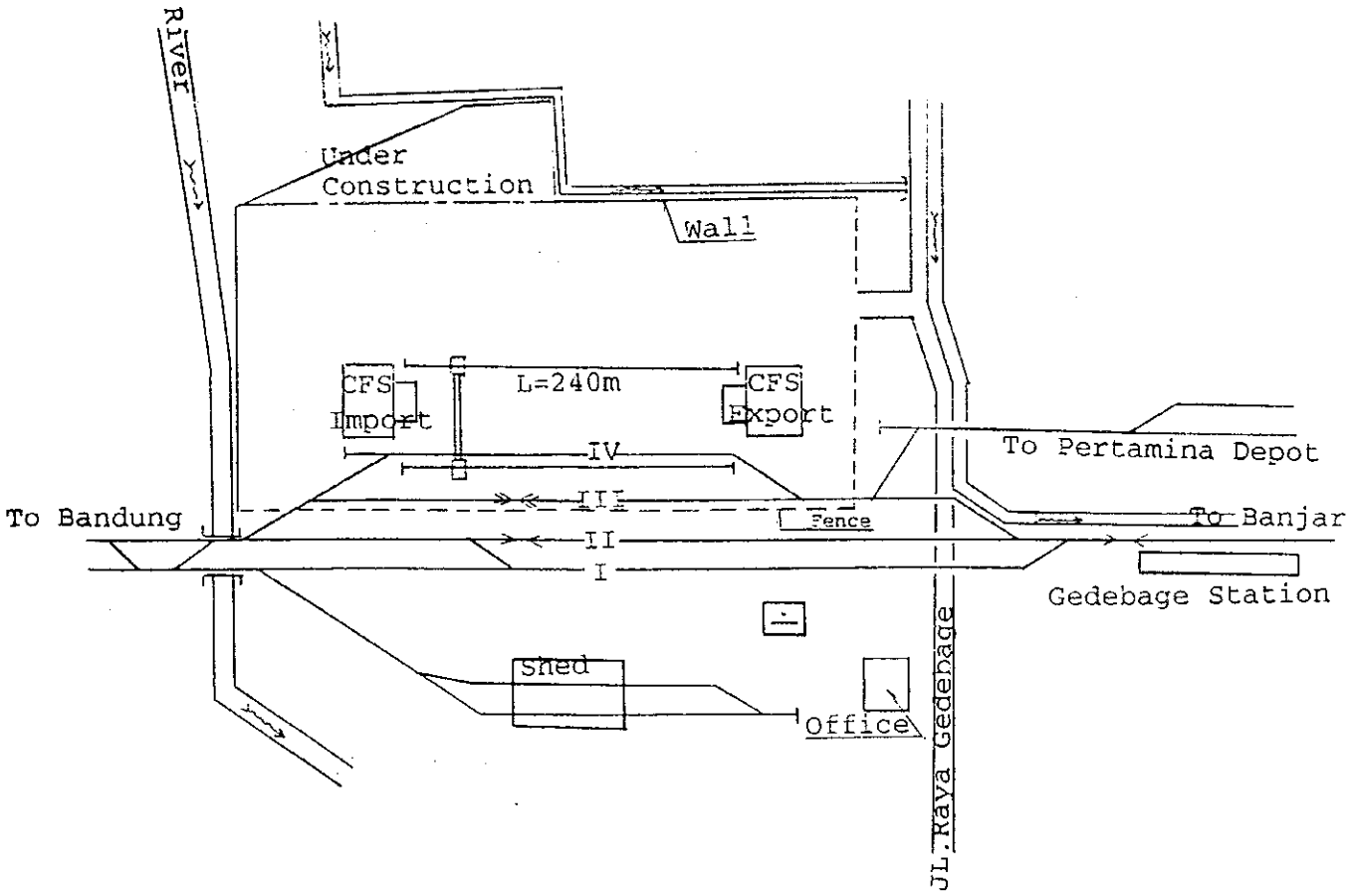


Fig. 2.51 Track layout of Gedebade Dry Port

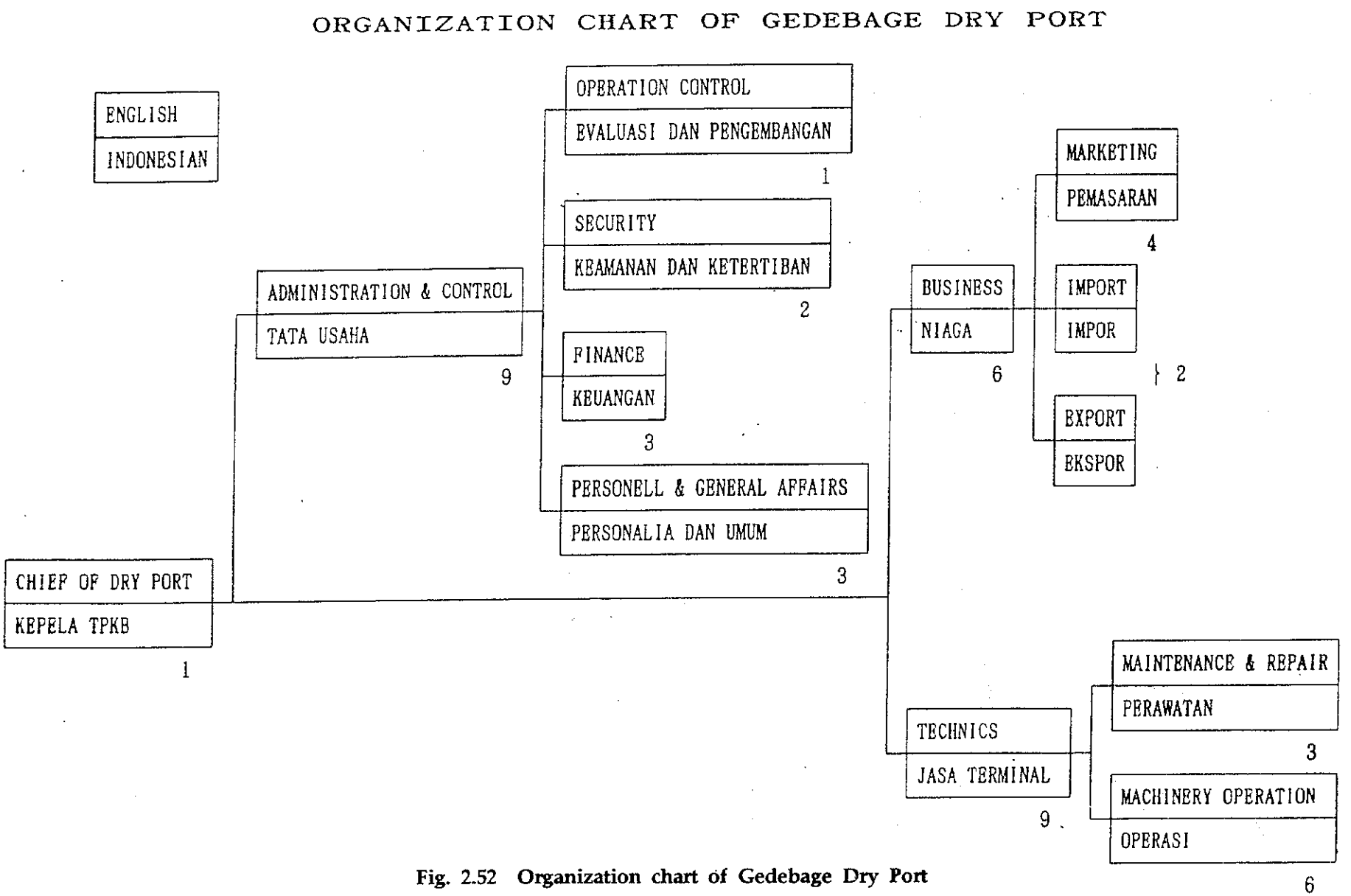


Fig. 2.52 Organization chart of Gedebage Dry Port

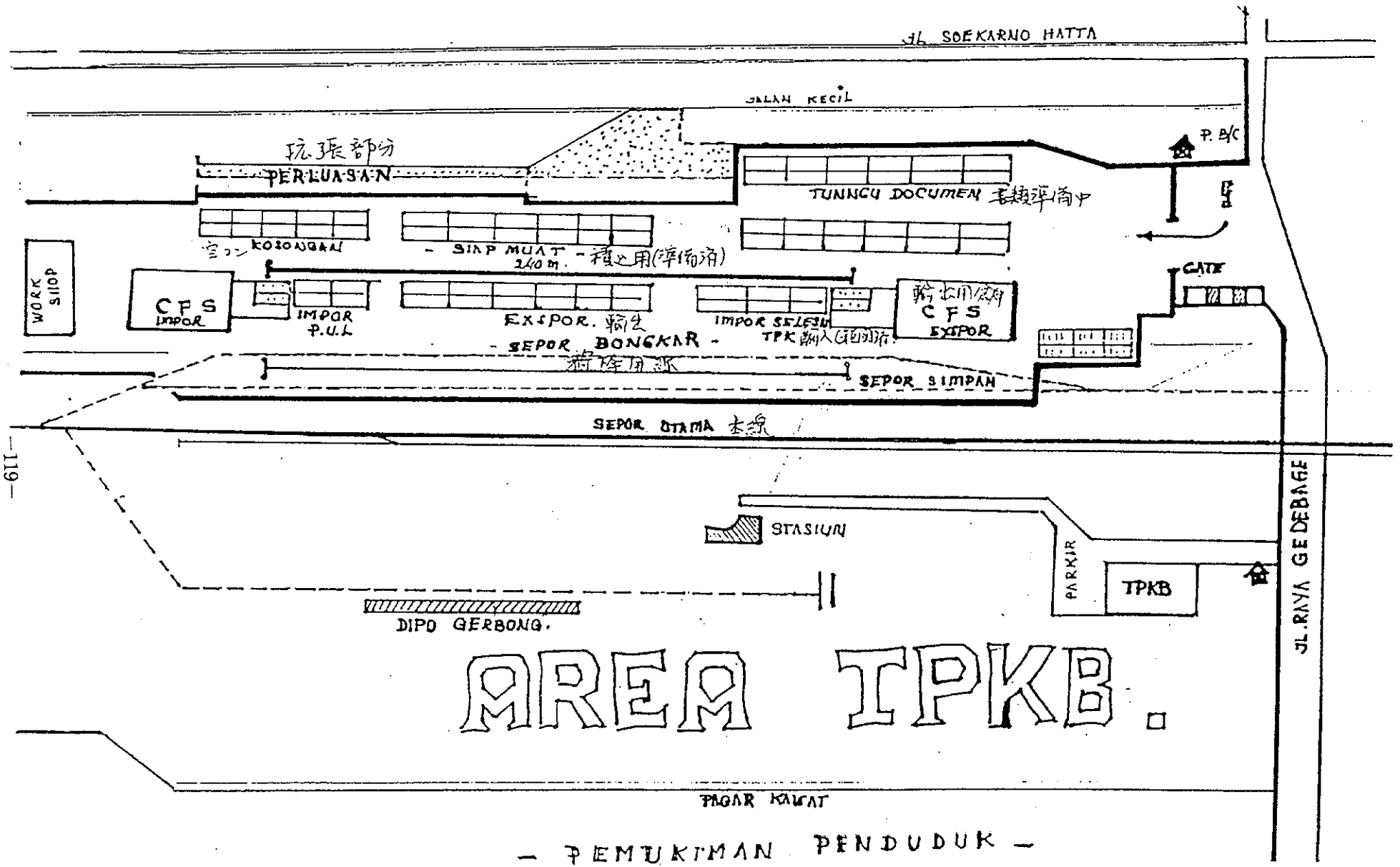


Fig. 2.53 Gedebage marshalling yard Layout

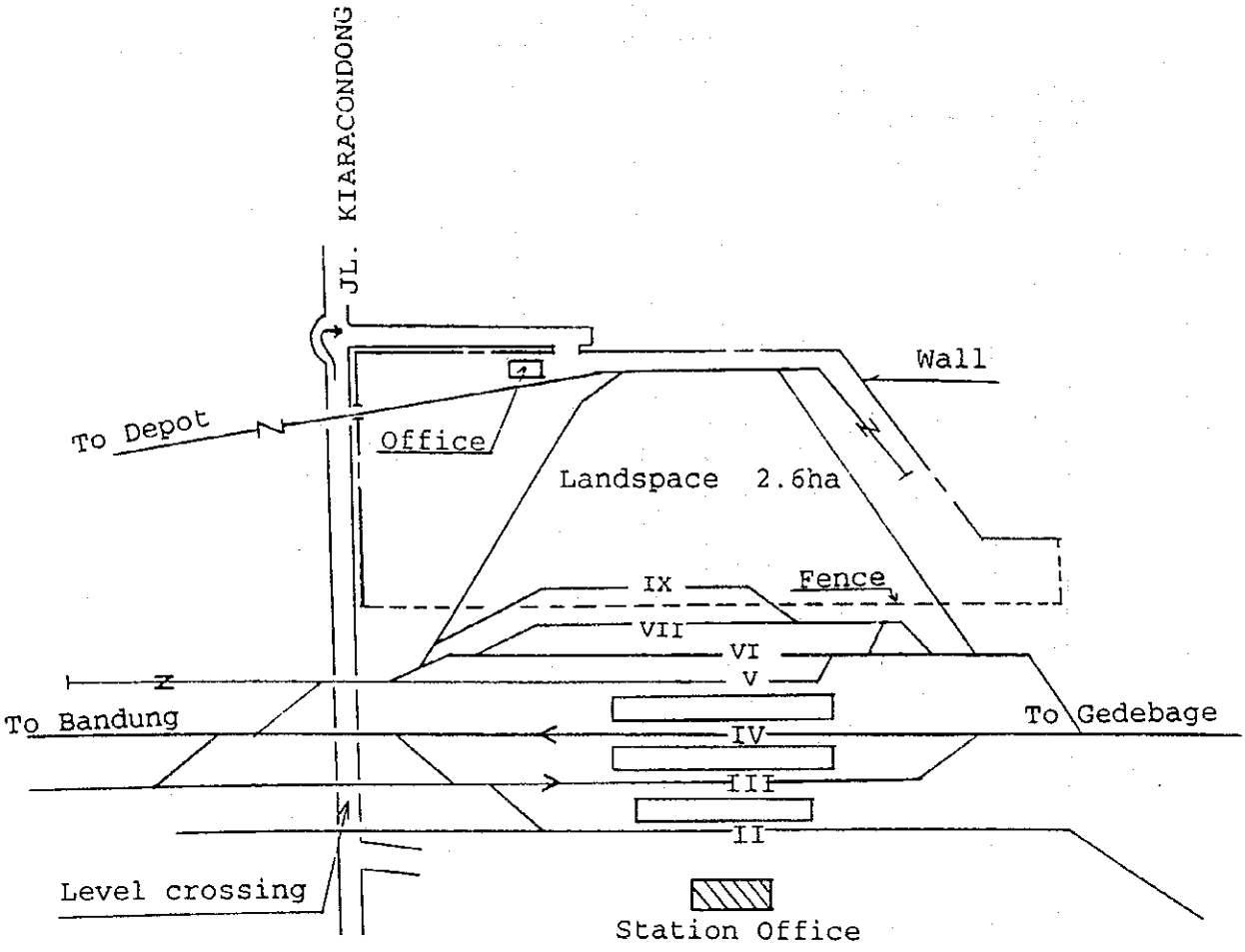


Fig. 2.54 Track layout of Kiaracondong

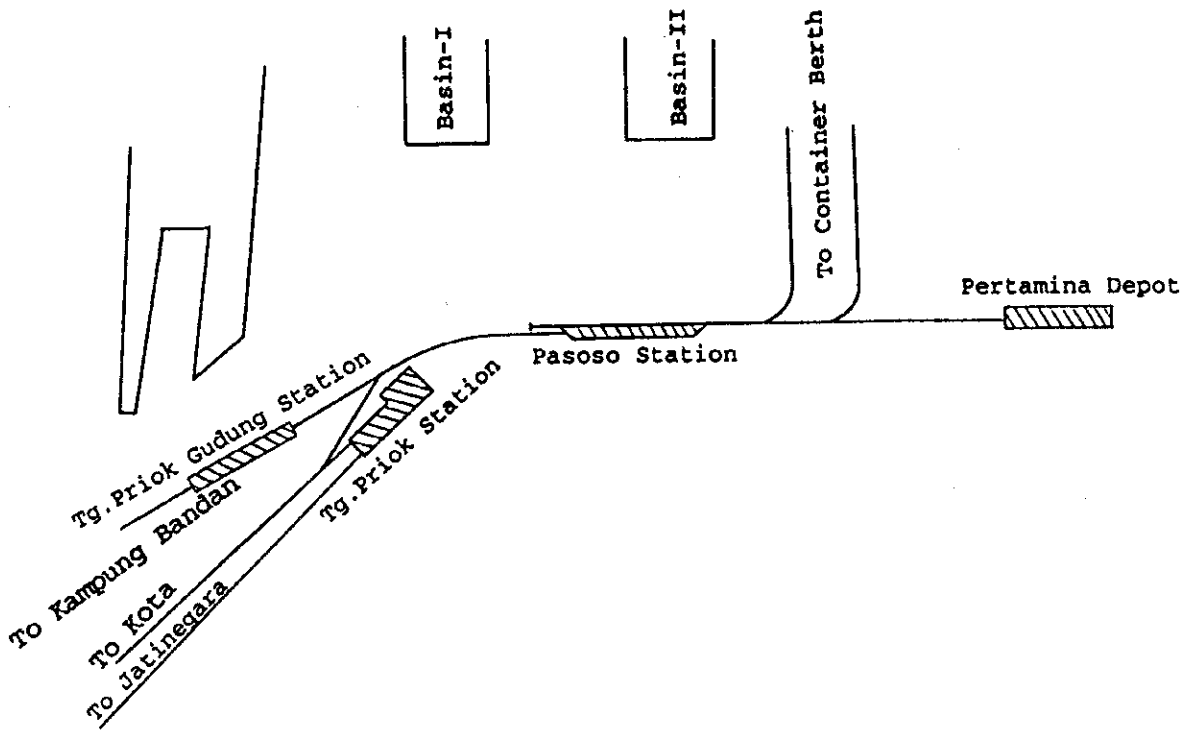


Fig. 2.55 Network around Tg.Priok St. Map

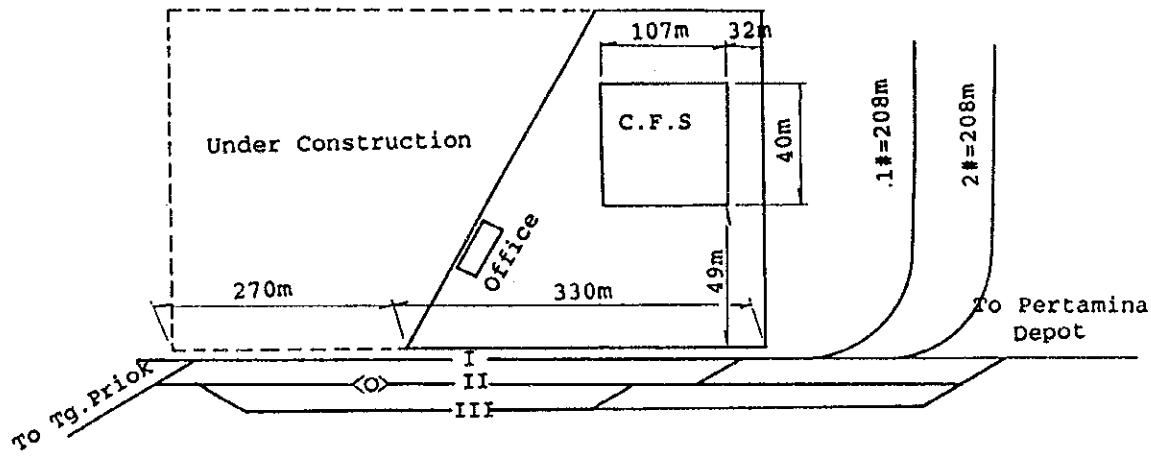
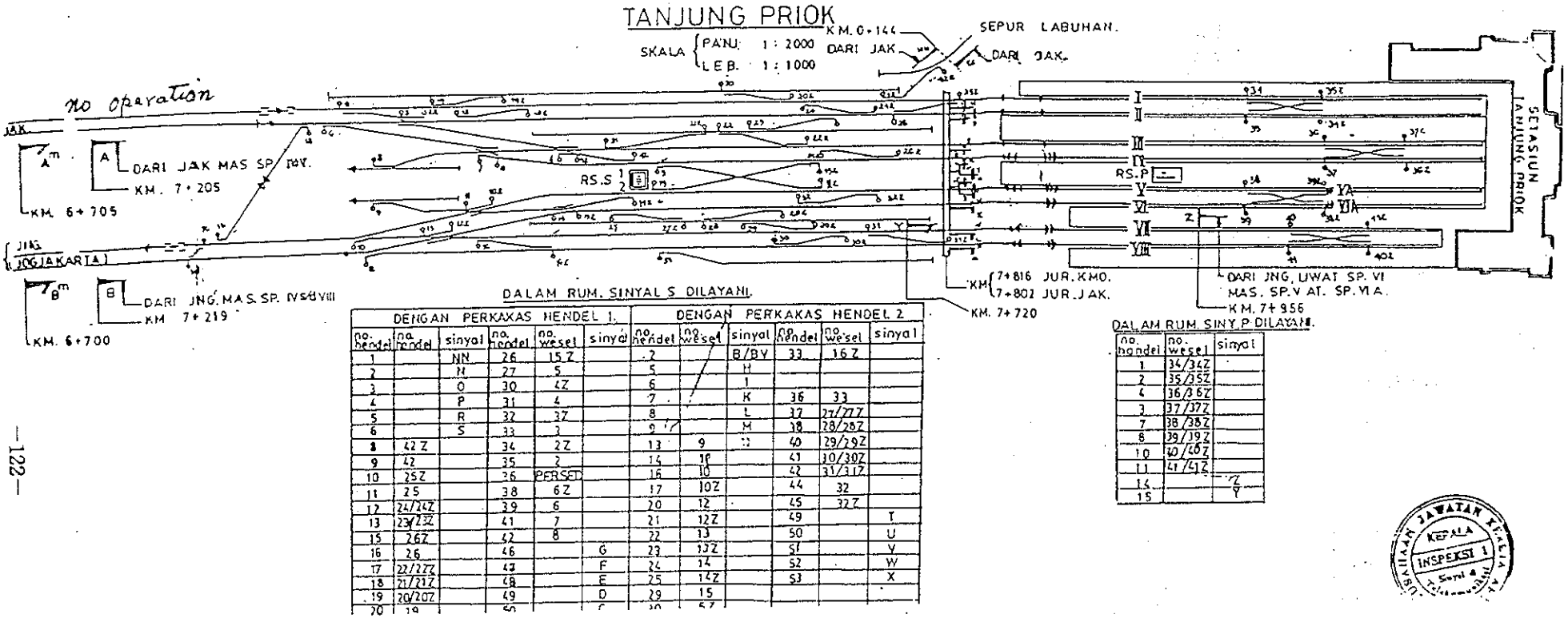


Fig. 2.56 Track layout at Pasoso



DALAM RUM. SINYAL S DILAYANI.

DENGAN PERKAKAS HENDEL 1.						DENGAN PERKAKAS HENDEL 2					
no. hendel	no. hendel	sinyal	no. hendel	no. wesel	sinyal	no. hendel	no. wesel	sinyal	no. hendel	no. wesel	sinyal
1		NN	26	15 Z		2		B/BY	33	16 Z	
2		N	27	5		5		H			
3		O	30	4Z		6		I			
4		P	31	4		7		K	36	33	
5		R	32	3Z		8		L	37	27/27Z	
6		S	33	3		9		M	38	28/28Z	
8	42 Z		34	2Z		13	9	::	40	29/29Z	
9	42		35	2		14	10		41	30/30Z	
10	25Z		36	PERSEO		16	10		42	31/31Z	
11	25		38	6Z		17	10Z		44	32	
12	24/24Z		39	6		20	12		45	32Z	
13	23/23Z		41	7		21	12Z		49		T
15	26Z		42	8		22	13		50		U
16	26		46		G	23	13Z		51		V
17	22/22Z		47		F	24	14		52		W
18	21/21Z		48		E	25	14Z		53		X
19	20/20Z		49		D	29	15				
20	19		50		C	30	15Z				

DALAM RUM. SINY. P DILAYANI.

no. handel	no. wesel	sinyal
1	34/34Z	
2	35/35Z	
4	36/36Z	
3	37/37Z	
7	38/38Z	
8	39/39Z	
10	40/40Z	
11	41/41Z	
14		
15		

Fig. 2.57 Tanjung Priok Track Layout

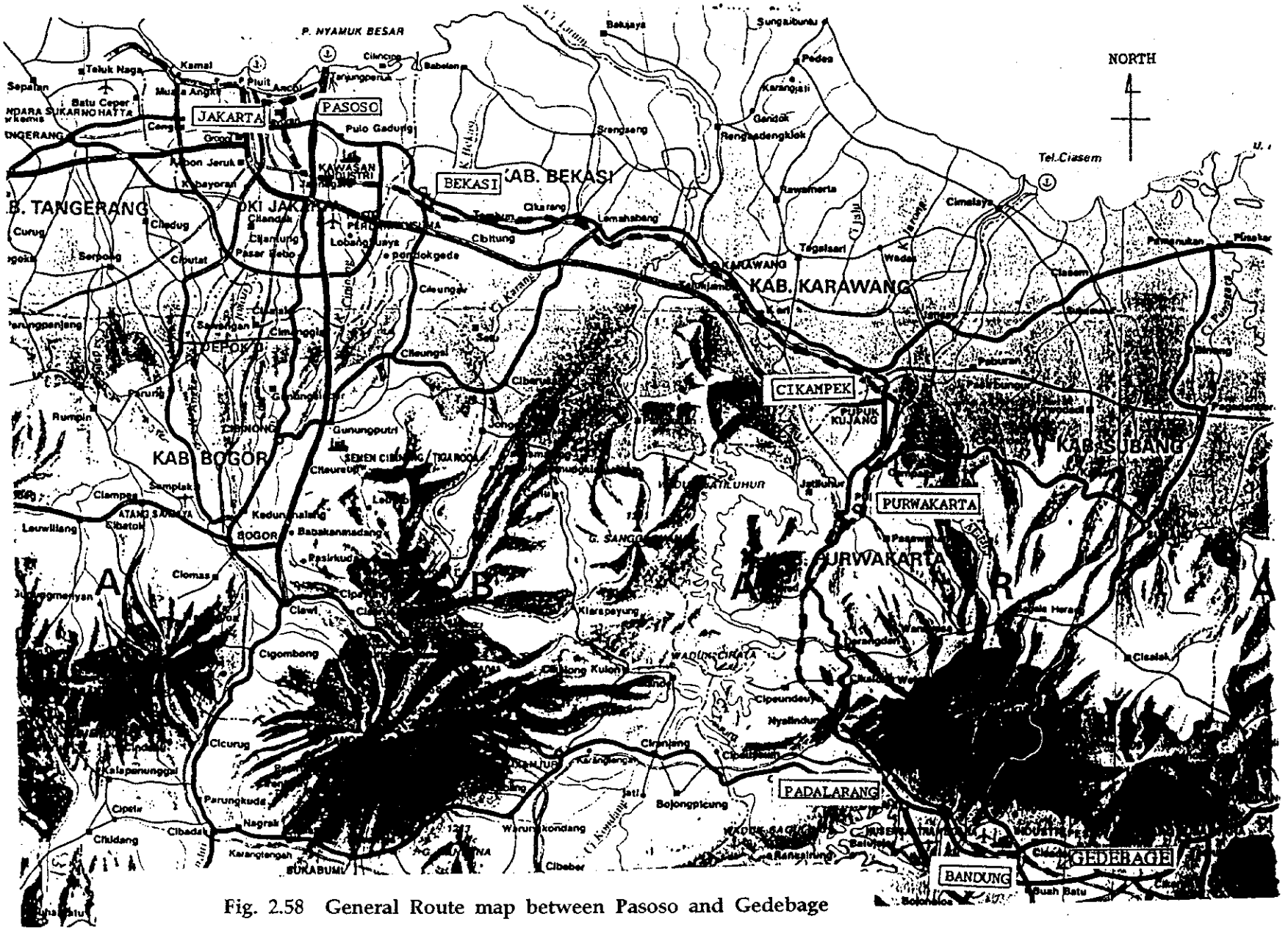


Fig. 2.58 General Route map between Pasoso and Gedebage

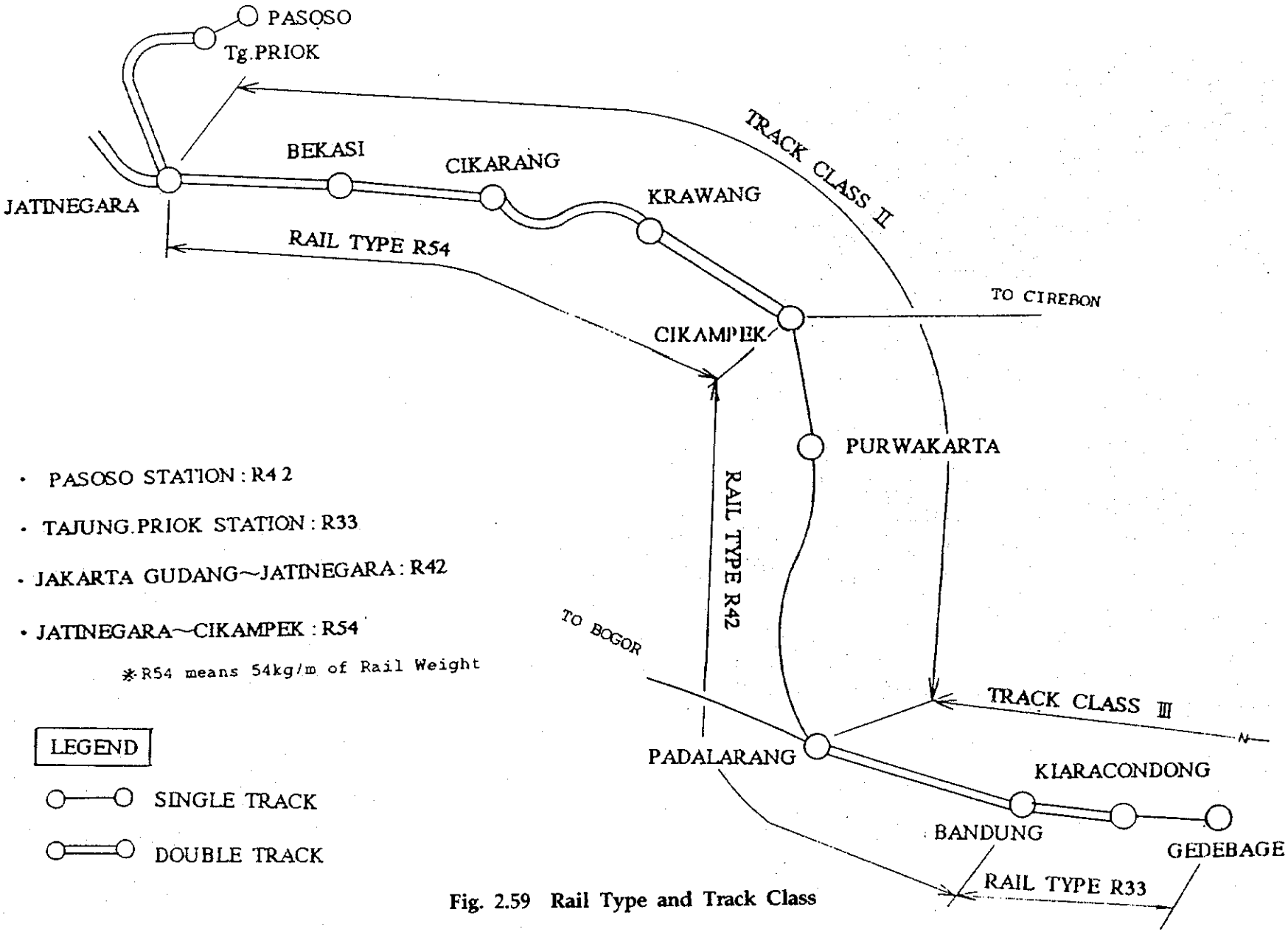


Fig. 2.59 Rail Type and Track Class

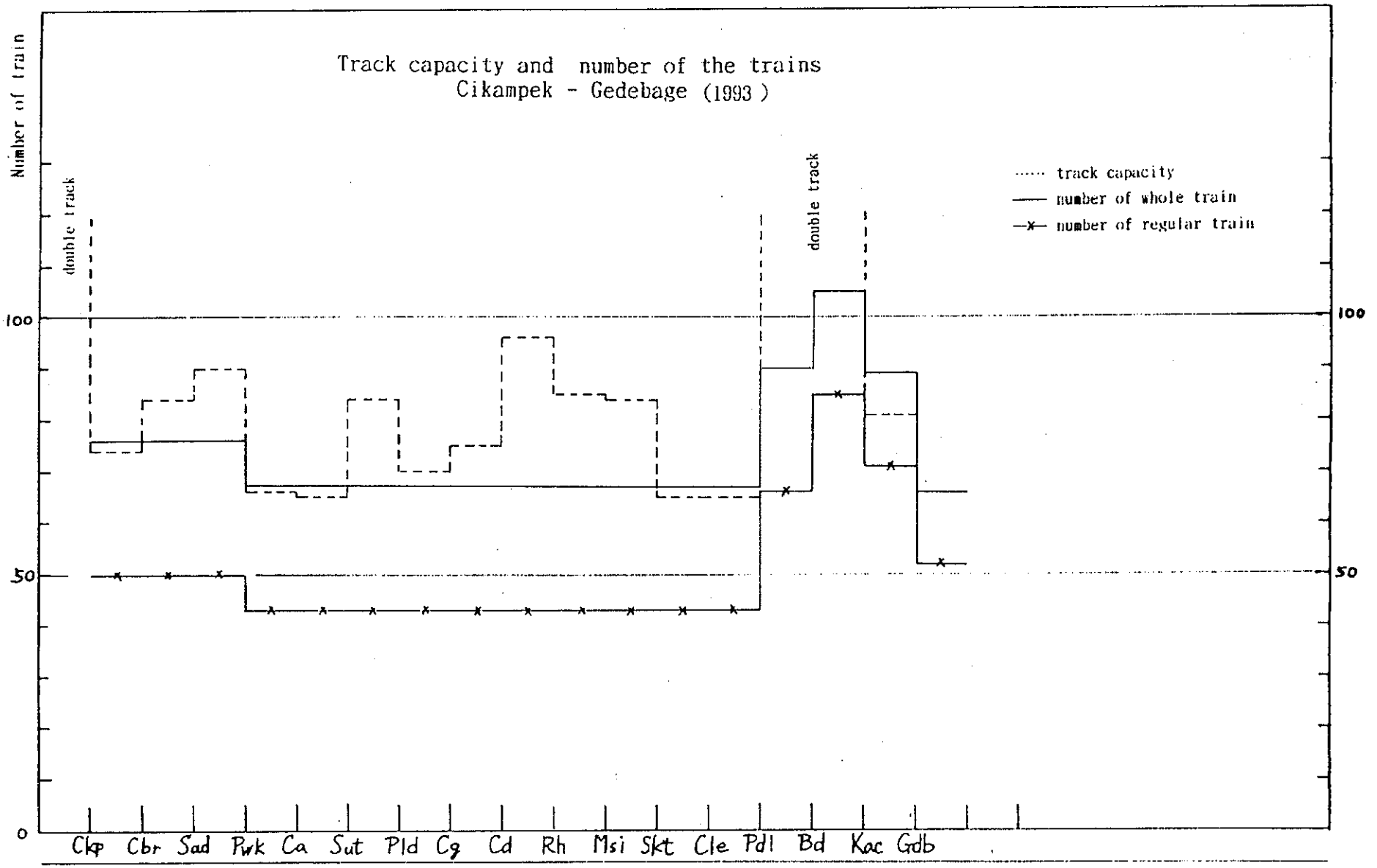


Fig. 2.60 Track Capacity between Cikampek and Gedebage

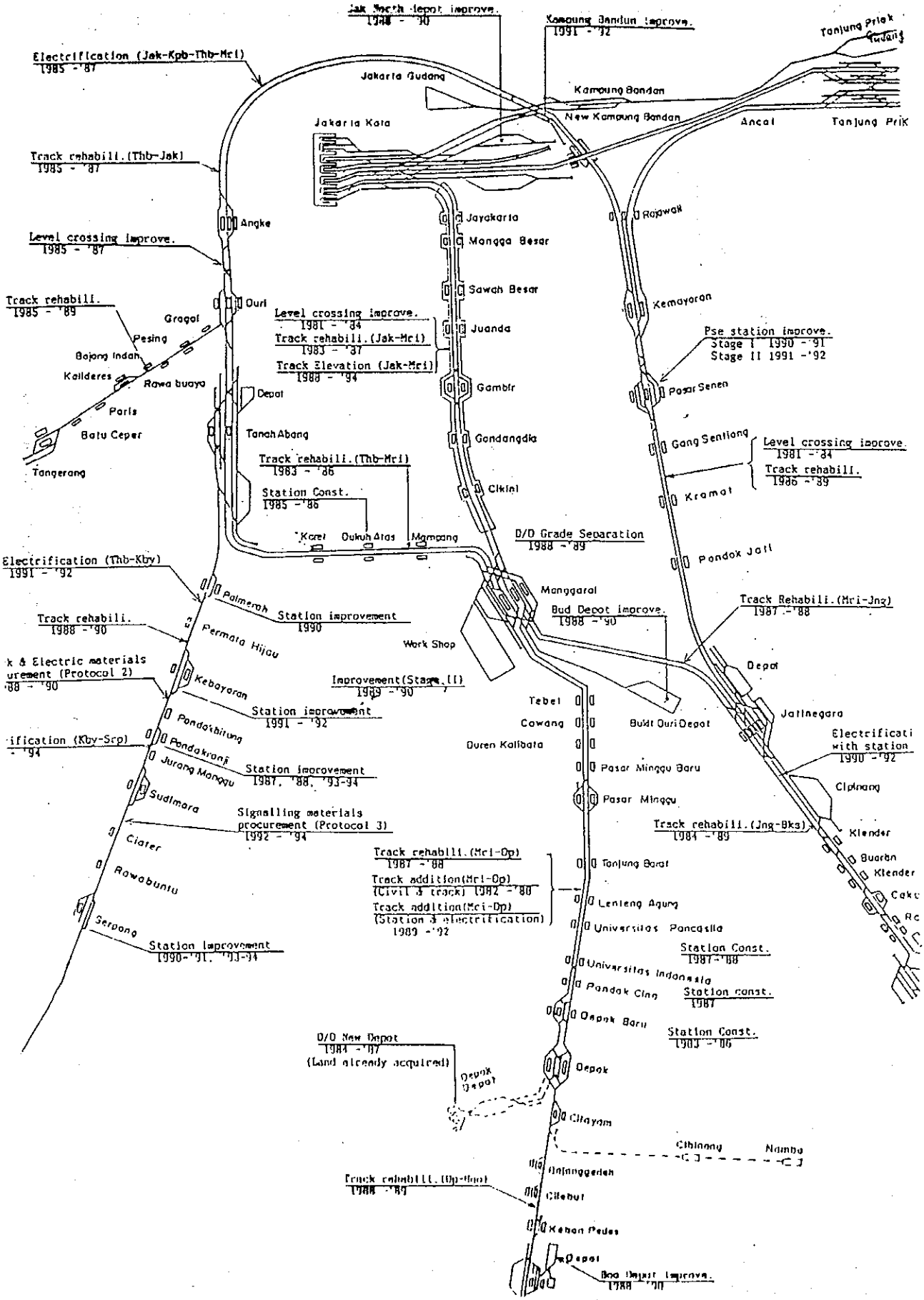


Fig. 2.61 Track Layout of Jabotabek Area

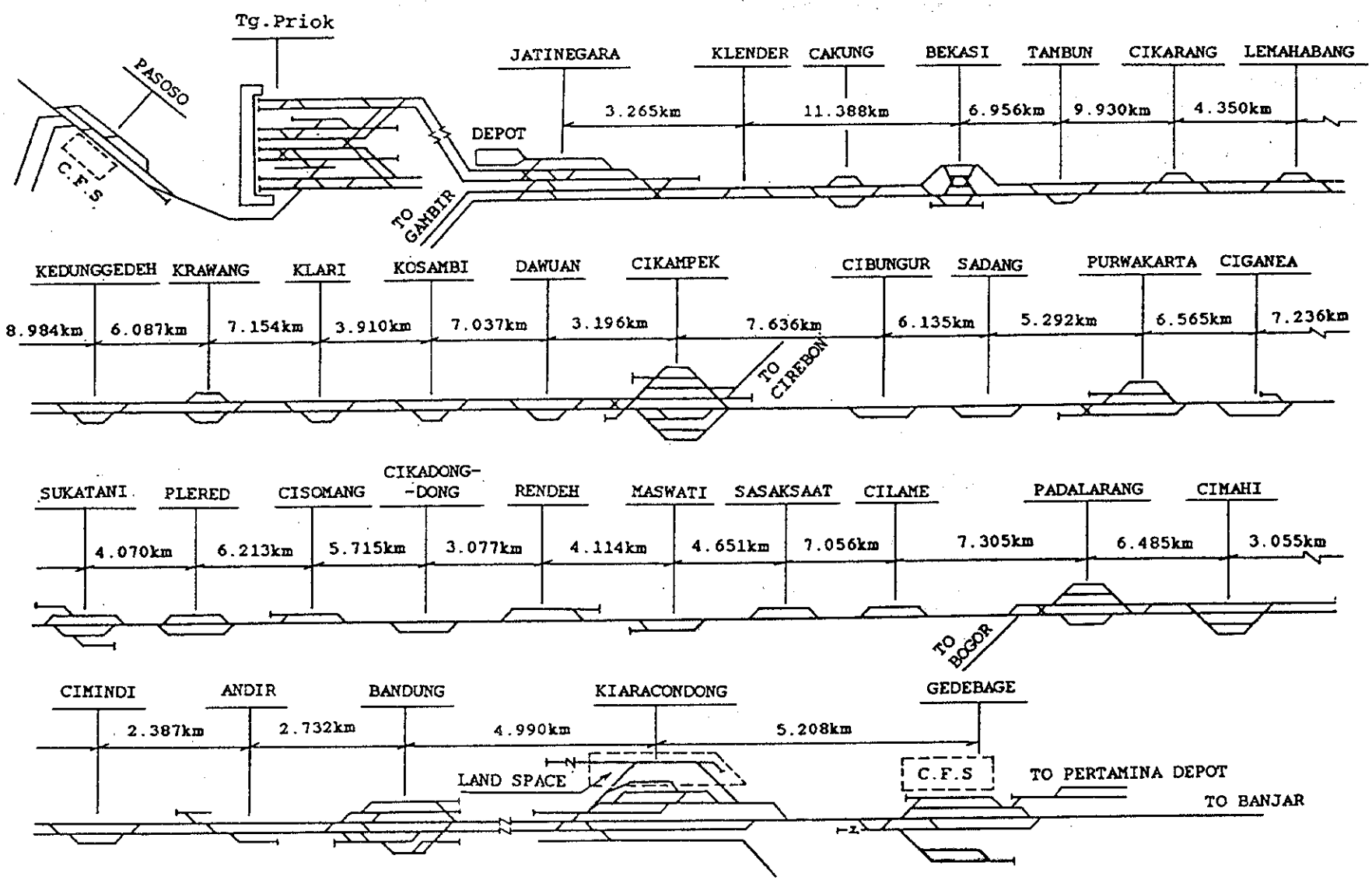


Fig. 2.62 Track Layout Between Pasoso and Gedebage

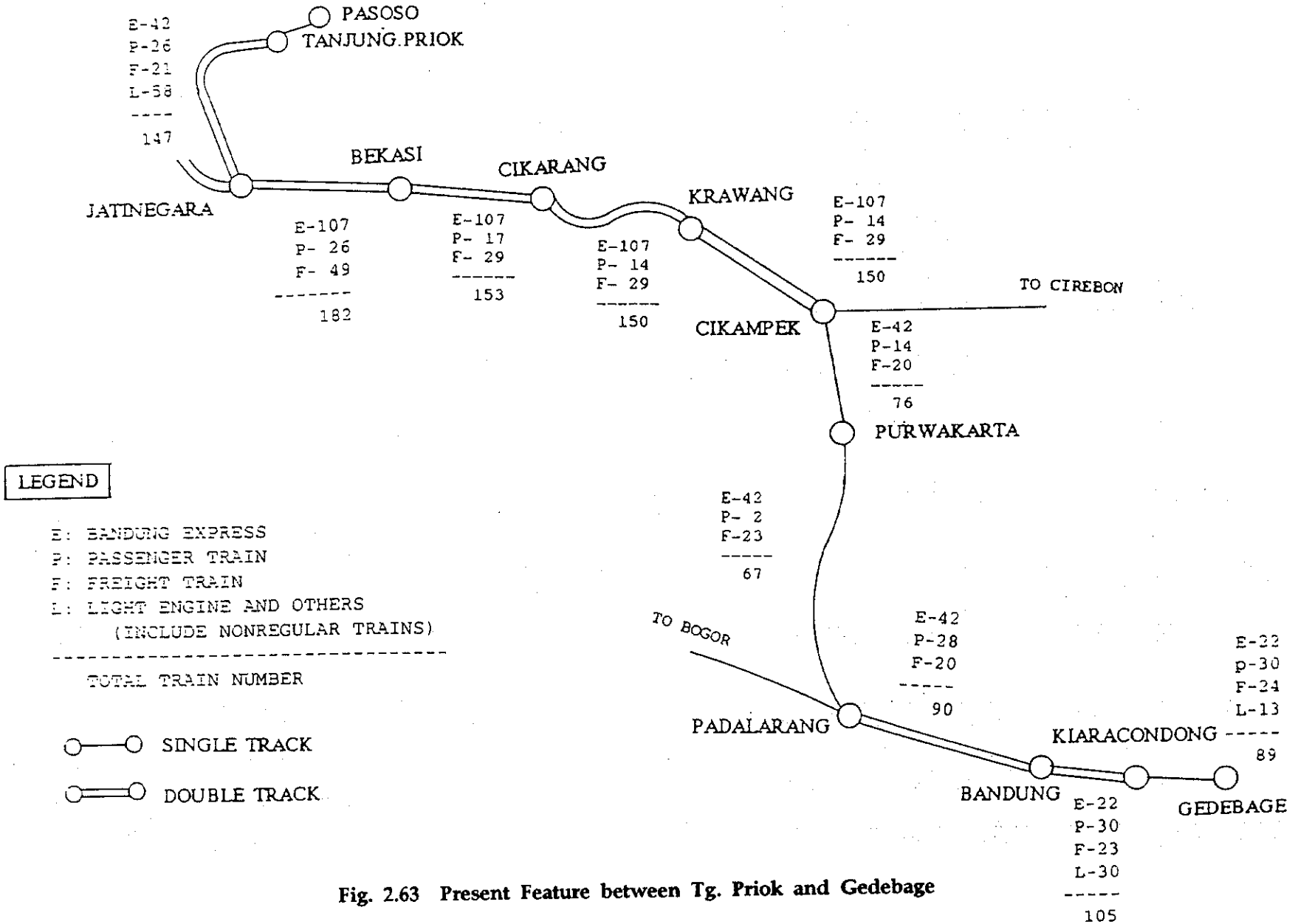


Fig. 2.63 Present Feature between Tg. Priok and Gedebage

2.7.4 Solojebres Dry Port and connecting railway

(1) Activity

a. State along railway

263. Central Java, where consists of Central Java State and Yogyakarta Special District, has area of 37,400 km^2 and population of 31.40 million, accounting for 2% and 18% of the whole country, respectively. It occupies the smallest area among the three regions of Java Island, western, eastern, and central Java. Cities such as Semarang located near Tanjung Emas Port have some industries. However, the industry in this region consists mostly of light industry such as textile industry comparing with western Java. Agriculture such as fruit cultivation along mountains has larger importance in the whole industrial structure.

264. The state capital, Semarang, is the center of this region and has population of 1.2 million. Tanjung Emas Port is located in front of Semarang. The Port construction started during the first half of the 1980. Under the 2nd phase development plan, a container terminal was constructed with the target completion year of 1996. An industrial complex was constructed in the suburbs in the east of the port.

265. Surakarta where Solojebres Dry Port is located has population of 520 thousand and is known as court culture and batik. The main industry is light industry such as batik textile, furniture, and leather goods. Although Surakarta has a tendency of decreasing population, the area around the city keeps developing under city development and industrial complex plans.

b. Transport goods

266. The main export cargo carried by the railway is textile, which accounts for about 60% of the export cargo. Other export cargo includes clothes, batik, furniture, sugar, shoes, tobaccos, melons, and plastic products. The main import cargo is poly - propylene, which accounts for 60 to 100%. Other import cargo includes paper and machines.

c. Freight traffic

267. The volume of container traffic increased rapidly during 1989 and 1991, but slowly since 1992 due to the decreasing import cargo traffic. However, it increased during the first 4 months of 1994. If the current traffic state lasts, the traffic of containers including empty containers is predicted to reach 3,000 TEUs in 1994, increased 1.39 times comparing with 1993. (Note that import containers handled at Palur Station have been included in the volume of traffic since December 1993.)

268. In Solo district, the volume of all containers was about 9,600 TEUs/year in 1993. Containers carried by the railway were 2,152 TEUs/year, and occupied only 22.4 % in share. **Tables 2.41, .42, .43 and .44** show container traffic by railway transportation.

Table 2.41 Volume of Container Traffic (by Year)

(TEU)

Year	Export (Full)	Import (Full)	Containers (Empty)	Total	Ratio (%)
1989	25	0	28	53	-
1990	626	26	650	1,302	2,457
1991	833	279	1,069	2,181	168
1992	872	195	1,055	2,122	97
1993	967	112	1,073	2,152	101
1994	(1,101)	(309)	(1,509)	(3,000)	(139)

( ): Estimated Volume

Table 2.42 Volume of Container Traffic (by Direction)

Transportation Direction	Full Containers	Empty Containers	Total	Monthly Average	Daily Average	Remarks
Smg - Sk	112	965	1,077	89.9	3.0	'93 1-12
Sk - Smg	967	108	1,075	89.6	3.0	
Smg - Sk	130	370	500	125.0	4.2	'94 1-4
Sk - Smg	367	133	500	125.0	4.2	
Smg - Sk	390	1,110	1,500			
Sk - Smg	1,101	399	1,500			

Estimate for 1994 obtained by multiplying above figure by 3.

Table 2.43 Volume of Container Traffic by Size (ft) in 1993 (in number of containers)

Transportation Direction	Full Containers	20 ft	40 ft	Share of 20 ft	Share of 40 ft
Smg - Sk	108	104	4	0.96	0.04
Sk - Smg	817	667	150	0.82	0.18

Table 2.44 Volume of Container Traffic (Daily Maximum in April 1994)

(TEU)

Transportation Direction	Full Containers	20ft	40ft	Empty Containers	Total	Remarks
Smg - Sk	14	(0)	(7)	9	23	4/6 max
Sk - Smg	4	(4)	(0)	0	4	
Smg - Sk	0	(0)	(0)	0	0	4/28 max
Sk - Smg	11	(9)	(1)	2	13	

d. Railway transportation and road transportation

269. Since only one train is operated daily, it takes three days to carry goods from a factory to a ship by railway transportation. However, it takes only one day by road transportation. For this reason, customers use a truck in spite of relatively high cost when they need quick transportation. They use the railway when they have enough time.

270. Since 75,000 Rupiah can be saved in total by selecting railway transportation, the railway can secure some demand. The transportation costs are estimated below.

* Railway transportation (3 days):
  Empty container delivery (1 day)
  + Loading, full container transportation (1 day)
  + Transportation to port (1 day)
* Road transportation (1 day):
  Empty container delivery + Loading + Transportation to port

271. Comparison of transportation costs

Railway transportation	272,000 Rp	Difference
Road transportation	346,750 Rp	74,750 Rp
(Breakdown of railway transportation cost)		
* Factory to station		50,000 Rp
* Delivery of empty container		35,000 Rp
* Shipment of full container		55,000 Rp
* Other cost up to shipment		132,000 Rp
Total		272,000 Rp

(2) Railway facilities

a. Route

272. The main line with approximately 112 km long, connecting between Solo and Semarang is used as the container route. This route is formed with the Northern Trunk Line that connects between Jakarta and Surabaya via Semarang, a Northern kernel city of central Java, together with the Southern Trunk Line that connects between Jakarta and Surabaya via Solo, a southern kernel city. **Fig. 2.64** and **Fig. 2.65** show the conceptual

diagram of the route between Solo and Semarang and the track capacity, respectively.

b. Container train route

Smg ------ Bbg ------ Gbn ------ Gd ------ Slo
|-Northern Trunk Line -|

273. Containers are carried from Solojebres, which is the container base, to Solo Balapan by a forward train. At Solo Balapan, container wagons are relayed by a conventional freight train. A train was operated once every 2 to 3 days until 1993, but has been operated once a day since the beginning of 1994. Since the average daily container traffic is as small as 4 TEUs, container wagons are connected together with other ordinary freight cars and operated via Gambringan. Since this decreases the punctuality and stability of transportation, cargo always arrives 1 to 2 hours behind the schedule. (Below shows a conventional train coupling container cars)

	Smg		Slo	Sk	Pl
Train 3244 :	19:07	---	01:19		
Train 3245 :	22:27	---	16:40	(forward Train)	

c. Semarang Gudang Station

274. As shown in **Fig. 2.66**, Semarang Gudang Station is a cargo station and is installed with a yard and cargo handling facilities. This station handles mainly ordinary cargo, but containers as well.
Since this station has 10 arrival and departure tracks and storage tracks, it has enough capacity for considerable traffic. However, the station is not sufficiently installed for container handling because the passage and cargo loading/unloading platform in the station yard are not paved.

275. The signalling facilities of this station consist of relay interlocking devices and color light signals to realize quick, easy, and safe operation handling.
A container train makes one round trip a day between Solo and Semarang Gudang. It is coupled with a conventional freight train because the container traffic is small.

276. The railway facilities to the container wharf of Tanjung Emas Port were completed in March 1993, but they are not used at present. For this reason, containers carried from Solo are unloaded at Semarang Gudang Station and carried to the container wharf by trailer, if the railway service to the container wharf starts, it will bring about various merits. For example, the shunting frequency in the yard can be decreased, container loading / unloading time can be shortened, and the transportation cost can be reduced. Therefore, such a railway service should be started in an early stage.

d. Container terminal at Tanjung Emas Port

277. The container terminal has two storage tracks and one engine run-round track. A shunting route is formed by operating switches installed on site. **Fig. 2.67** and **Fig. 2.68** show the track layout diagram and the line network diagram at the container terminal of Tanjung Emas Port, respectively.
The facilities at the container terminal are summarized below.

* Container platform :1 * 130 m, width 14 m
* Loading/unloading track :1 * 350 m
* Storage track :1 * 320 m
* Engine run-round track :1 * 300 m

278. Some problems are found there, the effective track length is 320 m and possible to retain 23 wagons with PPCW type. The platform length is about 130 m and the width is only 14 m, so that a mobile crane cannot work at the narrow platform and it uses the passage lead to the marshalling yard as a workshop. There are electric wires along the present platform, as the case may be, a working crane can touch them. The platform has some level difference due to roadbed subsidence.

e. Connection between Semarang Gudang Station and container terminal

279. The route from Semarang Gudang Station to the container terminal is about 1.7 km long. This route has three level crossings with heavy traffic, and the door at the entrance to Emas Port, which is a bonded area. It must be opened or closed for every shunting operation.
During a test run, train crew had to stop the train temporarily before the level crossings and the door every time and lead the train. This method took about 15 minutes from Semarang Gudang Station to the container terminal.

f. Solojebres Dry Port

280. Solojebres Station is an ordinary station that handles passengers as well. A part of the station yard is used as a dry port.
Fig. 2.70 shows the track layout diagram of Solojebres Station. The main tracks consist of four arrival and departure tracks. It has 3 storage tracks for the dry port. A train route is formed by operating switches at centralized signal cabin of the Solojebres station.
Fig. 2.69 shows the track layout sketch of Solojebres Dry Port.

Its facilities are summarized below.

*	Container platform	: 1 * 220 m
*	Loading/unloading track	: 1 * 220 m (max. 320 m)
*	Storage track	: 1 * 240 m
		1 * 190 m
*	Warehouse	: 2 buildings
	(for light cargo and heavy cargo)	

281. A train composed of 12 wagons can be retained because all of the three storage tracks have effective track length over 190 m. Two of them are long enough for a train composed of 16 wagons.

(3) Dry port management and operation

282. Solojebres Dry Port belongs to Solojebres Station. Although a chief is appointed for the dry port, it has no specified organization. The dry port has not the customs clearance, import/export inspection, and bank functions, but all the import and export formalities can be completed in Surakarta (Solo).

(4) Container handling and operation

283. A container train makes one round trip a day between Semarang and Solo. The container wagons are coupled with a conventional freight train because the container traffic is small. Container handling operations at various locations are explained below.

a. Semarang Gudang Station

284. The railway facilities to the container wharf of Tanjung Emas Port were completed in March 1993, but they are not used at present. For this reason, containers are loaded and unloaded at Semarang Gudang Station and carried to the container wharf by a trailer.

b. Container terminal at Tanjung Emas Port

285. On the day of the field investigation, a train for the container terminal at Tanjung Emas Port was going to test container transportation and loading/unloading operation. The container cars that arrived at the container terminal were pushed into the limited loading / unloading yard sequentially by a shunting locomotive. Containers were transferred to trailers parking near a mobile crane. One 40 ft container and three 20 ft containers were unloaded from 4 container cars (2 PPCWs and 2 PCWs) and loaded to three trailers in about 10 minutes. The speed of operation was 2.5 minutes per container, which is the standard speed.

c. Solojebres Dry Port

286. Solojebres Dry Port has only one 3.5 ton forklift and one 2 ton forklift. Therefore, full containers cannot be handled at this dry port. Since they can be carried only as bulk cargo between this dry port and factories, most of the import and export cargo is carried not by railway, but directly to Tanjung Emas Port by trailers.
Bulky cargo from factories is carried to the dry port by truck and stored in the light cargo or heavy cargo warehouses according to the unit weight.

287. Since heavy handling machines such as a toplifter are not used, containers are left on container cars during cargo stuffing and unstuffing. Light cargo is handled by manual and heavy cargo is handled by forklifts. To load and unload heavy cargo, a steel plate is spanned between the lengthwise platform in front of a warehouse and a container car, instead of a bridge. Since a forklift is used for cargo handling, a container car must be shunted after handling each container. Since Solojebres has no shunting locomotive, a container car must be shunted by binding it to the forklift with ropes and stored in the shunting sidings. Therefore, loading and unloading takes a long time.

(5) Future plan

288. Transportation system in Surakarta (Solo)

The following related railway plans are found in the city development plan for 1993 - 2013:

* Utilization of existing local lines for commuters and students
* Operation of sightseeing trains
* Promotion of elevated structures

Since relocating Solojebres Dry Port involves many problems, the current location will be kept as it is until 2013 according to the city plan.

(6) Existing Issues

289. Small container traffic volume is the most serious problem on the railway transportation between Solo and Semarang.

The railway transportation accounts for 22.4% of the container traffic in the entire Solo district. Although the demand for container transportation should be increased in accordance with economic growth, efforts should be made to shift containers from road transportation to railway transportation.

290. Textile and related factories are operating along the roads leading to Surabaya and Semarang. The development of marine container business depends on the direction of governmental regulation and the population trend. The population is decreasing slightly, but the area around Surakarta is prospering as an industrial zone. It is said that an expressway between Semarang and Solo will be constructed in the near future. When it is completed, it will suppress railway transportation.

Therefore, the transportation volume cannot be expected to increase rapidly under the above stated conditions. However, the normal transportation system that the team expects, will be realized at some time in future as long as containers are increasing. The acceleration to shift them from road to railway transportation will be possible by providing low service costs and extending effective marketing activities.

291. The team tries some investigation on the followings.

a. Dry port and related facilities

i) Semarang Gudang Station

292. This station has not only 10 arrival and departure tracks but storage tracks. When the railway service to the container wharf starts in near future, this station will become the relay station for container trains. In such a case, both the container car detention period and shunting time will be shortened. For this reason, this station has no facility problem for container train operation.

ii) Container terminal at Tanjung Emas Port

293. Even if the freight traffic between Solo and Semarang Gudang may increase and request the train with 16 cars for 40 ft container, the current facilities and operation methods are enough for retaining two trains. The total storage capacity will be estimated as 64 TEUs. This volume deserves 2.7 times as large as full container volume 700 TEUs/month (export 400 TEUs, import 300 TEUs) realized at the entire Solo district in 1993.

294. If loading/unloading work is assumed as 2.5 minutes per container, loading/unloading work for one train can be completed in 80 minutes. Therefore, the current facilities have sufficient capacity.
However, containers can be loaded and unloaded only on the passage to the wharf because the 14 m wide platform is too narrow for machine work. If the freight traffic increases, container cars must be shunted (moved) more frequently and enormous time must be spent for loading and unloading work because the 130 m long platform cannot be used effectively. The unloading/loading must be enlarged for assuring efficient cargo handling. Sufficient land space is available for extending the length and width of the platform.

iii) Solojebres Dry Port

295. The dry port has one loading/unloading track and two storage tracks. The storage capacity at this dry port is 88 TEUs per day, which means 2,640 TEUs/month. This is 3.3 times as large as all the container traffic in the entire Solo district 800 TEUs/month in 1993. The facilities at the dry port are designed for handling a great quantity of containers carried by through container trains. The platform for containers is paved and large enough for operating cargo handling machines such as a toplifter.

For this reason, this dry port can handle a growing volume of containers by installing additional cargo handling machines.

296. The problem is that facilities designed for mass transportation expected in future have to be used for handling a small number of containers at present. When the investment cost for a heavy cargo handling machine such as a toplifter is compared with the cost of manual work, such an expansive machine cannot keep the profitability, because of the lower cost by man power used for direct stuffing and unstuffing containers on the wagon. For this reason, containers are inevitable to be handled mainly by man power.

297. On April 1, 1994, cargo was loaded to 10 containers (nine 20 ft containers and one 40 ft container) including light cargo.
Even if it is all the heavy cargo, the maximum handling number of containers a day will be estimated as 14 containers at the working time as well as Gedebage case from 8:00 until 22:00 on the present handling system. In case the container volume increases and exceeds the above capacity in future, the existing track layout and small cargo handling machines are not bearable to the burden.

298. It is necessary to promote the handling ability by means of the introduction of heavy handling machine, in order to introduce normal operation system that means the eliminated shunting of container wagons and free loading at the platform.
However, the governmental regulation for container trailer transportation in the city will offer the new problem for shipping full containers by the railway transportation caused by the access road.

b. Related railway

i) Railway transportation

299. The section between Gambringan and Semarang Gudang on the Northern Trunk Line is severe for track capacity conditions. At present, 34 trains are operated on the facilities with a capacity for 39 trains. The container wagons are coupled with regular freight trains, and operated via Gambringan at present.

300. If a specialized container train is settled, it can take a direct route from Semarang

to Brumbung instead of the route via Gambringan. Therefore, the current track capacity can sufficiently meet the demand. The route is relatively flat as represented by the maximum track grade of 10/1000. The effective track length is enough. In other words, this section presents no problem related to the train length.

ii) Rolling stock

301. BB200 locomotives are used, but their hauling capacity is 300 ton. At present container cars are connected with conventional freight cars. When the container traffic grows enough to request a specialized direct container train, a new hauling locomotive must be introduced.
Whenever container volume increases more than about 20 TEUs, the container train and the purchase of tractive locomotive are eventually needed. The purchase of additional container wagons is also needed, in accordance with the demand increase.

iii) Signalling and communication facilities

302. The signalling facilities of Semarang Gudang Station and Solo Balapan Station consist of relay interlocking devices and color light signals. However, mechanical interlocking devices and semaphore signals are used at the other stations, the tokenless block system is also used between stations.

303. In order to secure punctuality and safety for high density and high speed operation in future, various improvement must be made. For example, interlocking devices should be changed to electronic interlocking devices, the automatic block system must be introduced, and a communication line network must be constructed. However, the current facilities have sufficient capacity for the increased number of trains predicted for 2010.

iv) Operation and management

304. A conventional train composed of container cars and ordinary freight cars always arrives 1 to 2 hours behind the schedule. This is not so serious problem for container transportation. However, it is necessary to recover the punctuality, which is an important and basic mission of transportation business.